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HUMAN ECOLOGY

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ELIMINATION THERAPY IN COMPLEX TREATMENT OF ALLERGIC RHINITIS

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Abstract: Elimination therapy can provide more effective treatment of allergic airway diseases.

Key words: elimination therapy, allergic rhinitis, pollen allergy.

One of the most important stages of allergic rhinitis therapy is isolation of mucous membrane from pollen invasion. Thus, preventive measures such as the elimination of pollen grains from mucous membrane of upper airway are important [1].

The goal of this study is to handle and analyze the results of nasal cavity elimination therapy and to evaluate its effectiveness.

36 patients with allergic rhinitis took part in the investigation. According to common diagnostic standards, the examination included anamnesis data, questioning, skin test, detection of specific IgE antibodies, cytologic analysis of nasal secretion.

Criteria for inclusion: 1. Confirmed existence of tree pollen allergy; 2. 18-60 years old; 3. Both gender patients; 4.Patients that have finished a 2 allergen-specific immunotherapy; 5. Existence of allergic rhinitis; 6. Signed informed consent.

Criteria for exclusion: 1.Severe allergic rhinitis; 2.Peracute inflammations; 3.Mental illnesses; 4.Patient non-compliance; 5.Usage of topical and systemic antiallergenic specimens.

Patients were examined twice: at the end of April before the birch blooming period and in the middle of May. Before the examination patients had not received medical therapy. All patients filled up a registration card. Birch pollen was chosen as one of the main pollen allergens in moderate climate in Russia [2]. All patients have been divided into three groups. The first group included patients with decreased expression of the symptoms by the usage of iso-osmolar salt-water solution. The second group included patients with recrudescence. The third group included patients, whose symptom expression didn’t change (Fig. 1). A majority of patients has shown recovery of several symptoms: eye inflammation, lacrimation, nasal irritation, post-nasal drip, olfaction abnormality.

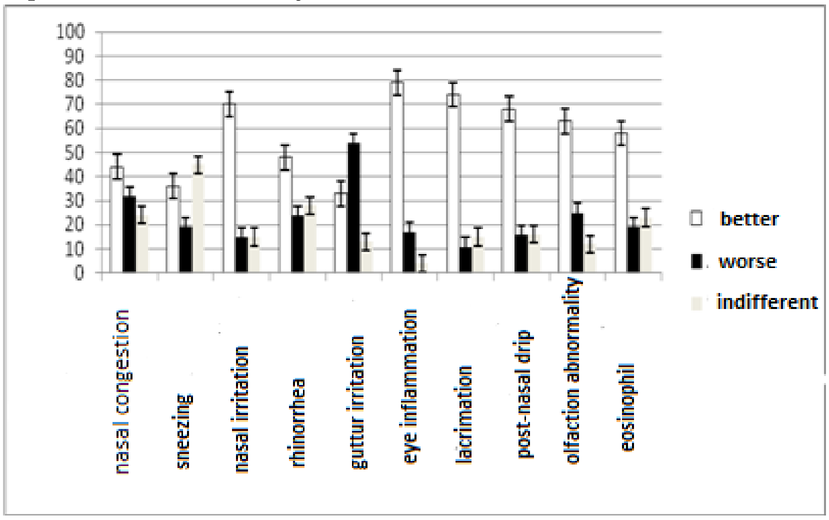

Figure 1. Elimination therapy effectiveness among patients with allergic rhinitis (%)

Elimination therapy is an essential part of allergic rhinitis therapy. The elimination of contact between the mucous membrane and pollen allergens can be achieved using three methods.

First is to move to an area without the allergen-source plant.

Second is staying indoors with regular air cleaning during the blooming period.

4

Third is lavement of the nasal cavity with iso-osmolar water solution. As it is seen, the third method is more acceptable and available to everybody. It does not have any negative effects, and shows some therapeutic effect in patients with allergic rhinitis.

To sum up, the usage of irrigation therapy at early stages of allergic inflammation development can help to decrease impact on the mucous membrane; therefore the inclusion of this therapy as a standard care procedure of allergic rhinitis is justified.

References

[1] Asher I., Anderson H., Beashey R. et al. International Servey of Asthma and Allergies in Childhood (ISAAC): rationale and methods. // EurRespir J. – 1995. – Vol.8. – P.483-491.
[2] http://kestine.ru/monitoring.aspx

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AN OVERVIEW OF THE IMPACT OF PSYCHOACTIVE SUBSTANCES ON THE HEALTH AND ADAPTATION OF STUDENTS

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Abstract The article presents a brief review on the analysis of the impact of psychoactive substances on the health and adaptation of students. It shows the mechanism of drugs affecting human body.

Key words: students, substance abuse, health, adaptation.

Today's social situation is characterized by a high degree of emotional tension, which influences the adaptive processes of students [1-4]. Youth has to maintain the normal state of the nervous system in various ways. In general, psychoactive substances in the right dosage have a positive effect in the treatment of certain human ailments. But using alcohol, tobacco and drugs time after time, results in chemical dependency, damages of physical and mental health, deviant [5] and

5

anti-social behavior [6], degradation of the personality and unmotivated aggression [7; 8].

Studying is a process demanding moral and mental strengh. But some students want to achieve a quick result using barbiturates, other tranquilizers and alcohol. Indeed they have a calming and sedative, hypnotic impact, but it is a risk of strong physiological dependence. Substance abuse leads to a loss of control evidenced by slurred speech, blurred vision, loss of control over muscles, it also affects breathing. Overdose can cause death due to severe oppression of the respiratory center of the brain [9].

Opiates (derivatives of the poppy) are psychoactive substances, which also have hypnotic and analgesic effect but depress the respiration centers of the brain, obfuscate intellectual processes. Nausea, vomiting, convulsions resulting from respiratory arrest come along with strong psychological dependence on opiates. Some young nervous students became addicted in two weeks [9]. Psychological dependence is associated with pleasant sensations that encourage people to repeat the experience of their use. Physiological dependence is formed when the body gets used to the regular intake of exogenous metabolizing substances in the body and reduces their endogenous production. [10].

Thus, it is possible to draw the following conclusions. The use of psychoactive substances in the wrong dosage significantly affects the functional status and adaptation of the person, particularly the young one.

References

1. Glebov V.V. Optimizacija rezhima truda i otdyha v psihofiziologicheskoj adaptacii uchashhihsja shkol // Izvestija SGU. Filosofija. Psihologi. Pedagogika. 2014.№1. – S. 87-90.
2. Anikina E.V., Glebov V.V. Psihofiziologicheskie pokazateli adaptacii afrikanskih studentov v uslovijah Moskvy // Vestnik psihofiziologii №1, 2015. – S.90-93.
3. Glebov V.V. Uroven' pishhevogo i psihofiziologicheskogo sostojanija studentov v uslovijah krupnogo goroda. // Vestnik RUDN, serija «Jekologija i bezopasnost' zhiznedejatel'nosti» 2012, № 2. – s.45-51.
4. Kuz'mina Ja.V., Glebov V.V. Dinamika adaptacii inogorodnih

6

studentov k uslovijam jekologii stolichnogo megapolisa //Mir nauki, kul'tury, obrazovanija. 2010. № 6-2. S. 305-307.
5. Sheregi F.Je., Aref'ev A.L. i soavt. Deviacii podrostkov i molodezhi: alkogolizacija,narkotizacija, prostitucija.M.2001.48 s.
6. Koshkina E.A., Kirzhanova V.V., Gurtovenko V.M. Ocenka rasprostranennosti upotreblenija psihoaktivnyh veshhestv v razlichnyh regionah Rossijskoj Federacii: Analiticheskij obzor. M., 2002. 52 s.
7. Rodionova O.M., Glebov V.V. Nemotivirovannaja agressija v razlichnyh social'nyh gruppah - ugroza social'noj stabil'nosti i bezopasnosti sovremennogo megapolisa // Vestnik RUDN «Jekologija i bezopasnost' zhiznedejatel'nosti» 2007. № 1. – S. 42-48
8. Laver B.I., Glebov V.V. Sostojanie mediko-psihologicheskoj i social'noj adaptacii cheloveka v uslovijah krupnogo goroda//Vestnik RUDN, serija «Jekologija i bezopasnost' zhiznedejatel'nosti» № 5, 2012-S.34-36.
9. Jolkin, V.F., Glebov V.V. Social'no-psihologicheskoe nasilie v gruppah s priznakami destruktivnogo kul'ta: kommunikativnye i fiziologicheskie aspekty // Vestnik Rossijskogo universiteta druzhby narodov.– Ser. «Jekologija i bezopasnost' zhiznedejatel'nosti». – 2013. – № 3, S.23-28
10.Glebov V.V., Arakelov G.G. Level of Schoolboys' Psychophysiological Adaptation Process in Metropolis Megapolis // Procedia - Social and Behavioral Sciences Volume 146, 25 August 2014, P. 226–232

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DIE VERÄNDERUNG DER GRUNDLEGENDEN FUNKTIONEN DES MENSCHLICHEN ORGANISMUS WÄHREND DES WELTRAUMFLUGS

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Annotation: Das Hauptergebnis der Studie des Weltraums (aus medizinischer Sicht) war nicht nur Beweis für den langen Aufenthalt in der bemannten Raumfahrt, sondern auch seine diversifizierten Aktivitäten dort. Deshalb kann man den Weltraum als den

7

menschlichen Lebensraum in Zukunft und den Weltraumflug als die wirksamste direkte Untersuchungsmöglichkeit des menschlichen Organismus unter diesen Bedingungen betrachten.

Stichwörter: Die Raummedizin, der Weltraum, die Schwerelosigkeit,der Mensch, der Menschenorganismus, der Raumflug

Abstract: The main result of studying outer space (from medical point of view) is the proof of possibility of long-term human existence in conditions of space flight, and one's versatile activities there. It gives an opportunity to review space area as a people's habitat in future, with a space flight being an efficient and immediate way of studying human organism reactions in these conditions.

Key words: Astromedicine, space, weightlessness, human, human organism, space flight

Der Symptomenkomplex, der der Luftkrankheit ähnlich ist (die Appetitsenkung, der Schwindel, die Speichelabsonderungsverstärkung, die Übelkeit, die Erbrechen, die Illusionen der Raumlage), stört etwa jeden dritten Astronauten. Dieser Symptomenkomplex tritt zutage in den ersten 3-6 Tagen des Weltraumflugs. Heute erklärt sich die Entwicklung des Symptomenkomplexs der Luftkrankheit durch die Veränderung des Funktionszustandes von Vestibularapparat des Austronauten und durch die Störung der Wechselwirkung seines sensorischen Systemens und auch durch die Besonderheit der Hämodynamik unter Schwerelosigkeit. [1]

Dieser Symptomenkomplex tritt zutage als das Gefühl eines Andranges und der Schwere im Kopf, die nasale Obstruktion, die geglättete Falten und das geschwollene Gesicht, die erhöhte Blutfülle und der Venenblutdruck in der Hals und Blutfüllungsindikatoren im Kopf. Der Unterschenkelumfang wird kleiner. All das wird mit dem Gewichtmangel des Blutes in der Schwerelosigkeit zusammengebunden, der zur Bluthäufung in den Untergliedmaßen und zur Erhöhung des Blutzuflußes in den Oberkörperteil führt.

Die Veränderungen der motorischen Funktion im Weltraunflug werden durch die Herstellung der neuen Bewegungsstereotypie im Laufe der ersten drei Tage des Aufenthaltes in der Schwerelosigkeit charakterisiert. In einigen Tagen des Fluges gewinnen aber die

Bewegungen normalerweise ihre Genauigkeit, die nötigen Bemühungen für ihre Realisierung vermindern sich, Arbeitsvorgänge erhöhen sich. Nach der Rückkehr zur Erde erhöht sich subjektiv das Gewicht der Elemente und des eigenen Körpers, ändert sich die Regelung der vertikalen Körperhaltung. Nach der Raumflugsforschung der motorischen Sphäre wird die Umfangsreduzierung der Untergliedmaßen, das Muskelmasseverlust und die Subatrophy Antischwerkraft-Muskeln, vor allem die langen und breiten Rückenmuskulatur zutage getreten.[2] Die Veränderung der Funktionen des Herz-Kreislaufsystem während dauernden Weltraumflugs treten zutage als die geringe Senkung einiger Indexe des arterieller Blutdruck, die Erhöhung des Venendrucsk in den Halsvenen und die Senkung des Venendrucks im Bereich des Unterschenkels. Nach dem Raumflug gewinnt das Blut sein Gewicht zurück und richtet sich auf die Untergliedmaßen. Das Blut von Astronauten kann in den Untergliedmaßen mehr sich anhäufen, als gewöhnlich. Infolge führt das zum Blutabfluss von dem Gehirn.

Die Erhöhung der Herzfrequenz ist das Schutzmaß des menschlichen Organismus. Dieses Schutzmaß schützt die genügende Gehirnblutversorgung während des Weltraumflugs. Wenn diese Schutzmaßnahme nicht ausreichend ist, kann der arterielle Blutdruck heftig senken. Deshalb hat das Gehirn den Blutmangel, und also den Sauerstoffmangel. Die Veränderungen des Wasser-Mineralhaushalts und der Funktionen der Niere tritt zutage nach dem Raumflug als die Gewichtsreduktion, die Reduzierung des Plasmavolumens und der Gesamtgehalt des tauschenden Kaliums im Organismus, und auch als die Wasserretention und Salzretention. Gleich nach dem Raumflug reduziert die Menge der hinausführenden Flüssigkeit der Nieren und steigt die Menge des hinausführenden Kalzium-Ions, des Magnesium-Ions und des Kalium-Ions.

Biochemische Untersuchungen haben gezeigt, dass unter dem Einfluss der Langzeitraumflug ein Umbau der Stoffwechsel geschieht. Man kann der ausgeprägten Veränderung des Stoffwechsels nicht konstatieren.[3]. Die Reduzierung der Menge der Erythrozyten schreitet im Laufe von einigen Zeit nach der Landung und wiederherstellt in etwa 1-1,5 Monate nach dem Weltraumflug fort. Die Reduzierung des Gehalts der Erythrozyten wird auf folgende Weise erklärt. Die Neuverteilung des Blutes, die in der Schwerelosigkeit entsteht, führt

9

zum reflektorischen Flüssigkeitsverlust und zur Reduzierung des Plasmavolumens des Blutes. Infolge dessen nehmen sie die kompensatorischen Mechanismen teil. Diese Mechanismen streben nach der Erhaltung der konstanten des zirkulierenden Blutes. Deshalb führt die Reduzierung des Plasmavolumens zur adäquaten Reduzierung der Masse der Erythrozyten. Die schnelle Regeneration der Masse der Erythrozyten nach der Landung ist unmöglich, weil die Bildung der Erythrozyten langsam ist. Alle Veränderungen während des Raumflugs sind funktionell (reversibel). Sie verschwinden zu verschiedener Zeit spurlos nach dem Weltraumflug. Es sei jedoch betont, dass die Reaktionsfähigkeiten nicht gut erlernt sind. Die Medizin noch nicht im Sande, mit allen Nebenwirkungen zu kämpfen. Die Arbeit in dieser Hinsicht gibt es noch eine Menge.

Literaturverzeichnis

1. [1] Nevesomost'.Mediko-biologicheskie issledovaniya / Redkol. V. P. Parin, O. G. Gazenko, E. M. YUganov i dr. – M.: Medicina, 1974.
2. [2] N.N. Gurovskij,A.D. Egorov. Zitationen von Internet-Quellen, Online im Internet/URL: http://www.astronaut.ru/bookcase/books/20gagarin/text/04.htm . Zugriffsdatum: 29.10.15.
3. [3] Chelovek v dlitel'nom kosmicheskom polete / Per s angl. P. V. Simonova i YU. P. Simonov; Pod red. O. G. Gazenko. – M.: Mir, 1974.

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LOS CAMPOS ELECTROMAGNÉTICOS CREADOS POR LAS BASES DE LAS REDES MÓVILES

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Resumen: Todas las personas que viven en las áreas cubiertas por las redes celulares, se encuentra bajo el efecto del campo electromagnético de estaciones base celulares. En Rusia hay las Normas y reglamentos sanitarios y Directrices existentes, pero no contienen criterios explícitos para evaluar la intensidad de los CEM y el método exacto de medición de campos electromagnéticos. Esto plantea una amenaza para la salud pública.

Palabras clave: campo electromagnético, red celular.

Abstract: All people living in the areas covered by cellular networks are under the effect of the electromagnetic field of cellular base stations. In Russia there are sanitary rules and regulations and guidelines, but they do not contain explicit criteria to assess the intensity of EMF and precise method of measuring EMF. This poses a threat to public health.

Key words: electromagnetic field, cellular communication.

En la etapa actual del desarrollo de la comunicación celular todos los usuarios de celulares están bajo los efectos periódicas de los campos electromagnéticos (CEM) generados por los teléfonos móviles y las estaciones base de la comunicación celular, y todas las personas que viven en las áreas cubiertas por las redes celulares, se encuentra bajo el efecto del campo electromagnético de la base estaciones de comunicación celular. Por lo tanto, los teléfonos celulares y estaciones base celulares, que son fuentes de los CEM, sea el objeto de la Vigilancia de la Salud. Hoy en día el estándar de comunicación más común es un estándar GSM. De acuerdo con las recomendaciones del transmisor estándar CEPT GSM paneuropea tierras celular digital móvil incluye el trabajo en dos bandas de frecuencia: - la banda de frecuencias de 890-915 MHz - para enviar mensajes a la estación móvil a la base; - Ancho de banda de 935- 960 MHz - para enviar mensajes desde la estación base a la móvil [1].

En Rusia hay las actuales Normas y reglamentos sanitarios 1383-03 "Requisitos de higiene para la colocación y explotación de las instalaciones de transmisión de radio," que establecen los parámetros y unidades normalizadas, en particular, dado que la evaluación de la exposición a los CEM sobre la población se lleva a cabo: en el rango de frecuencias de 300 MHz - 300 GHz - los valores medios de la densidad de flujo de potencia (PFD) mW/cm^2. Además, los reglamentos y las normas sanitarias establecen los niveles máximos permisibles de la gama de frecuencias de 30 kHz - 300 GHz para la población y los niveles máximos permisibles de electromagnética rango de frecuencia de campo de 30 kHz - 300 GHz en los lugares de trabajo [2]. Además de las reglas y normas sanitarias existir Directrices - MUK 4.3.046-96 "Determinación del campo electromagnético en la ubicación de los medios de transmisión y comodidades a los de radio móvil bandas VHF y UHF de tierras" que se hacen para ayudar a los ingenieros a los órganos e instituciones del servicio sanitario-epidemiológica y del organizaciónas de los medios de comunicación con el fin de proporcionar vigilancia de la salud de las fuentes de radiación bandas VHF y UHF.

Los Directrices utilizados para determinar los límites de las zonas de protección sanitarias, para predecir los niveles de los CEM con la ubicación de las estaciones de base y determinar los niveles de los campos electromagnéticos creados directamente por las estaciones móviles y que afectan a los usuarios de teléfonos móviles. Pero en los Directrices sanitarias no se describen son típicas de los teléfonos celulares en términos de mediciones, también describe un método para eliminar el teléfono transmisor a la máxima potencia y no hay ninguna unión de datos medidos a las regulaciones existentes. [3] Directrices MUK 4.3.1677-03 "Determinación del campo electromagnético generado por irradiando medios técnicos de la televisión, la radiodifusión FM y estaciones base en las comunicaciones de radio móvil terrestre," se aplica a la gama de frecuencia de radio que es 27-2400 MHz. Este documento no tiene en cuenta las ondas de radio en alta gama de frecuencia. [4] Por lo tanto, hoy en día existe el problema de la falta de un método universal de la medición de la EMI generada por el teléfono móvil.

Referencias

1. Popov V.I. *Osnovy sotovoi svyazi standarta GSM* [Fundamentos de la comunicación celular GSM]. Moscú, Eko-trendz, 2005. 296 p.
2. Sanitarno-epidemiologicheskie pravila i normativy SanPiN 2.1.8/2.2.4.1383-03 *"Gigienicheskie trebovaniya k razmeshcheniyu i ekspluatatsii peredayushchikh radiotekhnicheskikh ob"ektov"* [Requisitos de higiene para la colocación y explotación de las instalaciones de transmisión de radio]. Moscú, Federal'nyi tsentr Gossanepidnadzora Minzdrava Rossii, 2003.
3. Metodicheskie ukazaniya MUK 4.3.046-96 *«Opredelenie urovnei elektromagnitnogo polya v mestakh razmeshcheniya peredayushchikh sredstv i ob"ektov sukhoputnoi podvizhnoi radiosvyazi OVCh i UVCh*

12

diapazonov» [Determinación del campo electromagnético en la ubicación de los medios de transmisión y las instalaciones a la radio VHF móvil terrestre y las bandas de UHF]. Moscú, Goskomsanepidnadzor Rossii, 1996.
4. Metodicheskie ukazaniya MUK 4.3.1677-03 *«Opredelenie urovnei elektromagnitnogo polya, sozdavaemogo izluchayushchimi tekhnicheskimi sredstvami televideniya, ChM radioveshchaniya i bazovykh stantsii sukhoputnoi podvizhnoi radiosvyazi»* [Determinación del campo electromagnético generado mediante la radiación de medios técnicos de la televisión, la radiodifusión de FM y las estaciones de base en la radio móvil terrestre]. Moscú, Federal'nyi tsentr gossanepidnadzora Minzdrava RF, 2003.

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PSYCHOFUNCTIONAL STATE OF NON-RESIDENT FIRST-YEAR UNIVERSITY STUDENTS IN A MEGALOPOLIS

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Abstract: An assessment of the environmental impact on the psycho-functional state and the level of adaptation possibilities of non-resident students at different stages of learning was carried out with 230 first-year students at the beginning of training, in the middle and the end of the first academic year. The results revealed the dynamics of psychological and functional characteristics of the health status of students, which is associated with an active period of adaptation in the first year of study at University.

Key words: non-resident students, psych functional state, University, environment, regions, health, and adaptation.

The problem of adaptation of students to training conditions in higher education is acute [1-3]. It is connected primarily with the fact that there is a sharp change of a habitual way of life that causes the stress [4; 5]. This is especially true for students who arrived for studies from the faraway regions to Moscow [6-8]. A comprehensive assessment of indicators of adaptation of foreign students is to be the most important one in the organization of education, especially at the initial stage of University life of the entrant [9].

Objective and methods of research. A study was conducted on 230 students of the Faculty of Ecology and the Faculty of Humanitarian and Social sciences sciences of the Peoples' Friendship University of Russia and the Faculty of psychology of the Lomonosov Moscow State University) from PFUR and Moscow state University came from different regions of Russia (Central, Volga, North Caucasian and Siberian Federal districts and Moscow region), which became the experimental group. In research took part students of the first courses environmental, agricultural, humanitarian and social and psychological engineering (MSU) departments. Local students (Muscovites) became the control group. Testing was performed using Spielberg-Hanin, the Questionnaire (evaluation anxiety) and M.W. Eysenck's (diagnosis of the level of aggression, frustrations, anxiety and rigidness) and psycho-physiological testing of cardiovascular system by the method of CMEs (variation cardio rhythm) on the HSC (hardware-software complex) "Psychophysiology" (LTd "Medikom", Taganrog). We also surveyed the entire sample of the study.

The results of the study**.** Analysis of questionnaire data revealed that the most frequent adaptation was a nonresident of the complex socio-economic and ecological factors of the environment as well as individually-typological peculiarities of students. So the most frequent in the socio-economic context of adaptation for non-local students were the problems related to lack of funds for the whole of the sample studied (from 41% to 83%), new place to live (hostel), new academic staff, a different lifestyle, a different rhythm of work and rest, the new system of education and training practice.

The impact of environmental factors (traffic noise, air pollution and a violation of rhythm of sleep and wakefulness) were also significant for all nonresident students ($p < 0.01$). It is noted that in the dynamics of the adaptation process to many factors of environment by the end of the school year didn't happen. When examining the indicators of personal and situational anxiety (test Spielberg-Hanin) revealed that more than half of surveyed non-resident students (73,7%) had medium and high levels of personal and situational anxiety.

14

Frequent occurrence among non-resident students (more than 70% of the sample and 41 points) with a high level of situational anxiety were recorded in the Volga Federal district. Then next one was the Siberian Federal district (58.1 percent, 40 points). Then came the suburbs (to 49.4%, 39.3 points), North Caucasian (43,1%,39,1 points) and Central (34,8%,38,8 points). A smaller percentage of occurrences of anxiety showed the first year students from Moscow (by 33.3%, 38.2 points).

Analysis of the results of the Eysenck test to assess the state of frustration of nonresident students revealed that the majority (over 60%) of them had average values. This group included students from districts such as Volga, North Caucasus and the Moscow region (7,3; 7,5; 7,5; points, respectively).

The next was first year University students from the Central and Siberian Federal districts (6.9 and 6.5 points, respectively). Assessment of the level of functional state of organism of students of the 1st course in different districts of Russia has revealed the following picture. The majority of surveyed non-resident students studied sample was characterized by a medium level of tension in the system of vegetative regulation of cardiovascular system (CVS), which is directly related to the adaptation to new environmental conditions, including the educational process. We have observed that the greatest number of nonresident students with a pronounced tension of autonomic regulation of CVS was found among students from Volga, North-Caucasian Federal districts and Moscow region: 49,6%, 47,1%, 42,4%.

The results obtained can be associated with the impact of complex socio-economic, ecological factors of the environment of the capital city, as well as individual psychological features of nonresident students [4]. The analysis of the data showed that the physiological price of adaptation to Moscow for nonresident students from Volga, North Caucasus Federal district and the Moscow region was very high.

It was noted that the majority of nonresident students (69,8%) had medium and high level of CVS, which was expressed in tachycardia (high frequency heart rate over 90 beats/min), increased respiratory rate 19-20 inhale/exhale. Wave heart rate (LF, HF) and integral indicator (II) showed a high level of predominance of the sympathetic division of the autonomic nervous system (ANS).

15

On the other hand, relatively better indicators of adaptive processes were observed in non-resident students from the Central and Siberian Federal districts, where indicators of anxiety (situational) and frustration were lower (6.9 and 6.5 points, respectively).

Indicators of CVS in this sample were mostly non-resident students in the area of norm cardiac (heart rate range 72-79 beats/min) and moderate breathing rate (16-17 inhale/exhale). The heart rate (LF, HF) and integral indicator showed the average level of sympathetic predominance of the autonomic nervous system.

Conclusion**.** As a result of researches it can be noted that the high level of anxiety most of the nonresident students (Volga and North-Caucasian Federal district and Moscow region) increases a frustrated condition of enrolment that affect the functionality of CVS incoming students.

The whole complex presenting reactions of nonresident students is the result of non-adaptive processes caused by interrelation of environmental factors that are associated with relocation, change of routine, tense ecological situation in the capital, the beginning of study at the University and the individual characteristics of nonresident students. The results of the research show that the least favorable pattern during the adaptation process was specific for the first year students of the Volga and North Caucasian Federal districts and Moscow region.

The middle position in adaptive reactions to Moscow was noted in nonresident students from the Siberian Federal district. The best indicators of adaptation were noted in non-resident students from the Central Federal district.

References

1. Glebov V. V. The Level of food and psycho-physiological state of students in the major cities. // Bulletin of PFUR, series "Ecology and life safety" 2012, No. 2 P. 45-51

2. Glebov V. V. The Level of psychophysiological adaptation of students at the initial stage of training in higher school. // Bulletin of PFUR, series "Ecology and life safety" 2013, № 5 –P. 18-22

3. Glebov V.V., Arakelov G.G. Psychophysiological features and the processes of adaptation of first year students of different faculties of the

16

PFUR // Bulletin of PFUR, series "Ecology and life safety" 2014, No. 2 – P. 89-9
4. Glebov V. V. The Level of psychophysiological adaptation of students at the initial stage of training in higher school. // Bulletin of PFUR, series "Ecology and life safety" 2013, № 5 – P. 18-22
5. Glebov V.V., Anikina E.V., Ryazantseva M. A. Different approaches to study the adaptive mechanisms of the person // Journal “World of Science, Culture and Education”. 2010. No. 5. – P. 135-136.
6. Kuzmina Y. V., Glebov V.V. Dynamics of adaptation of foreign students to conditions of ecology of the Moscow megalopolis //Journal of the World of Science, Culture and Education. 2010. No. 6-2.
7. Kuzmina Y.V., Karasev I.A., Glebov V.V. Psychological and physiological indicators of adaptation processes of foreign students to training conditions in the capital city. // Collection of Scientific Materials. XV All-Russian Symposium with international participation "Ecological and physiological problems of adaptation", Moscow: RUDN.,2012, – P. 279-281
8. Kuzmina Y.V., Karasev I.A., Glebov V.V. The level of mental health of nonresident students in the learning process in higher education in the metropolis. //Materials international scientific and practical conference "Children, People and Environment: health, education, and environment". 5-9 June 2012, Barnaul: Dissertation, 2012, P. 141-143
9. Kuzmina Y.V., Karasev I.A., Glebov V.V. Psycho-physical state of the nonresident students in the process of adaptation to the socio-economic and educational conditions of the capital megalopolis. // Nature. Society. Human. Actual problems: materials of the International youth conference. – Voronezh: CPI "Science book", 2012, – P. 74-76.

17

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HUMAN'S MENTAL STATES IN EXTREME CONDITIONS

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Abstract: The article is focused on the essence and the maintenance of psychology of behavior in extreme situations. Examples of group behavior of people in extraordinary conditions are presented. The description of the changed conditions of the person and information and psychological recommendations of behavior of people in extreme conditions are given. The special attention is paid to mental effects of disasters and conditions of mental trauma experienced by person.

Key words: student, psychofunctional state, human's mental states, extreme conditions, health, adaptation.

According to Soviet and Russian physiologist Agadzhanyan, emergency situation is a situation that occurred in the accident, natural event or other disaster, accompanied by deaths, material loss or threat to the environment [1]. The possibility of natural catastrophes increases with the development of civilization, scientific progress and new technologies. Therefore, today more than ever humanity needs protection from a threat that violates human life processes and adaptation processes [2].

The study of human behavior in extreme conditions for many years has been engaged in various fields of scientific disciplines such as medicine, physiology, psychophysiology and psychology. The psychology of extreme situations deals with the study of psychological regularities of human life in emergencies (flying on airplanes and space rockets, swimming under water, work in remote places of the globe (the mine), etc.), as well as improving the intensity of the prediction of mental states in them. [2].

So, what are the features of the mental state in extreme conditions? The person very often begins to experience confusion, panic, as one suddenly sees danger that threats one's life. This condition is interlinked with emotion, fright, which immediately

18

destroys the unity of the whole system of the organism, fails coherence, slows thinking, and can create a thought disorder that does not allow meaningful control over the activities and is accompanied by incorrect movements, flowing type of unconditioned reflex. Such movements are often unnecessary and interfere with work activities; therefore, they lead to completely different opposite result: not defending, but have a negative impact on the person. Therefore, panic is characterized by defects in thinking, impaired control and understanding of things that happened, the transition to unconditional instinctive protective movements that may sometimes be inconsistent with the phenomena that is inherent in modern large towns and cities [3].

The mental states of people in extreme situations are diverse, and therefore their behavior is different. At the initial stage of emergency behavioral impacts of people usually have the vital direction, caused by the instinct of self-preservation, but the feasibility of such reactions varies from panic to reckless actions consciously reasonable. As the case of Ufa catastrophe (1989), it can be shown up that during the first 10-15 minutes after the explosion, people felt no pain (psychogenic anesthesia), without loss of clear consciousness and loss of common sense, so they managed to escape. Concurrently, there was increased efficiency of psychophysiological reserves and physical strength: some victims managed to get wagons with closed exits from the compartment in the literal sense of smashing and destroying the roofs of cars. Immediately after the victims were able to leave the train, they began organizing in small teams (10-15 people), where instinctively choose their leader, who supervised the rescue operations for the remaining victims [3].

Increased mobilization in the initial phase is characterized for the majority of people. But, if it is combined with panic, it can lead to absolutely different consequences, as loss of orientation, changes in the ratio between major and minor actions, the reinforcement of defensive action, deviation action for the salvation and ultimately the death of.

After these shocks many people have pathological changes in the psychic sphere, defined as post-traumatic stress disorder for a long time. Among psychopathological changes after injuries, accidents people most commonly find depression - 56%, psychogenic stupor - 23%, general agitation - 11%, hallucination condition - 5%, the inadequacy, the euphoria - 3%, nightmares in the dream - 90%,

19

irritability, guilt, reluctance. Special psychological treatment of psychologists and psychotherapists is required for the recovery of the human psycho. The study of numerous emergency cases concluded that the victims of accidents and disasters have a significant change in mental state: 98% people felt fear and horror, many victims have experienced headaches, vomiting, nausea, and had feeling faint. The victims had sleep disturbance (nightmares, insomnia), sad depressed mood, irritability [4].

Psychological consequences of disasters experienced by person. When they say that a person afflicts with past disasters, it means that one experienced a traumatic event which caused some specific symptoms. These symptoms are connected with the inner world of the personality and reaction to come to events, which in every case is individual. Dr V. V. Glebov considers that in addition to the severity of the stress factor, individual vulnerability to psychic trauma plays an important role, as evidenced in features of individual personality traits (immaturity, asthenic traits, hypersensitivity, dependence, the tendency to over control, aiming at the suppression of unwanted emotions), the tendency to victimization (tendency to be in the role of victims in similar situations). Significant correlation was established between relationship conflict with parents at the 3rd year of life and subsequent violations of adaptation.

Famous Russian psychiatrist Kekelidze assumes that other important risk factors for trauma include such personal characteristics as the accentuation of character, sociopathic disorder, low intellectual development, as well as the presence of alcohol or drug dependence. If a person is inclined to the exteriorization of stress, one is less susceptible to psychic trauma. Genetic predisposition (presence of a history of psychiatric disorders) can increase the risk of psychological trauma; prior traumatic experience is also affected by it (e.g., in connection with some kind of physical abuse in childhood, accidents in the past or the divorce of parents). The age factor is important: The young and old people have more difficulties overcoming extreme situations. The risk of trauma increases in case~~s~~ of isolation of the person for the period of experiencing trauma, loss of family and inner circle. The timely assistance and the reactions of family members who can encourage some painful manifestations plays a great role. [5-6].

20

Biological and psychological manifestations are typical for acute stress response. They are the most obvious criteria that this event is perceived by the victim as traumatic [7]. And although for the diagnosis of mental injury is not necessarily the presence of anamnesis of acute reactions to stress, its presence during or immediately after the injury says about the increased risk of development of symptoms of mental trauma in the future [8]. Russian psychologist Lebedev believes that if, immediately after the stress a person experiences a marked sympathetic arousal, increased heart rate, increased blood pressure, anxiety or panic, this is an unfavorable prognostic sign. In those cases where sympathetic load is large enough, the central nervous system may issue an appropriate hypersensitive response even for a single stressor [9]. Similarly, the presence of dissociation, which a kind of protective reaction to trauma is considered, suggests that the victim is experiencing this event as a serious stress. So if some event is "shocked" by person so that he is in a state of "stupor" or dissociative detachment, the possibility of the subsequent development of trauma increases [10].

Rethinking events is one of the main causes of reparative (repeat) trauma. However, the symptoms of reparative are the result of many factors, including denial. The memories of the event are offensive and are accompanied by avoidance with the prevalence of the negation [11].

Soviet and Russian psychotherapist Vasilyuk thinks that the ability to integrate traumatic experiences with other life events has impaired by people with mental trauma. Due to the fact that traumatic memories are not integrated into the cognitive schema of the individual and almost do not change over time – what is the nature of mental trauma, the victim remains "frozen", fixed on injury as on actual experience, instead of accepting it as an event of the past. [12]. According to the American psychiatrist and psychotherapist Yalom while traumatic memories exist in memory in the form of connected short stories and how intense emotions and somatosensory phenomena, which are updated when a person suffering a mental injury is in the excited state or when the stimuli and situations reminiscent of the trauma [13].

Thus, normal physiological sensations can be endowed with a menacing new meaning, like neutral environmental stimuli. Its own physiological activity becomes a source of fear of the individual.

21

References

1. Agadzhanyan N.A Zdorov'e studenta: Sports: uchebnoe posobie/ N.A. Aghajanian, I.E. Batotsyrenova, L. T. Sushkova; Vladimir. State. Univ - Vladimir: publishing a House, 2004. – 136 p.
2. Carol S. Fullerton P.D., Robert J. Ursano M.D. American Psychiatry Press, inc., Washington, 1997. – P. 301.
3. Deakin J.F. Amine mechanisms in anxiety and depression // Experimental Approaches to Anxiety and Depression. – 1998. – 233 p.
4. Glebov V. V. Uroven' psihofiziologicheskoj adaptacii studentov na nachal'nom jetape obuchenija v sisteme vysshej shkoly. // Vestnik RUDN, serija «Jekologija i bezopasnost' zhiznedejatel'nosti» 2013, № 5 –P. 18-22
5. Kekelidze Z. I., Chernikov M. A., Shchukin B. A. Psihiatrija chrezvychajnyh situacij // V kn.: Ocherki social'noj psihiatrii – M., 1998. – P. 310-330.
6. Korolenko C. P. Psihofiziologija cheloveka v jekstremal'nyh uslovijah – L.: Medicine, 1978. – 231 p
7. Kuzmina Y. V., Glebov V.V. Dinamika adaptacii inostrannyh studentov k uslovijam jekologii megapolisa //Journal of the World of Science, Culture and Education. 2010. No. 6-2. P. 305-30
8. Laver, B. I., Glebov V.V. Sostojanie mediko-psihologicheskoj i social'noj adaptacii cheloveka v uslovijah krupnogo goroda//Vestnik RUDN, serija «Jekologija i bezopasnost' zhiznedejatel'nosti» № 5, 2012-P. 34-36
9. Lebedev V. I. Lichnost' v jekstremal'nyh uslovijah. M.: Politizdat, 2001. – 303 p.
10. Panov, V. I. Vvedenie v jekologicheskuju psihologiju: Ucheb. posobie. Chast'1. – M.:Izd-vo MNEPU, 2001.
11. Rodionova O. M., Glebov V. V. Lekcii po disciplinam «Jekologicheskaja fiziologija» i «Biologija cheloveka» [Tekst] : ucheb. posobie : v 2 ch./ Rodionova O. M., Glebov V. V..,– Part 1 – M.: PFUR, 2013. – 92
12. Vasiljuk F. E. Urovni postroenija perezhivanija i metody psihologicheskoj pomoshhi // Voprosy psihologii. 1988. No. 5. P. 27-37.
13. Yalom, I. D. Gruppovaja psihoterapija. Teorija i praktika. – 2007 - 459 p

22

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NOISE POLLUTION IN THE WESTEN INDUSTRAL ZONE OF ODINTSOVO

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Abstract: The study examines the problem of noise pollution and its ill effect on human health on urbanized territories. Major effects of noise pollution include interference with communication, insomnia, and reduced efficiency. The author measured the level of noise pollution in Odintsovo Industrial Zone.

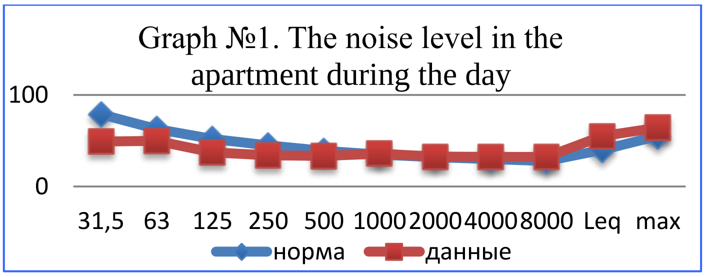
Key words: noise pollution, human health, noise standards, social and religious ceremonies, Noise Effects, Noise Reduction, public education

Nowadays, noise pollution has become an acute problem in many areas of the Russian Federation. The definition of noise is a sound, especially one that is loud, unpleasant or can cause a disturbance. The noises, which affect our environment, the most are mainly created by human activities including urbanization and traffic.

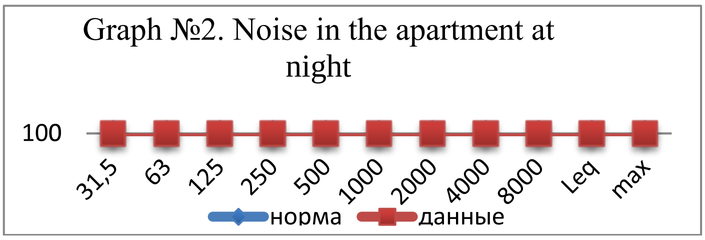
This study explores the effects of noise in public areas of the Western Industrial Zone of Odintsovo. The West Industrial Zone Odintsovo consists of a dozen warehouses, garages, factories, service stations, and a cemetery. It should be taken into consideration that the West Industrial Zone Odintsovo is located below the general living area of the city.

There is a large variety of noises which can be heard throughout the city, however they can be divided into two groups: natural and anthropogenic. Natural noises such as the rustling of leaves, movement of water along with the noise created by birds and other wildlife, have no negative impact on human health but the manmade noises are a source of discomfort for citizens. Sources of noise pollution include commercial and industrial noise, vehicular traffic, electrical appliances such as televisions and music systems, public address systems and generator sets. [1]

23



Graph №1. The noise level in the apartment during the day



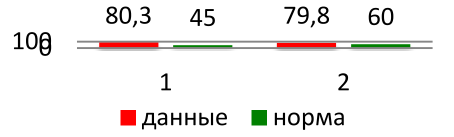
Graph №2. Noise in the apartment at night

Road traffic is a key source of noise in big cities due to the work of automobile engines, shock wheels of railway vehicles on the rail joints, etc. In addition, the noise sources in the transport sector are railway stations, car parking areas, auto service shops, depots, airport and other area. [1] According to the complaints of residents of the population, the main source of noise in the Western industrial zone is non-stop traffic of cars and trucks. To measure the sound pressure level the noise dosimeter OCTAVE-110 A was used.

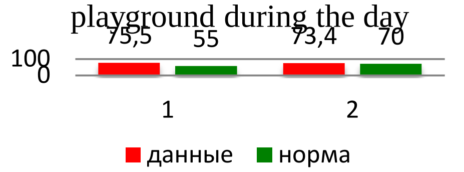
Measurements of noise were done in accordance with the methodical instructions on noise control in residential areas, in residential and community buildings. As a result the average noise levels (dB) were obtained in an apartment near a playground at night (from 23hours to 7 pm) and during the day (from 7 hours to 23 hours). The results show that in the apartment at night and during the day indicators at low frequencies (Hz 31,5-500) are within normal limits. But at high frequencies (1000-8000 Hz), the equivalent parameters as well as the maximum level exceed the allowable level set by regulations.

24

Graph №4. Level eq. (2) and max. (1) noise ot the playground at night



Graph №3. Level eq. (2) and max. (1) noise on the playground during the day



But at high frequencies (1000-8000 Hz), the equivalent parameters as well as the maximum level exceed the allowable level set by regulations. The maximum excess was observed in the apartment at night, this was due to the proximity of residential houses to the sanitary-protection zones of an enterprise working around the clock.There are the charts of noise levels below. The graphs show that the equivalent and maximum noise levels exceed the normal one in apartments and especially on the playground at night and daytime. Therefore, we can infer the presence of permanent and nonpermanent noise pollution. Thus, these buildings belong to the zone of constant acoustic discomfort. There is no doubt that noise affects human health adversely. The noise may result in loss of hearing, stress, high-blood pressure, loss of sleep, distraction affecting productivity, and a general reduction in the quality of life. The effects of noise are difficult to quantify because tolerance levels among different populace and types of noise vary considerably. There is a large amount of scientific literature assessing the effects of noise on human beings. For example, indiscriminate use of horn by the vehicles and wide spread use of loudspeakers in Indian social and religious ceremonies caused several health hazards to the urban inhabitants. It may cause deafness, nervous

25

breakdown, mental disorder, heart troubles, high blood pressure, dizziness and insomnia [2]. Exposure to noise pollution exceeding 75 decibels for more than eight hours daily for a long period of time can cause loss of hearing. The hazards increase with the intensity of the noise and the period of exposure. The sound produced by a bursting cracker, exceeding 150dB, can cause a ringing sensation called 'tinnitus' and can impair hearing permanently. In general about 1 percent of the population suffers from noise-induced pollution [3].

In thus study the level of noise pollution was measured, noise effects on human health were studied. The results obtained indicate that at high frequencies (1000-8000 Hz) the equivalent sound level ranges from 75, 80 dB on the playground and 50.55 dB in the apartment during the day and at night. Therefore, it is possible to conclude that the acoustic setting is unfavorable.

References

1. Chastotnaya kharakteristika shuma. Shumovaya bolezn. [The frequency response of the noise. Noise disease] Biofail. Nauchno-informatsionnyi zhurnal.- Available at http://biofile.ru/bio/22041.html

2. Polovikina U.S. " Shumovoye zagryazneniye okrusghayushey sredy urbanizirovannyh territoriy", KubGAU, № No76(02), 2012.

3. Vronskii, V. A. Okruzhayushchaya sreda i zdorov'e naseleniya urbanizirovannykh territorii . [Environment and health of population of urbanized territories] Geografiya i prirodnye resursy. - 2003. - N 3. - p. 49-52.

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COMPUTERSPIELSUCHT VON SCHULKINDERN

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Annotation: der Artikel beschreibt die Probleme und Lösungen der Computersucht bei Schulkindern. Der Artikel nennen die Anzeichen der Computersucht. Dieser Artikel wird vom Gesichtspunkt der Religion betrachtet.

26

Stichwörter: Computersucht, die Schüler.

Abstract: The article describes the problems and solutions of computer addiction among schoolchildren. The article enlists the signs of computer addiction and consideres one from the religious point of view.

Key words: computer addiction, students.

Die Zeiten ändern sich, es ändern sich die Menschen, es ändert sich die Welt. Bei der neuen Generation entwickeln sich andere Prinzipien. Die Schüler tauchen in die Realität der Computerspiele ein, verlieren das Interesse für die Umwelt. Ihr Leben laeuft nur noch in der unwirklichen Welt. Das kann für die Entwicklung der Persönlichkeitsqualitäten, der sozialen Anpassung und vor allem für die Gesundheit des Kindes, wie physisch, als auch psychisch gefährlich ist. Bei den Kindern des Schulalters geht die Bildung des Charakters verloren. Im Falle der Unterlassung der Seele werden die negativen Züge gezeigt: die Faulheit, die Bosheit, der Ehrgeiz und andere Sündenfalle. Während des Spieles geschieht im Bewusstsein des Schülers das Umprogrammieren bestimmter moralischer Stereotype, in der Seele bilden sich die Lüge, die Leidenschaften [1, c.38].

Mann kann ihnen folgenderweise helfen: man kann die Schüler in zwei Kategorien teilen: man geht in den Tempel und man geht nicht in den Tempel. Geht man in den Tempel, kann man den Menschen bringen, wer den Tempel oft besucht, nimmt an den Gottesdiensten teil und bemüht sich, sich zu ändern. Wenn der Schüler in den Tempel geht, wird die Autorität der Kirche für ihn unbestreitbar sein. Manchmal kommt es vor, dass diese Kinder " Platz nehmen " vor den gefährlichen Spielen [3,4].

Wenn man für die Kinder, die in den Tempel gehen neben der Autorität der Eltern, auch die Kirche hat, was ist dann mit denen die nicht in den Tempel gehen? Die Bildung der Persönlichkeit geht auf den Selbstfluss. In diesem Fall wird es für den Schülern komplizierter sein, die Schwierigkeit zu überwinden und, den Versuchungen entgegenzustehen [2, c.124].

Die Merkmale der Abhängigkeit von Computerspielen sind bei allen Kategorien der Schüler ähnlich. Der Verlust der vertraulichen Beziehungen zwischen den Eltern und dem Kind wird zerstört.

27

Die Computerabhängigkeit bringt die Degradation der Persönlichkeit. Mit der verbreiteten Krankheit ist es sehr schwer für die Eltern, und den Kindern zurechtzukommen [4, c. 13].

Man kann helfen, die Kinder in das Gebet der Mutter und die freundliche Atmosphäre in der Familie zu schützen [5; 6].

Auf jeden Fall ist es notwendig, das Kind von der gefährlichen Unterhaltung abzulenken :

1) Dem Kind die Beschäftigung für die Seele zu finden. Gerade solche Beschäftigung, mit dem Maximum des Vergnügens und des Nutzens für sich zu bekommen.

2) Zuzuteilen es gibt als mehrere Zeit, oft zu sagen nach den Seelen. Natürlich darf man nicht nur die Eltern im aktuellen für heute Problem beschuldigen. Oft spinnen die Schüler in die unwirkliche Welt wegen verschiedener Probleme in der Schule, wegen der zwischenmenschlichen Konflikte mit den Mitschülern ein. Wenn in der gegenwärtigen Welt er keine Freunde hat, so sucht er sie im Virtuellen.

3) In die Natur zu fahren, die aktiven Ausgehtage zusammen mit dem Kind und seinen Freunden durchzuführen. Natürlich, wollen viele Eltern zu Hause eine Zeitlang vor dem Fernseher sitzen, um sich nach der Arbeit erholen. Aber es ist um vieles besser, sich von der Seele, physisch zu erholen.

Es kommt vor, dass nach dem Gespräch die Kinder nicht verstehen, warum ihnen verboten wird, zu spielen. Dann muss man sich, selbst bemühen jenen zu kontrollieren, was spielt Ihr Kind, wie lange spielt es und welche für logisch entwickelte Spiele am besten kaufen kann.

Literaturverzeichnis

1. Matjuhina M.V., Mihal'chik T.S., Prokina N.F. i dr. Vozrastnaja i pedagogicheskaja psihologija: uchebnoe posobie dlja studentov ped. institutov. Pod red. Gamezo i dr. – M.: Prosveshhenie, 1984. – 256 s.
2. Medvedeva I.Ja., Shishova T.L., Mironova M.N. [i dr.]. Rebenok i komp'juter: sb. materialov. – Klin: Hristianskaja zhizn', 2007. – 320 s.
3. Arhiepiskop Luka (Vojko-Jaseneckij). Duh, dusha i telo. – M.: Pravoslavnyj Svjato-Tihonovskij Bogoslovskij Institut, 1997. – 55 s.
4. Svjashhennik Dubinin Aleksandr. TV i komp'juter, ih vlijanie na cheloveka. Jekran i nashi deti. – Pochaev: Izdatel'stvo Svjato-Uspenskoj Pochaevskoj Lavry, 2004. – 66 s.

28

5. Svjashhennik Sergij Nikolaev. Za sovetom k batjushke: Sbornik. – M.: Danilovskij blagovestnik, 2003. – 320 s.
6. Zitationen von Internet-Quellen, Online im Internet/URL: http://ladyelena.ru/kompyuternaya-zavisimost-u-podrostkov/. Zugriffsdatum: 12.09.2015

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IMPROVEMENT OF ECOLOGICAL-HYGIENIC PRINCIPLES OF MODERN ICE-MELTER CHEMICALS ASSESSMENT

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Abstract: Providing environmental and hygienic safety of ice-melter reagents using is an actual direction of current researches. Therefore, the thesis identifies the problem of laboratory method that researches a phytotoxic activity of ice-melter products.

Key words: ice-melter chemicals, phytotoxicity effect, salt mixtures, hygienic assessment, indicative, indirect environmental impact, seed grains, substance hazard category.

Roads and streets de-icing is an important factor that provides the safety of road traffic and people. Due to the climate Moscow region has a rather long winter from November 1 to April 15 [1, p. 4], there is a high requirement for effective means to destroy the ice. Today ice-melter chemicals are able to neutralize the snow and ice deposits formed as a result of prolonged freezing temperatures for a short period.

At first, thaw salt was used as ice-melter product in Moscow. It contains about 97 % of sodium chloride [2, p. 132]. As a result of its

29

widespread off-standard using the city had met salinization of roadside soils, depression and local loss of green landscape, sodium and chloride accumulation in snow, negative effect on asphalt and concrete, metal corrosion of vehicles, incidences of human and animal skin irritation effects [3, p 67].

Later ice-melter reagents included salt mixtures: chlorides, nitrates, nitrites and different organic salts. So today we have a large number of reagents that are complex multi-component chemical substances [1, p. 7]. Therefore, it must be indicated that before using reagents there is a necessary procedure to make an environmental impact assessment that analyzes the reagents for compliance with the hygiene requirements [4, p. 52].

Current hygienic findings indicate that all types of modern icing materials can have a toxicological effect on various biological objects (aquatic animals, plants, soil microorganisms). The assessment of ice-melter chemicals impact on soil biocenosis is very important because these organisms are indicative of hygienic environmental health. So the evidence of the negative reaction of soil biological objects on the reagents characterizes their negative impact on the soil environment.

Experiments also give evidence of toxicity of the thaw reagents for homeothermic animal species [4, p. 53]. No-effect concentration (NEC) must be observed when using such reagents.

Let's notice that today there is no integrated practice for the hygienic and ecological assessment of ice-melter chemicals in Moscow.

Dissolving salt mixtures creates aqueous salt solutions on the road and can be able to penetrate the roadside soil and, at the same time, effects on the root system of plants, so it is essential to make researches of the icing reagents phytotoxicity, which means toxic effect by the compounds in use on plant growth, on seed grains of higher plants [5, p. 3]. This experiment provides a contact between an analyte and seed grains. This method is designed to estimate the impact of water extracts from the wastes and to identify their substance hazard category. It must be noted that later this method was used for the explanation of the reagents hazard category too. But this approach is incorrect due to the fact that ice-melter chemicals are not wastes and there is no contact between reagents and plants because there is an indirect environmental impact on plant through the soil.

30

Thus it is very important to use the soil as a substrate in experiments when researches try to explore the ice-melter chemicals effect on plants. Only this approach is able to provide a correct assessment of the reagents hazard effects.

References

1.Regulations of winter cleaning of the carriageway of highways, streets, drives and areas (objects of road economy of Moscow) using deicing reagents and granite crushed stone of fraction of 2-5 mm (for the winter periods with 2009-2010 and further): Department of housing and communal services and improvement of Moscow, September 28.09.11.

2. Achkasov, A.I., Basharkevich, I.L., Varava, K.V., Samaev, S.B. The Pollution of the snow cover under the influence of deicing agents //scientific-and-technological journal *Prospect and protection of mineral resources,* 2006, 9-10 September-October, 132-137.

3. Chudakova, S. B. Toxicological and hygienic evaluation of the degree of danger anti-icing reagents. Thesis in Medical Science: 14.00.07. Chudakova Svetlana Borisovna. Moscow, 2006, 191.

4. Kryatov I. A., Tonapiy N. I., Vodyanova M. A., Rusakov N. V., Doneryan L. G., Evseeva, I. S., Ushakov D. I., Matveeva I. S., Vorobeva O. V., Tsapkova N. N. Methodological approaches to the substantiation of hygienic requirements to application of deicing materials //Scientific-practical journal Hygiene and sanitation // Publishing House Medicine. Moscow. Тom 93 № 6. 2014, 52–54.

5. Guidelines 2.1.7.2279-07 Justification hazard class of waste production and consumption of phytotoxicity. Federal Service on Surveillance for Consumer rights protection and human well-being. put into effect 2007-12-28. Moscow, 2007.

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EVALUATION OF THE PROFESSIONAL ENVIRONMENT IMPACT ON PSYCHOSOMATIC HEALTH OF BUILDING TRADESMEN

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Abstract. The article presents the problem of assessing the impact of factors of the professional environment on psychosomatic health of building tradesmen. There are data on environmental factors that significantly affect psychosomatic health of builders. There is information on occupational diseases of builders. In addition, the peculiarities of psycho-physiological factors of the industrial environment exert on the functional activity of the body of building tradesmen: state of monotony, fatigue and the condition of the strenuous activities of building tradesmen

Key words: builders, occupational diseases, psychosomatic health

Psychosomatic health is characterised by normative parameters of psycho-physiological functions of the body, and must satisfy age norms, the lack of irreversible changes in the body functioning [1]. Assessment of human health, when working in the building and construction work should cover the following aspects: reversible physiological stress of the employee, morbidity, occupational diseases, occupational injuries [2]. The neuropsychiatric, cardiovascular, circulatory, immune and other systems of the body are under stress coming from a complex of environmental factors [3; 4]. Working conditions in the open air for building tradesmen (masons, welders, riggers, etc.) are climatic factors (climate, day length, electromagnetism, etc.) [5, 6]; dust, chemical pollution, noise and vibration [6]. Chronic occupational diseases come from exposure to chemical agents. In 2010 in the Russian Federation an assessment of occupational morbidity due to exposure to chemical factors was done. There were welder (7,65%), mechanic-repairman (4,98%) and the electric welder of manual welding (3,02 %) [7]. Occupational diseases such as pneumoconiosis were firstly due to an extensive use of industrial aerosols (silicosis, silicon-asbestosis, asbestosis and other pneumoconiosis from dust), beryllium, and other types of exogenous allergic matters. Asbestos use was banned, but many buildings still contain asbestos, so construction workers are at risk of exposure to asbestos during the reconstruction or dismantling of buildings. Silicosis and pneumoconiosis are common among construction workers due to high levels of air pollution of the building area by industrial aerosols.

Specific factors affecting the health of building tradesmen are psycho-social and psycho-physiological too: living conditions, socio-cultural conditions, the satisfaction of wages and financial situation, relationships in the team, the experience, associated with forms of work organization (monotony, fatigue and a state of strenuous activity), leisure and transport. [8; 9; 10]. The prevailing psycho-emotional state is characterized by boredom, indifference and absence of interest, which is reflected in the work of the CNS: a part of the incoming information is blocked at the level of the thalamus. This can often decrease attention and concentration and provoke accidents. Fatigue and functional status of the builder occurs under the influence of continuous intensive work. It could reduce the efficiency of the labor process. A strong fatigue means an exhaustion of internal resources of human organism. It is characterized by a decrease in labor motivation, impaired attention and memory. At the physiological level, there is the emergence of protective inhibition in the CNS [10]. When continuing the fatigue may eventually require a long rehabilitation. Builders who work in extreme conditions, at night or in unfavorable environmental conditions (too hot or too cold, too wet, overpolluted, too noisy, etc.) have to activate the volitional sphere. They must have got a high motivation to achieve results. The functioning of the body is determined by a high activity of the sympathetic nervous system and high frequency rhythms of the brain [11].

Conclusion. Construction is one of the largest industries, we always need new housing and industrial buildings. However, this activity affects building tradesmen psychosomatic health. Workers constantly experience stress from the environmental factors, which, ultimately, lead to occupational diseases. The professional builder's diseases include pneumoconiosis and other types of exogenous allergic alveolus's, chronic bronchitis, etc. Specific factors affecting the health

33

of builders include also psycho-social and psycho-physiological factors influencing the level of wakefulness and functional activity of building tradesmen.

References

1. Shuvalov Y. V., Mikhailova N. In., Savchenko A. V. Reference model of the variation of potential and geo-ecology - proceedings of Conf. students - Perm, 2001
2. Zhukov V. N., Svistunov A. V. Influence of natural and technogenic factors on human - abstracts of the 3rd int. Conf. "Environment and development North-West of Russia". - SPb.: MANEB, 1998
3. Sidel'nikov, A. Yu., Glebov V. V. Operation of functional systems and the level of adaptation of young specialists of the construction complex of Moscow.//Collection of scientific materials. XV all-Russian Symposium with international participation "Ecological and physiological problems of adaptation", Moscow: RUDN.,2012 -P. 283-285
4. Rakhmanin, Yu. Physical factors in human ecology and environmental hygiene// Hygiene and sanitation, 2009, № 5.- P. 4-7
5. Apchel V.Ya., Tsygan V. N. Stress and stress man - SPb, 1999
6. Voloshin I. A. Occupational risks in the construction http://www.kiout.ru/info/publish/207
7. Voloshin I. A. Occupational risks in the construction http://www.kiout.ru/info/publish/207
8. Sidel'nikov, A. Yu., Glebov V. V. Dynamics of heart rate variability of students building profile of the capital city during the school year// Higher education today 2012, No. 7, P. 29-32
9. Sidel'nikov, A. Yu., Glebov V. V. Psychological aspects of adaptation processes of students to training in high school building // Vestnik MGSU 2012 №9-P. 272-27
10. Sidel'nikov, A. Yu., Glebov V. V. The Psychophysiological assessment of adaptation of young specialists in the conditions of Moscow's construction complex. // Human. Nature. Society. Actual problems: materials of the International youth conference. – Voronezh: CPI "Science book", 2012, P. 147-149
11. Glebov V. V., Anikina E. V. Influence of integrated factors on the adaptation of the human population in a megalopolis (by the example of Moscow) // Journal of the International Academy of Sciences (Russian section). 2010. No. 3. P. 134-136.

34

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THE INFLUENCE OF ENVIRONMENTAL FACTORS ON THE MENTAL ACTIVITY OF MOSCOW SCHOOL CHILDREN

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Abstract. The article presents the results of studies of the effects of environmental factors on psycho functional and mental status of school children living in different environmental conditions. Short and long term memory performance was tested (233 schoolchildren of age from 11.4 to 12.7 years). It is revealed that the combined effects of adverse environmental and social environment on children's bodies lead to a significant deterioration of mental activity in schoolboys. At various combinations of favorable and adverse environmental and social environment the action of environmental factors was partially offset, which affects the performance of short-term and long-term memory of schoolboys.

Key words: functional status, memory performance, anthropogenic factors, Moscow children.

Introduction. Schoolchilden of the capital of Russia meet information overload, acceleration of the rhythm of life, socio-psychological tensions, negative environmental changes. All this demands some accommodation and training [1]. Such condition is proper for different social environment [2; 3; 4]. The impact of unfavorable factors of the bio-social environment in large industrial cities can greatly complicate the process of adaptation to the school environment [5; 6; 7; 8]. The aim of this study is to identify the extent of the influence of environmental factors on mental activity of schoolboys of Moscow.

Organization and methods of the present study**.** Assessment of mental activity is conducted involving 233 healthy children of the 5th form. The gender and age composition of schoolboys was as follows: 109 boys and 124 girls at the age from 11.4 to 12.7 years. The represented two schools located in different districts of Moscow.

35

Memory testing was performed using A. R. Luria test on short and long term memory.

Results and discussion. A preliminary study of the socio-economic and environmental conditions of the studied sample of (questionnaires, environmental monitoring data areas) allowed to form 4 groups: experimental group E1 consisted of schoolboys living in disadvantaged environmental and social conditions; the E2 group included pupils living in adverse ecological and social environment; the E3 group consisted of living in disadvantaged social environment and favorable ecological environment and group 4, conventionally called control group included pupils living in the favorable ecological and social environment.

Assessment of levels of different types of memory of schoolboys in secondary school. The level of mental activity of a man is closely linked with memory; we examined the technique of 10 words using the A. R. Luria test samples, (short term memory). Comparing the experimental E1 and control K group revealed that the combination of adverse environmental and social factors has a negative impact on short-term memory. So, the majority of schoolboys in secondary classes of the group E1 showed "weak" and "satisfactory" levels (18.3% and 59,1%, respectively) i.e. the subgroup of showed low level of learning after the first presentation of stimulus (short term memory). Only 21.3% of schoolboys in this subgroup showed a "good" level of memorization. "Excellent" level of memorization in this group amounted to 1.3% of schoolboys. In the control group, where the combination of environmental factors is of a favorable character, marked reverse trend. So a "good" level of memorization (short term memory) showed 42.5 per cent, and an "excellent" level of 10.3% of schoolboys in the control group. Comparative statistical analysis of data groups by nonparametric criterion of Kruskal-Wallis test showed significant differences between groups ($p=0.0002$ and $p=0,0003$). Comparative analysis in the experimental subgroups E2 and E3 with diverging environmental factors (favorable adverse environmental and social environment and vice-versa) showed a leveling of the environmental factors that affected the percentage of schoolboys by levels of "good" and "excellent" to 34.4% and 3.7%; 34,2% and 3.9% respectively. A similar situation was seen in the level of long-term and visual memory. The study noted that schoolboys from ecologically

36

unfavorable district (SEAD) were more difficult to become active, to mobilize at the beginning of the activity.

Conclusions. The environmental conditions of the studied areas of Moscow (South-Western and South-Eastern administrative districts) showed different levels of anthropogenic impact. Thus, South-Western Moscow according to the official statistics is an ecologically clean area. The South-East administrative district of Moscow is classified as ecologically "dirty" area with a strong anthropogenic impact. The study of combined effects of adverse environmental and social environment on children's bodies showed a significant deterioration of mental activity of schoolboys (group E1). At various combinations of adverse and beneficial effects of the ecological and social environment (group E2) and vice versa (group E3) of the action of environmental factors was partially offset, which affects the performance of short-term and long-term memory of schoolboys. Under favorable environmental impact and social environments of mental activity of pupils of the middle classes (the group) proceeded without overstrain of the functional systems.

References

1. Glebov V.V. Sostojanie jekologii i adaptacionnyh processov shkol'nogo naselenija krupnogo industrial'nogo goroda. //Vestnik RUDN, serija «Jekologija i bezopasnost' zhiznedejatel'nosti» № 4, 2012 - S.25-32.
2. Glebov V.V., Anikina E.V. Vlijanie kompleksnyh faktorov na adaptaciju populjacii cheloveka v uslovijah megapolisa (na primere goroda Moskvy) // Vestnik Mezhdunarodnoj akademii nauk (Russkaja sekcija). 2010. № 3. S. 134-136.
3. Glebov V.V., Anikina E.V., Rjazanceva M.A. Razlichnye podhody izuchenija adaptacionnyh mehanizmov cheloveka // Mir nauki, kul'tury, obrazovanija. 2010. № 5. -S. 135-136
4. Danacheva M.N., Nazarov V.A., Glebov V.V. Vlijanie jekologicheskih i gigienicheskih faktorov na psihofiziologicheskoe sostojanie shkol'nikov v uslovijah megapolisa //Mir nauki, kul'tury, obrazovanija. 2010. № 6(1). -S. 90-92.
5. Kovaljov V.V., Glebov V.V. Smolenskaja oblast' – Moskva: vozmozhnosti jekologicheskogo blagopoluchija // Vestnik RUDN,

37

serija: «Jekologija i bezopasnost' zhiznedejatel'nosti». 2010. № 1.– s. 38-42.
6. Laver B.I., Glebov V.V. Sostojanie mediko-psihologicheskoj i social'noj adaptacii cheloveka v uslovijah krupnogo goroda // Vestnik RUDN, serija «Jekologija i bezopasnost' zhiznedejatel'nosti» № 5, 2012 – s.34-36.
7. Sidel'nikova N.Ju., Danacheva M.N., Glebov V.V. Uroven' psihofiziologicheskogo sostojanija shkol'nikov, prozhivajushhih v raznyh sredovyh uslovijah stolichnogo megapolisa. // Materialy Mezhdunarodnoj nauchno-prakticheskoj konferencii «Aktual'nye problemy jekologii i prirodopol'zovanija» Vypusk 17, Chast' 1, 2015. Moskva, Izd-vo RUDN, s. 125-130.
8. Glebov V.V., Arakelov G.G. Level of Schoolboys' Psychophysiological Adaptation Process in Metropolis Megapolis // Procedia - Social and Behavioral Sciences Volume 146, 25 August 2014, s. 226–232.

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FORMALDEHYDE: CONSEQUENCES OF USING FOR HUMANS AND ENVIRONMENT

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Abstract: This article deals with the problems of environmental pollution with formaldehyde and its derivatives. It analyzes their impact on the human body. Dynamics of average annual concentration of formaldehyde in the air in Moscow has been established revealing the necessity of pollutants elimination. On the basis of the study suggestions about ways to reduce the harmful effects of formaldehyde on the human body are made.

Key words: Formaldehyde, phenol-formaldehyde resin contamination , concentration, toxicity.

Formaldehyde is highly toxic, it damages the genetic material, reproductive organs, respiratory passages, mucous membranes, skin

38

covering, central nervous system and especially the vision organs and retina of eyes. The main sources of pollution of environment are emissions of different manufactures, in particular chemical ones. Formaldehyde is widely used in the production of rib woods, fabrics (as finishing agent), as row of plastics, as hardening agent and strong preserving agent (for keeping biological materials and embalming dead bodies). Formaldehyde is one of dangerous aquatic and air pollutants, which causes strong allergies (eye watering and cough). It is emitted by car, cigarette smoke, furniture, made with rib woods. It is a component of phenol formaldehyde resins.

Phenol-formaldehyde resins are phenol polycondensation products used as connective and mastic in wood boards production, paint and coatings, abrasive, heat-insulated, fireproof materials, etc. In 2008 its throughput in Russia attained 123,9 thousand of tones.

The largest of 25 phenol-formaldehyde resins enterprises are OJSC 'Uralhimplast', Federal Treasury Enterprise 'Ya.M.Sverdlov's Factory', CJSC 'Metaldyne', OJSC 'Carbolite', CJSC 'Tyumen plastics factory', and also LLC PA 'Tokem'. Nowadays 25% of demand on the Russian market is satisfied by means of import production [2].

Formaldehyde is formed not only as a result of anthropogenic activity, but also in natural processes. It takes part in synthesis of photochemical products during smog. That's why its concentration in the atmosphere is changed with seasons, reaching the maximum in summer months. Dynamics of average annual concentration of formaldehyde in the environment in Moscow, Russia: 2009 – 0,014 mg/m3, 2010 – 0,015 mg/m3, 2011 – 0,016 mg/m3.

Formaldehyde comes with waste water, and also in process of erosion from the atmosphere. It is condensed with amines and forms cystogen with ammonia.

In water medium it is incurred for biodegradation which is conditioned by the activity of bacterium. Background concentration is equivalent to some mg/Nm3, in city air it reaches 0,005–0,01 mg/Nm3. (higher near the industrial areas and in short peaks during rush hour or photo-chemical smog.

It is not a rare case that formaldehyde is 70-80% of total air pollution. Average Daily MPC of formaldehyde is very low (0.5 mg/Nm32).

39

The furniture from DPP can raise the level of formaldehyde in houses up to 0,001 mg/Nm3and higher. The furniture made with plywood and genuine wood (massif) or with fully massif can be a source of formaldehyde, too. In this case it is paint and coatings and other materials used to process the furniture which contains formaldehyde, especially during the first two months of usage.

Entering in a human body is quick, the susbstance is fully absorbed, particularly accumulated in bone marrow and transformed into methanol and formylic acid, this reaction occurs in liver.

It disturbs upper air passages and causes nasopharyngeal cancer and degenerate processes in parenchymal organs, breaks the metabolism of the vitamin C.

More often it provokes the development of nasopharyngeal carcinoma.

There are some backgrounds and data of preconceptual studies to support that formaldehyde makes its contribution to disease of leukemia.

Fern, chamaedorea, Chrysanthemum bush, dracaena, ivy, Ficus Benjamin are the row houseplants which have wonderful qualities to swallow up formaldehyde directly from the air.

Of course the danger of toxication by formaldehyde on the street is still observable.

Nevertheless, human body will rub better through periodic action of toxic agent than chronic effects. Inside houses it is necessary to choose permissible home decoration materials.

Authorities must carefully localize sources of gas emission and clean ventilation air.

References

1. Evroziyskiy himicheskiy rynok. Megdunarodnyy delovoy jurnal. «Proizvodstvo i rynok fenolformaldegidnyh smol v Rossii». – Retrieved from: http://www.chemmarket.info/ru/

2. Zabolevaemost zlokachestvennymi novoobrazovaniyami naselenia Moskvy I administrativnyh okrugov v 2011 gody. Inf. Bill. FBUZ « Centr gigieny I epidemiologii v gorode Moskve» «Rospotrebnadzora RF, Moskva. Pp 33

40

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ANALYSIS OF INFORMATION ENVIRONMENT IMPACT ON STUDENTS

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Abstract. The article presents aspects of the development and wide use in daily activities and everyday life of information technology. It is shown that along with great use of new information technologies they pose threat to the population, especially children and teenagers. In the first place they endanger neuro-mental activity, and interpersonal communication.

Key words: information technology, population, children, adolescents, mental activity, interpersonal communication.

The use of high-tech devices (watching news on TV or internet, working with text or graphic documents, watching films, playing video games) forms a so called “Information environment” [1]. Being in information environment influences functional systems of human's body [2]. Studying this influence requires complex methods, such as:

1) Using information environment only for business purposes (working with documentation, e-mail, working with different file types);

2) Using information environment for communication (social-networks, forums, etc.);

3) Using information environment for entertainment (mostly considering video-games) Interacting with any device would cause a number of negative consequences on human's organism, such as eye fatigue, excessive load of visual apparatus; impact on hand and spinal joints [4].

Gaming and internet addiction risk group are children and teenagers. Several specialists don't consider “internet-addiction” a mental disorder, experts in psychiatry doubt an existence of this illness or deny its harm, others admit abnormal addiction relieving pretty obvious physical and psychological symptoms [4]. If we carefully look at the world of video games, we'll see that video-games help to develop logics, strategic skills, improve team work skills, and help learn taking decisions in stressed situations. “Gamers” are at a high social level [4].

In conclusion, we can see, that with its appearance information environment has brought as positive sides, so negative ones for all the humanity, but, taking in consideration the fact, that we can’t exclude it out of our lives, we can only develop methods of healing and prevailing different negative consequences of its influence. And I should mention, that many deviations do not differ so much from the ones, not caused by modern technologies, taking as an example internet-addiction, it can be easily compared with drug-addiction, and troubles with sight can be caused by many different reasons, not only by spending your time with gadgets.

References

1. Bowen L. Video game play may provide learning, health, social benefits, review finds. February 2014, Vol 45
2. Glebov V. V. the ecology and adaptation processes of the school population of a large industrial city. // Bulletin of PFUR, series "Ecology and life safety", No. 4, 2012 P. 25-32
3. Glebov V.V., Arakelov G.G. Level of ’ Psychophysiological Adaptation Process in Metropolis Megapolis // Procedia - Social and Behavioral Sciences Volume 146, 25 August 2014, P. 226–232
4. Tikhomirova L. F. Expert approach is the basis of health saving technologies / Yaroslavl pedagogical Bulletin. – 2002. - No. 4. P.23-27
5. Weinstein A, Lejoyeux M. Internet addiction or excessive Internet use. The American Journal of Drug and Alcohol Abuse. 2010 -P343-398.

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THE INFLUENCE OF METEOROLOGICAL FACTORS ON HUMAN HEALTH

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Abstract. The Earth’s climate is changing and there is an adverse effect on the human body. In this work the maps of Gismeteo and Geospase

42

were analyzed and the histograms of the relationship between the aggravation of human disease and the manifestation of the solar magnetic factor were introduced. Hypertension is defined as a sustained elevation of arterial blood. Encephalopathy is the occurrence of confusion, altered level of consciousness.

Key words: climate, human disease, solar magnetic factor, hypertension, myocardial infarction and encephalopathy.

The purpose of this research is to study the influence of the solar magnetic factors on people's health in Podolsk, Moscow region. The hypothesis was that diseases of the cardiovascular and nervous systems are connected with solar magnetic factors.

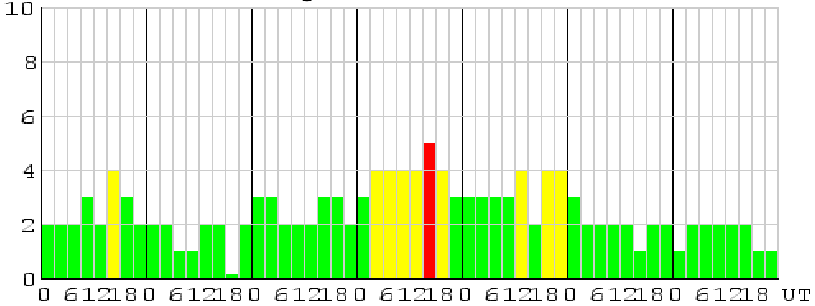

Figure 1. Ap and Kp index of geomagnetic field according to the mid-latitude stations of Eurasian region. [4]

Methods of investigation: literary and stock analysis, analysis of maps (gismeteo and geospace) of geomagnetic storms and information of solar activity peaks, research of health statistics and health records of patients. Solar magnetic storms and solar activity increase diseases such as hypertension, myocardial infarction and encephalopathy [3].

During the period from December 12, 2010 to December 12, 2012 388 people were diagnosed with these diseases.

Data recorded from April 2, 2012 to April 8, 2012 about the influence of the solar magnetic and of geomagnetic field on hypertension and encephalopathy crisi are presented as histograms:

43

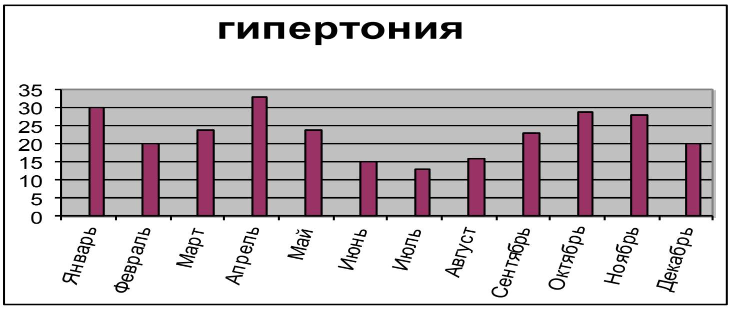

Figure 2**.** Hypertension crises per month in 2012.

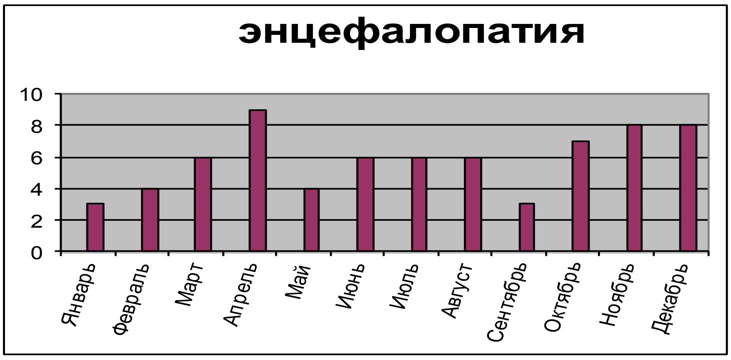

Figure 3.Encephalopathy crises per month in 2012.

After a comparative analysis of the histograms introduced above, it was concluded that the highest level of hypertension and encephalopathy (33 and 9, respectively) were registered in April. It corresponds to the peak activity of the geomagnetic field in this month.

Therefore, the diseases frequency depends on the occurrence of unstable geomagnetic and solar activity.

Recommendations**.** The essential basis is a healthy lifestyle which includes physical exercises, balanced nutrition and healthy sleep. These recommendations increase the adaptive properties of an organism and reduce a negative influence of meteorological factors.

References

1. Bogolubov V.M. Medicinskaya reabilitacia.[Medical reabilitation] 2010 - 435p.

44

2. Chizhevsky A.L.-Zemnoe eho solnechnix bur [Earth echo of solar storms] – 1976 -367p.
3. Shalnova SA, Deev AD, Oganov RG. Factors influencing the mortality from cardiovascular disease in Russian population. // Kardiovasculyarnaya Terapiya I Profilaktika. 2005;4:4-9.

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TOXICOLOGÍA DE LOS ELEMENTOS RADIACTIVOS

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Resumen: El artículo se trata del efecto que los isótopos radiactivos tienen en el orgamismo humano o animal. Se explican los efectos tóxicos de yodo-131, cesio-137 y estroncio-90.
Palabras clave: elementos radioactivos, toxicología, yodo-131, cesio-137, estroncio-90.

Abstract: The article investigates the impact that the radioactive isotopes have on human and animal organisms. The toxic effects of iodium-131, cesium-137 and strontium-90 are considered.
Key words: radioactive elements, toxicology, iodium-131, cesium-137, strontium-90

Las sustancias radiactivas tóxicas se han convertido en un gran problema en Rusia después del accidente en la Central nuclear de Chernóbil. Para observar la toxicidad de los radioisótopos fueron elijidos yodo-131, cesio-137 y estroncio-90. Son estos elementos que transportan la radioctividad al cuerpo humano y animal después de los accidentes en plantas nucleares y pruebas de armamento nuclear. [1, p. 19]. Ya que este tipo de radiación es más común para la población del área contaminada cercana a la planta, van a tratarse sólo las consecuencias internas para la salud. La característica más importante de la irradiacón interna es que, cuando los radionúcleos se incorporan en el organismo, llegan a participar en metabolismo y permanecen en los tejidos mucho tiempo, produciendo radiaciones ionizantes perjudiciales. Es imposible desminuir la radiactivadad de los

45

radionúcleos. O se desintegran o se excretan del organismo naturalmente [2, p. 109].

Toxicológia del yodo-131.

Sabemos que hay 24 radioisótopos del yodo. Sus masas atómicas oscilan entre 117-126 y 128-139. Todos los isótopos son artificiales y se han producido gracias a las reacciones nucleares (principalmente se forman por la fisión de los átomos pesados) [2, p. 124]. Yodo-131 tiene un periodo de semidesintegración de 8,02 días [3, p. 91]. Los radioisótopos de yodo pueden penetrar en el organismo a tráves del aparato digestivo, sistema respiratorio, piel, conjunctiva, heridas etc. El yodo es un bioelemento, por eso al penetrar en la sangre, se absorbe por completo. Hasta 60% del yodo se deposita en la glándula tiroides. Si suponemos que la concetración del yodo en la sangre es 1, en otros órganos su concenrtación será: en músculos, bazo, páncreas – 1; en riñones, hígado, ovario – 2-3; en glándula salival, orina – 3-5, en heces, leche – 5-15, en tiroides – 10000. El efecto tóxico se manifiesta, en primer lugar, en la disfunción de tiroides. En dosis grandes yodo-131 lleva a la destrucción de la tiroides y la sustitución de la parénquima por el tejido conectivo. Los hórmones de la tiroides controlan varios procesos fisiológicos en el organismo, por consiguiente el fallo tiroideo causa problemas con el metabolismo, crecimiento y buen funcionamiento del sistema reproductivo. [2, p. 125; 4, p. 58-59]

Toxicológia de cesio-137.

Los radioisótopos de cesio son peligrosamente tóxicos, puesto que emiten las partículas beta y los rayos gamma. Cesio-135 tiene un periodo de semidesintegración de 30 años [3, p. 91]. Cuando cesio está ingerido con comida, se absorbe y pasa a la sangre, se acumula en músculos (hasta 80%) y en huesos (10%). Cesio se excreta por riñones (90%) y intestino. El periodo de semi-vida de excretación de 10% de cesio es alrededor de un día. Para el resto hace falta más tiempo: entre 50-200 días [1, p. 18]. Las consecuencías de la irradiación del cesio no son diferentes a los efectos adversos causados por los rayos gamma [2, p. 126-127; 1, p. 18].

Toxicológia de estroncio-90.

En aspecto biólogico de todos los radioisótopos de estroncio, generados por la fisión de los átomos pesados, estroncio-90 es el más improtante. Tiene un periodo de semidesintegración de 28 años. [3, p. 90]. Estroncio-90 se deposita en las células del esqueleto y se queda allí

46

por mucho tiempo. Mientras tanto, irradia los tejidos, y por eso los cambios en el tejido de hueso y en la médula ósea producen más rápido que en otros organos o tejidos.

El carácter del proceso patológico depende de la dosis y la duración de irradiación. En los animales está demostrado que la irradiación de estroncio suprime el apetito y causa la pérdida del peso. Además, afecta el estado funcional del sistema nervioso.

Las consecuencias de la irradiación crónica se manifiestan, en primer lugar, causando las enfermedades de los huesos, médula ósea y vasos sanguíneos. La fibra de miocardio crece anormalmente y, en casos difíciles, degenera el tejido adiposo. Se observa subida de la tensión arterial.

Aparecen sérios cambios funcionales y morfológicos en el tracto gastrointestinal provocados por la intoxicación de estroncio-90. Los cambios en la fórmula sanguínea y en los organos de hematopoyesis son más detectables y visibles durante todo el proceso de la enfermedad.

Los aminales jóvenes tienen altraciónes más notables en los huesos. Los procesos patológicos en el esqueleto se manifiestan en la opresión de la osificación, transformación de la materia ósea, desarrollo anormal del tejido conjuctivo reticular, alteración de los procesos regenerativos del hueso y aparición de las estructuras atípicas inmaduras. Todo esto puede llevar al desarollo de un tumor maligno.

Asimismo, se notan alteraciónes en la función de las glándulas endócrinas, en concreto, de la glándula pituitaria, glándulas suprarenales, tiroides y gónadas. Estroncio es perjudicial para los ojos, porque puede producir los cambios distróficos y catarata. [2, p. 127-131; 5, p. 21-22]

Conclución. En general, basandose en los datos observados, se puede concluir que tenemos que seguir investigando los efectos de los elementos radioctivos, a pesar de que ya sabemos mucho.

Hoy en día el tratamiento de la radiotoxemia es muy complejo, porque consiste en varias terapias – inyecciónes de los antibióticos, antiviruses, sustituto de sangre y transplante de médula ósea – y requiere seguir las condiciones asépticas.

Además, si el tratamiento no se recibe a tiempo, la tasa de muerte es casi 100%.

Sin embargo, aunque la persona reciba el tratamiento inmediatamente, hay muchas posibilidades de que no vaya a sobrevivir después. Por eso, es muy importante seguir las reglas y las normas existentes para prevenir desarollo del proceso tóxico.

Un accidente producido en la planta nuclear, sea por el factor antropogénico (como en la Central nuclear de Chernóbil), o por la causa natural (como en Fukushima I), o por la causa technogénica (como en Three Mile Island), no afecta sólamente a los habitantes de los pueblos cercanos, sino a los países cercanos o todo el mundo, debido a las condiciones climaticas y meteorológicas.

Por consiguiente, es tan importante monitorizar todos los factores, que pueden causar el accidente, y todos los países tienen que cooperar para aumentar las medidas de seguridad.

Referencias

1. Vasilenko, I. Ya. “Radioaktivniy tseziy” [Texto]/ I.Ya. Vasilenko, O.I. Vasilenko// Energia: ekonomica, tekhnika, ecologia. – 2001. -#7. – p. 16-22.
2. Belov, A.D. “Radiobiologia” [Texto]/ A.D. Belov, V.A. Kirshin, N.P. Lysenko, V.V. Pak, L.V. Rogozhina – M.: Kolos, 2005. – 384 p.
3. Praktikum “Osnovy radiokhimii i radioecologii” [Texto]/ Pod redaktsiei M.I. Afanasova – M.: khim. Fakultet MSU im. Lomonosova, 2012. – 97 p.
4. Vasilenko, I. Ya. “Radioaktivniy yod” [Texto]/ I.Ya. Vasilenko, O.I. Vasilenko// Energia: ekonomica, tekhnika, ecologia. – 2003. -#5. – p. 57-62.
5. Vasilenko, I. Ya. “Radioaktivniy tseziy” [Texto]/ I.Ya. Vasilenko, O.I. Vasilenko// Energia: ekonomica, tekhnika, ecologia. – 2002. -#4. – p. 26-32.

48

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A COLONY OF EUROPEAN BEAVERS IN MOSCOW

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Abstract: The study is devoted to monitoring the vital functions of the European beaver in metropolis conditions, in order to assess the anthropogenic pressure it is exposed to in a metropolis.
Key words: monitoring, European beaver, settlement, metropolis, anthropogenic pressure, semi-aquatic, edificatory.

There is a big settlement of beavers (more than 6) in Moscow's Pokrovskoe-Streshnevo Park on the River Khimki originating from the Khimki Reservoir [1]. Beavers have long attracted people as amazing animals that build elaborated hydrotechnological facilities, such as lodges, dams, canals; they fell trees, store food for the winter, take care of their family, their offsprings [2]. It is particularly noteworthy that beavers live within the boundaries of the metropolis and are regularly exposed to strong anthropogenic pressures. The relevance of the work is in the fact that wild animals live within a metropolis. The study is an ongoing monitoring of the beaver settlement (about a year) for relationship between beavers and other inhabitants of the river, as well as anthropogenic factors. Thus, the purpose of this work is to study a settlement of the European beaver located in Moscow and assess the anthropogenic pressure it is exposed to in the metropolis.

The study has been carried out on the territory of the monument of nature "The Valley of the River Khimki". The length of the river is about 18 km below the dam of the Khimki reservoir, the river is fed by the springs of Pokrovskoe-Streshnevo Park. The nature monument was established in 1991, its area is 15.2 acres. There are alder forests as well as fragments of meadows and lowland swamps in the floodplain of the river Khimki. A beaver dam with a length of about 7 meters is located downstream. There grow such plants from the Red book of Moscow as

49

ostrich fern, May lily, yellow anemone, corydalis, water forgeron, great bellflower and nettle-leaved bellflower. It is also a habitat for some bird species that are rare in Moscow: red-headed and tufted duck, hobby, moorhen, crow, long-tailed tit [1].

The object of the study

European beaver (Castor fiber L.) belongs to the order of rodents. [3] It is a semi-aquatic, exclusively herbivorous animal that rarely moves away from the pond to a distance of 100 m. The length of the body is 75-120 cm; the weight is 20-30 kg. [4] The fur is made of long coarse guard hair and a soft wavy underfur, the color is from light brown to black. Beavers are common in the boreal part of Eurasia from the Atlantic coast to the Baikal region and Mongolia (acclimatized in Primorye and Kamchatka). It inhabits coasts of small ponds, slowly flowing rivers, lakes, ponds, reservoirs, irrigation canals and quarries. [3] It lives mostly in families. A full family consists of a couple of adults and some youngsters born in the past and current years. Its lodge has a complex structure, inlets are always under water. Beavers build lodges on low swampy shores and shallows, they are cone-shaped piles of twigs, sealed with mud, their height is 1-3 m and diameter is 10 m [5]. Families of beavers build dams below the settlements in order to maintain the water level in the reservoir. Adam consists of pieces of cut tree trunks, branches, twigs, held together by clay, silt [4]. Beavers are guided by the sense of smell and mark their territory by the secret of musk glands called castoreum [6]. Beavers eat bark, thin branches of trees, leaves, preferring aspen, willow, birch, water, and riparian herbaceous plants [3,4]. In autumn they fell trees gnawing the bottom of the trunk, then they separate the branches and the trunk, and cut the trunk into pieces for easier transportation [5]. Beavers are active at night and at dusk in summer, in winter their activity decreases and shifts to the daytime [3]. Their breeding season lasts from the mid-January until the end of February. Cubs are born in April – May. Sexual maturity is reached in the second or third year of life [5].

Beaver provides valuable fur and beaver stream used in perfumery and medicine. Its meat is used for food. Because of intensive hunting it was on the brink of extinction. European beaver is saved in national parks, from which it is artificially resettled to the places of their former habitation [3].

50

Methods of research

Monitoring is conducted once a week for 2-4 hours in the evening, time is determined by beaver's daily activity [2]. Thus, the method involves observation and analysis of the results obtained. Beavers have been observed since July, and we plan to monitor them until next April. All their activities, periods of activity, quantity of eaten or stored food, their habits, the relationship between themselves and other inhabitants of the river such as ducks, muskrats, water voles, rats, as well as the effect of anthropogenic factors are recorded.

During the monitoring period we have mapped the territory of the river, determined the species composition of plants – raspberries (Rúbus idáeus), black alder (Álnus glutinósa), Siberian larch (Lárix sibírica), birch (Bétula péndula), white willow (Sálix álba), crack willow (Sálix fragílis), etc. We have also revealed what plants beavers prefer: aspen, willow, raspberry, sedge, wormwood.

Beavers live in Moscow on the outskirts of the Park in a few meters from the road and brick buildings. Beavers are edificators, so in the middle of the river, where most of their activities take place, there are a lot of moves and dams. 2-3 individuals from the whole family are not afraid to get closer to people. Beavers carry home larger parts of the apples and other fruit and vegetables that people throw into the water. While smaller parts are eaten by them on the spot, while swimming in shallow waters. They often mark their territory with odorous beaver stream, alerting other animals of the Park. The settlement of beavers attracts a lot of people whatever the weather is.

Conclusions. There are about 8 individuals in the park; many of them are young beavers, which indicates that the population is stable. It has been determined that beavers coexist with other species that inhabit the Park and with people very well. No negative effects of feeding them by people have been detected so far.

References

1. Poljakova G. A., Gutnikov V. A. Parki Moskvy: jekologija i floristicheskaja harakteristika (Parks of Moscow: ecology and floristic characteristic), Institut lesovedenija RAN, M.: GEOS, 2000, 408 s.

2. Al'bov S.A., Andreeva M.V., Bashinskij I.V., Golubkov V.V., Kacman E.A., Gorjajnova Z.I., Krylov A.V., Onipchenko V.G., Prokin A.A., Hljap L.A. Rechnoj bobr (castor fiber) kak kljuchevoj vid

51

jekosistemy maloj reki na primere prioksko-terrasnogo gosudarstvennogo biosfernogo prirodnogo zapovednika (Beaver(castor fiber) as a key form of the ecosystem of small river as example of the Oka-terraced State Biosphere Nature Reserve), redaktor: Dgebuadze Ju.Ju. Moskva, 2012
3. Danilov P.I., Kan'shiev V.Ja., Fedorov F.V Rechnye bobry Evropejskogo severa Rossii (Beaver European North of Russia), [otv. Red. Danilov P.I.]; In-t biologii KarNC RAN, M.: Nauka, 2007, 199 s.
4. Zav'jalov N.A., Krylov A.V., Bobrov A.A., Ivanov V.K., Dgebuadze Ju.Ju..Vlijanie rechnogo bobra na jekosistemy malyh rek (Influence of beaver on the ecosystems of small rivers), M.; Nauka, 2005, 186 s.
5. Zav'jalov N.A. Harakteristika bobrovyh poselenij (Characteristic of beaver settlements), V kn.: Jekosistema maloj reki v izmenjajushhihsja uslovijah sredy, pod red. A.V. Krylova, A.A. Bobrova, M.: T-vo nauchn. Izdanij KMK, 2007, pp. 26-33s.
6. Korytin S.A. Povedenie i obonjanie hishhnyh mlekopitajushhih (The behavior and the sense of smell of carnivorous mammals), M.: Izd-vo LKI, 2007, 224 s.

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MORPHOFUNCTIONAL FEATURES OF BLOOD FORMATION IN THE WHITE SALMON DIGESTIVE TRACT IN LARVAL PERIOD

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Abstract: The main indicator of general physiological condition of a being is its internal environment. Qualitative study of developing blood cells is conducted upon embryonic holistic view. Central and peripheral hematopoietic organs especially their topography and maturation are studied.

Key words: Hematopoiesis, haematopoetic cells, erythroblast, myeloblast, monoblast

52

Due to the active development of industrial fish breeding physiological, morphological, and histochemical characterization of fishes are necessary to make an assessment of influence of conditions of dwelling on a fish organism.

After hatching from their eggs pre-larvae of white salmon pass through a number of larval and immature stages to reach their adult form. From the 5^{th} day juvenile fishes grow scales (squamation), the absorption of the yolk-sac finishes the transitional stage (19 days). The swim bladder gets operational and the fish can feed itself autonomously.

The fish gastrointestinal tract participates in the haematopoiesis development only at the end of the larval period. So, small haematogenic islands in bodies of a gastrointestinal tract were noted in the larval period of development of a white salmon at the age of 45 days. There is a development of lymphocytes, the main units of the adaptive immune system, of granulocytes also called polymorphonuclear leukocytes (PMN, PML) [2, p.19].

The conducted research of larvae of a white salmon showed that only at the IV stage of the larval period (45 days) single haematogenic islands in a mucous membrane of a throat appeared. The majority of blood cells were compactly together. Among blast-cells erythroblasts dominated: erythrocytes – 28%; lymphocytes – 12% [3, p. 67].

Histology sample preparation analysis of tissue specimens for sectioning, staining and diagnosis showed that the single formed haematogenic islands in a stomach wall have been noted for the first time at the IV stage of larval development.

More than a half of all blood cells in islands are from the lymphocytical range: mature lymphocytes were 38%; erythropoetics were 28%.

The analysis of qualitative structure of the developing blood cells of a stomach wall gave the following results: 81% cells of white blood, only 18% of cells of red blood. The developing eosinophils prevailed over neutrophils.

In the embryonic period there was an expansion of a cavity of a digestive tract of which it was formed an average gut which was surrounded by a single-layer prismatic epithelium.

The wall of an average gut by the end of the embryonic period consisted of three developing covers: serous layer, muscular layer and

53

mucous. In the whitebait period, 80,3 ± 3,17% of blood islands were found in the basis of high intestinal fibers of an average gut which had the extended form.

The basis of islands was represented by reticulum tissue and the developing blood cells. As for the juveniles in an average gut long intestinal fibers prevailed.

Low fibers were wide. In the larvae mucous membrane of an average gut there were 64% lymphoblast; 20% of myeloblasts as unipotent stem cells, 7% of monoblasts and erhytroblasts.

The basis of the haematogenic islands is made by cells of white blood (77%). And the lymphoblast cells dominated all others (53% of white blood). Among red blood cells erhytroblasts dominated (12%). In all bodies of gastrointestinal tract there are no parent cells, and also these bodies are universal bodies of blood formation.

Thus, generally -blast cells dominated: 66% were lymphoblasts, monoblasts were the smallest quantity (3%).

References

1. Ostroumova I.N. *Pokazateli krovi i krovetvoreniya v ontogeneze* [Blood counts and blood formation in ontogenesis] *Izvestiya Vsesoyuznogo NII ozer i rechnogo khozyaistva* [Proceedings of the All-Union Scientific Research Institute of lakes and river management], 1987, T. 43, №3, P. 64-67.
2. Ivanova N. T. *Atlas kletok krovi ryb. Sravnitel'naya morfologiya i klassifikatsiya formennykh elementov krovi ryb* [Atlas of blood cells of fish. Comparative morphology and classification of blood cells of fish]. Moscow: Nauka, 1982, 184p.
3. Zhiteneva, L.D., Poltavtseva T.G., Rudnitskaya O.A. *Atlas normal'nykh i patologicheski izmenennykh kletok krovi ryb* [Atlas normal and pathologically altered blood cells of fish]. – Rostov-na-Donu: Rostovskoe knizhnoe izdatel'stvo, 1989. – 109 p.

54

Bochkareva E. O.
ANALYSIS OF THE DYNAMICS OF ENDOPARASITIC INFECTION OF SMALL MAMMALS IN THE NATURE RESERVE BASEGI
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Abstract: The article presents the analysis of the infestation of small mammals (insectivores, rodents, predatory) with endoparasites in the Nature Reserve Basegi. The collection of endoparasites of small mammals is based on partial helminthological autopsy of animals. The study showed an increase in the infestation of small mammals by endoparasites since 2001.

Key words: State Nature Reserve Basegi, Perm Krai, endoparasites, small mammals.

Introduction**.** The State nature reserve Basegi founded in Perm Krai in 1982 presents good opportunities for envirionmental studies, precisely, for studies of endoparasites in small mammals [1].This is due to a relative simplicity of catching and field study of small animals.

Materials and Methods**.** Materials for the study are taken from stock of the materials of 1981-2012 and from our own field research of 2013-2014. The collection of endoparasites was carried out by using partial helminthological dissection of small mammals, due to the simplicity and ease of catching these animals. For catching small mammals we used hunting grooves, fences.

Helminthological studies of rodents conducted in the reserve in 1981-2014 analyzed 10556 small captured mammals, 4,892 are rodents, 5,650 insectivores and 14 carnivorous animals [2; 3]. Most of the small mammals trapped in 1981-2014 are not infected by endoparasites. Only 4.61%, (488 animals) were hosts for various groups of endoparasites, rodents constituted the majority of this group: 86.1% (420 animals); insectivorous were 13.7% (67 animals) and carnivorous were 0.2% (1 animal). Assessing the dynamics of infection of sexually mature groups of small mammals in general, we distinguish several levels of

55

infestation. High level of infection was noted in 1985, 2001, 2007, 2008. with the 10, 0 to 14.5% infested animals.

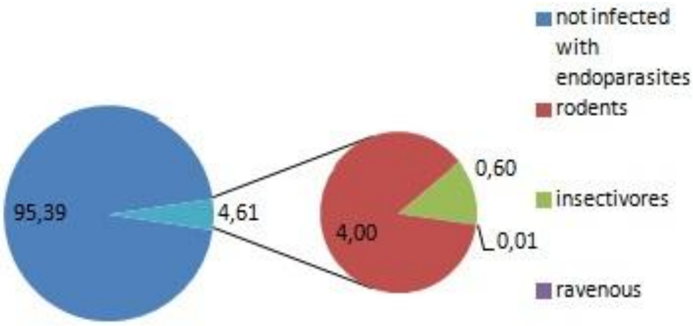

Figure1. Infestation small mammals endoparasites, % [2,3]

Medium level – in 1982, 1983, 2010, 2012, 2014 – from 4.0 to 7.5%. Low level – in 1981, 1984, 1986, 1989, 1991, 1996, 2003, 2004, 2006, 2011, 2013 – from 1.0 to 3.5%. Very low level in 1990, 1993, 1999, 2002– from 0.2 to 0.4% (Figure 2).

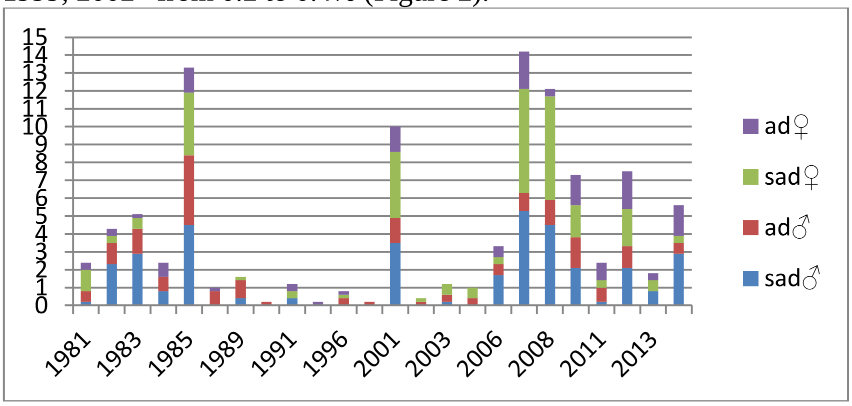

Figure.2 The dynamics of infection of sexually mature groups of small mammals, % [2; 3]

Two more notices. First, in the high and medium levels' years we observed the highest proportion of young animals infested. Second, the infection in all years is higher in males than in female. Quantitive estimations of small mammals in the reserve are carried out in 3 vertical zones: mountain-forest, subalpine, mountain tundra. Most small

56

mammals that infected with endoparasites were captured in the mountain-forest belt (60,0%).

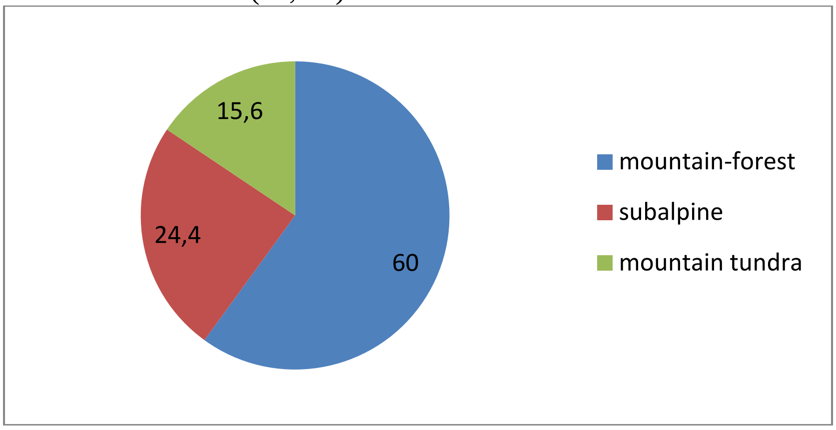

Figure 3. The ratio of small mammals that are infected endoparasites, vertical zones, % [2; 3]

In subalpine zone the proportion of animals-hosts is substantially smaller (24,4%) than in the mountain forest. The lowest percentage of infection was detected in the mountain tundra belt (15,6%) (Figure 3). This can be explained by the fact that infection with endoparasites is characteristic of the wetter areas, as the lifecycle of the major groups of parasitic worms (cestodes, nematodes) is relied with water and the invertebrates living in these conditions.

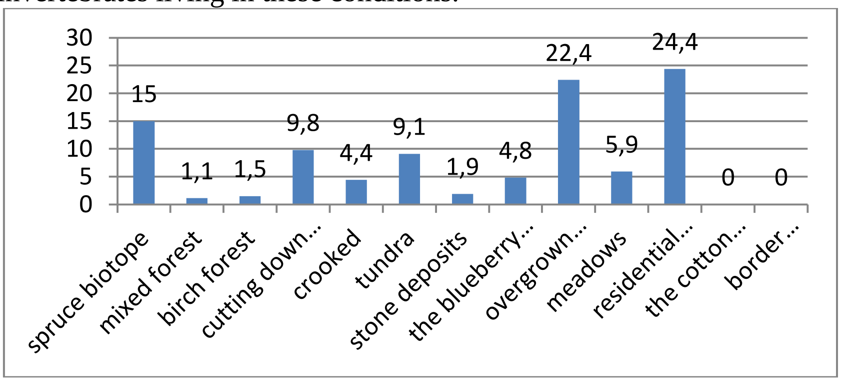

Figure 4. The ratio of small mammals that are infected with endoparasites, in groups of biotopes, % [2; 3]

57

The highest percentage of infected animals was observed near the residential buildings, because of deforestation due to human activities, and in overgrown meadows. This in turn is due to the change of vegetation and change in species composition and abundance of animals living there (Figure 4).

Figure 5. Changes in relative abundance, the proportion infected in the reserve "Basegi" according to the trapping grooves [2; 3].

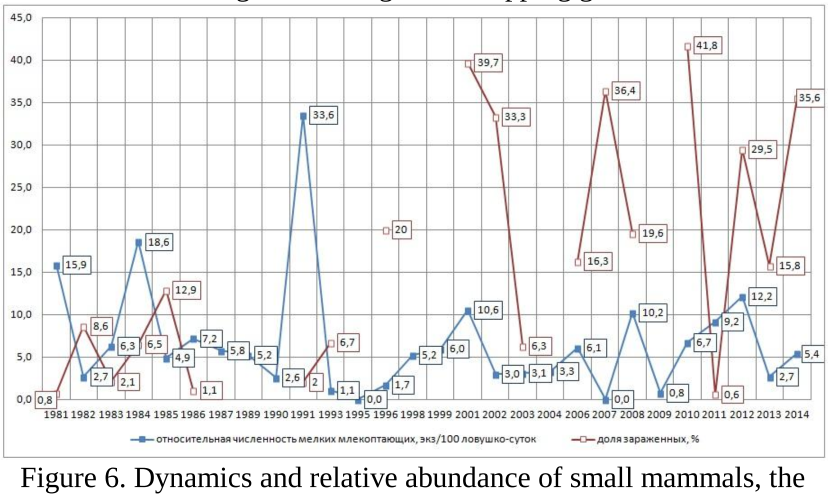

Figure 6. Dynamics and relative abundance of small mammals, the proportion of carriers according to the account of the traps [2; 3].

58

Analyzing the change in the infestation of small mammals in the reserve, caught by the grooves, can be noted the following feature – increasing the proportion of contamination is due to the minimum number of captured small mammals - 1982, 1985, 2002, 2007, 2012.

In the years of maximum abundance of small mammals the percentage of infected individuals is significantly reduced. In addition, in 1993 and 1996 accounting in the grooves did not come across any one infected individual (Figure 5).

For those animals that have been caught using lines of traps in some years the maximum percentage of infected individuals had still to years high or high abundance (2001, 2010, 2012. 2014, Figure 6).

The decrease in the number of infected small mammals depends on natural conditions.

Too high and low temperatures, low humidity are unfavorable for the development of helminths.

For infected with endoparasites of animals caught and the traps and grooves there has been an increase of infestation in the whole reserve. Especially significant growth has been there in the last 15 years, since 2001.

Perhaps this is due to the fact that this year the territory of the reserve Basegi was used for recreational purposes, mainly for environmental education.

References

1.Voronov G.A., Nikulin V.F., Akimov V.A., Balandin S.V. Zapovednik «Basegi». Zapovedniki SSSR. Zapovedniki evropeiskoi chasti RSFSR. I. - M., Mysl', 1988. S. 248-264.

2. Baza dannykh ucheta melkikh mlekopitayushchikh zapovednika «Basegi» za 1981 – 2013 gg. [Elektronnyi resurs]. – Perm': Dokument Excel, 2013

3. Kartochki vskrytiya melkikh mlekopitayushchikh v zapovednike «Basegi», Perm', PGNIU, geograficheskii fakul'tet, 2014 (kafedra biogeotsenologii i okhrany prirody geograficheskogo fakul'teta PGNIU)

59

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LICHENS AS ONE OF THE BIO-INDICATORS OF AIR POLLUTION
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Abstract: The article deals with lichens as bio-indicators of the environment. The problem of the air pollution is considered. The article contains species of lichens indicative at different levels of pollution.

Key words: lichens, air pollution, bio-indicators, pollutants

Bio-indications are organisms that are used for monitoring of the health of the environment. Lichens are a vivid example of biological indicators of air pollution.

Lichens are a peculiar group of living organisms, growing on all continents, including Antarctica. They consist of a fungus and an alga, which live together in symbiotic association and function as one organism. The fungus absorbs water and dissolved minerals; also it provides structure and protection for the alga. The alga forms of organic substances for itself and its fungal partner because it has chloroplasts and can photosynthesize.

From all ecological groups of lichens are particularly sensitive lichens that grow on the bark of the tree (epiphytic lichens) [1].

In fact, in the largest cities around the world these species have a number of the basic patterns: the more industrialized the city, the more polluted the air is, the less it occurs within the lichen species, the less area is covered lichens on tree trunks, the lower "vitality" of lichens [2]. Moreover, the increase of the degree of air pollution causes the disappearance bushy, next foliose and then scale (cortical) forms of lichens.

Lichens are highly sensitive to air pollution, especially to sulphur dioxide (SO_2), since they derive their water and essential nutrients mainly from the atmosphere rather than from the soil. Furthermore, their efficient absorption systems result in rapid accumulation of sulphur when exposed to high levels of sulphur dioxide pollution [3].

60

The alga suffers more from sulfur dioxide because this chemical compound destroys the chlorophyll and inhibits the process of photosynthesis.

In addition to sulfur dioxide on lichens are harmful and other pollutants such as nitrogen oxide (NO), nitrogen dioxide (NO_2), carbon monoxide (CO), carbon dioxide (CO_2), fluorine compounds [1]. Moreover, most chemical elements and compounds, which negatively affect lichens, are part of the emissions of most industrial manufacturing that allows the use of lichens as indicators of anthropogenic pressure.

Lichens can be used to measure toxic elemental pollutants and radioactive metals in that they link these substances in their fungal threads where they concentrate them over time [4]. Thus ecologists can appreciate that the accumulation and determine the history of the local air.

Table 1. Some lichens indicative of different levels of pollution [3]

Highly Polluted	*Hypogymnia physodes, Xanthoria parietina, Lecanora dispersa, Diploicia canescen*
Moderately Polluted	*Evernia prunastri, Foraminella ambigua, Lecanora chlarotera, Ramalina farinacea*
Slightly Polluted	*Parmelia caperata, Graphis scripta, Bryoria fuscescens, Physconia distorta*
Minimal or no Pollution	*Usnea subfloridana, Parmelia perlata, Degelia plumbea, Ramalina fraxinea*

Furthermore, lichens are able to react to air pollutants year-round. Also they are not expensive to use in the assessment of air pollution.

As a result, lichens are widely used as bio-indicators of environment. But method of monitoring of environmental pollution, mainly air by using lichens has received the name of lichen-indications.

References

1. Kumar A. G. (2015, May 22). Lichens: The Natural Bio-Indicator of Air Pollution. Retrieved from http://www.indianbotanists.com/2015/05/lichens-natural-bio-indicator-of-air.html

2. Bogoljubov A. S., Kravchenko V. M. (2001). Ocenka zagrjaznenija vozduha metodom lihenoindikacii, M: Jekosistema, 5 str.

61

3. Air pollution: Air Quality and Lichens. Retrieved October 10, 2015, from http://www.air-quality.org.uk/19.php
4. TERC: Lichens as Bioindicators. Retrieved in October 10, 2015, from http://staff.concord.org/~btinker/GL/web/air/bioindicators

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BIOENSAYOS DEL SUELO CERCA DE AUTOPISTA

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Resumen: Se ha realizado bioensayo de la contaminación del suelo con metales pesados y otras sustancias a diferentes distancias de una de las carreteras de Moscú. Los objetos de prueba empleados fueron cebada, pasto azul de Kentucky, trébol rojo y berro de jardín. Se sugirieron algunos parámetros, sensibles a los cambios de la concentración de contaminantes en el complejo del suelo.

Palabras clave: bioensayos, suelo, autopista, cebada, pasto azul de Kentucky, trébol rojo, berro de jardín, biomonitoreo, contaminación del suelo, autopista, Leniskiy Prospekt

Abstract: A bioassay of soil pollution with heavy metals and other substances at different distances from Moscow roads was performed. The used test objects were barley bluegrass, Kentucky bluegrass, red clover and watercress. Some parameters sensitive to changes of the concentration of pollutants in soil complex were suggested.

Key words: bioassays, soil, highway, barley, Kentucky bluegrass, red clover, garden cress, biomonitoring, soil contamination, highway, Leniskiy Prospekt

El biomonitoreo es parte del monitoreo ecológico, el cual estudia el estado del medio ambiente mediante sus indicadores biológicos.

El biomonitoreo tradicionalmente se divide en dos partes principales: bioindicación y bioensayos [1]. En el experimento descrito, se desarrolló los bioensayos de la contaminación del suelo, recogido a varias distancias de la autopista con el objetivo de establecer el impacto

62

de la contaminación del autotransporte en el desarrollo de las plantas [2-4].

Las muestras de suelo se seleccionaron por muestras puntuales de tres puntos a varias distancias de Leniskiy Prospect (30, 60 y 90 m) [5-7]. Las muestras de control se seleccionaron a 40 km de Moscú en la región de Instrinsk. (Suelo de cultivos agrícolas). El contenido de metales pesados y otras sustancias se determinaron en el laboratorio (Tabla 1). Podemos observar, que la concentración de los elementos estudiados en las muestras, recogidas alrededor de la autopista, es más alta que en la prueba de control. Por eso, en cuanto se aleja de la autopista principalmente disminuye más la concentración de cromo, cobre y zinc, pero la concentración de manganeso, inversamente crece [8-10].

Está claro que, la diferencia de la concentración de los derivados de petróleo y el benzopireno es un poco mayor en los suelos cercanos a la vía en relación con la muestra de control.

Para los bioensayos se usaron cebada (*Hordeum vulgare*), pasto azul de Kentucky (*Poa pratensis*), trébol rojo (*Trifolium pratense*) и berro de jardín (*Lepidium sativum)*, los cuales se sembraron en número de 100 unidades en los recipientes de plástico con varias muestras de suelo. En el transcurso del experimento se definió la germinación de las plantas, pero también se midió los parámetros biométricos como el largo de la raíz, el largo y ancho de las hojas, el largo del tallo y número de cotiledones, se anotó también características de las hojas.

Tabla 1. Contenido de metales pesados y otras sustancias en las muestras de suelo

		control	30 m	60 m	90 m
pH (KCl)	unidad	6,2	5,9	4,8	4,1
Cr	mg/kg	9,9	22	16	16
Mn	mg/kg	570	690	930	1060
Co	mg/kg	4,8	7,1	6,4	7,5
As	mg/kg	1,6	3,5	2,5	2,5
Ni	mg/kg	8,4	18	16	16
Cd	mg/kg	0,17	0,28	0,27	0,24
Cu	mg/kg	6,7	20	13	12
Pb	mg/kg	5,9	16	16	18

63

Zn	mg/kg	31	71	52	48
Hg	mg/kg	0,044	0,062	0,058	0,06
Derivados de petróleo	mg/kg	50	170	110	150
Benz(a)pireno	mg/kg	0,0073	0,017	0,0076	0,0054

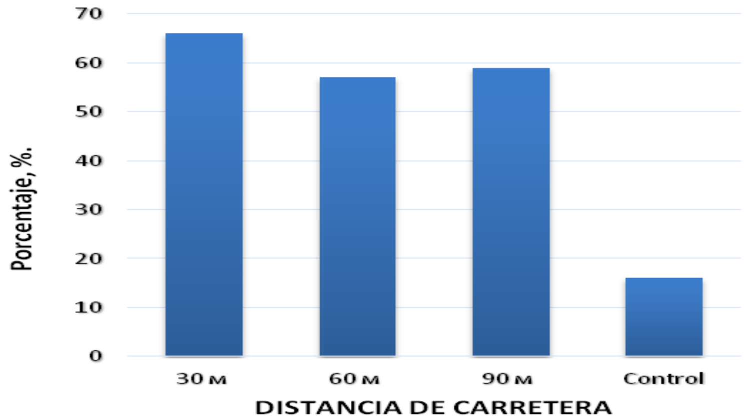

Figure1. La germinación de semillas de cebada en suelos recogidos a diferentes distancias de la carretera.

Se demostró, que de los cuatro objetos de prueba la cebada y el trébol rojo son más aptos para los bioensayos por su relación con su rápido crecimiento debido a la aparición rápida y simultánea de las plántulas y su facilidad para la medición de parámetros biométricos. Los otros dos objetos de prueba, el pasto azul de Kentucky y el berro, fueron inadecuados para los bioensayos. El pasto azul de Kentucky tarda demasiado tiempo en crecer y como los berros, no son aptos para las mediciones biométricas.

La germinación de la cebada (Fig. 1) se disminuye a medida que se aleja de la carretera (el valor mínimo de germinación se observa en el grupo control, que puede estar asociado con otra composición mecánica del suelo: composición levemente limosa para las muestras de la carretera y composición fuertemente limosa para las muestras de control). Sin embargo, en general, las diferencias entre las muestras en distintas distancias de la carretera son insignificantes.

A medida que la distancia de la carretera aumenta, crece tanto la longitud de la raíz como la longitud de las hojas (Figura 2). La anchura

64

de la hoja prácticamente no cambia. Por lo tanto, no puede considerarse un indicador apto para las fines de los bioensayos.

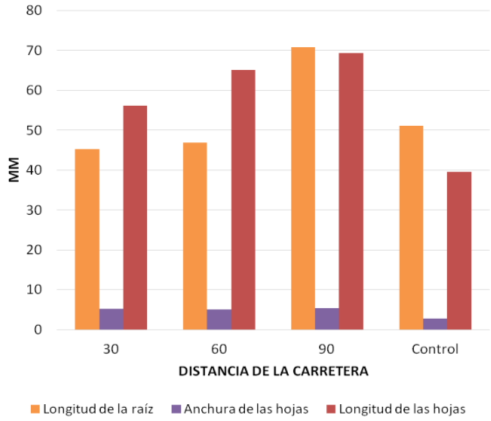

Figure 2. Parámetros biométricos de plántulas de cebada que crecen en los suelos recogidos a diferentes distancias de la carretera.

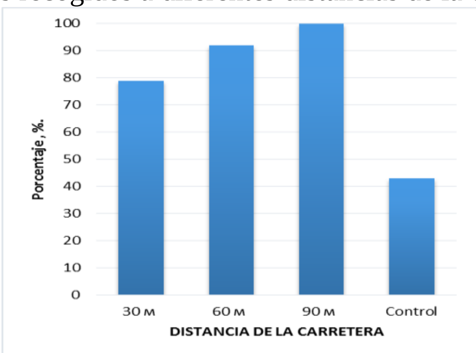

Fig. 3. La germinación de semillas de trébol rojo en suelos recogidos a diferentes distancias de la carretera.

Hay aumento de germinación de trébol con el aumento de distancia de la carretera (Fig. 3). La germinación de la muestra de control baja, esta relacionada con la composición mecánica del suelo fuertemente limoso. Se destaca que, a una distancia de 90 metros de la carretera en el trébol rojo se observa un 100% de germinación.

La longitud de la raíz y la longitud de la hoja de los brotes de trébol rojo, a medida que se aleja de la autopista, prácticamente no cambia (Fig. 4). Ligeramente cambia la longitud del tallo, la cual en principio, podría servir como indicador biométrico.

65

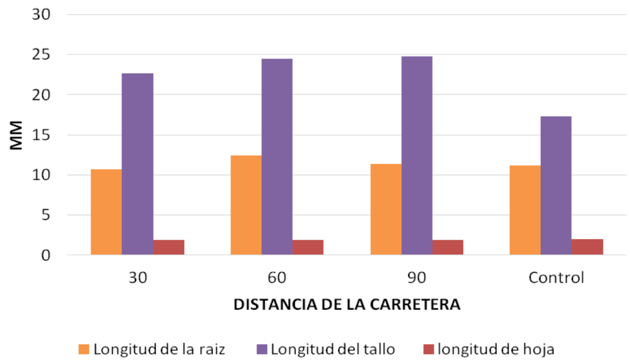

Fig. 4. Parámetros biométricos de plántulas de trébol rojo que crecen en los suelos recogidos a diferentes distancias de la carretera.

La germinación de berros (Fig. 5) prácticamente no cambia en función de la distancia de los puntos de muestreo de la carretera de automóviles.

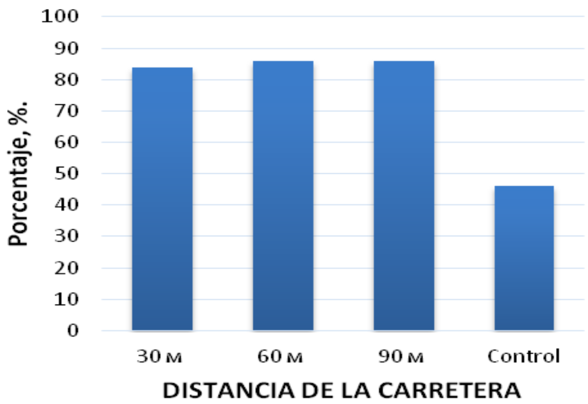

Fig. 5. La germinación de semillas de berro de jardín en suelos recogidos a diferentes distancias de la carretera

Sin embargo, cuando se consideran los parámetros biométricos, resulta que la longitud de la raíz de berro disminuye de manera constante a medida que se aleja de las muestras de suelo de la autopista (Fig. 6) pero, la longitud de la raíz y el tallo de igual manera, primero se incrementan en la muestra tomada a 60 metros de la carretera, y luego vuelve a disminuir en la muestra tomada a una distancia de 90 metros de la carretera

66

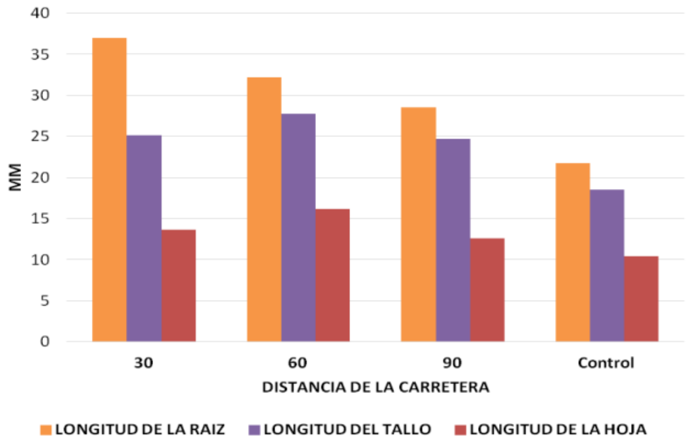

Fig. 6. Parámetros biométricos de plántulas de berro que crecen en los suelos recogidos a diferentes distancias de la carretera.

Como resultado, fueron establecidos algunos parámetros que pueden ser medidos en las tres especies de plantas estudiadas como objeto de bioensayo (Tabla. 2).

Tabla 2. Idoneidad de ciertos parámetros para fines de bioensayo

Planta	Longitud de la raíz	Longitud del tallo	Longitud de la hoja	Ancho de la hoja
trébol rojo	?	si	no	-
cebada	si	-	si	no
berro de jardín	si	?	no	-

Conclusiones

1. El pasto azul de Kentucky no es adecuado para la bioindicación, debido a la larga aparición de sus brotes y la dificultad en las mediciones de los parámetros biométricos de la planta.
2. Para la cebada y los berros se considera como indicador la longitud de la raíz. (para el trébol rojo se requieren estudios adicionales).
3. La longitud del tallo es un indicador para el trébol rojo, no es indicador para la cebada y se requiere investigación adicional para los berros.
4. Los parámetros de la longitud de la hoja son útiles como indicador sólo para la cebada.

67

5. La anchura de la hoja cambia poco en las plantas por eso, no se puede utilizar como un parámetro biométrico confiable.
6. Cuando más se aleja de la autopista, la germinación de la cebada disminuye, la del trébol aumenta, mientras que la del berro se mantiene sin cambios.
7. Los parámetros más sensibles, variaciones que coinciden con los datos de los estudios químicos del suelo, son la longitud de la raíz y la anchura de la hoja en la cebada y la longitud de la raíz de la raíz en los berros.
8. El autor agradece a Alesya Kuznetsova por su ayuda en el desarrollo del experimento.

Referencias

1. *Bioindikatsiya zagryaznenii nazemnykh ekosistem* [Bioindication of terrestrial ecosystems' pollution]. Moscow: Mir, 1998. 350 p.

2. Melekhova O.P., Egorova E.I., Evseeva T.I. Biologicheskii kontrol' okruzhayushchei sredy: bioindikatsiya i biotestirovanie [Biological environment control: bioindication and biotesting]. Moscow: Akademiya, 2007. 288 p.

3. Frolov A.K. Okruzhayushchaya sreda krupnogo goroda i zhizn' rastenii v nem [The environment of a large city and plant life in it]. Saint-Petersbourg: Nauka, 1998. 328 p.

4. Mezhenskii V. N. Rasteniya-indikatory [Indicator plants]. Moscow: Publ. ACT; Donetsk: Stalker, 2004. 76 p.

5. Mayachkina N.V., Chugunova M.V. Osobennosti biotestirovaniya pochv s tsel'yu ikh ekotoksikologicheskoi otsenki [Bioassay features of soil for the purpose of ecotoxicological assessment]. Vestnik Nizhegorodskogo universiteta im. N.I. Lobachevskogo [Bulletin of the Nizhny Novgorod University]. 2009, № 1. URL: http://www.unn.ru/pages/issues/vestnik/99999999_West_2009_1/14.pdf

6. Val'kov V.F., Kolesnikov S.I., Kazeev K.Sh. Vliyanie zagryazneniya tyazhelymi metallami na fitotoksichnost' chernozema [Influence of heavy metal pollution in the black soil phytotoxicity]. Agrokhimiya [Agrochemistry]. 1997. № 6. P. 50 55.

7. Bagdasaryan A.S. Biotestirovanie pochv tekhnogennykh zon gorodskikh territorii s ispol'zovaniem rastitel'nykh organizmov [The bioassay of soil technological zones in urban areas with plant

68

organisms]. PhD dissert. Stavropol', 2005. URL: http://libed.ru/knigi-nauka/205313-1-biotestirovanie-pochv-tehnogennih-zon-gorodskih-territoriy-ispolzovaniem-rastitelnih-organizmov.php
8. Makeeva T.I., Nikonova G.N. Otsenka antropogennoi nagruzki na territorii po pokazatelyam stabil'nosti razvitiya rastenii [Assessment of anthropogenic load in the territory in terms of the stability of plant development]. Problemy i puti ikh resheniya. Tez. dokl. nauchno prakt.konf. 2002. Moscow, 2002 P. 201-207.
9. Mironov A.A., Evsigneev I.E. Avtomobil'nye dorogi i okhrana okruzhayushchei sredy [Highways and Environment Protection]. Tomsk, 1986. 214 p.
10. Tarasenko I.N. K voprosu o biotestirovanii [On the question of bioassay]. Ekologiya i okhrana okruzhayushchei sredy [Ecology and environment protection]. 1999, № 5. P. 167.

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DER EINFLUSS VON ELEKTROMAGNETISCHEN WELLEN AUF DIE UMWELT

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Annotation: Elektromagnetische Wellen beeinflussen lebendige Organismen. Ihre Auswirkung ist sehr besonders. Oft merken wir uns sie nicht. Die Menschheit denkt, dass elektromagnetische Wellen harmlos für lebendige Organismen sind, aber es ist falsch. Deshalb ist ihre Untersuchung sehr wichtig.

Stichwörter: elektromagnetische Wellen, Umwelt, elektromagnetische Strahlung.

Abstract: Electromagnetic fields influence living organisms. Their effect is very specific. Often we don't even notice it. Humanity thinks that electromagnetic fields are harmless for living organisms, but this is not true. That's why their study is very important.

Key words: electromagnetic fields, environment, electromagnetic radiation.

69

Der gezielte Einsatz von elektromagnetischer Energie in verschiedenen Bereichen der menschlichen Tätigkeit hat dazu geführt, dass man zum vorhandenen natürlichen magnetischen Feld (elektrischen und magnetischen Feld der Erde, atmosphärischer Elektrizität, Solarstrahlung etc.) elektromagnetisches Feld künstlichen Ursprungs hinzugefügt hat.

Biologisch wichtig sind sowohl die von Menschen gemachten hochfrequenten elektromagnetischen als auch niederfrequenten Felder, die durch Freileitungen und Umspannwerke erzeugt sind [1].

Wie bekannt, hat beliebige Materie – auch die Bio-Materie – elektromagnetische Natur. Alle periodischen Wechselbeziehungssysteme (ohne Ausnahme), wie z.B. Molekularstruktur der Proteine, Neuro-Endokrin-, Blut-Kreislaufsysteme u.a., initiieren automatisch die Entstehung eigener sog. Superposition (eines Strahlungs-Feldes) und werden wiederum von ihr unterstützt. Beliebige Veränderung der Charakteristika solcher Superpositionen (Felder) ruft die Korrektur der Struktur-Parameter der Bio-Materie hervor, die ursprünglich diese Superposition hervorgerufen, quasi «geboren» hat [4, s. 105].

Seinerseits ist der biologische Organismus ein offenes physikalisches System, welches mit seiner unmittelbaren Umwelt Energie und Materie-Substanz ständig austauscht. Aus dieser Perspektive wird die Einwirkung auf die Molekular-Struktur der Bio-Form mittels eigener elektromagnetischen Superposition am effektivsten durch die Außen-EMS provoziert, die den Zustand des Menschen -als eines Subjektes mittendrin im globalen Umfeld (adäquates geo-physik. Umfeld, Natur)- entweder stabilisiert oder umgekehrt destabilisiert (durch technogene Strahlung, Elektrosmog). Dieser Strahlungs-Reiz löst einen Konflikt in der in genetischer Basis verankerten Information aus. Als Resultat kann diese künstlich erzeugte, technogene EMS vom Körper nicht adaptiert werden und provoziert nunmehr zahlreiche Systemdefekte und innerstrukturelle Konflikte [5, s.50].

Laut fundamentaler physikalischer Gesetzmäßigkeit, geschieht aus den Zonen eines konzentrierten Potenzials (mit hohem Polarisationsniveau) eine automatische Ladung-Umverteilung in die Zonen eines minderen Potentials, mit Bestrebung, diese ungleichen Konzentrationen auszugleichen. Der Körper des Menschen ist ein

70

wesentlich neutraleres Objekt. Daher absorbiert er aus seiner Umgebung – weil er ein offenes physikalisches System darstellt – auf natürliche Weise all diese technogene Strahlung [2].

Auf diese Art und Weise provoziert jeder beliebige Energie-Erzeuger in der Nähe des Menschen die Absorbierung der elektromagnetischen Strahlung von der Zellstruktur des Organismus einwirkend bis in die Tiefe der submolekularen Verbindungen. Besonders gefährlich sind hochfrequente Komponenten solcher Trägerwellen, ausgestrahlt von Handys oder ähnlichen Strahlungsquellen (Wi-Fi, Fernseher u.a.), die den semantischen "Sinn"-Kontext des Signals kennzeichnen.

Es ist bekannt, dass die Energie einer elektromagnetischen Welle proportional zum Quadrat ihrer Frequenz ist. Genau aus diesem Grund ist die hochfrequente Strahlung der Alltagsgeräte für den Menschen am gefährlichsten, denn diese ist fähig in die Molekular-Struktur der DNA-Matrix einzudringen und somit eine atypische Zell-Mutation auszulösen [3, s.5].

Die große Ausbreitung elektromagnetischer Wellen hat zur Entstehung einer relativ neuen Komplexe Schadstoffe wie "Elektrosmog" geführt. Darunter versteht man eine Reihe von verschiedenen Strahlungen, die bei der Arbeit der komplizierten elektromagnetischen Geräte entsteht [2].

Derzeit ist hohe biologische Aktivität von elektromagnetischen Wellen festgestellt. Einige Arten von Lebewesen und Pflanzen reagieren besonders empfindlich auf bestimmte Frequenzen. Somit kann der Fisch eine Frequenz von 50 Hz bei einer hohen Feldstärke schlecht übertragen. Waldwachstum verlangsamt, wenn die Modulation der Mikrowellen 12, 25, 50 und 100 Hz beträgt. Blumen reagieren auf Schallfrequenz [3, s. 2].

Regelmäßige Auswirkung von elektromagnetischen Wellen kann zu Funktions-, Gedächtnisstörungen führen, Aufmerksamkeit beeinträchtigen, was viele Krankheiten verursacht. Elektromagnetische Wellen erhöhen das Risiko von Herzkreislauf-, endokrinen System, Entstehung der Krebszelle, zerstört Immunität und Potenz. Nach Ansicht von Experten der Weltgesundheitsorganisation erreicht heute der Grad des Elektrosmogs das Niveau der Verunreinigung mit schädlichen Chemikalien.

71

Literaturverzeichnis

1. Aires Technologies (2013-2015). Zitationen von Internet-Quellen, Online im Internet/URL: http://airestech.ru/technologies/printsip-deystviya. Zugriffsdatum: 24.10.2015.

2. Karpenko V.N. Elektromagnitnye volny Maksvella i fotony (kvanty) [Maxwell's electromagnetic waves and photons (quantums)]. – 2000. Available at: http://antirelativity.workfromhome.com.ua/wave_maxwell.htm (accessed: 29.10.15).

3. Grzegorz Redlarski, Bogdan Lewczuk, Arkadiusz Żak, et al. (2015). The Influence of Electromagnetic Pollution on Living Organisms: Historical Trends and Forecasting Changes, BioMed Research International, vol. 2015, 1-5. doi:10.1155/2015/234098

4. Barners, F.S. (2006). Bioengineering and Biophysical Aspects of Electromagnetic Fields. Boulder: Taylor and Francis Group.

5. Grigor'ev O.A., Bicheldei E.P., Merkulov A.V., Stepanov V.S., Shenfil'd B.E. Opredelenie podkhodov k normirovaniyu vozdeistviya antropogennogo elektromagnitnogo polya na prirodnye ekosistemy [Defining approaches to valuation effects of electromagnetic fields on human natural ecosystems] sb. Ezhegodnik Rossiiskogo natsional'nogo komiteta po zashchite ot neioniziruyushchikh izluchenii [Collected papers. Yearbook of the Russian National Committee on Non-Ionizing Radiation Protection]. Sbornik trudov [Proceedings]. Moscow: RUDN Publ., 2003. pp. 46 - 74.

72

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THE MUDFLOWS OF MOUNTAIN SHASTA, CALIFORNIA

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Abstract: The article describes mudflows in the mountain region in California. Nowadays it is very important to forecast this phenomenon to prevent irreparable consequences. Due to mudflows economies of region suffer, people die and other serious problems occur.
Key words: The mudflows, mountain, glaciers, geosystems, map, water flow, Mount Shasta.

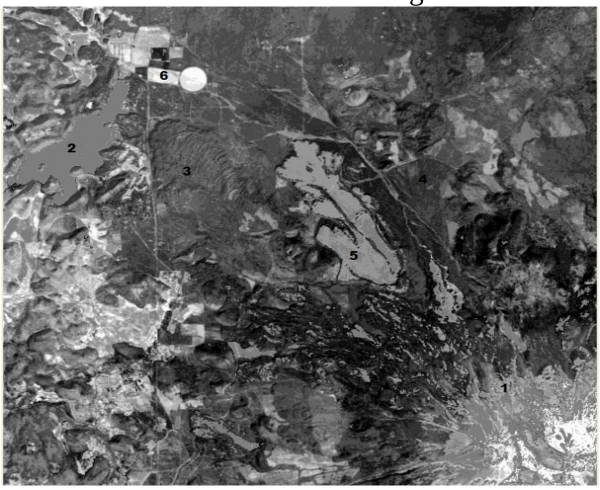
This article is a review of problems associated with mudflows. Mud flow is the water which contains a large amount of suspended particles and silt. It has higher density and viscosity than a stream flow and can deposit only the coarsest part of its load; this causes irreversible sediment entrainment. Its high viscosity will not allow it to flow as far as a water flow [1]

In the summertime, especially in the late afternoon, the glaciers on Mount Shasta melt and melt water send the stream channels down at their bases. Water is quickly absorbed by the volcanic substrate. However, if it has been especially warm for a certain period, or a summer thunderstorm adds to the melt water, mudflows can be formed.[2]

One of the smaller glaciers located on mt. Shasta is called Konwakiton. Historically there were five great mudflows in this region. The first flow was in 1924, and the last one in the 1993. The events of these years are connected with meteorological parameters such as humidity and temperature. Even a small glacier can carry destructive mudflows.[3] The main method of the mudflow research in the region is mapping, analysis of satellite maps and literature. The pictures allow monitoring flow from the glaciers. Specialist can warn and prevent accidents according to meteorological conditions. The satellite maps inform the scientists about humidity, temperature, altitude capability. These parameters can affect the flow rate and they are very important to prevent a disaster. In order to simplify the analysis of the maps, many

73

programs of geosystems are used. Program users can change color of mudflow according to the flow intensity, composition and other component of environment.[4] In this work we reviewed satellite pictures, to see where the main flow in this region is.



Pic.1 Satellite map of Mountain Shasta 2012yr.

This map describes mudflow location with number 2. Numeral 1 is occupied by lava flows of varying composition and ages. Numeral 5 is Lake Shastina. 3 an 4 is great mudflow in 1997 (Whitney and Bolam), 6 is locality. Please note that mudflow extends all the way to the agricultural region. This shows how it is important to know where will be avalanches and mudflow before building Town.

Nowadays specialist can monitor many components which lead to disaster in the mountain region. The research is necessary for the construction of houses or recreation. When creating a tourist ecotrail analysis of avalanches and mudflows is required for the safety of people [5]. However sometimes local government ignore the possibility of disaster.

References

1. Andreev Yu.B., Bozhinskij A.N., Ushakova L.A. Lavinnyj risk: klassifikaciya I upravlenie.Vestn. Mosk. Un-ta. Ser.5, Geogr. 2004. p 3-4.

2. Rhodes, Philip T. letter to John Mariano of the USGS. College of the Siskiyous. 2006.

74

3. Lewis, S.J.: Climbing Mt. Shasta. Shasta Marketing Co., 2003. p 5.
4. Wagner, D.L. and G.C. Saucedo. Geologic Map of the Weed Quadrangle, California, 1:250,000. State of California, Department of Conservation, 2000.
5. Simcox, Howard D. Snow pack on Shasta greatest in many years California, 2002.

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ECOLOGICAL CHARACTERISTICS OF PINE FORESTS AND RECREATIONAL PRESSURE ON THEIR HERBACEOUS COVER

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Abstract: Recreational pressure has great harmful impact on pine forest herbaceous cover. It affects biodiversity, coenotic ecogroup ratio, life-form ratio of grass cover of studied areas.

Key words: pine forests, herbaceous cover, grass cover, recreational pressure

Pine forests are one of the most attractive landscapes for tourists. Recreational pressure on such vulnerable ecosystems nowadays is very high, so it is important to study its impact on herbaceous cover.

Today natural ecosystems are exposed to a high anthropogenic pressure due to population growth and technical progress. Recreational pressure is an important part of anthropogenic pressure, which greatly affects nature habitat [1].

Camping and recreation are becoming increasingly popular nowadays and their negative impact on different ecosystems is growing. Recreation leads to soil panning, littering, extinction of different plant and animal species. Soil panning leads to depletion of grass cover and leaf mold [2] and to extinction of various organisms forming soil biota. All these effects disrupt the balance in an ecosystem and if the impact is too high and the ecosystem cannot cope with it, the forest degrades.

75

To survive under such conditions, the ecosystem should have great sustainability. If the pressure is higher than the limit of sustainability, the ecosystem cannot recover from the damage done to it [3].

Sustainability of forest ecosystems is an urgent issue of modern phytocoenology [4, 5, 6]. Among the scientists who studied the problems of recreational influence on pine forest herbaceous cover we should mention Lev Pavlovich Rysin [7, 8, 9]. Although he has published a lot of works on this subject, recreational sustainability of pine forests still needs to be studied.

The purpose of the work is to determine how different ecological factors (especially recreational pressure) affect pine forest herbaceous cover.

To achieve that purpose the following tasks were set:

1) Determination of plant biodiversity of studied areas;

2) Coenotic and biomophological analysis of studied forests flora;

3) Establishing the relation between biodiversity changing, coenotic ecogroups ratio and anthropogenic pressure.

Studies were held on 5 test sites, situated in different protected areas. Every forest had a different level of recreational pressure (assessment method [2]). Oksky reserve was on the zero stage of digression, Poveltizhye – on the fourth, Losiny Ostrov – on the second, Kuzminky Park – on the third, and the most disturbed area, Serebryany Bor, was on the fifth stage of recreational digression. Also in every test area crown density was measured, and it was almost equal in all tested areas (slightly higher in Oksky reserve).

Pinus sylvestris forms pine forest widely spread across the country. During this work mainly pine forests with different herbs and gramens in understory herb cover were studied.

First, the diversity of plant species of the pine forests was studied. The highest diversity was observed in Poveltizhye. The lowest diversity was in Kuzminky Park. The total species diversity is higher in areas located outside Moscow than in Moscow parks.

Secondly, the analysis of plant life-form ratio in herbaceous cover of the studied areas was done. A life form of a plant is a complex of morphological features, indicating the plant adaptation to certain conditions of environment.

76

The variety of life-forms according to I. G. Serebryakov is wider in Oksky Reserve and Voskresenskoye Povetluzhye. This ratio, with dominating long-rooted plants, short-rooted plants and bunch-grass perennials, is typical for pine forests. In Moscow parks whole groups of species are missing: lianas, dwarf semishurbs. The ratio of Moscow parks containing fewer plant life-forms is considerably different from the ratio of protected areas outside Moscow (see Picture 1).

With higher recreational pressure the percent of some groups decreases, and these are tufted-herbs, creeping-rooted plants, long-rooted, tap-rooted plants.

Another system of plant life-forms is Kristian Raunkiaer's system [Y]. Life-form ratio according to this system is an indicator of climate conditions, and it is quite similar in all tested areas. Therefore, according to Raunkier's system no significant changes in life-form ratio were observed on the territories with higher recreational pressure.

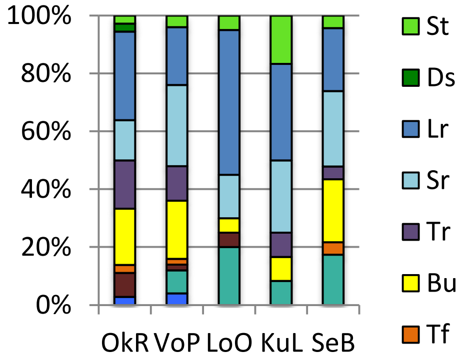


Figure 1. Life-form ratio (Serebryakov system): OkR –Oksky Resrve, VoP - Voskresenskoye Povetluzhye, LoO - Ostrov, KuL –Kuzminky-Lublino, SeB - Serebryany Bor; St –stolon plants, Cr –creeping-rooted plants; Tr –taproot plants, Sr –short-rooted plants, Lr –long-rooted-plants, C –creeping plants, Tf–tufted-herbs, Bu –bunch-grass, Ds – dwarf semishrubs, L - lianas.

For every studied forest a coenotic ecogroup ratio of plant species of herbaceous cover was estimated.

77

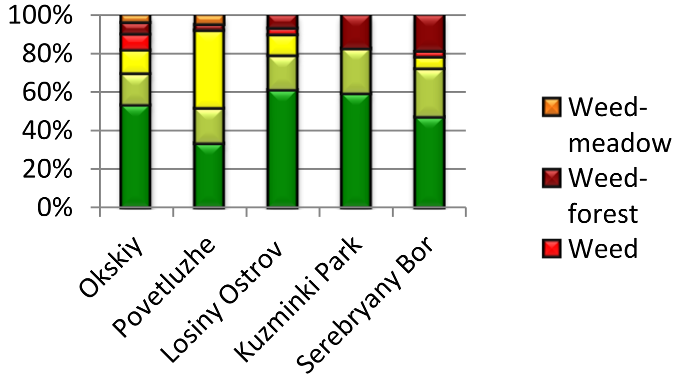


Figure 2. Coenotic ecogroup ratio of plant species of herbaceous cover of studied areas

Oksky reserve represents a normal ratio of a pine forest: forest species are dominating, the percentage of meadow and meadow-forest species is lower, and the percentage of weed, weed-forest and weed-meadow species is significantly lower. In understory cover of pine forests in Moscow parks, forest and meadow-forest species are also dominating, but there are no weed-meadow species at all, and the percentage of weed-forest species is higher. So, with recreational pressure increasing, the percentage of forest species decreases, and the percentage of weed and meadow species increases (see Figure. 2).

Transect studies allow to assess the effect of recreational pressure on pine forest herbage more adequately. The life-form ratio of different squares of transects of the most disturbed and the least disturbed area is shown in the pictures below.

The highest recreational pressure was in the first square of each transect, and it was declining as we went deeper into the forest. Moreover, crown density showed a reverse relation – it was higher in the fifth square of transect, than in the first one. In the least disturbed area, Oksky reserve (Figure 3) with decreasing and increasing recreational pressure the number of forest and meadow-forest herb species grows, while the number of weed-forest and meadow species decreases.

78

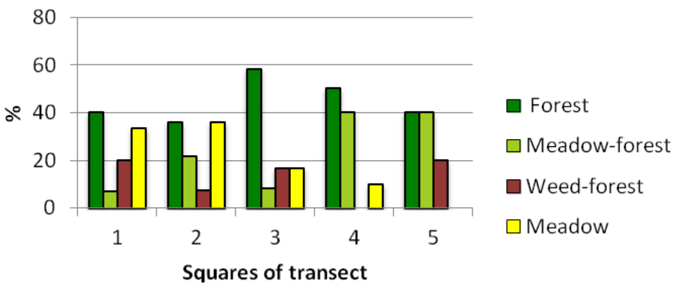
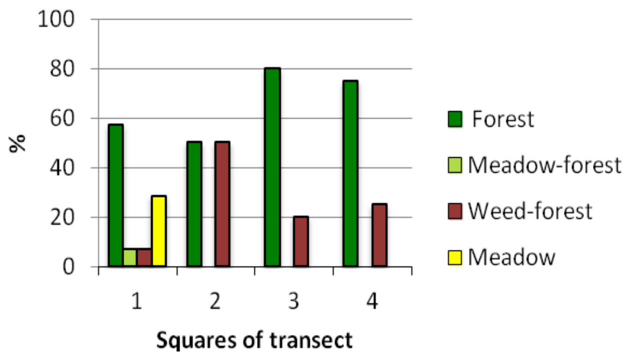


Figure 3. Coenotic ecogroup ratio of herbage species in connection with changing recreational pressure and crown density in Oksky reserve.

The transect study of the most disturbed area, Serebryany Bor (Pic. 4), shows the same relation. All other transect studies confirm it.



Picture 4. Coenotic ecogroup ratio of herbage species in connection with changing recreational pressure and crown density in Serebryany Bor.

Conclusions:

1) Biodiversity is higher in protected areas located outside Moscow than in Moscow parks.

2) According to I.G. Serebryakov system of plant life-forms, perennial plants dominate in the flora of pine forests and the leading groups are long-rooted and short-rooted plants. This ratio is typical for pine forests. With higher recreational pressure the percentage of recreationally-sensitive plants decreases: tufted-herbs, creeping-rooted plants and dwarf semishurbs.

3) Life-form ratio according to K. Raunkiaer system is similar for every area and matches with the ratio which is normal for this climate zone. No significant changes in life-form ratio according to Raunkiaer were observed in systems with higher recreational pressure.

4) Normal coenotic-ecogroup ratio for plant species of herbaceous cover contains more forest and forest-meadow species, and fewer meadow, meadow-forest, weed, weed-meadow, and weed-forest species. In areas with high recreational pressure the number of weed-forest species is high. With recreational pressure increasing, the proportion of forest species decreases, and the proportion of weed and meadow species increases.

References

1. Oborin M.S. Osobennosti analiza rekreatsionnoy i antrogennoy nagruzki vsledstvie sanatorno-kurortnoy i turistskoy deyatel'nosti [Features of analysis of the recreational and anthropogenic loading as a result of sanatorium-resort tourist activity], Geograficheskiy vestnik № 2 / 2010 URL: http://cyberleninka.ru/article/n/osobennosti-analiza-rekreatsionnoy-i-antropogennoy-nagruzki-vsledstvie-sanatorno-kurortnoy-i-turistskoy-deyatelnosti accessed date: 25.10.2015).

2. Polyakova G.A., Malysheva T.V., Flerov A.A. Antropogennoe vliyanie na sosnovye lesa Podmoskov'ya [The anthropogenic impact on the pine forests near Moscow]. Moscow: Nauka, 1981. 144 p.

3. Ermakova A.A. Problemy opredeleniya rekreatsionnykh nagruzok i rekreatsionnoy emkosti territoriy [Problems of definition of recreational pressure and recreational capacity of the territory]. Vestnik VGU [Messenger of Voronezh Government University]. Voronezh: VGU Publ. 2009, №2. PP. 16-20.

4. Donella H. Meadows. Jorgen Randers, Dennis Meadows. Limits to Growth: The 30-Year Update - Chelsea Green Publishing, 2004, 368 p.

5. Akimova T.A., Khaskin V.V. Ekologiya. Chelovek – Ekonomika – Biota – Sreda: uchebnik dlya vuzov [Human – Economy – Biota – Environment: textbook for universities], 3th pub. Moscow: YuNITI-DANA, 2006. 495 p.

6. Chapin, F. S., Torn, M. S. & Tateno, M. Principles of ecosystem sustainability. // The American Naturalist. 1996. 148(6). P. 1016-1037.

7. Dinamika i ustoychivost' rekreatsionnykh lesov [Dynamics and sustainability of recreational pine forests]. Rysin L.P., Abaturov A.V.,

80

Savel'eva L.I. and others. Moscow: Tovarishchestvo nauchnykh izdaniy KMK Publ., 2006. 165 p.
8. Rysin L.P., Rysin S.L. Rekreatsionnaya tolerantnost' travyanistykh rasteniy [Recreational tolerance of herbaceous plants]. // Vliyanie rekreatsii na lesnye ekosistemy i ikh komponenty [Recreation affect on forest ecosystem and their compounds]. Moscow: ONTI PNC RAN Publ., 2004. PP.74-132.
9. Rysin L.P., Savel'eva L.I. Sosnovye lesa Rossii [Pine forests of Russia]. Moscow: Tovarishchestvo nauchnykh izdanii KMK Publ, 2008. 289 p.

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DESIGN OF ARTIFICIAL BIOSYSTEMS ON CLOSE MSW LANDFILLS IN THE CHECHEN REPUBLIC

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Abstract. Basic principles and the algorithm design of artificial ecosystems in closed landfills are studied and are being realized.

Key words: municipal solid waste, artificial ecosystems, landfills, bioremediation, the Chechen Republic

The artificial ecological system is a set of man-made conditions for the habitat of living species. Currently, the Russian Federation has got about fifteen hundred landfills and more than seven thousand authorized landfills. In recent years, many researchers are interested in the issue (see the review in [1]). The creation of artificial ecosystems in a former landfill area will tap natural bioremediation mechanisms to help these man-made structures to be naturally transformed into natural ecosystems. The operating instructions for the design, operation, and reclamation of landfills for municipal solid waste (1996) does not specify the steps and criteria of the recovery after

81

remediation to the level of biogeocoenosis (biome). To fill this gap, we have carried out its own research in the two existing landfills located near Grozny, the Chechen Republic, Andreevskaia dolina ("St. Andrew's Valley") and Vtorsyryo.

We are based on three principles. The principle of the Organic nature life suggests the creation of such an ecosystem that organically fit into the natural environment of the region. The principle of Concordance involves the use in bioremediation of plant species that are typical for the region and have the adaptive capacity to the adverse effects of the landfill body. The principle of Eco-friendliness provides and effective structure of realization, the use of plant communities that are resistant to the effects of the landfill body and will reduce the level of its impact on the environment of the region [2]

Analysis of gases emitted by the landfill body showed that the carbon monoxide at the "St. Andrew's Valley" site is five times more the MPC norm and it affects the plant life [3]. Hydrogen sulfide, nitrogen dioxide and sulfur dioxide do not excess the MPC. Models have been constructed, the distribution of pollutants and temperature in the thick surface layer of "St. Andrew's Valley" landfill and of Vtorsyryo site.

Our research group has studied climatic conditions, soil cover, terrain, types of landscapes, biodiversity of plant and the whole ecosystem around the landfills. It is the steppe ecosystem. Assessment of the viability of plants and their degree of adaptation to the adverse effects of landfills, have been carried out by morphological criteria: the size of the leaf blade and length, number of live branches, the percentage of foliage crowns of trees and shrubs, the number of leaves without necrosis. In total, 900 specimens of trees and shrubs have been analyzed. As a result, it was found that:

A. Within the sanitary protection zone of "St. Andrew's Valley" solid waste landfill:

1) medium quality state (41 points) for the English oak (*Quercus róbur*) and narrow-leaved oleaster (*Elaeagnus angus*tifolia);
2) degradation (less than 40 points) for the white willow (*Salix alba*) and the black poplar (*Populus nigra*), *Ligustrum vulgáre*, ordinary hawthorn (*Crataegus laevigata*), common hazel (*Corylus avellana*);

B. Within the sanitary protection zone of the Vtorsyryo site:

82

1) Good state (45 points) for the *Quercus robur* and narrow-leaved oleaster; 2) medium quality state (41 points) for the white willow and the black poplar, *Ligustrum vulgare*, ordinary hawthorn, common hazel. This means that these species may be involved in conducting bioremediation landfill bodies and the creation of artificial ecosystems.

Description of herbaceous cover was performed by the procedure worked out by I.L. Bukharin and A.A. Dvoeglazova. As a result, it was revealed that sandy sainfoin (*Onobrychis arenária*) and white clover (*Trifolium repens*) prevail in the grassland near the landfills. By virtue of a well-developed tap root system and the fact that they are undemanding, these plants can also be used to create an artificial ecosystem.

We have carried out the development of the project of artificial ecosystems: its logics, modeling, landscape design, selection of plant species and modeling of plant communities at closed landfills. The achieved result is a model of plant community: the definition of a set of plants and the geometry of their planting in landfill soil.

In the nearest future we're going to go with the project engineering practices, farming practices and agricultural chemistry: terrain will be smoothed; plants will be planted or sown. Artificial ecosystems will be under constant environmental monitoring: it will be necessary to carry out the sampling of air, soil, surface and underground water and moisture, the plants; analyze data and compare these data with existing ones. Then adjust the status of artificial ecosystems by management decisions.

In conclusion, the design and then the creation of artificial ecosystems in closed landfills will solve the pressing environmental problem of the restoration of disturbed areas to the level of natural ecological systems.

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References

1. Bicheldey T.K., Latushkina E.N. Biogas emission prognosis at the landfills // International Journal of Environmental Science and Technology. - 2010. - Vol. 7 (4). - P. 623-628.

83

2. Sivakumar D. Experimental and analytical model studies on leachate volume computation from solid waste // International Journal of Environmental Science and Technology. - 2013. - Vol. 10 (5). - P. 903-916.
3. Zhang X., Jiang H. Spatial variations in methane emissions from natural wetlands in China // International Journal of Environmental Science and Technology. - 2014. - Vol. 11 (1). - P. 77-86.

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VEGETATION COVER OF LENA-ALDAN INTERFLUVE AND THE RIVER AMGA (SPATIAL IMAGERY)

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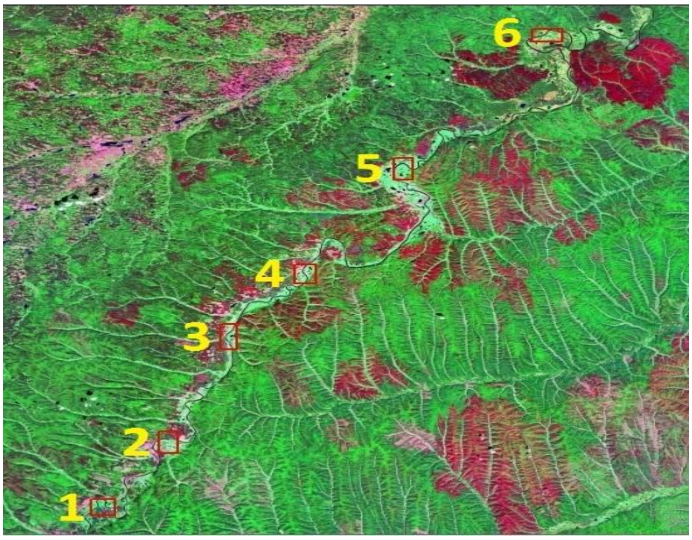
Abstract: The main direction of this work is focused on using satellite imagery for making and analysis of vegetation maps of medium scale of the range of communities of Leno-Aldan interfluve of the Sakha Republic.

Key words: geographic information systems, vegetation cover, satellite imagery, geobotanical mapping.

As part of the study numeralization of medium-scale satellite imagery of the valley of the river Amga was done, and the image was got from the artificial planet LANDSAT 7.0 (pic. 1). The program ArcView GIS 3.2 was used for calculation contours of vegetation types, squares and percentage ratio of studied territory. There are 6 areas in the size of 5 to 5 sq.km. in the Amga valley-growing larch birch forest steppe (Figure1). The area of interest is related to Aldan - Lensky District, center of Yakutia, middle province by geobotanical subdivision (Andreev and others, 1987). According to subdivision by M.N.Karavaev from Lena-Amga interfluves, the area for research was the ninth district – Amga valley-growing larch birch forest steppe. The territory of the district of Amga valley-growing larch birch forest steppe takes comparatively narrow line which is made with the valley of the river Amga and its porches. The analysis of the vegetation maps

84

related to studied territories was led and some definite characteristics of space structure of vegetation cover were found out. On the basis of all the tables of space structure of vegetation cover the general table for all the 6 points of covered vegetation subdivisions with the common square and percentage ratio of separate vegetation types was done. This table let lead comparative characteristic of covered subdivisions on the studied territories.



Picture 1. Lena River Valley. Key areas.

All in all 199 contours were found out according to the 6 areas. There are 30 contours on the first area, 28 contours on the second area, 26 contours on the third area, 25 contours on the fourth area, 28 contours on the fifth area and 62 contours on the last, the sixth area. General items in the comparison analysis are the facts such as that on all the areas wet meadows are wide spread. Also on all the areas vegetation fields are met. Most of all, the vegetation field is presented on the last area.Aquatic and in-shore aquatic vegetation of the lakes are observable on all the areas and are characterized with big quantity, but little square. The studied district is related to Amga valley-growing larch birch forest steppe, that’s why the vegetation of fluid stream flows is observable and they have almost the same percentage ratio.

The present meadows with the participant of shrubby communities are brightly mentioned on the first area (45.1%), it is more

85

or less mentioned on the second area, and it is not observable on the rest areas at all. The present meadows are presented on all the areas besides the third and the fifth one. Only the third one and the fifth one have the present meadows together with the wet ones in the space structure. The complex of the meadow communities of different wetness with shrubs is presented only in the fourth and the fifth areas, where they take the most of the territory. Anthropogenic vegetation of settlements is met in the first and the fourth areas. In the fourth area anthropogenic vegetation of settlements takes a large proportion of territory. The vegetation complex of isles is observable on the second and the third areas. And the vegetation of bank sand is presented on the first, second and sixth areas.

On all the areas the forest is presented only in one or two types. And they take not large territories.

Incrementally downstream it can be noticed that the occurrence of wet meadows decreases. The structure of the vegetation cover was analyzed in the program STATISTICA 8 in the way of leading of cluster allocation with the method Ward's with using Euclidian distance and we got its dendrogram. Cluster allocation allows finding the common features that the participants have. Dendrogram shows that the structure of vegetation cover which the first area has is strongly different from the others. It is explained by the fact that the first area is situated in the midstream of the river Amga and the most part of it is covered with the present meadows with the participation of shrubby communities. The fourth and the fifth areas are forming one allocation block and it says about their similarity. Both of the areas are situated in the downstream of the river Amga and in the space structure of vegetation the leading type is the complex of meadows with different wetness with shrubs. The second, third and sixth areas are united in one allocation block. The second and the third areas are situated in the midstream of the river Amga, and the sixth area is in the downstream of the river Amga. We can see their similarity in high rate of the base unit, which is the field vegetation (24,2%, 14,8%, 28%).

References

1. Troeva E.I., Cherosov M.M. [Ecological approaches to adjusting the vegetation map of Yakutia with using computer technologies // Domestic geobotany: milestones and perspectives: Proceedings of the

86

Scientific Conference with international participation]. - SPb .: Publishing house "Boston-spectrum", 2011. - Vol.1. - P.427-429.
2. Karavaev M.N. [Vegetation cover // Yakutia.] - M.: Science, 1965. - P. 247-292.
3. [The Atlas of Agriculture YASSR] / Ed. I. A. Matveeva and others. – Yakutsk, The State University of Kuibyshev, 1989. - 116 p.
4. Karavaev M.N [Geobotanical subdivision of eastern part of the Central Yakut plain // The Problems of Physical Geography: Coll. of Scientific articles.] - M.: Publishing House of the USSR Academy of Sciences, 1958. - P. 230.

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ANALYSIS OF INFESTATION OF SMALL MAMMALS BY IXODIDAE TICKS IN THE NATURE RESERVE BASEGI

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Abstract. An analysis of infestation of small mammals by parasitic ticks in the Nature Reserve Basegi in Perm Krai has been performed. Physical and geographical conditions in the Reserve have been examined. The ixodidae life-cycle: larva, nymph, adults is studied.

Key words: State Nature Reserve "Basegi", parasitism, Ixodidae, small mammals

Introduction. State Nature Reserve Basegi is the first of two organized by the Department of Nature Conservation and biogeocenology of Perm State National Research University [1]. The reserve was established for the protection and study of the fundamental areas of undisturbed mountain taiga and Ural over 30 years ago in Perm region. During these years a variety of studies were conducted on its territory. One important new issue is the presence of ticks (Ixodidae) in Basegi. Biologist Simkin G.N. found that the main tick breadwinners are small mammals and birds [2].

87

Methods and Materials. Materials for the study are taken from the collection conserved in the Reserve stock (1981-2012) and collected during our own field studies (2013).

The distribution of ticks in the reserve and their number are constantly changing. [1]

The reserve "Basegi" offers to students only the first group of animals for a research. First of all, this is due to the relative ease of capture and study in the field, as well as their great importance in nature. Therefore, further consideration of the distribution of ticks will be focused on the study of small mammals [3]. From 1981 to 2013 the most numerous small mammals under study were insectivores, 51.05% of the total catch. Rodents constitute 48.81% of all caught species, and only 0.14% (1 animal) was a predatory (Figure 1). During these years 9644 entries of the censi were for caught small mammals. 4.25% were infected by ticks. There were found 410 Ixodidae. Our team collected 116 Ixodes, including 59 adults (imago), 22 nymphs, 35 larvae. 294 captured rodents were with Ixodes, including 167 adults, 52 nymphs, 75 larvae. So, adults were the most numerous.

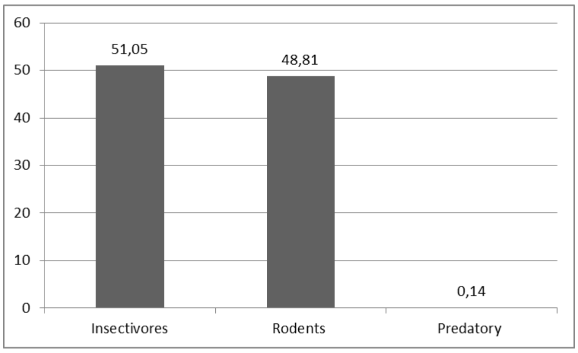

Figure 1.The ratio of insectivores, rodents and predators caught in the reserve "Basegi" in the period from 1981 to 2013, %.

The data revealed that the main types of breadwinners in the Basegi State Nature Reserve are common *S. araneus, Cl.rutilus, Cl. Glareolus.* Dynamic study of the number of ticks on the territory of Basegi in 1981 to 2013 shows that the first five years after founfing the reserve number of parasites (Ixodes ticks) of small mammals was not great: from 0 to 9 insects. In 1986 there was a noticeable increase in the number of ticks to 96 insects.

88

Table 1. The number of trapped small mammals and Ixodes ticks on the territory of Basegi in 1981 to 2013.

Kind of small mammals	Number of trapped animals	Number of infected by Ixodes, %	Ixodes			The total number of Ixodes
			I	N	L	
S. araneus	2661	2,33%	33	12	17	62
S. caecutiens	647	1,55%	7	1	2	10
S. isodon	638	0,31%	1	0	1	2
S. minutissimus	28	0,00%	0	0	0	0
S. minutus	428	2,57%	5	1	5	11
S. tundrensis	244	3,69%	2	6	1	9
N. fodiens	132	15,91%	11	1	9	21
T. europaea	145	0,69%	0	1	0	1
Total insectivorous	4923	2,36%	59	22	35	116
Cl. glareolus	1447	5,04%	32	17	24	73
Cl. rufocanus	433	3,23%	7	2	5	14
Cl. rutilus	857	9,92%	43	16	26	85
M. agrestis	221	1,36%	1	2	0	3
M. arvalis	894	5,82%	52	0	0	52
M. oeconomus	391	10,49%	23	10	8	41
M. schisticolor	124	11,29%	2	2	10	14
A. agrarius	1	0,00%	0	0	0	0
A. sylvaticus	8	0,00%	0	0	0	0
A. terrestris	29	0,00%	0	0	0	0
S. betulina	301	3,99%	7	3	2	12
S. vulgaris	1	0,00%	0	0	0	0
Total rodents	4707	6,25%	167	52	75	294
M. erminea	4	0,00%	0	0	0	0
M. nivalis	10	0,00%	0	0	0	0
Total predatory	14	0,00%	0	0	0	0
Total small mammals	9644	4,25%	176	60	50	410

Table 1 shows the number of caught mammals and ticks in different periods of life cycle: imago (I), nymphs (N), larvae (L).

89

Peak activity occurs from 11 to 25 June. Then, until the early 2000s, the number of ticks did not exceed 3 insects. Since 2003 it has been a significant change in the number of ticks – imago, nymph, larva. In 2006 there was a significant rise from 3 to 37 insects found on a small mammal body in 6 days. Then there was a reduction of up to 2009. Since 2010, there have been a large number of ticks. Their number in recent years decreased to 28 insects.

Explanation for such difference in the number of ticks may be the following: the duration of the main works in the reserve was two or three months. The minimum duration of the works in the reserve was in 1991 and amounted to 4 days. Works to identify ticks on the body of small mammals were not held in 1992, 1994, 1997, 1998, 2000, 2005.

Analysis shows that rodents are mostly infested. The main types-of breadwinners in the reserve are red and voles [5].

Counting the number of ticks in 1981 to 2013 shows that the peak activity of ticks was in 2013 (190 insects). In addition, these last 10 years there are an increasing number of ticks, the number of adults prevails over the number of nymphs and larvae.

References

1. Mal'kov G.B. Lesnye gryzuny ochagov kleshchevogo entsefalita Permskoi oblasti. Avtoreferat kand. dissert. – Perm', 1996. -19s.
2. Shilova S.A. Zoologo-parazitologicheskaya kharakteristika ochagov kleshchevogo entsefalita Permsk. oblasti // Sb. nauchno-prakticheskikh rabot. - Perm', 1959, vyp.2. – S. 16-23
3. Simkin G.N. Biogeotsenozy taezhnogo lesa. - M.: Izdatel'stvo Moskovskogo universiteta,1974. – 174 s.
4. Voronov G.A., Nikulin V.F., Akimov V.A., Balandin S.V. Zapovednik «Basegi». Zapovedniki SSSR. Zapovedniki evropeiskoi chasti RSFSR. I. - M., Mysl', 1988. S. 248-264.

90

Podushkina O.A.

LES FACTEURS ANTHROPIQUES LIMITANT LA BIODIVERSITÉ DE LA FORÊT-STEPPE DANS LA RÉGION DE KURSK (LA RUSSIE CENTRALE)

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Résumé: La présente étude est consacrée à la vie de la forêt-steppe dans une zone industrielle de la Russie Centrale. L'analyse du Livre rouge de la région de Kursk démontre que l'utilisation et la gestion des ressources naturelles créent des facteurs limitant la biodiversité qui diminue rapidement.

Mots-clés: pression anthropique, facteurs limitant la biodiversité, forêt-steppe, Russie Centrale

Abstract: The present study is devoted to the life of the forest-steppe in an industrial area of Central Russia. Analysis of the Red Book of the Kursk region has been undertaken. It is shown that the use and management of natural resources create factors limiting biodiversity which decreases rapidly.

Keywords: anthropic pressure, biodiversity limiting factors, forest-steppe, Central Russia

Introduction**.** Les pressions de nature anthropique et leurs impacts sur les situations peuvent être exprimés sous formes de facteurs anthropique qualitatifs et quantitatifs limitant la biodiversité [1]. La biodiversité est le trait pertinent du fonctionnement des écosystèmes, ainsi que de la biosphère en entier. Aujourd'hui les services écosystémiques sont mis en place pour préserver la biodiversité ce qui est un des problèmes cruciaux à cause de la pression anthropique grandissante liée à l'utilisation et à la gestion des ressources naturelles. La biodiversité diminue rapidement en raison de facteurs la limitant dont les facteurs anthropique sont parmi les plus importants. On voit le processus du développement des espèces et des populations dépendre des activités humaines. L'auteur de la présente étude a assisté au

91

monitoring suivi au jour le jour de la flore et de la faune dans la région de Koursk (la Russie Centrale).

Selon E. A. Parakhina [2], la conservation de la biodiversité est l'un des principaux défis pour de nombreux pays et organisations environnementales, en particulier en ce qui concerne les espèces qui sont menacées d'extinction. La préservation des plantes rares peut être effectuée de diverses manières, y compris par l'introduction de ces espèces dans la culture agricole ou jardinière.

Depuis le milieu du 20e siècle le type de zone de forêt-steppe a subi des changements importants, qui se reflète dans la réduction des forêts à grande échelle. E. A Gorokhov [3] a contribué à l'étude des forêts-steppes. Son analyse de la situation actuelle et de l'état écologique de la région de Koursk montre qu'à l'heure actuelle il y a un problème aigu de simplification notable de la structure naturelle, de réduction des richesses naturelles venant principalement de l'activité agricole et de la construction des chemins. Cela conduit à la perturbation de l'équilibre écologique du pays et à l'affaiblissement de la stabilité des écosystèmes.

La diversité de la végétation du parc naturel, situé dans la région de Volgograd, a été étudiée et décrit par l'équipe de L.P. Parshutina [4]. Il a été constaté que l'appauvrissement de la biodiversité est principalement due aux activités humaines, aux impacts économiques.

Matériels et Méthodes.

Dans différentes parties de la planète différents facteurs agissent plus ou moins fort. L'analyse de ces facteurs limitant la biodiversité est le but de notre recherche qui est basée sur l'étude des livres rouges des régions du sud de la Russie Centrale.

Ce sont les régions de Koursk, de Lipetsk, de Voronezh, de Belgorod, de Bryansk et de Rostov, une zone industriellement développée avec, en même temps, différentes activités agricoles qui sont prises en guise d'exemple de l'état présent de la forêt-steppe russe.

C'est la région de Kursk qui est le sujet de notre étude qui a été menée sur la base d'informations sur les facteurs limitants la biodiversité de plantes et d'animaux représentés dans les Livres rouges de cette zone.

L'étude a été réalisée de façon quantitave: nous avons fait le calcul du nombre d'espèces animales et végétales de la région de Kursk.

92

Nous avons dressé la liste des principaux facteurs limitants leur existence. Puis, nous avons dressé la liste des espèces qui sont exposées à un facteur limitant. Enfin nous avons calculé le pourcentage des espèces atteintes par chaque type d'activités humaines.

Résultats.

Les auteurs des descriptions de la nature de la forêt-steppe de la Russie Centrale [2; 3; 4] parlent en gros de l'impact de l'homme, ou bien, au contraire, se concentre sur un facteur précis. Le ratio des espèces rares inscrites dans le Livre rouge [5; 6] et le nombre total des animaux et des plantes des régions de Koursk, de Lipetsk, de Voronezh, de Belgorod, de Bryansk et de Rostov est présenté dans le tableau 1.

Tableau 1. Animaux et plantes de la région de Kursk

Région	Plantes Total des espèces	Animaux Total des espèces	Plantes Espèces rares	Animaux Espèces rares	Plantes Espèces rares (% du total)	Animaux Espèces rares (% du total)
Kursk	220	119	57	44	25,9	20
Voronezh	373	382	159	184	42,6	48,2
Belgorod	213	269	91	98	42,7	36,4
Lipetsk	398	196	169	61	42,5	31,1
Bryansk	138	113	44	47	31,9	41,6
Rostov	273	217	177	53	64,8	24,4

Nous avons réuni les facteurs suivants par ordre alphabétique:

- braconnage
- chasse aux oiseaux qui passent pendant la migration
- collecte des plantes pour la pharmaceutique et pour les bouquets à vendre
- création des zones de loisirs et de récréation
- défrichement
- dérangement dans les lieux d'habitation
- destruction ou dégradation de l'habitat
- drainage des zones humides
- empiégeage

93

- exploitation des bois, déboisement, déforestation
- extermination par l'homme
- extraction minière – craie, sable dans notre cas
- fenaison trop précoce
- labourage des steppes
- pâturage et paissance
- pêche
- plantation de cultures
- pollution des eaux
- réduction de la base alimentaire
- surpâturage
- utilisation de pesticides

Présentons l'impact des activités humaines sur les reignes d'animaux, de plantes et de champignons (Tableau 2).

Tableau 2. Groupes systématiques des organismes atteints d'activités humaines limitant la biodiversité

Taxons	Facteurs limitant la biodiversité
poissons	pollution de l'eau pêche; braconnage
amphibiens et reptiles	pollution de l'eau extermination par l'homme
mammifères	déforestation et exploitation du bois pollution de l'eau braconnage, modification des habitats réduction et changement de la base alimentaire.
oiseaux	empiégeage; chasse aux oiseaux migrants braconnage déforestation et exploitation du bois réduction de la base alimentaire
insectes	défrichage application des pesticides
lichens	changement d'habitats zones de récréation
champignons	zones de récréation collecte de saison
muscinées	exploitation du bois et déforestation diminution d'eau (drainage)
plantes supérieures	exploitation du bois et déforestation; récréation; pâturage; défrichage; collecte des bouquets

94

Le calcul de nombre d'espèces atteintes par chaque activité humaine de la région de Kursk a permis de ranger les facteurs d'après leur importance pour la biodiversité.

Quand au monde animal deux facteurs des neuf se révèlent comme les plus importants: ce sont le braconnage (41,20 % d'espèces atteintes) et l'empiégeage et le dérangement dans les lieux d'habitation (40,30 %). Viennent après l'exploitation des bois et la déforestation (26 %); la chasse aux oiseaux qui passent pendant la migration (23,50 %); la destruction ou la dégradation de l'habitat (21,80 %); l'utilisation de pesticides (16,60 %); le pâturage et la paissance (15,20%), le labourage des steppes et le drainage des zones humides (10,90 % chacun).

Quand au monde végétal le facteur le plus important des neuf c'est le pâturage (33,2% d'espèces atteintes), les deux suivants sont: l'exploitation forestière avec, comme suite, le déboisement (20%) et le défrichement (20%). Viennent après l'exploitation extractives – craie, sable dans notre cas (16,8 %); plantation de cultures (15%); surpâturage (13,2 %); collecte des plantes pour la pharmaceutique et pour les bouquet à vendre (12,7%); création des zones de loisirs et de récréation (12,3%); la fenaison trop précoce (10,9%)

Discussion. On peut voir que la nature de la forêt-steppe de la Russie Centrale est encore riche mais subit un grand impact de l'homme. Mais on peut aussi voir qu'un facteur précis, à bien réfléchir, ne peut être considéré comme inévitable. Il y a des facteurs très importants auxquels la nature doit se faire, tels sont les types d'influence de l'agriculture, des chemins, mais on voit que l'homme commence à y prêter plus d'attention.

Conclusions.

La pression anthropique grandissante sur la nature demande une étude scrupuleuse de la richesse naturelle de chaque zone afin de suivre les changements du monde végétal et animal. C'est un processus dynamique qui touche les principaux écosystèmes. Le fait que les activités humaines limitent l'existence de l'espèce constitue une menace non seulement pour une espèce ou une population, mais, en fin de compte, à l'ensemble de la nature. Pour préserver les espèces rares et menacées il devraient, autant que possible, minimiser l'impact de ces facteurs. En analysant les données du Livre Rouge de la région de Koursk nous pouvons conclure que la perte des espèces et de leurs

95

habitats est principalement due aux activités humaines. L'analyse des données met l'accent sur les principaux facteurs limitant la biodiversité:

1. Pour la faune: pollution des eaux, piégeage et braconnage, destruction, déforestation, déclin et changements dans l'approvisionnement alimentaire et de l'habitat, utilisation des pesticides.

2. Pour la flore: perturbations de mode de vie par l'homme, zones des loisirs, cueillette saisonnière des champignons et des bouquets de fleurs, exploitation forestière, changements hydrologiques, pâturage, labour.

La région de Koursk est situé au centre de la Russie dans la plaine d'Europe orientale. Le territoire est situé dans la zone de climat continental modéré et des conditions climatiques favorables à l'agriculture efficace. Actuellement, la forêt-steppe centrale a subi des changements négatifs: on voit que la superficie des zones de steppe est sensiblement réduite, les sols ont fortement dégradés, les zones forestières sont réduites. L'existence et le fonctionnement des écosystèmes dépendent de nous. Le problème de la préservation de la diversité biologique est en grande partie la fonction des impacts anthropiques croissants sur les espèces et la biosphère dans son ensemble.

Références

1. Millenium Ecosystem Assessment (2005), Ecosystems and human welll-being : A synthesis, Island Press, Washington, D.C. – Retrieved from:
www.millenniumassessment.org/documents/document.356.aspx.pdf

2. Parakhina E.A. Sokhranenie redkikh introdutsirovannykh drevesnykh rastenii (na primere VNI ISPK Orlovskoi oblasti) [Preservation of the rare introduced wood plants (on the example of VNI ISPK of the Oryol region)]. Printsipy i sposoby sokhraneniya bioraznoobraziya: materialy III Vserossiiskoi nauchnoi konferentsii [Principles and ways of preservation of a biodiversity: materials III of the All-Russian scientific conference]. Ioshkar-Ola, Pushchino: Mar. Gos. Univ., 2008, 674 p.

3. Gorokhova E.A. Rol' lesostepnykh landshaftov v podderzhanii optimal'nogo landshaftno-ekologicheskogo sostoyaniya Kurskoi oblasti [Role of forest-steppe landscapes in maintenance of an optimum

96

landscape and ecological condition of Kursk region]. Geograficheskie issledovaniya: istoriya, sovremennost' i perspektivy: materialy mezhdunarodnoi nauchno-prakticheskoi konferentsii, g. Kursk, 23-24 aprelya 2010 g. [Geographical researches: history, present and prospects: materials of the international scientific and practical conference, Kursk, 23-24 Apr. 2010]. Kursk: KGU, 2010, 258 p.
4. Parshutina L.P. Raznoobrazie rastitel'nosti prirodnogo parka «Nizhnekhoperskii» (Volgogradskaya oblast') i puti ego sokhraneniya [Variety of vegetation of natural park "Nizhnekhopersky" (Volgograd region) and ways of its preservation]. Printsipy i sposoby sokhraneniya bioraznoobraziya: materialy III Vserossiiskoi nauchnoi konferentsii [Principles and ways of preservation of a biodiversity: materials III of the All-Russian scientific conference]. Ioshkar-Ola, Pushchino: Mar. Gos. Univ., 2008, 674 p.
5. Zolotukhin N.I., Zolotukhina I.B., Ignatov M.S., Poluyanov A.V., Popova N.N., Prudnikov N.A., Soshnina V.P., Filatova T.D. Krasnaya kniga Kurskoi oblasti. Tom 2. Redkie i ischezayushchie vidy rastenii i gribov [Red List of Kursk region. Volume 2. Rare and endangered species of plants and mushrooms]. Tula: 2002, 165 p.
6. Vlasov A.A., Bausov I.A., Vlasova O.P., Grechanichenko T.E., Korol'kov A.K., Lada G.A., Mironov V.I., Tatarenko D.E.Krasnaya kniga kurskoi oblasti. Tom 1. Redkie i ischezayushchie vidy zhivotnykh [Red List of Kursk region. Volume 1. Rare and endangered species of animals]. Tula: 2002, 120 p.

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PLANT RESISTANCE TO OIL PRODUCTS IN SOIL

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Abstract: Oil spill and oil products have an integrated effect on the soil and a vegetational cover and leads to changes of structure and morphological, physical, chemical and biological properties of soils. The main impact on soil is made by high-gravity oil. That's why new, effective way of soil treatment is required, including methods of phytoremediation.

97

Key words: oil products pollution, phytoremediation, petroleum contamination.

Phytoremediation is a bioremediation process that various types of plants use to remove, transfer, or destroy contaminants in soils and groundwater [1-3].

To carry out the experiment 50 seeds of four species: oat (*Avena sativa*), buckwheat (*Fagopyrum esculentum*), marigold (*Tagetes erecta*), pea (*Pisum sativum*) were planted into the soil polluted with high-octane gasoline (92) in 1 and 3% concentrations and also into the soil without pollution (reference). Watering was made by necessity. The experiment lasted 93 days.

Petroleum contamination in soil has a negative impact on germinating capacity of seeds [4-6]. Oil and oil pollution creates a hydrophobic and anaerobic conditions. As a result oil adsorbs on soil particles, as well as on the surface of the seed, which prevents the entry of moisture and oxygen. This fact is the main reason for the decline of germination [7-10]. In general, germinating capacity depends on the concentration of soil pollutant. Comparing all the species of plants, oat and marigold has shown the highest germinating capacity (Fig.1).

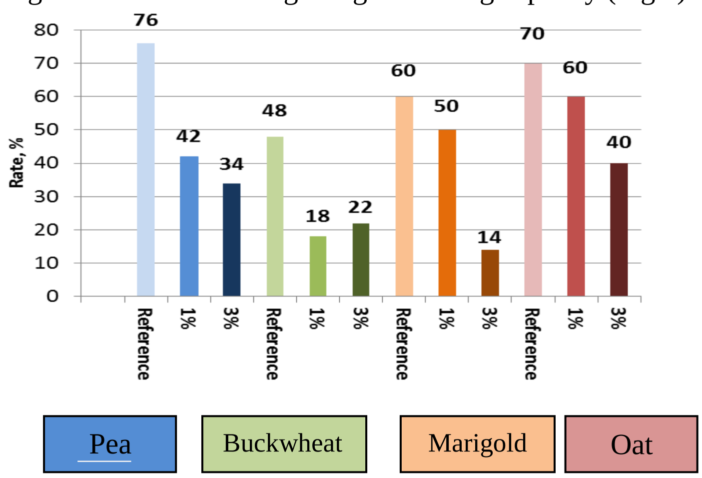

Figure 1. Germinating capacity in soils with different concentration of pollution.

98

The highest toxic effect was showed by pea (Fig.2). At 3% polluted soil the dynamics of growth was very low till the beginning of August, and then the plants died. At 1% pollution, in comparison with the control plants, pea was oppressed without blossom.

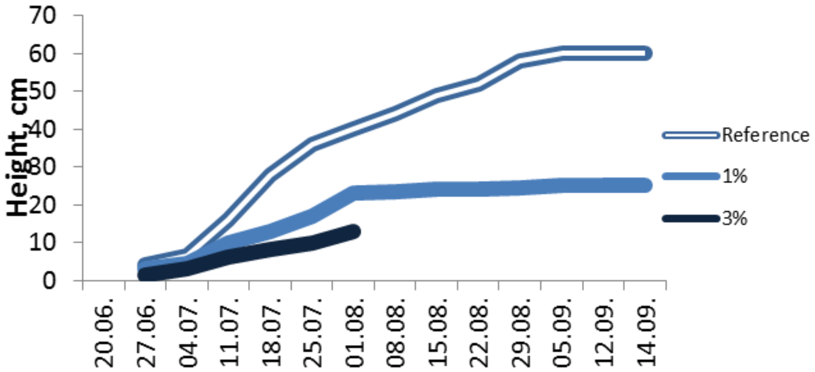

Figure 2**.** Growth dynamics of pea in soils with different concentration of pollution.

A stable growth and development dynamics were showed by marigold (Fig.3). The plants were in stress but it didn't lead to death. In general, plants at 1% polluted soil as well as at 3% polluted soil were growing approximately equally. Most species of marigolds are used for planting of greenery in urban areas. Marigolds are defined as unpretentious plant with high resistance to different soil pollution.

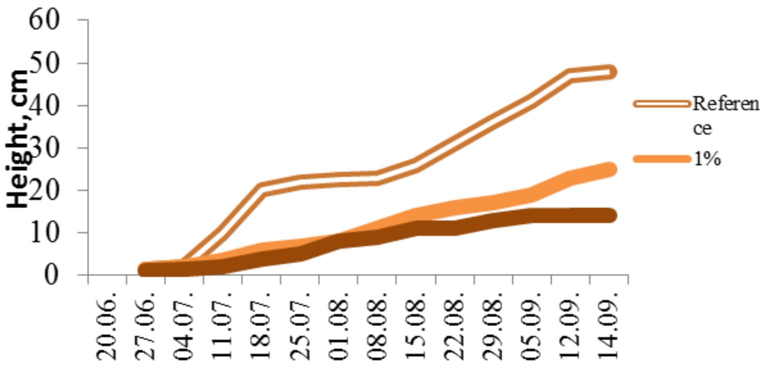

Figure 3**.** Growth dynamics of marigold in soils with different concentration of pollution.

99

In growth dynamics of buckwheat in comparison with control plants essential aberrations were observed (Fig.4). The plants' growth was slow. It is obvious that at 3% polluted soils strong suppression of plants was observed, and at the final stage of the experiment difference of height with reference group was about 50 cm. At 1% polluted soils plants' suppression also occurred and growth dynamics changed insignificantly. Buckwheat is defined as a heat-loving plant, and exigent to soils and water regime. That's why the plant grew and developed slowly.

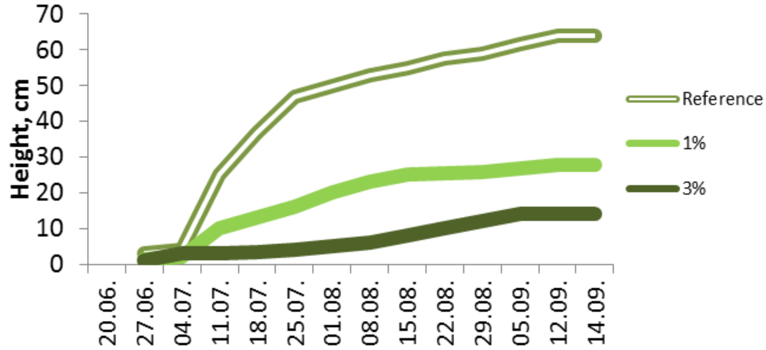

Figure 4. Growth dynamics of buckwheat in soils with different concentration of pollution.

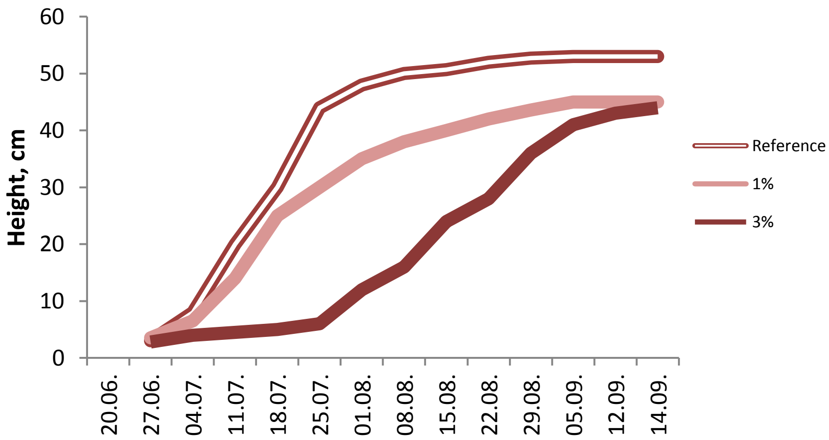

Figure 5. Growth dynamics of oat in soils with different concentration of pollution.

100

From all the introduced plants the minimum deviations of growth dynamics is observed for oat (Fig.5). Height difference with reference group at 1% polluted soil is approximately 5-10 cm, however stable dynamics proves that plants are stably growing in such conditions. At 3% polluted soil essential deviations in growth are observed in comparison with the reference group.

At the initial stage of experiment plants were strongly suppressed and as a result up to the end of July the growth of plants almost stopped. During the subsequent periods the increase in growth was observed, and by the end of the experiment the height of plants at 3% polluted soil, as well as plants at 1% polluted soil was approximately identical. We can observe high resistance of oat to oil products pollution of soils. Plant resistance to pollution can be determined by 4 main criteria at 3% concentration, such as germinating capacity, stunted growth, blossom and fructification. Each criterion was assigned a certain score from 0 to 6. The absence of germination was assigned 0, low germinating capacity (< 20%) – 1, medium germinating capacity (20-60%) – 3, high germinating capacity (>60%) – 6 points. Stunted growth is also an important criterion. Plant death was assigned 0, high (>70% from reference group) – 1, medium (30-70% from reference group), low (<30% from reference group) – 6 points.

According to total score we can determine whether plant has resistance to pollution or not: 0-4 – plant does not have resistance or has low resistance to pollution, 5-12 – plant has middle resistance to pollution, 13-16 – plant has high resistance to pollution (Table 1).

Table 5**.** Total score of certain species

Plant	Total score	Resistance degree
Oat	15	High resistance to pollution
Marigolds	6	Medium resistance to pollution
Buckwheat	5	Medium resistance to pollution
Pea	3	Without resistance or low resistance to pollution

According to the analysis of the growth dynamics and other parameters the ranking of selected species was determined (Fig.5). The highest resistance was showed by oat, then come marigold, buckwheat and pea.

101

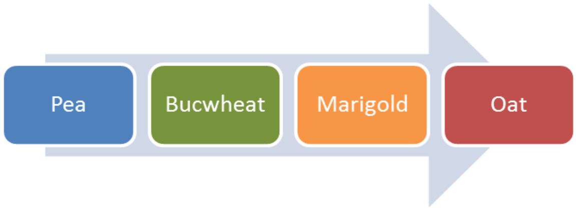

Figure 5. Ranking of selected species

1. At 1% concentration petroleum pollution for marigold, buckwheat and pea the decrease of height was observed. Insignificant reaction to pollution was showed by oat.

2. At 3% concentration pollution significant reduction of height was showed by all the species, including oat. For pea the concentration was too high and it led to plant death.

3. The height and dynamics of growth are important characteristics of plant oppression due to soil pollution.

4. Soil pollution at either 3% or 1% concentrations has an impact on germinating capacity and lead to sprout death.

5. Petroleum pollution affects blossom. At 3% pollution the blossom of marigold and pea didn’t occur. For other species the delay of blossom was observed.

6. As a result of petrol influence the delay and reduction of fruiting was observed for all the species. At 3% concentration of pollution pea and buckwheat fruiting didn’t occur.

References

1. Kireeva N.A., Grigoriadi A.S., Vodop'janov V.V., Amirova A.R. Podbor rastenij dlja fitoremediacii pochv, zagrjaznennyh neftjanymi uglevodorodami [Plant selection for process of phytoremediation of petroleum hydrocarbons in soil]. Izvestija Samarskogo nauchnogo centra Rossijskoj akademii nauk. 2011, №5. PP. 184-187.
2. Kireeva N.A., Tarasenko E.M., Bakaeva M.D. *Detoksikacija neftezagrjaznennyh pochv pod posevami ljucerny (Medicago sativa L.)* [Detoxication of oil pollution of soils with alfalfa *(Medicago sativa L.)*]. Agrohimija [Agrochemistry]. 2004, №10. PP. 68-72.
3. Ivanenko N.V. *Ekologicheskaja toksikologija: uchebnoe posobie* [Ecological toxicology: the manual]. Vladivostok: VGUJeS, 2006. 108 p.

102

4. Nazarov A.V. *Vlijanie neftjanogo zagrjaznenija pochv na rastenija* [Oil pollution influence on soils]. Vestnik Permskogo universiteta. 2007, №5. PP. 134-141.
5. Robson D.B., Germida J.J., Farrell R.E. et al. Hydrocarbon tolerance correlates withseed mass and relative growth rate. // Bioremediation J. 2004. P. 185-199.
6. Rudenko E.Ju. *Ekologicheskie osnovy biologicheskoj rekul'tivacii neftezagrjaznennyh pochv* [Ecological foundation of soil pollution bioremediation]. – Samara: Samar. Gos. Tehn. Un-t, 2012. 166 p.
7. Shamraev A.V., Shorina T.S. *Vlijanie nefti i nefteproduktov na razlichnye komponenty okruzhajushhej sredy* [Oil products influence on different components of enviromment]. Vestnik OGU. 2009, №6. PP. 642-645.
8. Shishov L.L. *Pochvy Moskovskoj oblasti i ih ispol'zovanie* [Soils of Moscow region and land use]. Pochvennyj institut im. V.V. Dokuchaeva, 2002. 500 p.
9. Stupin D.Ju. *Zagrjaznenie pochv i novejshie tehnologii ih vosstanovlenija: Uchebnoe posobie* [Soil pollution and the newest technologist of soil remediation]. – SPb.: Publ. Lan', 2009. 432 p.
10. Turovcev V.D., Krasnov V.S. *Bioindikacija*: *ucheb. posobie.* [Bioindication: the manual]. – Tver': Tver. gos. un-t, 2004. 260 p.

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BIOTOPICAL DISTRIBUTION OF DASYHIPPUS IN SOUTH FOREST DIVISION OF THE URAL STATE RESERVE

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103

Abstract: The article deals with biotopical distribution and species correlation of Lepidoptera registered in the South forest division of the Ilmen State Reserve. They are classified into hydrophilous, xerophilous and mesophilous.

Key words: diurnal butterflies, Lepidoptera, Dasyhippus, Ilmen State Reserve, hydrophile, xerophile, mesophile.

Pallas, Eversman, Butlerov were the first to research butterflies in the Volga and Ural regions. At the end of the 19^{th} century Sokolov D.A. and Krulikovsky L.K. studied fauna in Ural [1]. They registered about 100 species of diurnal butterflies. A collective work named "Diurnal Butterflies of South Ural" was published in 2004. It is an annotated list of diurnal butterflies of Bashkiria, Orenburg and Chelyabinsk regions.

At the moment 1375 species of 660 genuses and 55 Lepidoptera families are discovered and described on the mountains area of the South Ural [2,3].

The subject of the research is biotopical distribution of diurnal butterflies in the South forest division of the Ilmen State Reserve (picture 1). The research was carried out in summer of 2012-2015. Butterflies were sampled according to the standard techniques. Species were identified according to the atlases.

Biotopes differing in phytocoenosis were examined. They are forest and swamp lands, grasslands and suppression zones different in the degree of human-caused impact. The characteristic feature of the South forest division is the contrast in vegetation on comparatively small areas.

The choice of sampling points depended on landscape, vegetation spread and human-caused impact on the landscape. The landscape determines Lepidoptera as a dominant specie, because it makes them food dependent as specific species of butterflies [4]. The territory of the researched stations was not less than 100 m2. To analyze the Lepidoptera biodiversity within the stations with more precision various locations having distinctive vegetation, landscape changes, humidity and light intensity factors were covered.

Picture 1. Sampling points

Nympfalidae are stated to be diverse in species (37%). It demonstrated their preference of humid areas which are frequent on the territory. The second in frequency are Pieridae (23%). Then go Satyridae (17%) (pic.2).

It is caused by the food plant abundance and other kindly factors such as humidity, light intensity, wind protection and others.

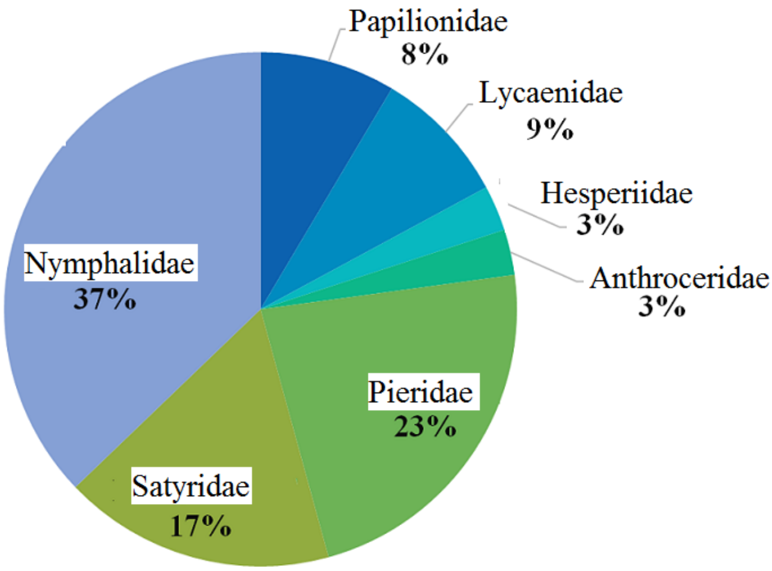
One of the factors determining alfa and beta Lepidoptera Dasyhippus diversity is the relations of the insects with flowering plants. High trophic specialization of butterflies-caterpillars influences the presence of one Lepidoptera specie and the absence of another. If there are few flowering plants in coenosis, imagoes may migrate to other phytocoenoses with more rich vegetation.

To define alfa and beta diversity the data was gathered in 7 biotopes. The Shannon, Simpson, Berger-Parker diversity indices were used.

The analysis of Shannon-Weaver index shows that the waterside and grassland near the swamp are characterized by a high diversity of

105

species. The tendency to increase organism diversity and density may explain that. The minimal index value was registered in man-made landscapes. It accounts for monoculture predomination, gramineous in particular and a high recreational load on the phytocoenosis.



Picture 2. Main Lepidoptera species

Among the described Lepidoptera imago there were some species preferring high humidity such as: parnassius mnemosyne, celastrina argiolus, lycaena virgaureae, gonepteryx rhamni, lopinga achine, melanargia galathea, aphantopus hyperantus, coenonympha hero,coenonympha oedippus, minois dryas, apatura iris, argynnis laodice, limenitis camilla, nymphalis antiopa, melitaea diamine and brenthis ino [4].

We refer papilio machaon, parnassius apollo, hesperia comma, zygaena filipendulae, pontia edusa, zegris eupheme, aglais urticae, vanessa atalanta and colias hyale to xerophiles.

Butterflies preferring moderate humidity are polyommatus icarus, pieris brassicae, aporia crataegi, leptidea sinapis, anthocharis

106

cardamines, inachis io, argynnis paphia, argunnis camilla, neptis Sappho and argynnis pandora [4].

The overwhelming majority of Lepidoptera we describe are hydrophiles (46%). This is not accidental. Characterizing different microclimates we showed the prevalence of well-watered biotopes. Two lakes (Ilmenskoye and Argayash) located on the area create a high humidity level. The abundance of places that are topographically low and rich tree vegetation also contribute to high humidity. Mesophilous and xerophilous lepidoptera are twice less in number. Small amount of open biotopes warmed by the sun explains such a distribution of butterfly species. Mesophiles occur at the edge of forests, while xerophylous species inhabit highlands devoid of tree vegetation.

The research revealed 36 species of diurnal butterflies belonging to 8 families on the territory of the South forest division of the Ilmen State Reserve. It was found out that Nympfialdae and Pieridae species are predominantly large in number: 37%, 12 species and 23%, 8 species respectively. Satyridae species are less common (17%, 6 species). Lycaenidae, Hesperiidae, Zygaenidae and Papilionidae species are extremely rare.

Low diversity of some species (Lycaenidae, Hesperiidae, Zygaenidae and Papilionidae) is affected by a range of external factors. Papilionidae, for instance, are protected species of the 1^{st}, 2^{nd} and 3^{rd} categories. Lycaenidae are rather abundant in the researched biotopes, but they are hard to catch due to their small size. Hesperiidae and Zygaenidae are oligophagous, in other words, they are strictly dependent on food plants. So the abundance level of the specie is low, but their population on the researched area is large.

Hydrophiles constitute the majority of Lepidoptera we studied (46%). High humidity level is caused by two lakes (Ilmenskoye and Argayash), great number of places that are topographically low and have different degrees of peat formation, and rich tree vegetation that traps moisture. Mesophilous and xerophilous Lepidoptera are twice less in number. It is connected with a small quantity of open biotopes well warmed by the sun. Mesophilous butterflies occur at the edge of forests, while xerophylous species inhabit highlands devoid of tree vegetation.

107

References

1. Gorbunov P.Yu., Ol'shvang V.N., Lagunov A.V., Migranov M.G., Gabidullin A.Sh., L'vovskii A.L. Bulavousye cheshuekrylye Urala [Dasyhippus Lepidoptera of South Ural]. Moscow, KMK Publ., 2007,456 p.
2. Trofimova T.A. Predvaritel'nye rezul'taty i problemy inventarizatsii fauny cheshuekrylykh (Insecta, Lepidoptera) Yuzhnoural'skogo gosudarstvennogo prirodnogo zapovednika [Preliminary results and cataloguing of Lepidoptera in South Ural State Reserve]. Tezisy dokladov nauchn.-prakt. konf. «Problemy sokhraneniya bioraznoobraziya na Yuzhnom Urale 13-14 maya 2004 g.» [Scientific conference abstracts “Conservation of biodiversity in South Ural, May 13-14, 2004”]. Ufa, 2004, pp. 123-124.
3. Anikin V.V., Sachkov S.A., Zolotuhin V.V., Nedoshivina S., Trofimova T.A. Fauna lepidopterologica Volgo-Uralensis 150 years later: changes and additions. Part 9. Tortricidae (Insecta, Lepidoptera), Atalanta, 2006. (unpublished).
4. Trofimova T.A. Analiz landshaftno-ekologicheskogo raspredeleniya fauny cheshuekrylykh (Insecta, Lepidoptera) v gorakh Yuzhnogo Urala [Landscape and environment distribution study of Lepidoptera in mountains area of South Ural]. Vestnik Samarskogo universiteta [Bulletin of Samara State University], 2006, no.7, vyp.47, pp.217-231.

108

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STUDY OF FEATURES OF BLACKBIRD (TURDUS MERULA) MIGRATORY BEHAVIOR IN CENTRAL RUSSIA

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Abstract: The study of migration behavior of the blackbird (Turdus merula) in Central Russia in the framework of the "Eurasian project of blackbirds" has been conducted. The purpose and main ideas of the Russian sector of the project, materials and methods are described. The first results and planning further research are outlined.

Key words: blackbirds's habitat, Turdus merula, Central Russia, migration behaviour

Introduction**.** In various parts of the world some species may be represented by sedentary, migratory or partially migratory populations. The phenomenon of partial migration is known for many groups of vertebrates [1; 2; 3], and undoubtedly has a certain ecological value.

One partially migratory species with a wide distribution area is a blackbird (Turdus merula). The area includes south of Spain, Germany and central Russia, where the species is sedentary, partly migratory and migratory, respectively [4]. Many factors can influence the migratory behavior and there are various hypotheses to explain this. [5]

The phenomenon of the blackbird partial migration is relatively little known, it is interesting to clarify its mechanisms. In particular, what is a regulator of the start of migration: strictly innate mechanisms or more flexible behaviour depending on the environment.

To achieve this goal, we determined the factors that affect the timing of the beginning of the migration of the blackbirds population in different areas. Then we are suggesting the basic mechanisms regulating to the start of migration in central Russia.

Within the framework of the international program of Max Planck Institute for Ornithology of studies dedicated to the migratory behavior of the blackbird in different areas (Eurasian project on Blackbird, Eurasian Blackbird Operation) we started in 2013 the

109

observations in the Central Russia, at the Malinki biological station IPEE named after Severtsov of Russian Academy of Sciences. The conducted long-term research is aimed at determining the major factors in the formation of migratory behavior.

Materials and methods.

The Malinki biogeocoenosis station is in the forest zone, a subzone of the southern taiga dominated by coniferous and mixed coniferous-deciduous forests. There is a small river Zhiletovka with mainly alder floodplain with the dominance of nettle (*Urtica dioica*) in the grass layer. Large areas of spruce forests in adjacent areas struck by bark beetle and are in a state of decay. Mostly clear sanitary felling carried out. Now these areas are in the New Moscow and some of the surrounding villages under construction, but directly at the biological station the anthropogenic load is relatively small.

There are common bird species such as the white wagtail (*Motacilla alba*), hooded crow (*Corvus cornix*), pied flycatcher (*Ficedula hypoleuca*), robin (*Erithacus rubecula*), fieldfare (*Turdus pilaris*), great tit (*Parus major*), blackcap (*Sylvia atricapilla*), ratchet-warbler (*Phylloscopus sibilatrix*), chaffinch (*Fringilla coelebs*), siskin (*Spinus spinus*), characteristic for the Central Russia. Blackbird in these areas is a rare species, although it is found everywhere in the Moscow region. Here, at the research station and its immediate surroundings birds of this species live constantly, and that was the reason for choosing this place for research.

Catching birds for the purpose of labeling (as well as for the on-going experiment on migration) is performed with mist nets with 18mm mesh. The length of the used nets is of 9-12 meters with the height of 3m. From three to six nets are put in a line. Usually there are 3-5 lines like this working simultaneously. They are installed mainly on the edges, clearings with young fir trees and shrubs near the riverbed of Zhiletovka. Checks are carried out every 1.5 - 2 hours, depending on weather and time of day. Birds' trapping was carried out immediately on their spring arrival in the period from early April to late May.

The radio transmitter is designed to work within a year, and its weight is 4,25g. All tagged birds are monitored by the recorder, which records every minute the signal from the transmitter of birds present on the site.

110

The receiving recorder antenna is installed in one of the outbuildings of the biological station, at an altitude of 12 meters. The radius of action is about 1 km.

Also (given that the bird may go beyond the range of the recorder antenna working distance), we possibly complement data recorder, recording with hand tracker (a device for receiving the signal) from pre-defined points around the biological station.

Results. All caught birds were ringed, weighed, and their standard measurements (bobbin, wing, primaries) and blood samples were taken and underwent genetic analysis.

For the purpose of labeling it was supposed to catch 20 birds each year, and for the movement experiment 40 (20 pairs of birds) in a season. In 2013 and 2014 birds had radio transmitters and banding, in 2015 the experiment to capture movement is also held. In 2014, radio transmitters were tagged 20 birds, of which 1 dead, 4 left the area in the summer, 2 left the station in the morning. Thus, we can assume that reliable data on top autumn migration have 13 birds to study.

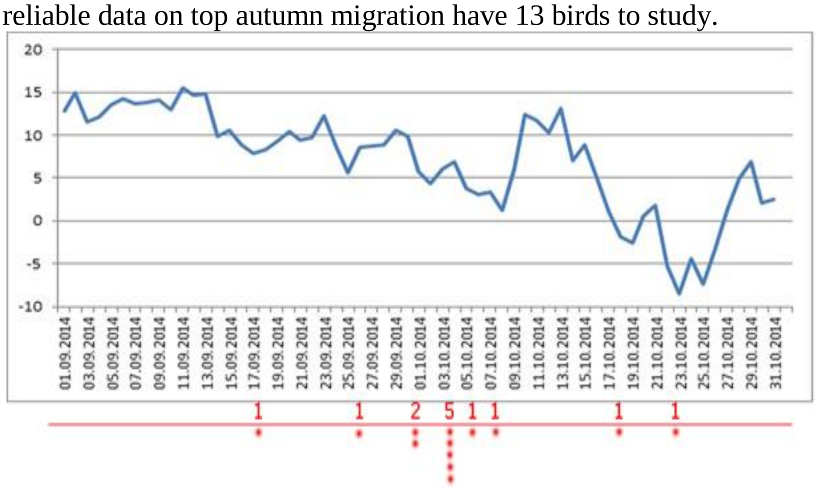

Figure 1. The average temperature in central Russia (01.09.2014-31.09.2014)

Data on the average daily temperature for the period of September - October 2014 were taken from the archives of the weather with the website "Reliable prognosis", rp5.ru (Figure 1).

111

Figure 1 demonstrates a graph of temperature change in September and October 2014. Red dots show the number of birds leaving the area on the corresponding day. It is clearly seen that at the beginning of the decrease in temperature (less than + 10 ° C) portion of the first birds leave at the first tangible decrease (October 4-7), the majority (7) of the observed birds are removed from the site. Subsequent decreases (by October 23) show that the area is abandoned by birds.

The birds disappeared from the area in the fall during the night hours (from 19 p.m. to 4 a.m.) and we considered it as migration start.

Discussion. It is difficult to speak about the reliability of the obtained results on the basis of just one field season. However, the trend of the intensity of the autumn departure from falling average daily temperatures can be traced quite clearly. In our opinion, it deserves attention as a working hypothesis to be checked in the process of further long-term studies.

We plan to get a definite answer to the question, what is the trigger for the beginning of the migration: environmental factors or it is genetically determined. During this field season birds were caught in those parts of the area where this species is migratory and partial migrant. From all three groups of birds it is being planned to produce offspring with subsequent separation of the young obtained from each group into three parts, and releasing them into the wild in areas where this species is sedentary, partial migrant and migratory, respectively. All birds will also be marked and we, therefore, will be able to observe the behavior of migratory birds from different parts of their range in the same environmental conditions in Malinki. In conclusion, it should be noted that according to our data, the fall in temperature is an important factor in the migratory behavior of the blackbird in our latitudes; however, to draw final conclusions is premature. According to preliminary data noted a strong correlation timing of departure the birds down the average daily temperature.

References

1. Brodersen J, Chapman BB, Nilsson PA, Skov C, Hansson L-A, Brönmark C (2014) Fixed and Flexible: Coexistence of Obligate and Facultative Migratory Strategies in a Freshwater Fish. PLoS ONE 9(3): e90294.

112

2. Chapman B. B., Brünmark Chr., Nilsson J.- E., Hansson L.-A. The ecology and evolution of partial migration. – Lund Univ., Ecology Building, SE-223 62 Lund, Sweden.
3. Moussy, C., Hosken, D.J., Mathews, F., Smith, G.C., Aegerter, J.N. and Bearhop, S. (2013), Migration and dispersal patterns of bats and their influence on genetic structure. // Mammal Review, 43: 183–195.
4. Lundberg Per. Dominance behaviour, body weight and fat variations, and partial migration in European blackbirds Turdus mcrula // Max-Planck-Institut ftir Verhaltensphysiologie, Vogelwarte Radolfzell, D-7760 Radolfzell, Federal Republic of Germany, 1984.
5. Møller, Anders, Pape, Jukka, Jokimäki, P. Skorka, P. Tryjanowski. Loss of migration and urbanization in birds: a case studyof the blackbird (Turdus merula). // Oecologia(2014) 175:1019–1027.

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ASSESSMENT OF COENOPOPULATION VITALITY OF DACTYLORHIZA BALTICA IN DIFFERENT HABITATS

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Abstract: The vital state of *Dactylorhiza baltica,* one of Orchidaceae species, was studied in different habitats and criteria for its state assessment were suggested.

Key words: coenopopulation, vital status, habitat, population density, Orchidaceae, Dactylorhiza baltica.

Introduction. The species of the Orchidaceae are the most vulnerable plants of flora, because of their specific features and weak stability to anthropogenic pressure. Multidisciplinary studies of their biology are necessary for the conservation of these rare plants. The Orchidaceae is the largest family of monocots. We know about 30000 species of wild orchids. About 17 000 species are threatened with extinction. Every year scientists describe new species of orchids. The species of the Orchidaceae are very diverse in structure and color of flowers. They are spread almost all over the territory of the Russian

113

Federation. Of the 136 species of orchids growing on the territory of Russia, 44 are in the Red Book of Russia. Thirty species of orchids are common in the Moscow region, 24 species are included in the Red Book of the Moscow region, and 18 species are found in protected areas [1, p.85].

Russian orchids are land perennial herbs adapted to seasonal climate with cold winters. All of them have simple not branched shoots. The size, location and shape of the leaves are quite diverse. The phyllotaxis (the arrangement of leaves on the stem) is often regular, sometimes contiguous. The leaves on the bottom of the vertical stem and rhizomes of orchids have a special shape - rather small, sometimes barely noticeable, having the form of colorless or brownish scales [2, p. 52].

The leaves of orchids are always simple (with a one-piece leaf blade), with full margins, with parallel or arcuate veining. The form of leaf blades is diverse. They may be linear, lanceolate, oval, elliptical, and ovate. Leaves can be thin or slightly fleshy, with petioles or without stalks; smooth of various shades of green or mottled [3, p.24].

The growth of the embryo is very peculiar. It forms a specific structure – protocorm (colorless spherical body up to 2 mm in diameter, covered with strips of single-celled). After a while there appear one and then another 2-3 tiny scale-like leaves on the protocorm. Protocorm has an underground lifestyle. During this time, it turns into a special organ, which is called rhizome, and since it contains some fungus hyphae it is often called mikorhizom. Several tiny scale-like leaves are formed on the rhizome. It grows gradually and increases the number of its segments, it accumulates nutrients and finally on the soil surface there appears a small, plain, but quite real green leaf. The orchid escapes from the underground world and than it can enjoy the benefits of the process of photosynthesis [4, p.8; 5, p.48].

Throughout its life each plant undergoes a series of age-stages. First it is sprouts, then the youthful (juvenile) state when vegetative organs are still being formed and the plant does not look like an adult yet. The transition age is characterized by a combination of juvenile and generative features [6, p.30].

Materials and results.

The studies were conducted in two areas in 2015.

114

The first study was conducted on the territory of the national park «Smolenskoye Poozerye (Smolensk Lakeland)» (onward – SP), and the second area was located in the Staritsa district of the Tver' region (village Vassilyevskoe) (onward – VA). The SP is located in the north-western part of the Smolensk region. It is the single largest protected area in the region. The national park was established in 1992. The total land area is 146 237 hectares [7, p.30]. The Staritsa district is located on the eastern edge of the Valdai Hills, a marina on the Volga [8, p.30].

The object of the investigation was one species of orchids: *Dactylorhiza baltica*. *Dactylorhiza baltica* is the plant with thick stem. The height of this plant is 40-50 cm. The leaves are wide and long. The inflorescence is long and dense spike. *Dactylorhiza baltica* is rare species, which found in northern regions, listed in the Red Book [9, p.57]. We used the following parameters as criteria for describing the state of some coenopopulations: the population density, the living state of adult plants, and the age structure.

Geobotanical descriptions were carried out on test plots of 10*10 m according to the standard procedure.

To determine the density and the ratio of age groups within coenopopulations sample plots (1*1 m) were laid by the method of A.A. Uranov. In accordance with conventional methods, taking into account the specific features of the ontogenesis of orchids, the following age groups were identified: juvenile (j), immature (im), vegetative (v), and generative (g). The juvenile individuals have one leaf and only one central vein. The immature individuals have two leaves with 3 veins. The leaves of vegetative individuals are bigger. The generative individuals have stem and a lot of leaves [10, p.23].

The age spectrum (Fig. 1) was left-sided in SP and the age spectrum of VA was right-sided.

To study the biometric features of orchids in each coenopopulation from 8 to 25 plant specimens in the generative phase were measured. The following parameters were measured: the plant height, the inflorescence length, the number of leaves, the length and width of a leaf of the average formation. The width was measured at the widest part of the leaf, the length – from the leaf base to the tip; the number of veins was measured on an average formation leaf, as well as the number of flowers per stem.

115

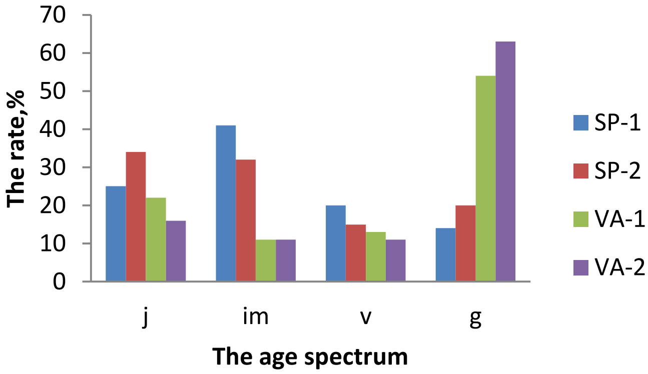

Fig.1.The age spectrum of *Dactylorhiza baltica* in different habitats.

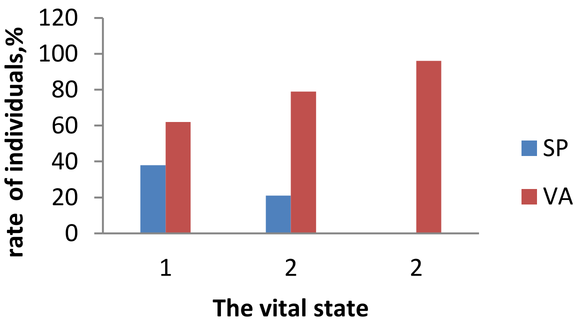

Fig.2. The vital state coenopopulation of *Dactylorhiza baltica* in different habitats.

Biometric data was determined to assess the vitality of plants. The vital state was detected (by the method of I.M. Ermakova [11]) and points from 1 to 3 were assigned (the bigger the plant, the higher the score). The level of plant vitality is high in v. Vassilyevskoe (Fig. 2), which indicates a good state of the coenopopulation.

Coenopopulation №1 in SP is characterized by a relatively large number of specimens (56 specimens in 2015), and the relative population density that equals 2.8. The average level of vitality predominates. The age spectrum is left-sided, with a predominance of vegetative specimens. The coenopopulation is in a satisfactory condition.

116

Coenopopulation №2 in the same park has 41 specimens, and the relative population density is 2.05. The vital status is low. The age spectrum is left-sided with a predominance of vegetative specimens. The coenopopulation is in a satisfactory condition.

Coenopopulation №1 in VA (the edge of the forest) is characterized by 46 specimens, and the relative population density equals 1.25. The vital status is average. The age spectrum is right-sided with the predominance of generative specimens. The coenopopulation is in a satisfactory condition.

Coenopopulation №2 in VA (the meadow) numbers 19 specimens and the relative population density is 0.6. The vital status is average. The age spectrum is right-sided with a predominance of vegetative specimens. The coenopopulation is in a satisfactory condition. Thus, a low number of specimens does not necessarily indicate a decline in the vitality of a coenopopulation.

All the studied coenopopulations are of full-assemblage. The coenopopulations VA-1 and VA-2 have the right-sided age spectrum. The coenopopulations SP-1 and SP-2 have the left-sided age spectrum. The right-sided age spectrum is typical for violate territory; the left-sided age spectrum is typical for untouched territory.

The national park is dominated by juveniles; it indicates a good condition coenopopulation. Left-spectrum is typical for populations with intense reproduction. The specimens growing in Vassilyevskoe have a right-sided spectrum, with a predominance of adults and a relatively high vitality. Analysis of the vitality of the individuals and coenopopulations of *Dactylorhiza baltica* has shown that in all the studied coenopopulations there are individuals with different levels of vitality. The vital state is higher in populations with right-sided age spectrum in studied habitats.

References

1. Kuvykina O.V. Orkhidnye Rossii: zhiznennye formy, biologiya, voprosy okhrany [Orchids of Russia: life forms, biology, protection]. Moscow: Nauka, 1996. PP. 56-57.
2. Vahrameeva M.G., Denisova L.V., Nikitin S.V., Samsonov S.K. Orkhidei nashei strany [Orchids of our country]. Moscow: Nauka, 1991. PP. 20-23.

117

3. Shennikov A.P. Vvedenie v geobotaniku [Introduction in geobotany]. Moscow: MGU, 1964. PP. 46.
4. Pavlova V.N., Tikhomirov V.N. Biologicheskaya flora Moskovskoi oblasti [The biological flora of the Moscow region]. Moscow: MGU; Publ. «Argus», 1995. PP. 23.
5. Markovskaya N.V. Ekologo-biologicheskaya kharakteristika orkhidnykh [Ecological and Biological characteristics of orchids]. Moscow: MGU, 2004. PP. 48.
6. Denisova L.V. Sostav tsenopopulyatsii nekotorykh dikorastushchikh predstavitelei sem. Orchidaceae [Composition of coenopopulation some wild representative Sem. Orchidaceae]. Kiev: Nauka, 2001. PP. 87.
7. Reshetnikova N.M. Sosudistye rasteniya natsional'no parka «Smolenskoe Poozer'e» [Vascular plants of the national park «Smolenskoy Poozer'e»]. Tula: Graf I K, 2002. PP. 4.
8. Tsvetkov D.A. Staritsa i okrestnosti [Starica and surroundings]. Moscow Worker, 1977. PP. 24.
9. Kiseleva K.V., Maiorov S.R., Novikov V.S. Flora srednei polosy Rossii: Atlas-opredelitel [The flora of central Russia: identification book]. Moscow: ZAO « Fiton», 2010. PP. 20.
10. Uranov A. A. Voprosy izuchenija struktury fitocenozov i vidovyh cenopopuljacij [Questions of studying the structure of phytocoenosis and species coenopopulations]// Cenopopuljacii rastenij [Coenopopulations of Russia]. Moscow: Nauka, 1977. V. 2. P. 7-20.
11. Ermakova I.M. Zhiznennost' tsenopopulyatsii i metody ee opredeleniya // Tsenopopulyatsii rastenii (osnovnye ponyatiya i struktura)[The vital state of coenopopulations and methods for determing]. Moscow: Nauka, 1996. PP.

118

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ECOLOGICAL ZONING OF THE KHIBINY

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Abstract: The purpose of this paper is to examine recreational resources of the Kola Peninsula and the development of environmental routes in the Khibiny.
Key words: ecological tourism, the Kola peninsula, Khibiny, ecological zoning, environmental routes.

There is a growing interest in the promotion of recreation in the northern areas, so this area needs to be developed, but only on the condition that it will be safe for the vulnerable northern nature. Eco-tourism development can be considered as one of the variants of development of the Khibiny Mountains region, rather than the mining industry. This is facilitated by the proximity of cities, availability of transport routes and the uniqueness of the local nature.

The Kola Peninsula is located in the north-west of Russia and administratively belongs to Murmansk region. The climate is typical for the area. Flora and fauna are very diverse. The peninsula is rich in minerals [1, p.54]. The indigenous population of the Peninsula is the Saami, who gave the names to local geographic objects. Ecology of the region is subject to strong anthropogenic impact due to the activity of the mining plants, which pollute the atmosphere and destroy mountains of ore mining in the open way [2, p.157].

One of the objectives of this paper is the development of eco-tourism in the Khibiny. To do this we had to create a landscape map. The satellite image of the Khibiny massif was taken in July 2013, and with the aid of the computer program ArcGis 9.3 we added hypsometric maps of relief and vegetation to it, thus, 11 natural complexes were identified. Thanks to the landscape map ecological zoning of the

119

territory was made. These areas were chosen in accordance with the relief and the nature of the vegetation growing on the selected sites.

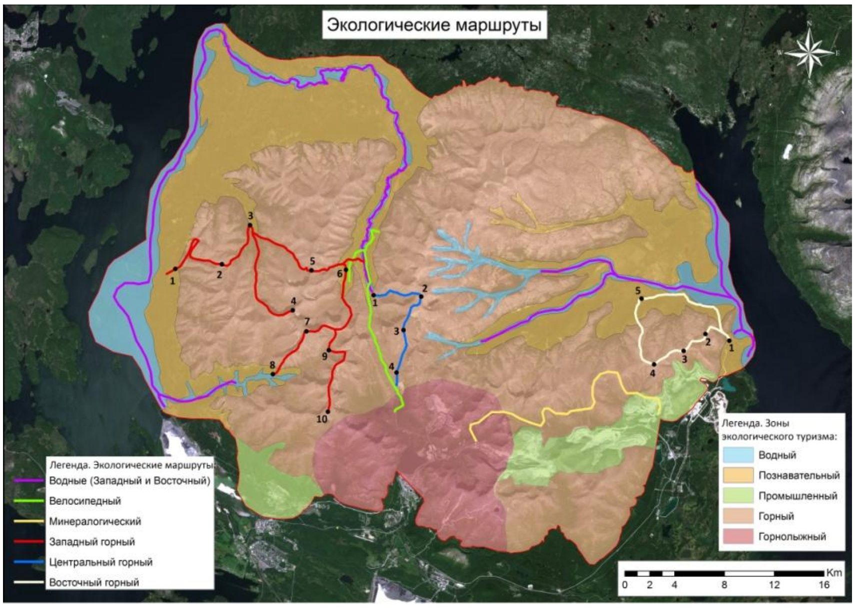

Figure 1. Zones of ecological tourism. Environmental routes

We have identified 5 zones of ecological tourism: water, educational, industrial, mining and ski ones [3, p.136].

• Boating includes rafting on rafts and kayaks, as well as the journey along the shores of lakes.

• Educational tourism. This is combined tourism, which includes walking tours, cycling, mineralogical, ethnographic ones and others.

• Industrial tourism. These are trip excursions to existing or abandoned production sites in order to identify the environmental impacts of the grounds.

• Mountain hiking. This includes passes, many kilometers hiking and climbing to the top of the mountains as well.

• Ski tourism. The area around the existing ski resort Kirovsk [4, p.44].

After the territory of the Khibiny had been divided into zones based on local landscapes, environmental routes based on driveways messages were developed, the nature of the relief, the availability of

120

water in the parking places, as well as the attractiveness of the landscape were found out. So we created seven routes: two water routes, three mountain routes, cycling and mineralogical ones [5, p.92]. Mountain routes were completed with parking areas, since such routes were distinguished by their length, complexity and autonomy.

References

1. Kudinov B. F., Iz istorii razvitiya turizma [From the history of tourism development], Moscow: Nauchnyi Mir Publ., 1986.
2. Kashulina G.M. (1997). State of ecosystems in the Central Barents Region: scales and factors of disturbances. Tromso, Norway.
3. Gorelov A.V. Moi Khibiny [My Khibiny]. Murmansk: book publishing house, 1980.
4. Konstantinova N.A., Belkina O.A. (1994). On the conservation of Kutsa area (south - west of Murmansk Region, Russia). Zuerich, Switzerland.
5. Sokolov V.E., Filonov K.P., Ekologiya zapovednykh territorii Rossii [Ecology of protected areas of Russia]. Moscow: Yanus-K Publ., 1997.

Engeribo Timinebipa

THE CHALLENGES OF ENVIRONMENTAL MONITORING IN NIGER DELTA, NIGERIA

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Abstract: Upon the effects of the increasing threat to the environment and global warning and climate change, Federal government has established and enacted laws and policies to govern and monitor the activities of these oil companies

This paper outlines the various government agencies, laws governing environmental monitoring/protection in Nigeria and the challenges they face in performance of their duty.

Key words: Ecosystem, environmental monitoring, Niger delta

121

Introduction. As the impacts of environmental problems are becoming severe to the citizens of Nigeria and the entire environs, the Nigerian government has enacted so many laws to this effect in order to ensure healthy environment for its citizens. Some of these laws are regulate oil activities, while others are directed to protect the different spheres of the environment such as land, water, air and atmosphere. Also there are many environmentally friendly activities the government of Nigeria is embarking on, both at international and national levels, which are aimed at improving the environmental and mitigating social and cultural atrocities caused by oil exploitation.

The Niger Delta consists of diverse ecosystems of mangrove swamps, fresh water swamps, rain forest and is the largest wetland in Africa and among the ten most important wetland and marine ecosystems in the world, but due to oil pollution the area is now characterized by contaminated streams and rivers, forest destruction and biodiversity loss in general the area is an ecological wasteland.

Such friendly activities to ensure safer environment are:

- ratifying of some international environmental treaties;
- indulging in gas utilization projects;
- forests management activities;
- monitoring of the activities of oil companies.

As Nigeria depends so much on oil production for economic growth and national development, many exploration and exploitation activities are going on in the areas that contain huge reserves of crude oil and gas deposits in Nigeria. Niger Delta in Nigeria is the main area where oil activities are going on in Nigeria, and the inhabitants of this area have been receiving the negative impact of these activities. The main issues of oil production in the Niger Delta are the problem of oil spillage; different kinds of pollutions by oil waste; the issues of gas flaring and health effects.

Because of these environmental and social impacts of these oil activities, the inhabitants and Non-governmental Organizations (NGOs) have been complaining and protesting tirelessly against the companies which are carrying out these activities. As a result, Nigerian government enacted and established many environmental and civil laws, agencies to monitor the actions of the oil companies, and to improve the environmental state and condition. Nigerian government especially enacted gas flaring prohibition laws, The NESREA act 2003,

122

NOSDRA, DPR(Department of petroleum resources), NDDC(Niger Delta Development Commission), NCDMB (Nigerian content development and monitoring board), to stop/monitor the flaring of non-associated gases and associated gases and other environmental hazards which cause climate change, social and environmental atrocities against the citizens of Niger Delta.

Materials and Method. This involved collecting data including government laws governing environmental monitoring / protection of the Niger Delta region and government agencies responsible for environmental monitoring in Nigeria. This involved obtaining data from past and present studies, government and non-government bodies and existing literature.

The study relied on secondary data, data was obtained from Niger Delta Development Commission (NDDC), The Nigerian National Petroleum Cooperation, World Bank Reports, Published and Unpublished materials, Books, Newspapers, Conference and Seminar Papers, Journals and the internet. Below are listed Nigeria government agencies that are responsible for environmental protection and monitoring:

- Federal Environmental protection Agency (Now FMENV U&H) Act No.1988;
- Department of Petroleum Resources (DPR);
- GUILDELINES and standards for environmental Pollution control in Nigeria;
- S.I 15-NATIONAL Environmental Protection Management of solid and Hazardous waste Regulation (1991) (FMENV);
- FEPA (NOW FMENV) National Agenda 21 (1991);
- FEPA (NOW FMENV) National Policy in the Environment (1999);
- Forestry Law CAP 51, 1994;
- Land use Act of 1978;
- Bayelsa State Environment And Development planning edict of 1999;
- National inland waterways authority act No.13 of 1997;
- Oil pollution Act (OPA) of 1990.
- National oil spill Detection and response Agency (NOSDRA) (2006).

123

PETROLEUM Related Laws and Regulations includes:

- Endangered species Decree Cap 108 LFN 1990;
- Harmful waste Cap 165 LFN 1990;
- PETROLEUM (DRILLING AND PRODUCTION) regulations, 1969;
- FEDERAL ENVURONMENTAL protection Agency Cap 131 LFN 1990;
- Mineral oil(safety) Regulations, 1963;
- International convention on the Establishment of an international fund for compensation for oil pollution damage, 1971;
- Convention on the prevention of Marine Pollution Damage , 1972;
- African convention on the conservation of nature and Natural resources, 1968;
- International convention on the establishment of an international fund for the compensation for oil pollution Damage, 1971;
- The environmental impact assessment (EIA) degree No.86 of (1992);
- The environmental impact assessment (EIA) (1992);
- CLEAN NIGERIA ASSOCIATES (C.N.A) (1981);
- Oil trajectory and Fate Models for oil spill disaster Monitoring (1998).

Irrespective of the enacted laws / agencies to prohibit gas flaring and other environmental related offences in Nigeria, oil companies are gripping hold on some reasons, such as weak laws or absence of regulatory framework which does not specify standard technical details on the level of hazardous substances to be emitted hence it's difficult to monitor, limited access to markets, international and local), and insufficient finances and infrastructures. Most importantly, these laws are outdated.

Highlighted below are lapses difficulties in environmental monitoring in Nigeria:

- There is no specific standard/ technical details on the level of hazardous substances to be emitted hence its difficult to monitor;
- Weak/absence of regulatory framework;
- Limited access to site;
- Insufficient finances and infrastructure;
- Lack of adequate information;

124

- Lack of experts and facilities;
- Poor implementation of government policies.

Results and recommendations

Laws governing environmental and safety monitoring should be reformed as it is obvious that laws above are back in 1999, and 2007 which are the latest, so they are outdated in comparison to the environmental challenges and state-of-the art safety measures that the country needs.

More personnel should be involved in training and funds should be made available for monitoring and research.

In conclusion, I would suggest that the environmental insurance policy should be introduced in Nigeria, which requires all oil companies to deposit certain amount of money before operation promising to adhere to the environmental rules and regulations. In case of the failure to adhere to these rules they would lose those funds.

References

1. Nerry Echefu. Environmental impact assessment in Nigeria: regulatory background and procedural framework / UNEP EIA Training Resource Manual. Case studies from developing countries. Case 7. pp. 63-74. – Retrieved from: http://www.unep.ch/etu/publications/14)%2063%20to%2074.pdf
2. Institutional aspects of sustainable development in Nigeria – Retrieved from: http://www.un.org/esa/agenda21/natlinfo/countr/nigeria/inst.htm.

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THE DRAINING OF THE ARAL SEA

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Abstract: The draining of the Aral Sea is one of the main problems of the global environment. The consequences of this disaster are significant: reduction of water quality, deterioration in people`s health, climate changes, soil salinization. Once the Aral took the fourth place in size among the lakes in the world. Now it turns into a small pond.

125

Human activity is the major reason of the Aral Sea draining. Mindless withholding water from the Syrdarya and Amurdarya led to a large decrease in water level of the Aral Sea.

Key words: draught, salinity, sulfates and carbonates, causeway, the Small and the Large Aral, irrigation systems.

The Aral Sea (Lake) is located on the border of Kazakhstan and Uzbekistan. It occupies a large area in the territory of the Turan lowland. Its height is 48.5 meters above the sea level. The left and right banks of the Aral Sea are different from each other. The eastern coast is a sandy lowland and the western coast is the rocky cliffs. The Aral Sea is considered "Sea Island", as it has many islands. There are several big islands such as the Renaissance, Barsa – Kelmes and Braids - Aral. [1]

The Aral Sea is an endorheic salt lake. Here the water is clear and it has a bright blue color. It was called the Blue Sea in Ancient Russia. However, it is a little muddy in the mouth. The salinity of the lake is 3 times lower than in the ocean. The majority of salts in the lake are presented by sulfates and carbonates. There are two rivers, which flow into the Aral Sea: the Amurdarya and the Syrdarya. Until 1960 the Aral Sea was the fourth largest lake in the world. Its area was 66,000 km^2, with the average salinity of 10-11 ‰, and the depth was 69 m.

It is known that in times BC the Aral Sea became shallow for 5 times. This was due to the fact that the rivers flowing into the lake, changed direction. In the middle of the Cenozoic era, the Aral Sea was connected with the Caspian Sea. The level of the Aral remained practically the same in the 19th century and the half of the 20th century.

Since the beginning of 1950 the level of the Aral Sea has consistently decreased by 20-40 centimeters per year. In 1969 its level dropped by 2 meters. In 1989 the Aral Sea was divided into the Small and the Large Aral as a result of the draining. [2] In 1994 the sandy causeway was built for raising the level of the Small Aral. Unfortunately, it was broken down because of a strong wind. In 2001 the Large (southern) Aral was divided into a deep-water western part and a shallow eastern part. The eastern part dried in 2009.

There are several reasons that affect the draining of the Aral Sea. The main reason is the withdrawal of large amounts of water for irrigation. The cotton is grown in Uzbekistan. It is a moisture-loving

126

culture, which requires a large amount of water. Moreover, the irrigation systems were built in the pools of the Syrdarya and Amurdarya. Water is also taken for industrial enterprises. The Aral loses much more water because of evaporation than it gets from the rain, snow and underground waters. As a result of this process the volume of the lake is decreasing and the salinity is increasing.

The drying of the Aral Sea has many consequences. As a result of the increasing salinity of the water, the number of fish species has dropped dramatically. Fishing is preserved only in the Small Aral. The shipping has stopped because of the strong shallowing.

The functioning of terrestrial systems is due to the terms of the relationship of groundwater and environmental components. [3] The process of desertification has started as a result of reducing the groundwater level. Green vegetation is replaced by halophytes and xerophytes. Only half of the local species of mammals have survived.

Dried territories have become the storage of dust, salts, pesticides and agricultural chemicals. These particles are spread by the wind and some of them get into the atmosphere.

The draining of the Aral Sea influences the climate of surrounding areas. There was a continental climate with mild winters and warm summers before. Nowadays it has become sharply continental. Summer becomes drier and shorter winters are longer and colder. Draughts happen more often.

People living in these parts suffer most of all. There is the highest child mortality rate in Central Asia. People drink water, which is poisoned with pesticides. They are breathing the dust with hazardous substances. Northern and north-eastern winds are moving sodium bicarbonate, sodium chloride and sodium sulfate to the most densely populated and economically developed area to the south from the delta of theAmurdarya.

In conclusion, it will be impossible to restore the initial water level in the Aral Sea. It is necessary to increase the annual inflow of the Syrdarya and Amurdarya rivers in 4 times. However, Turkmenistan and Uzbekistan are going to continue to grow cotton as it is the exported culture. Due to the growing population of these countries they withdraw more water for agriculture to feed people. If the operation of irrigation systems is not stopped, the Aral Sea will turn into a small pond, which will increase the salinity of water. There are some solutions to this

127

problem, for example, to upgrade the system of irrigation channels but it requires a huge amount of money.

References

1. *Aral`skoe more segodnya* [the Aral Sea today] Available at: http://earth06.narod.ru/samo/6.htm (accessed 25 October 2015)
2. *Aral`skoe more I prichiny ego gibely* [The Aral Sea and the reasons for his death] Available at: http://lifeglobe.net/blogs/details?id=484 (accessed 24 October 2015)
3. *Ecologichesye problemy Aral`skogo morya I puty ih reshenia* [Ecologycal problems of the Aral Sea and ways of solutions] Available at: http://www.ecolognatural.ru/enat-1018.html (accessed 26 October 2015)

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LANDFILL SITE SELECTION BY USING GIS AND AHP. CASE STUDY: TVER REGION

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Abstract: The article considers the system of solid waste management in Tver region. It describes a method of landfill site selection using GIS and MCE. The hierarchical structure of the decision making problem was established by using AHP for the case study.

Key words: solid waste management, landfill site selection, GIS, MCE.

Waste is an essential consequence of the life of the city. One of the major problems in solid waste management is the selection of the appropriate site for waste disposal. Landfill site selection (LSS) in urban or rural areas is a critical issue for the planning process because of its enormous impact on the economy, ecology and the environmental health of the region. One of the most serious and growing potential problems of Solid Waste Management (SWM) is the shortage of land for disposal. Dumping of waste is the most widely practiced method of recycling of solid waste, but, unfortunately, it generates a lot of

128

environmental and sanitation problems. Despite this dumping of solid waste for a long time will remain the most common method of disposal and recycling. Tver region – the subject of the Russian Federation, is a part of the Central Federal District. Its area is 84,201 sq km. Tver Region is located in the northwestern part of Russia. Tver region includes 7 urban districts and 36 municipal districts [1].

During 2014 about 1.064 million tons of waste were formed in the territory of Tver region. In 2012, on the territory of Tver region 110 illegal dumps of the total area of 168,000 sq.m. were registered. According to the information provided by Rosprirodnadzor in Tver region, most landfills are technically outdated in this region, about 50% of landfills have been used over 30 years. Based on these data, we can conclude that there is a need for the landfill site selection [2].

Sanitary norms require an extensive evaluation process in order to identify the optimum available disposal location. This location must comply with the requirements of the existing governmental regulations and at the same time must minimize economic, environmental, health, and social costs. Many factors could be considered while assessing a site as a possible location for solid waste landfilling. The methodology used in this study consists of the following steps [3].

- reviewing the data for the determination of the general approaches to LSS;
- determination of the criteria used in LSS studies;
- preparation of the digital GIS database that includes all spatial information, which is related to the selected criteria;
- implementation of the AHP method to calculate the main criteria;
- analysis of inconsistency ratios;
- calculation of the landfill suitability index using the Simple Additive Method (SAW) and preparation of the suitability map.

In order to start the identification process of potential sites, a list of the most relevant criteria was selected through the literature review from different studies based on GIS and AHP. In general, these criteria reflect the basic economic, natural and physical policies defining suitability of a site for the development of waste management infrastructure facilities.

LSS requires consideration of a comprehensive set of factors and balancing of multiple objectives in determining the suitability of a particular area. It involves a complex array of critical factors that are

129

derived from economic policies and environmental disciplines. Accordingly, for LSS, MCE techniques are required. MCE techniques were developed to evaluate alternatives based on the decision maker's subjective values and priorities [3].

AHP was developed by Satty to help the decision makers to arrive at the best decision in the case of multiple conflicting objectives (criteria). It is a flexible decision making tool for multi-criteria problems used in this study to determine relative importance of LSS criteria. AHP helps decision makers to organize and evaluate the relative importance of selected objectives and the relative importance of alternative solutions. In general, AHP method is a common decision making technique, which can be used to analyze and support decisions with multiple objectives. In order to do that, a complex problem is divided into a number of simpler problems within the hierarchy [4]. The hierarchical structure of the decision making problem was established by using AHP for the case study. The hierarchical structure of the decision making problem consists of three levels. The first level represents the main goal of the decision hierarchy which is LSS, the second level represents the two main criteria, which emphasize financial restriction and environmental protection respectively, and the third level includes twelve criteria for different aspects of the main criteria [4].

In our study we use such criteria as: resident population (0-500), (500-1000), (1000-1500); inconsistent population (0-500), (500-1000), (1000-1500); the distance from water sources and water surfaces; current land (agricultural land, forest, commercial, special meaning); the impact on the aesthetics of the surrounding area; the climate (rainfall, wind speed); the composition of the soil; transport (distance transport routes, access to transport links); infrastructure (facilities for waste treatment, the distance to the source of energy); the relief of the terrain (the slope angle (0 °-10 °), the slope angle (10 ° -20 °), the slope angle of 20 °); the distance to populated areas (up to 20 km, 20-80 km and more than 80 km) [5].

Based on the data on the formation of solid waste, it is proposed to focus the analysis on the central part of Tver region, the territory which includes 4 major cities and the regions where there is the greatest need for waste disposal sites. This area occupies about 14% of Tver region. It is a home to 51% of the population. About 86.7% of the total

130

amount of municipal solid waste is generated in this area. We identify areas with the greatest concentration of solid waste and the most pressing needs in the infrastructure for waste disposal. The further task is to determine the most appropriate location for landfills. The total area of waste disposal sites should be at least 80-100 hectares. Standard landfills occupy 30 hectares, so we need to select at least three landfill sites.

References

1. Territorial'nyj organ Federal'noj sluzhby gosudarstvennoj statistiki po Tverskoj oblasti [The Territorial Department of the Federal State Statistics Service in Tver Region]. Available at: http://tverstat.gks.ru (accessed 3 September 2015).
2. Upravlenie Rosprirodnadzora po Tverskoj oblasti [The Federal Service for Supervision of Natural Resources in Tver Region]. Available at: http://www.prirodnadzortver.ru/ (accessed 3 September 2015).
3. Geneletti, D. Combining Stakeholder Analysis and Spatial Multicriteria Evaluation to Select and Rank Inert Landfill Sites. Waste Management, no. 30 (2), 2010, pp. 328-337.
4. Giovanni De Feo, Sabino De Gisi. Using MCDA and GIS for Hazardous Waste Landfill Siting Considering Land Scarcity for Waste Disposal. Waste Management, no. 34, 2014, pp. 2225-2238.

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ENVIRONMENTAL ASSESSMENT OF AEROSOLS IN THE ATMOSPHERIC SURFACE LAYER IN MOSCOW

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Abstract: Monitoring of the radionuclide content in aerosols and the dispersed composition of aerosols is carried out to estimate the impact of air pollution on health.

Key words: aerosols, air, assessment, dust, monitoring, radiation, radionuclides.

131

Currently, during the systematic radiation monitoring of the surface layer of the atmosphere the compulsory subject to control is the content of radionuclides in aerosols. Until recently, this parameter was not regulated in the Russian Federation, while there was a valid norm of 40 micrograms / m3 in the EU. However, recent studies, including those conducted by the World Health Organization (WHO) showed that fine suspended particles of dust in the size range of 2.5 microns (PM2.5) and 10 microns (PM10) in atmospheric aerosols have an impact on sickness rate. These particles influence the human body negatively, causing damage to the lung tissue and the occurrence of respiratory diseases, when they are inhaled in the upper respiratory tract. In this regard, in Russia, the transition was made to normalize the content of dust particles PM2.5 and PM10 in the air. Resolution of the Chief State Sanitary Doctor of the Russian Federation on 2010 approved the hygiene standard, which contains the required values for these particles. The organization and realization of monitoring of fine particles are necessary to assess the impact of air pollution on health. The results should be used for planning drastic measures to improve air quality [1, p. 5].

The aim of the work is to conduct environmental assessment of aerosols of the atmospheric surface layer in the city of Moscow.

A lot of relevant methods and procedures were used to achieve the tasks in the research process, namely the procedures to obtain and prepare samples as well as to perform measurements.

The samples obtained during the pre-diploma practice were investigated in this research. A total of 16 samples were selected for monitoring the radionuclide content in aerosols and calculation of volumetric concentration and 20 samples – to monitor the dispersed composition of aerosols and determine the mass distribution of each fraction of suspended particles.

Sampling was carried out at a stationary radiation monitoring post, which was located in the area of the division of the Federal State Unitary Enterprise "Radon" in the area of Volokolamsk highway, under the guidance of the staff of the enterprise. The period of sampling was from September 5, 2014 to December 18, 2014. Sampling of aerosols was carried out by using specialized devices. To determine the specific volumetric activity of radionuclides a filter device of the type "Typhoon-3A" with Petryanov filters was used. To determine the

132

particulate composition of aerosols a six-cascade impactor was used [4].

As a result of statistical processing of the measurement data we got the final table with the monthly averages of volumetric concentrations of radionuclides for four months: September, October, November and December.

The comparison of the average values of the observed volumetric activities and allowable volumetric activities (DOA) of radionuclides (the standard ratio of NRB-2009) was carried out in this research [6].

Special attention was paid to iodine-131 as it is an element of the nuclear fuel cycle and in case of normal operation of enterprises, working with sources of ionizing radiation it should not be released into the environment. If iodine-131 is present in aerosol samples of the surface layer of the atmosphere, we have to wonder about its sources [2].

The table with the results of statistical processing, which contains the data on the distribution of fractions for suspended particles in the mass fraction is presented in the work. The results of the study of the samples of particles PM2,5 and PM10 were compared with the maximum permissible concentration according to hygienic standards [3].

Comprehensive environmental assessment of the surface layer of the atmosphere aerosols at a stationary post of radiation monitoring in the city of Moscow was carried out.

References

1. Barinov A.S., Korenkov I.P., Lashchenova T.N. Radiatsionno-opasnyi ob"ekt i okruzhayushchaya sreda [Radiation Hazardous Facilities and the Environment] Bezopasnost' okruzhayushchei sredy [Environmental Security]. Moscow, 2007, pp. 34-39.

2, Gaffney P. A. Comprehensive Research Plan for Developing PM2,5 Emission Inventories (2011). Available at: http://www.epa.gov/ttnchie1/conference/ ei10/pm/gaffney.pdf.

3. Haywood J., Boucher O. Estimates of the Direct and Indirect Radiative Forcing due to Tropospheric Aerosols: a Review. Reviews of Geophysics, 2000, no. 38, 513 p. doi: 10.1029/1999RG000078.

133

4. Korenkov I.P., Kirillov V.F. Metody opredeleniya radioaktivnykh veshchestv v vozdukhe [Methods for Determination of the Radioactive Materials in the Air]. Moscow, Meditsina Publ., 1978, pp. 21-41.
5. Kozlova M.V. Izuchenie kontsentratsii dolgozhivushchikh aerozolei atmosfernogo vozdukha v zavisimosti ot zapylennosti [Study of Concentrations of the Long-Lived Atmospheric Aerosols Depending on the Dust Content] Gigiena i sanitariya [Hygiene and Sanitation]. Moscow, 1968, pp. 42-45.
6. Sanitarnye pravila. SP 2.61.758-99. Normy radiatsionnoi bezopasnosti (NRB-99/2009). Gigienicheskie normativy [Sanitary rules. 2.61.758 SP-99. Radiation safety norms (NRB-99/2009). Hygienic standards]. Moscow, Minzdrav Rossii Publ., 1999, 116 p.

[1]Kamagate S.A., [2]Makarova M.G.

L'IMPACT DE L'AGRICULTURE SUR LES RESSOURCES FORESTIÈRES ET LA CONSERVATION DE LA BIODIVERSITÉ EN CÔTE D'IVOIRE

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Résumé: Le développement dynamique des cultures d'exportation a contribué activement à la déforestation en Côte d'Ivoire. Mais 178 espèces animales et végétales sont aujourd'hui menacées en raison de la déforestation, du braconnage et de la destruction de l'habitat.

Mots-clés: Côte d'Ivoire, développement économique, agriculture, déforestation, diversité biologique, reboisement.

Abstract: The dynamic development of export crops has actively contributed to the deforestation in Ivory Coast. But 178 animal and plant species are now endangered because of deforestation, poaching and habitat destruction.

Key words: Ivory Coast, economic development, agriculture, deforestation, biodiversity, reforestation.

134

La Côte d'Ivoire est un petit pays du bassin du Golfe de Guinée, dont l'épine dorsale économique est l'agriculture [1; 2]. Le secteur agricole représente près de 30% du PIB, 70% des recettes d'exportation et la principale source de revenus pour la majorité (66%) de la population [3; 4]. Le modèle de développement économique en Côte d'Ivoire est basé sur la production de cultures d'exportation. Le pays est le premier producteur de cacao au monde, le deuxième plus grand sur le continent africain pour l'exportation de caoutchouc et le troisième pour la production d'huile de palme. La richesse des ressources forestières en Côte d'Ivoire a été l'une des principales composantes du développement économique du pays au cours des deux premières décennies de l'indépendance, et l'industrie du bois, a été, avec le café et le cacao, la troisième source de revenus et d'emplois.

Le sujet de notre recherche est le développement durable du pays sur le plan écologique et économique. L'analyse statistique de la typologie des exploitations agricoles montre que l'agriculture en Côte d'Ivoire reste extensive et l'observation au cours des 20 dernières années de la croissance de la production dans ce secteur a été obtenue par l'augmentation de la superficie cultivée, plutôt que due à l'intensification de la production agricole. Ainsi, en 1965, les terres agricoles occupaient 1,9 million d'hectares, soit 6% de l'ensemble du territoire du pays, en 1975 - 11%, et, en 1990, elles ont atteint 7,5 millions d'hectares, soit 23% du pays [4]. La deuxième caractéristique qui affecte la durabilité écologique et économique du pays est la croissance rapide de la population et sa répartition inégale entre les régions du pays. La valeur moyenne du taux de natalité dans le pays a atteint 3,8%. Environ 50% du territoire est la zone de forêt au sud, où l'on cultive la majeure partie des cultures d'exportation (café, cacao, caoutchouc, huile de palme).

Les sols et le potentiel agro-climatique de cette région contribue à la prospérité de l'agriculture, de sorte que cette région est un centre d'attraction pour les migrants internes et externes et abrite 78% de la population [3]. Le centre, la zone soudano-guinéenne est d'environ 19% du territoire et se caractérise par des conditions transitoires à la savane et se spécialise dans la production de cultures vivrières de subsistance (patates douces, maïs, igname, etc.).

En raison de la forte migration des populations autochtones de cette zone vers le sud, il existe de grandes parcelles de terres en jachère.

135

Le Nord de la Côte d'Ivoire (environ 31% du territoire), est recouverte d'une savane sèche (zone soudanaise) avec les céréales (mil, sorgho) pour cultures et le coton comme la principale culture de rente. Cette zone a une faible densité de population et un fort taux de migration de sa population vers le sud. La prédominance des petites exploitations agricoles et l'augmentation de la population rurale dans la zone sud ont forcé l'expansion des terres cultivées au détriment de la forèt.

Par conséquent, à ce jour, le taux annuel de déforestation reste élevé. On estime qu'au début du 20ème siècle, la forêt couvrait plus de 16 millions d'hectares. En 1965, elle était déjà à 9 millions ha.

Les prix élevés du café et du cacao qui ont été observés depuis le milieu des années 1970 jusqu'à la fin des années 1980, ont conduit à une augmentation de la superficie de café et de cacao, et ont causé la perte de la superficie forestière de plus de 3 millions ha [3].

Depuis le début des années 1980, la déforestation est de plus de 5% et, en 1991 la superficie des forêts a diminué à 3 millions ha. La tendance de la déforestation persiste au cours des dernières années.

Aujourd'hui, la zone de la forêt dans le pays est d'environ 2,5 millions d'ha. La principale raison de cette déforestation est la forme extensive de l'agriculture qui est basée sur les techniques de brûlis. Cette technique provoque aussi les incendies de forêts naturelles.

Une autre cause traditionnelle de la déforestation dans les pays tropicaux est la production de combustibles pour répondre aux besoins énergétiques des populations locales. Les besoins en bois de chauffe augmentent avec la croissance de la population, et sont la cause du taux élevé de la déforestation dans les régions à forte densité de population, ainsi qu'à proximité des centres urbains.

La Côte d'Ivoire a le plus haut niveau de biodiversité en Afrique de l'Ouest, avec plus de 1.200 espèces animales et 4.700 espèces de plantes. Mais 178 espèces végétales et animales sont maintenant considérées comme menacées d'extinction à cause de la déforestation, du braconnage et de la destruction de leur habitat [1, p.162].

Le taux élevé de dégradation des forêts représentent un problème écologique important dans le pays. Consciente de l'importance de la conservation des ressources forestières, le pays a pris toute une série d'actes législatifs et des programmes spéciaux de reboisement. La régulation de la forêt en Côte d'Ivoire est basée sur deux importantes lois: la loi № 65-255 du 4 août 1965, relative à la protection de la faune

136

et de la mise en œuvre de la chasse; la loi № 65-425 du 20 décembre 1965 concernant le Code forestier, qui définit le cadre juridique de l'industrie forestière, de la protection et du reboisement de la forêt. Le Code forestier régit la délivrance des concessions forestières. En 1995, il a été mis en place une stratégie nationale pour la gestion des parcs et réserves naturelles. Ce programme vise à préserver la biodiversité du pays à travers la préservation des parcs nationaux et réserves.

En 1996, la Côte d'Ivoire a ratifié la Convention sur la diversité biologique. En 1999, il a eté réalisé des études détaillées des forêts avec la publication d'une monographie sur la diversité biologique nationale. Ces études ont révélé d'importantes lacunes et les problèmes qui existent dans la conservation des ressources forestières.

À l'heure actuelle, la priorité de la politique du gouvernement est de freiner la déforestation et relancer le reboisement dans le pays. Pour les entreprises de l'industrie forestière opérant dans la production de bois, le reboisement est obligatoire. Ainsi, dans la période 1997-2000, il a été restauré plus de 40 000 hectares de forêt. Le reboisement annuel moyen atteint 8.000 hectares [4]. Mais ces lois sont violées par la population locale au cours de l'expansion des terres agricoles, et les migrants qui viennent dans la zone sud du pays. Ils envahissent les forêts, y compris le territoire des parcs nationaux, ce qui conduit à leur dégradation. Une façon d'atteindre la régénération est d'intégrer les populations locales dans la gestion des projets forestiers.

Ces stratégies de la participation de la population visent à intéresser matériellement les gens, en instaurant en particulier la propriété collective des forêts par les communautés rurales. Mais la part des programmes de reboisement collectif reste très faible, moins de 1% [2] parce, que la population reçoit plus de revenus avec les cultures d'exportation, car elles veulent des investissement à rentabilité immédiate, ce qui est inévitable dans la grande pauvreté dans laquelle elles vivent.

L'état essaye de résoudre les problèmes liés aux ressources forestières avec la Société de Développement des Forêts (SODEFOR) et la Direction de la Protection de la Nature (DPN) qui proposent les mesures suivantes pour résoudre les contradictions existantes:

1) améliorer la capacité de gestion des parcs et réserves de Côte d'Ivoire; 2) développer une stratégie pour une meilleure gestion des

137

parcs et réserve avec la plus grande participation des communautés locales et du secteur privé.

Mais la situation reste tendue, parce que toutes les stratégies pour résoudre le problème de la conservation ne donnent pas les résultats escomptés parce que les moyens de l'état sont limités, et la population est très pauvre. La situation dans les années avenir sera insoutenable si l'état ne résout pas définitivement la question de l'état des forêts. Les superficies de forêts naturelles vont décroître à tel point que les efforts d'aménagement seront vains. Ce qui sera catastrophique pour la biodiversité du pays, qui est déjà très menacée.

Références

1. Africa: Atlas of Our Changing Environment, Division of Early Warning and Assessment (DEWA) - United Nations Environment Programme (UNEP), Nairobi - Kenya, 2008. - 393 pages

2. Brou Y.T. Impacts des modifications bioclimatiques et des l'amenuisement des terres forestières dans les paysanneries ivoiriennes: quelles solutions pour une agriculture durable en Côte D'Ivoire, Cuadernos Geograficos, 45 2009-2. - pp. 13-29

3. Koffi K. J.M., Kouadio B. K. et Ballet J., Inégalités de droits et soutenabilité des ressources forestières en Côte d'Ivoire, Juin 2012. - 18 pages

4. L'Etude prospective du secteur forestier en Afrique (FOSA) Côte d'Ivoire, Bureau régional de la FAO pour l'Afrique (Ghana) - Accra, 2001. - 34 pages

138

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ANALYSIS OF THE EFFECTIVENESS OF SUPERVISING AND MONITORING THE ENVIRONMENTAL SAFETY IN THE REPUBLIC OF KALMYKIA

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Abstract: This work is devoted to the state supervision and control of environmental safety in the Republic of Kalmykia, which is now an integral part of the overall safety system. The study methods and the results of the work effectiveness of the Ministry of Natural Resources and Environmental Protection for 2011-2013 are presented here. The results obtained can be used in the future for a more complete study. Some recommendations for improving the supervision and control of environmental safety in the Republic of Kalmykia have been developed.

Key words: environmental monitoring, environmental safety, control and supervision, the Republic of Kalmykia, the Ministry of Natural Resources and Environmental Protection

The purpose of the work is to study the current state of supervision and control of the environment in the Republic of Kalmykia. Currently supervision and control of environmental safety is part of the overall safety system. Therefore, it should be considered at the global, regional and local levels. The Global Environmental Monitoring System (GEMS), established jointly by the international community in 1974, spans the globe. This system is implemented at several levels:

• IMPACT – the study of severe impacts on a local scale;

• Regional – manifestation of the problem of migration and transformation of pollutants, combined effects of various factors;

• Background – based on biosphere reserves, where any economic activity is excluded.

To achieve the goal we have resolved the following main tasks:

139

• Analysis of the legal basis for the organization and implementation of the state environmental control, established by the Constitution of the Russian Federation, the laws of the President and Government of Russia, the regional governments of the Russian Federation, environmental legislation, as well as a number of special regulations;

• Study of the economic and geographical position of the Republic of Kalmykia;

• Analysis of the methods of work of the Ministry of Natural Resources and Environment of the Republic of Kalmykia.

The results of surveillance and control of environmental safety are extensively discussed in the media, which indicates the importance attached to environmental issues by the Government of the Republic of Kalmykia. Protection, supervision and control of the environment are vested in the Ministry of Natural Resources, which is the executive power body of the Republic of Kalmykia that performs the function of legal regulation in the republic. The Ministry of Natural Resources operates on the basis of administrative regulations approved by the Government. In accordance with the economic and geographical features of the Republic of Kalmykia, the following types of state supervision exist:

1. The federal government control
2. The regional government supervision.

Analysis of the Ministry of Natural Resources work showed that to improve the efficiency of state environmental supervision it was necessary to increase funding; to provide the material and technical base for inspectors; to train the staff; to establish a certified laboratory for monitoring the main parameters of the environment. As a result of verification of compliance with environmental legislation, violations against legal entities and individual entrepreneurs have been revealed.

The results obtained in the performance of the work may be used in the future for a more complete study and working out recommendations to address the problems of supervision and control of environmental safety in the Republic of Kalmykia.

References

1. Federal'nyj zakon «Ob ohrane okruzhaushei sredy» ot 10.01.2002 N 7-FZ (red. ot 24.11.2014) s izmeniniyami от 29.12.2014.

140

2. Federal'nyj zakon «Ob ohrane atmosfernogo vozduha» ot 04.05.1999 N 96 – FZ (red. ot 29.12.2014).
3. Federal'nyj zakon «Ob othodah proizvodstva» ot 24.06.1998 N 89 – FZ (red. ot 29.12.2014) s izmeneniyami i dopolneniyami, vstupil v silu 01.02.2015.
4. St. 65 Gosudarstvennyi kontrol v oblasti ohrany okruzhayushei sredy (v red. Federalnogo zakona 31.12.2005 N 199 - FZ).
5. Federal'nyj zakon «O zashite prav yuridicheskih lits i individualnyh predprinimatelei pri provedenii gosudarstvennogo kontrolya (nadzora) i munitsipalnogo kontrolya» ot 26.12.2008 N 294 – FZ (red. ot 06.04.2015).
6. St. 13.1 «Rezhim postoyannogo gosudarstvennogo kontrolya» ot. 18.07.2001 N 294 – FZ.
7. Plan proverok na 2012-2014 god razrabotan I soglasovan s inymi kontroliruyushimi organami, napravlen i utverzhden Prokuraturoi Respubliki Kalmykia v sroki, ustanovlennymi FZ 26.12.2008 N 294 – FZ.
8. Doklady Ministerstva prirodnyh resursov i ekologii Respubliki Kalmykia ob ecologicheskoy situatsiy na territoriy Respubliki Kalmykia za 2011-2014 gody.

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USO DEL SIG EN EL ESTUDIO DE SITUACIÓN AMBIENTAL DEL CHACO SECO, AMÉRICA LATINA

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Resumen: El presente artículo describe principales características del Chaco Seco. Como la ecoregión única el Chaco Seco juega un rol importante en conservación de la biodiversidad y sustentabilidad del ecosistema. Por otro lado esta llanura contiene muchos recursos naturales y es muy favorable para la agricultura. En el artículo está examinado el uso de Sistemas de información geográfica en resolución de problemas ambientales del Chaco Seco.

141

Palabras clave: Chaco Seco, desmonte de bosques, SIG, ecoregión, ambiente

Abstract: This article describes the main characteristics of Chaco Seco. This unique ecoregion is extremenly important for the conservation of biodiversity and stability of the ecosystem. On the other hand, this field is full of natural resources, what makes it beneficial for agriculture. There is examined the use of Geographical information systems in the environmental problems solving in Chaco Seco.

Key words: Chaco Seco, the clearing of forests, GIS, ecoregion, environment

El Chaco Seco es una ecorregión, situada en América Latina en tres países: Argentina, Bolivia y Paraguay. La mayor parte de la región está localizada en Argentina. Dentro del Chaco Seco se pueden distinguir tres subregiones: El Chaco Semiárido, El Chaco Serrano y El Chaco Árido (Fig.1). El Chaco Semiárido es la más extensa y ocupa el oeste de Chaco y Formosa. Es en esta subregión donde el bosque chaqueño encuentra su mayor expresión por la continuidad y la extensión. [1, p.76]

El Chaco Serrano forma la mayor parte del límite oeste de la región. Está formado por elementos de las Sierras Pampeanas y las áreas más bajas. Las sierras forman una barrera orográfica para los vientos húmedos, lo que provoca mayores precipitaciones en las zonas orientales y climas más secos hacia el oeste. [1, p.76] El Chaco Árido ocupa el sudoeste de la región. Está prácticamente rodeado por sierras, lo que le confiere características particulares. Falta de agua y fuerte proceso de evaporación hacen condiciones para salinas. Por ejemplo, las Salinas Grandes son las mayores de Argentina. [1, p.77]

Un problema que ha aparecido en la región en los últimos años es el avance de la agricultura. Se da sobre la base del desmonte de grandes extensiones de bosques. Al hacerse sin una regulación o un plan ambiental de manejo, implica la pérdida y la fragmentación de ambientes y hábitat. [1, p.80] Para hacer monitorio de desmontes y cambios del uso de la tierra, el Laboratorio de Análisis Regional y Teledetección (LART) de la Facultad de Agronomía de la Universidad de Buenos Aires (FAUBA) conjunto con el Instituto Nacional de Tecnología Agropecuaria (INTA) y la Red Agroforestal Chaco Argentina (Redaf) usaban sistemas de información geográfica (SIG).

SIG es es una programa específico que permite crear consultas interactivas, integrar, analizar y representar de una forma eficiente cualquier tipo de información geográfica referenciada asociada a un territorio, conectando mapas con bases de datos.[2]

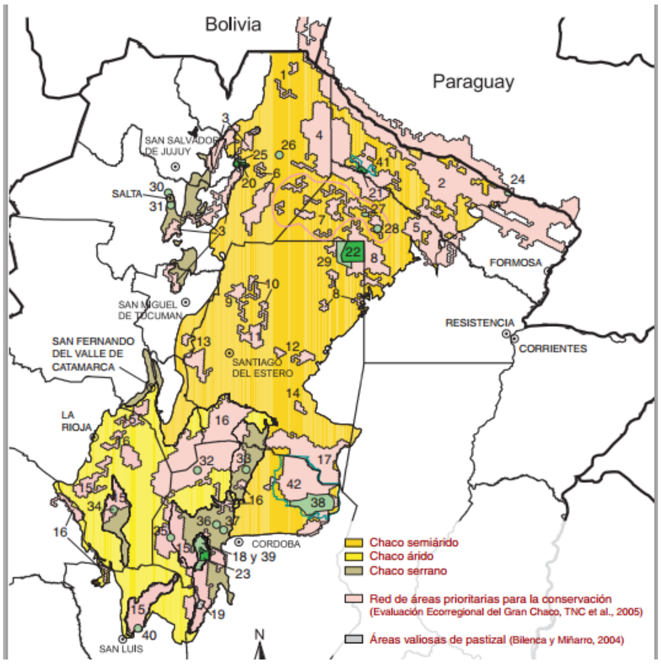

Figura 1. Mapa del Chaco Seco [1, p.73]

Se utilizaron 50 escenas de imágenes satelitales Landsat para el área de estudio para realizar el monitoreo de desmontes en el período 1976-2012. Se descargaron imágenes cercanas al mes de diciembre (ya que los desmontes se realizan en la época seca, que finaliza en los meses de octubre- noviembre), con baja presencia de nubes. Para la caracterización de la dinámica espacial y temporal se cuantificaron los cambios en la superficie y ubicación de los lotes desmontados a lo largo del tiempo.[3] La información se integró en un SIG en el cual se pueden realizar consultas a distintas escalas (Fig.2). La imagen final muestra el cambio del uso de la tierra en el Chaco Seco desde 1976

143

hasta 2012.[3] Se puede ver, que la mayor parte de desmontes fue hecha durante dos periodos 1977-1986 y 2007-2012.

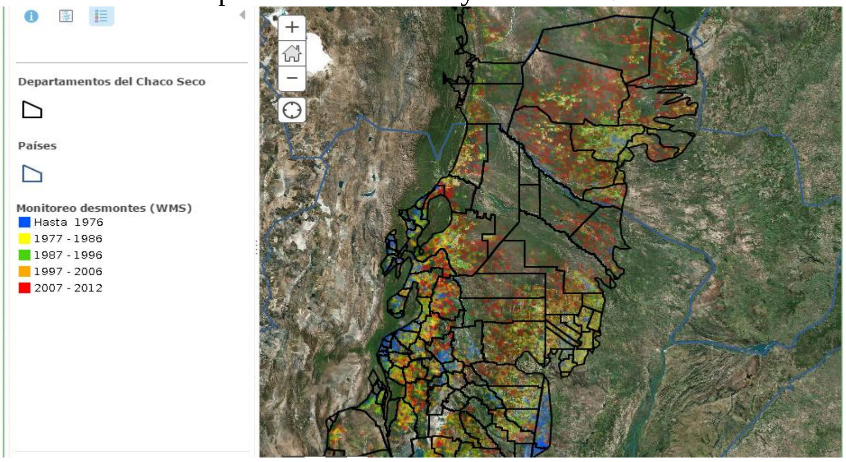

Figura 2. Mapa de monitorio desmontes del Chaco Seco (azul – hasta 1976; amarillo – 1977-1986; verde - 1987-1996; naranja – 1987-2006; rojo – 2007-2012) [3]

Durante los últimos 10 años porcentaje de los bosques desmontados aumentó, especialmente en el norte de la región. Los resultados también fue demostradas en el gráficos, en que se puede ver superficie desmontada (miles de ha) en Argentina, Bolivia y Paraguay para período 2000-2012 (Fig.3) y tasa de transformación anual Q% para el período 2000-2012 en Argentina, Paraguay y Bolivia (Fig.4).

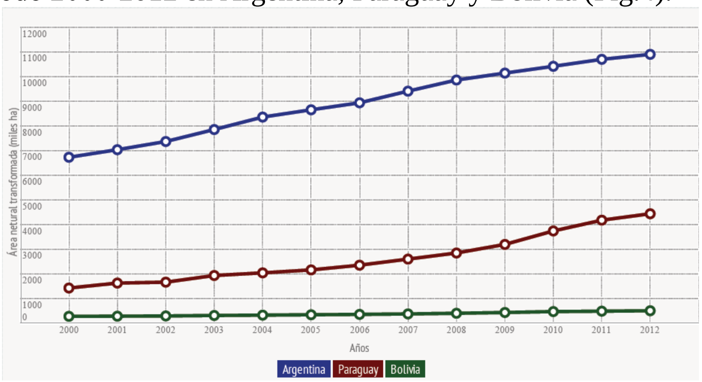

Figura 3. Superficie desmontada (miles de ha) en Argentina, Bolivia y Paraguay para período 2000-2012 [3]

144

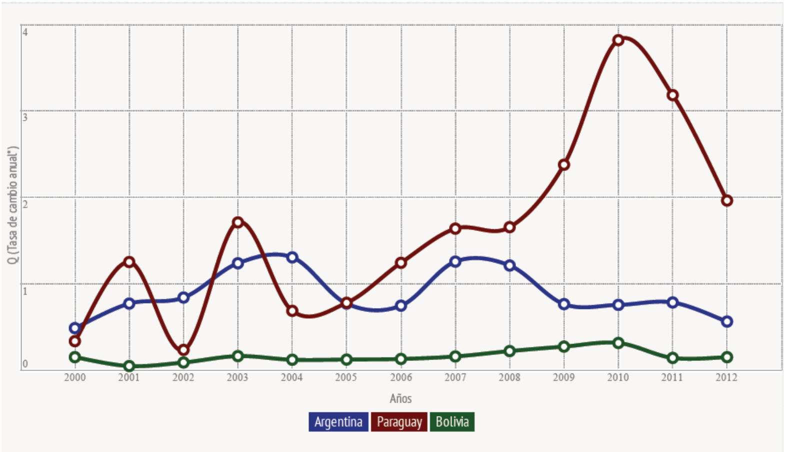

Figura 4. Tasa de transformación anual (Q) en función del tiempo para el período 2000-2012 en Argentina [3]

Q% es una tasa muy utilizada a nivel mundial, ya que pondera el área transformada por el área inicial ocupada por vegetación natural, por eso es que este índice permite comparar tasas de distintas regiones que poseen distinta superficie original de bosque, en varios lugares del mundo. [3]

$$Q\% = \left\{ \left[\frac{A2}{A1} \times \frac{1}{t2 - t1} \right] \times 100 \right\} \times (-1)$$

Donde A1 y A2 representan las áreas naturales para los años t1 y t2, respectivamente. [3] En el gráfico se puede ver, que desde el año 2010 en Bolivia y Paraguay y desde 2011 en Argentina tasa de cambio anual ha bajado. El principal razón es la reforma del derecho del uso de bosques y el límite de deforestación ilegal. [4]

Chaco Seco cuenta con un importante potencial productivo, una maravillosa biodiversidad y una gran riqueza cultural. Pero para que estas cualidades se conserven y se desarrollen, es necesario cambiar la forma en que el hombre y el Estado interactuaron con ellas. Esto podría ser, por ejemplo, mediante la implementación de un programa de ordenamiento territorial que integre estos tres aspectos. Sólo en este marco será posible una explotación sustentable de los recursos naturales, compatible con la conservación de la biodiversidad y con un desarrollo cultural y social en la región.

145

Referencias

1. Sebastián A. Torrella I., Jorge Adámoli. La situación ambiental de la ecoregión del Chaco Seco. La Situación Ambiental Argentina 2005. Régimen de acceso: ttp://www.fvsa.org.ar/situacionambiental/chacoseco.pdf
2. Sistemas de información geográfica, tipos y aplicaciones empresariales [Recurso electrónico]: - Régimen de acceso: http://sig.cea.es/SIG
3. Monitorio de desmontes en el Chaco Seco, [Recurso electrónico]: - Régimen de acceso: http://monitoreodesmonte.com.ar
4. Secretaria de Ambiente y desarrollo sustentable [Recurso electrónico]: - Régimen de acceso: http://www.ambiente.gov.ar/

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INDUSTRIAL EMISIONS IN MOSCOW REGION: DISPOSAL AND PROCESSING

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Abstract: The present day methods of the waste management are discussed. Industrial waste disposal and utilization, unauthorized dumps are urgent problems in Moscow region

Key words: Industrial wastes, landfills, toxic waste, illegal dumps, groundwater, environment, recycling of industrial waste.

Industrial waste generation has been increasing and currently reaches 50 billion tons. This giant figure is certainly related to the use of outdated technologies that do not allow recycling of the waste.

There exist various methods of waste disposal, they are defined according to the aggregate states of matter and classified according to hazard class. Wastes of first and second class of hazard are collected in special containers and then sent to landfills. Wastes of the third and fourth class of danger are sent to treatment facilities. And the waste of the fifth class of hazard can be safely discarded in landfills, these wastes do not incur serious damage.

There are two methods of industrial waste disposal: surface and underground. The underground type of industrial waste disposal

146

includes burial in an underground bunker, this method of burial is efficient and clean, but due to high price used only for a small number of industrial emissions. This type of burial is mainly used for hazardous waste. Land type dumping of industrial wastes includes the ones with a small content of toxic emissions. Both of the presented methods reduce the pollution of the environment significantly, but still are not 100% effective. During precipitation, water enters into the soil with a share of buried waste in it. Thus, the soil is enriched with various chemical substances in the filtrate. A significant part of the leachate enters the groundwater. That is why you should pay attention when choosing a landfill. In Russia the authorities do not pay attention to this issue, and the main part of the burial occurs near a source of drinking water.

Another important problem is the biogas combustion landfill. The methane gas extends to distances of 500 meters and can get into the basements of houses where for any technical reason can explode. It also has a destructive effect on vegetation, causing its rapid extinction.

To avoid negative impacts of waste disposal it is necessary to observe some rules: 1. To take high places with deep groundwater; 2. Disposal layersing; 3. Piping of disposal sites to collect leackage; 4. Disposal grounds make impervious to water; 5. Line up wells at the depth of the groundwater, to monitor the quality of groundwater.

In Russia a serious environmental threat is posed by the industrial waste. Currently there are only a small number of polygons. Sites of illegal dumps are taken for industrial waste due to the lack of landfills. About 250 million hectares of land are seized for the territory of landfills. Some landfills are replaced by others. If our country turns into a garbage dump, it may face the "garbage crisis".

The reason for the appearance of unauthorized dumps is - the high cost of the industrial waste utilization methods. After all, as many believe, we have a lot of land. But the essence of the problem is understood only by specialists. And, unfortunately, this will continue as long as people will have no places to live surrounded with illegal dump sites.

Professionals today are pending for approvals of a number of regulations on waste management, such as: "guidelines and procedures for determining the hazard class of waste", "Federal classification catalogue of production and consumption wastes ".

147

Each of us can contribute to the improvement of the ecological situation of the environment. For this purpose it is necessary to observe some rules of the ecological environment, because primarily pollution affects human beings.

References

1. Bobovich B.B. *Pererabotka promyshlennykh otkhodov* : [Recycling of industrial waste] Uchebnik dlya vuzov. – Moscow.: «SP Intermet Inzhiniring», 1999. – 445 p.

2 Grushko Ya.M. *Vrednye organicheskie soedineniya v pro-myshlennykh stochnykh vodakh*: [Organic compounds in industrial wastewater] Uchebnik. L.: Khimiya, 1982. – 216 p.

3. Grachev V.A., Nikitin A.T., Fomin S.A. i dr. *Obrashchenie s otkhodami proizvodstva i potrebleniya v sisteme ekologi-cheskoi bezopasnosti: nauchno-metodicheskoe posobie / Pod obshchei redaktsiei chlen-korr. RAN, prof. V.A. Gracheva i prof. V.A.* [Waste production and consumption in the system of ecological security: research handbook / Edited by Corresponding Member. Russian Academy of Sciences, prof. VA Grachev and prof. VA]   – Moscow.: Izdatel'stvo MNEPU, 2009. – 500 p.

4. Pal''gunov P.P., Sumarokov M.V. *Utilizatsiya promysh-lennykh otkhodov*. [Industrial waste disposal]   – Moscow.: Stroiizdat, 1990. – 352 p.

5. Akimova T.A. *Ekologiya*   [Ecology] – Moscow.: YuNITI, 1999. – 445 p.

6. Belitskii A. C. *Okhrana prirodnykh resursov pri udalenii promyshlennykh zhidkikh otkhodov v nedra zemli.* [Protection of natural resources at the disposal of industrial liquid waste into the earth]   – Moscow.: Nedra, 1976. – 145 p.

7. Kolbasov O.C. *Mezhdunarodno-pravovaya okhrana okruzhayu-shchei sredy.* [International legal protection of the environment]   – Moscow.: Mezhdunarodnye otnosheniya, 1982. – 240 p.

8.Protasov V.F. *Ekologiya, zdorov'e i okhrana okruzhayushchei sredy v Rossii: Uchebnoe i spravochnoe posobie. – 3-e izd*. [Environmental, health and environmental protection in Russia: Training and Reference Manual. - 3rd Edition] – Moscow.: Finansy i statistika, 2001. – 672 p.

148

9. Isidorov V.A. Ekologicheskaya *khimiya: Uchebnoe posobie dlya vuzov.* [Environmental Chemistry: Textbook for high schools] – Saint Petersburg: Khimizdat, 2001. – 304 p.

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ACTIVE SPACE DEBRIS REMOVAL

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Annotation: No man-made space debris removal system is currently in operation. This paper examines the concept of space debris and its sources, ways to remove it and describe possible control systems.

Key words: space debris, the near-Earth space environment, the low-Earth's orbit, space debris removal system

The purpose of this paper is to examine the implementation of systems and technologies, which are used for removing space debris from the Earth's orbit. Space debris is a specific type of space object that is human-made, no longer functional, and in the Earth's orbit. There are currently hundreds of millions of space debris fragments orbiting the Earth at speeds of up to several kilometers per second. The indiscriminate nature of orbital mechanics means that they pose a continuous threat to all assets in the Earth's orbit [1,p.35].

The uncontrolled growth of space debris fragments increasingly threatens the provision of satellite services that have become integrated into the operations of the global economy and military, such as GPS precision timing and navigation [2,p.11]. Space debris ranges in mass from several grams to many tons, and in diameter from a few millimeters to tens of meters from roughly 100 kilometers above the Earth's surface to more than 36,000 kilometers [3]. The most dangerous pieces of space debris are those ranging in diameter from one to ten

149

centimeters, estimated as 300,000 in orbit. These are large enough to cause serious damage, yet current sensor networks cannot track them and there is no practical method for shielding spacecraft against them. Consequently, this class of orbital debris poses an invisible threat to operating satellites. Debris larger than ten centimeters (19,000 in orbit), can also incapacitate satellites but they are large enough to be tracked and thus potentially avoided. Debris smaller than one centimeter, in contrast, cannot be tracked or avoided, but can be protected against by using relatively simple shielding [1,p.36].

There are many sources of space debris, including satellites that are no longer functional; mission related objects, such as tools lost by astronauts during extravehicular activities [4,p.5]. Fragmentation debris (fragmentation can be either accidental or intentional) is the largest source of space debris. Three countries in particular are responsible for roughly 95 percent of the fragmentation debris currently in the Earth's orbit: China (42 percent), the United States (27.5 percent), and Russia (25.5 percent) [5].

There are two ways to reduce space debris: mitigation and removal. [4,p.10]. Common concepts include electrodynamic tethers, solar sails, drag augmentation devices, orbital transfer vehicles, and space-based lasers. [6,p.1]. Tethers, for example, only work on objects greater than ten centimeters [7,p.340]. In contrast, space-based lasers using photoablation to guide debris out of critical orbits (a currently unavailable technology because its deployment is extremely expensive) could reach further than low-Earth's orbit, but would only work on debris smaller than ten centimeters.

There are two main methods of solution of the problem of space debris: to limit its emissions and elimination of existing debris. Implementation of the latter method is facing a number of difficulties, both technical and economic. But, despite the fact that the designing and implementation of a space debris removal system entails certain risks, early investment and development is a necessity for the protection of satellite technologies, which are vital to the global economy and the army. In moving towards the creation of a global system for the removal of orbital debris would be possible to mitigate and minimize the potential damage from space debris and to ensure the sustainable development of the near-Earth space environment.

150

References

1.Wright, David. Colliding Satellites: Consequences and Implications. Union of Concerned Scientists. Space Debris. Physics Today, 2007, no.60.Available at:http://www.ucsusa.org/assets/documents/nwgs/SatelliteCollision-2-12-09.pdf (Accessed 14 July 2015)

2.Logsdon, John M. 2001. Just Say Wait to Space Power. Issues in Science and Technology Spring. Available at:http://www.issues.org/17.3/p_logsdon.htm (accessed 18 August 2015).

3.National Aeronautics and Space Administration (NASA). 2010. Orbital Debris Quarterly News 14(1). Available at:http://orbitaldebris.jsc.nasa.gov/newsletter/pdfs/ODQNv14i1. pdf (Accessed 25 July 2015).

4.Ansdell, Megan. Active Space Debris Removal: Needs, Implications, and Recommendations for Today's Geopolitical Environment. Journal of Public and International Affairs,2010, vol. 21,no.1. Available at:https://www.princeton.edu/jpia/past-issues-1/2010/ (Accessed 15 June 2015)

5.National Aeronautics and Space Administration (NASA) 2008. Orbital Debris Quarterly News 12(1). Available at:http://orbitaldebris.jsc.nasa.gov/newsletter/pdfs/ODQNv12i1.pdf (accessed 17 August 2015).

6.Foust, Jeff. 2009. Putting a bounty on orbital debris. The Space Review, July 27.Available at:http://www.thespacereview.com/article/1427/1 (accessed 25 August 2015).

7.Johnson, Nicholas L.2009 Statement before the House Subcommittee on Space and Aeronautics, Committee on Science and Technology, April 28. Available at: http:// gop.science.house.gov/Media/hearings/space09/april28/johnson.pdf (accessed 27 July 2015).

151

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ECOLOGICAL SITUATION IN BIG CITIES OF RUSSIA

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Abstract: Critical ecological problems appear in big cities of Russia, because city is a center of economic development and culture. In big cities there are a lot of large industrial factories which constantly damage atmosphere, water and soil. The aim of the present work is to study ecological situation in big cities of Russia and means of solving the ecological problems.

Key words: ecological situation, ecological problems, environmental pollution, big cities.

Nowadays ecological situation in the world is one of the most urgent and almost unsolvable problems. As A.V. Naumov says, today "the world is "ill" with "bad" ecology" [1]. Many researchers believe that Russia is one of the most ecologically troubled countries of the whole world. It is connected with the fact that two-thirds of the whole nature ecosystem of Russia is strongly oppressed. And only a little percent of the vast territory of the country has a relatively low index of ecological danger [2]. In the course of this work we use scientific researches of F.Kh. Adikhanov, A.K. Golichenkov, A.A. Gorelov, B.I. Kochurov, E.E. Kuzmina, A.V. Naumov, V.B. Sazhin, V.S. Semenov, P.I. Sidorov and S.S. Sulakshin.

According to the data of F.K. Adikhanov, the most polluted regions of the Russian Federation are the regions of the cities where there is chemical, metallurgical and petrochemical production, including regions of Kemerovo, Novgorod, Murmansk, Chelyabinsk, Belgorod, Novosibirsk, republics of Tyva and Sakha, and Krasnoyarsk territory [3].

E.E. Kuzmina also states that ecological problems are mostly observed in the big cities of Russia. The reasons are emissions of big factories, pesticides and nitrates in agricultural production and radioactive contamination [2]. Thus, in the 1980-es ecologists sounded

152

the alarm and began to solve different environmental problems [4]. Dangerous emission of big cities can be observed within hundreds of kilometers. For example, agglomeration of dangerous ecological emission in Moscow is spread within 200 kilometers [3]. The main reasons of environmental pollution in big cities are energy engineering, metallurgy, chemistry, transportation, food-processing industry and construction materials industry. In Russia there are chemical dangers, emissions of non-ferrous industry and cellulose and paper factories [5]. Apparent less dangerous ecological problems may also lead to irreparable harm. For example, one of the main ecological problems of big cities is automobile transport. Thus, in Moscow environmental pollution by automobile transport is approximately 80 per cent from the whole range of pollution sources [3]. E.E. Kuzmina emphasizes the danger of environmental pollution by means of buses and trucks with diesel engines. Diesel fuel combustion leads to pollution of the atmosphere by toxics and carcinogens such as carbonic oxide, sulfur, arcenium, lead, etc. Not only air, but also flora by the side of the roads is in danger, as well as domestic animals eating this flora and people consuming meat and milk of these animals. From the point of view of E.E. Kuzmina, the most dangerous region of Russia in the sphere of automobile pollution is Krasnoyarsk territories [2].

General ecological situation in big cities of Russia is influenced greatly by deposition of sediments from sewage installations. Waste water is discharged, as a rule, within the boundaries of big cities and its suburbs. As a result great territories of soil are full of dangerous waste products which cannot be neutralized [3].

Importance of ecological situation in Russia and former Soviet Union is closely connected with nuclear weapon testing which began during the period of the Cold War [2]. Ecologists are worried also about Russian spaceport “Plesetsk”, which is situated in the territory of the Arkhangelsk region, and regions of falling of spaceships’ detached parts [6].

From the point of view of V.S. Semenov, the main tasks of ecology are the following: 1) ecological security arrangements on the basis of nondepletable environmental management; 2) elaboration of ecological bases of industries and agriculture; 3) preparation of mechanisms of ecological problems solution from the aspect of sociology and economics; 4) development of methods of environmental

153

forecasting; 5) solving of legal problems of environmental management [5]. In order to fulfill the tasks mentioned above, in Russia there is the "Ecology Doctrine of the Russian Federation". [7]. As for industrial factories of Soviet times, their system of sewage treatment is nowadays out of date and requires change or modernization, although it was built according to strict norms [5].

In order to provide environment control, government together with prominent scientists in the sphere of ecology elaborates principles of non-waste industry. New industry of Russia is switching to new materials and technologies which help to reduce emission. We should also emphasize Russia's adoption of new, environmentally friendly power supply [2].

As for the capital of Russia there is a program of moving industry out of city boundaries in order to reduce the load upon environment. But still, as S.S. Sulakshin states, this program will concern industrial zones with commercial interest which are not the most "dangerous" industries for ecology [8].

Many researchers of ecological situation in Russia think that we need not only special-purpose programs to solve ecological problems, but also shift in values and priorities. It means changing of people's concepts of their place and role in the environment [9].

One of the most effective means of solving ecological problems is a strict liability of people for ecological crimes. According to the Article 26 of the Criminal Codex of the Russian Federation, ecological crimes are the following: 1) violation of rules of environment control in industries; 2) violation of rules of handling materials and emission which are ecologically dangerous; 3) violation of safety regulations by handling microbiologic or other biologic materials and toxins; 4) violation of veterinary regulations and rules which are established for combating plant diseases and invaders; 5) water pollution; 6) atmosphere pollution; 7) sea pollution; 8) violation of Russian legislation about continental shelf and exclusive economic zone of the Russian Federation; 8) soil pollution; 9) violations of rules of subsoil protection and use; 10) illegal production of water animals and plants; 11) violation of rules of fishery protection; 12) illegal hunt; 13) elimination of critical habit areas of organisms from the Red book of the Russian Federation; 14) illegal extraction of trees and bushes; 15)

154

forest elimination or damage; 16) violation of regime of specially protected territories and natural objects [1].

First of all, we have studied ecological situation in big cities of Russia and drawn a conclusion that modern Russia is one of the most ecologically challenged countries in the world. In the big cities of our country there are chemical, metallurgical, and petrochemical productions which pollute environment.

Secondly, among the main reasons of ecological problems in big cities of Russia we have distinguished chemical, non-ferrous and cellulose and paper industries which pollute greatly the atmosphere, water and soil. We have emphasized also ecological danger of automobile transport of big cities including diesel engines, problem of sewage installations and also results of technological progress (nuclear weapon testing and spaceports).

Thirdly, we have examined means of solving of ecological problems in big cities of Russia and distinguished more effective means such as establishment of organizations to control ecological security, foundation of “Ecology Doctrine of the Russian Federation”, providing of industrial enterprises with sewage treatment facilities, usage of principles of non-waste industry, switching to new materials and technologies, including new power supply units, programs of replacing industry out of city boundaries, bringing to responsibility for ecological crimes.

References

1. Naumov A.V. Rossijskoe ugolovnoe pravo [The Russian Criminal Code]. T.3. 4th ed. M.: Volters Kluvers, 2007. p. 656.
2. Kuzmina E.E. Vlijanie nauchno-tehnicheskogo progressa na jekologiju Rossii // Uspehi sovremennogo estestvoznanija [The impact of technological progress on ecology of Russia // The success of modern science]. 2014. №8. pp. 20-22.
3. Adikhanov F.K. Jekologicheskoe pravo [Environmental law]. 3th ed. Barnaul, 2006. p. 381.
4. Kochurov B.I., Antipova A.V., Lobkovskii V.A., Jekologicheskaja situacija v Rossii na obzornoj karte // Priroda [The environmental situation in Russia on the overview map // Nature]. 2002. №12(2). pp. 51-56.

155

5. Sazhin V.B., Polovnikov A.B., Seldinas I. Problemy jekologii i racional'nogo prirodopol'zovanija v kontekste jekonomicheskogo razvitija Rossii // Uspehi v himii i himicheskoj tehnologii [Problems of ecology and environmental management in the context of Russia's economic development // Advances in chemistry and chemical technology]. 2009. №12(105). T. 23. pp. 94 -108.
6. Sidorov P.I., Gudkov A.B. Jekologija cheloveka na evropejskom severe Rossii // Jekologija cheloveka [Human Ecology in the European North of Russia // Human Ecology]. 2004. №6. pp. 15-21.
7. Golichenkov A.K. Jekologicheskoe pravo Rossii: slovar' juridicheskih terminov: Uchebnoe posobie dlja vuzov [Russian Environmental Law: Dictionary of Law Terms : A Textbook for High School Students]. M.: Publishing House «Gorodets», 2008. p. 448.
8. Sulakshin S.S. Strategii Rossii v istoricheskom i mirovom prostranstvah / Materialy Vserossijskoj nauchnoj konferencii (Moskva, 5 ijunja 2009 g.) [Russia’s Strategy in the historic and world space / Scientific Conference Proceedings (Moscow, 5.06.2009)]. M.: Nauchnyi ekspert, 2009. p. 872.
9. Gorelov A.A. Social'naja jekologija [Social ecology]. M.: IF RAN, 1998. p. 262.
10. Semenov V.S., Stepanyan Ts.A. Konflikty i soglasie v sovremennoj Rossii (social'no-filosofskij analiz) [Conflicts and harmony in today's Russia (socio-philosophical analysis)]. Directmedia, 2013. p. 334.

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ECOLOGICAL SITUATION IN MOSCOW

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Abstract: Nowadays many factors exert bad influence on the ecological situation in Moscow. That's why only a little part of the city is suitable for life.
Key words: air pollution, water pollution, noise, soil pollution, plants, geoecology.

Ecological situation in Moscow can be analysed under the following criteria:

156

Air pollution**.** Huge amount of cars, motorways and industrial enterprises emit carbon monoxide, nitrous oxide and other different hydrocarbons, dust, nitrous oxide, Fe, K, Mg and Si. The transparency of the air is not sufficient. These emissions cause about 50% more fogs and 10% more rains [1]. Noise**.** High level of noise is one of the biggest problem in big cities. The area of cities suffering from high noise level is more than 60%. The main source of noise in Moscow are transport, construction equipment, noise of domestic origin [2].

Water pollution. The waterbodies cover 3000 ha, there are 140 rivers and 400 ponds [2]. Here are the MPC values and the real amount of these substances in waterbodies.According to the table almost all indicators are above normal.

Table 1. Average monthly pollutant concentrations in the cross-sections of the Moscow river in the 1st quarter of 2015 [3].

№	Analyzed indicators	MEL (Maximum Exposure Limit) for fish industry	MEL cultural and everyday
1	Transparence, cm		not less than 20
2	Dry residue, mg/l		1000
3	pH		6,5-8,5
4	BOD5, mg O2/l		4
5	COD, mg O2/l		30
6	Dissolved oxygen, mg/l		not less than 4
7	Chlorides, Cl mg/l	300	350
8	Sulphates, SO4 mg/l	100	500
9	Phosphates Men(PO3)n, Men+2PnO3n+1, MenH2PnO3n+1, mg/l	0,05- oligotrophic waters 0,15 - mesotrophic waters 0,2 - eutroph waters	3,5
10	Ammonium ion, NH4+, mg/l	0,5	1,5
11	Nitrite ion, NO2-, mg/l	0,08	3,3
12	Nitrate ion, NO3,	40	45

157

	mg/l		
13	Total iron, Fe, mg/l	0,1	0,3
14	Manganese, Mn, mg/l	0,01	0,1
15	Copper, Cu, mg/l	0,001	1
16	Zinc, Zn, mg/l	0,01	1
17	Lead, Pb, mg/l	0,006	0,01
18	Chromium 3+, Cr, mg/l	0,07	
19	Chromium 6+, Cr, mg/l	0,02	0,05
20	Chromium total, Cr, mg/l		0,05
21	Aluminium, Al, mg/l	0,04	0,2
22	Nickel, Ni, mg/l	0,01	0,02
23	Cadmium, Cd, mg/l	0,005	0,001
24	Cobalt, Co, mg/l	0,01	0,1
25	Sulfides , mg/l	0,005 0,0005 - oligotrophic waters	0,05
26	Anionic surfactants, mg/l	0,1	0,5
27	Oil products, mg/l	0,05	0,3
28	Phenol, C6H5OH, mg/l	0,001	0,001
29	Formaldehyde, mg/l	0,1	0,05
30	Arsenic	0,05	0,01
31	Calcium	180	
32	Magnesium	40	50
33	Potassium	50 10 for waters with mineralization up to 100 mg/l	
35	Selenium	0,002	0,01
36	Fluoride	0,05	1,2
37	Natrium	120	200
39	Molybdenum	0,001	0,07

158

Soil pollution: soil cover in Moscow has lots of disruptions in the structure, a high level of contamination with heavy metals, organic substances and domestic rubbish [4]. The capacity of the anthropogenically transformed soil is about several centimeter-1 meter. The amount of green spaces of soil in Moscow is about 40% [5]. The pH- 6,6-7,5 slows down migration of heavy metals in the soil [5]. From 5 to 70 % of Moscow soil is covered with rubbish [5]. A big amount of stony soil-about 70%-exerts a bad influence on plants growth. Especially in the center of the city.

Plants**:** there are only about 30% of green spaces in Moscow. They are situated in parks and forest parks. There are only 300 types of plants in Moscow. There are: maple-24%, linden-22,3%, poplar-13,7%, ash-8,8%, birch-8,1%, elm-tree-5,8%. About 55% of the trees are weak [6].

Geoecology of Moscow is in a bad condition also. The temperature of the subterranean waters is increasing. There have been conducted lots of researches of the subterranean waters of the city and there has been found a big amount of ammonia in them. MPC of many substances are exceeding normal values [7]. The reason of a high concentration of polluting substances in the waters is a big amount of man-made landscapes, buildings, factories and their emissions [8].

In conclusion we can say that in Moscow the unfavorable ecological situation. There are all kinds of pollution: water, air, soil, geo-environmental. Each object contains a number of harmful substances exceeding the maximum permissible affecting the ecological situation of the city and the health of its inhabitants. However, you can also identify areas of Moscow the most and least favorable for living: the most favorable ecological situation is in the northwest of the city, and the least **-** in the north-east and center.

References

1. Likhacheva E.A. Ecological chronicles of Moscow, 2007. – 304 c, c. 143, 165-167.

2. Department of Natural Resources and Environmental Protection of the City of Moscow (Mosnature). http://www.mosecom.ru/. The date of appealing to the source– 03. 11. 15.

3. General scheme of landscaping the city of Moscow. //Landscape architecture. Design, 2007, №1.

159

4. Moscow government. Department of natural resources and environmental protection of Moscow. http://eco.mos.ru/. The date of appealing to the source – 03. 11. 15.
5. Ministry of natural resources and ecology of the Russian Federation. http://www.mnr.gov.ru/. The date of appealing to the source– 03. 11. 15.
6. State report "The condition of the environment in Moscow in 2006". M,, 2007 г.
7. Moscow government. Department of natural resources and environmental protection of Moscow. http://eco.mos.ru/. The date of appealing to the source – 03. 11. 15.
8. Likhacheva E.A. Ecological chronicles of Moscow, 2007. – 304 c, c. 143, 165-167.

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EVALUACIÓN DE LA INFLUENCIA DEL CAMBIO CLIMÁTICO SOBRE LAS INCIDENCIAS DE ENFERMEDADES PARA GUATEMALA DURANTE EL PERÍODO 2008-2012

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Resumen: El cambio climático afecta de manera directa los países del istmo Centroaméricano, ubicándose Guatemala en el cuarto lugar a nivel mundial en términos de vulnerabilidad. El cambio climático tiene efectos directos sobre la salud. Los efectos más importantes del cambio climático sobre la salud son el estrés calórico y la mayor prevalencia de malaria, dengue y el cólera, así como otras enfermedades transmitidas por el agua. En el presente artículo se hace una evaluación sobre la relación que presentan los cambios en los patrones climatológicos con las incidencias de estas enfermedades en Guatemala, para el período que abarca del 2008 al 2012.

160

Palabras clave: Cambio climático, vulnerabilidad, incidencias de enfermedades, Guatemala.

Abstract: Climate change directly affects the countries of the isthmus of Central America, placing Guatemala in the fourth place worldwide in terms of vulnerability. Climate change has direct effects on human health. The most important effects of the climate change on health are heat stress and the increased prevalence of malaria, dengue and cholera, as well as other water-borne diseases. In this article we present an assessment of the relationship that presents the changes in weather patterns with the cases of these diseases in Guatemala, for the period from 2008 to 2012.

Key words: Climate change, vulnerability, cases of disease, Guatemala.

Introducción. Las fuentes del cambio climático son diversas y complejas, y están significativamente relacionadas con los patrones actuales de desarrollo. Durante el presente siglo, el planeta sufrirá variaciones importantes en los patrones de precipitación y de temperaturas, el nivel de los océanos y la ocurrencia de fenómenos meteorológicos e hidrometeorológicos, lo cual afectará los ecosistemas, las actividades humanas y la seguridad de la población, daños a la infraestructura, mayor vulnerabilidad y riesgo de desastres, dependencia de energías contaminantes, afectación de los medios de vida y la cultura de los pueblos indígenas, entre otros.

Cualquier variación mayor que experimente el clima, afectará de manera directa el equilibrio dinámico en el cual los ecosistemas coexisten. Afectando componentes tales como microorganismos, vectores insectarios, reservorios animales, y seres humanos susceptibles, generando un cambio en la incidencia y distribución de numerosas patologías, mayoritariamente infecciosas. Al respecto, existe preocupación mundial en torno al impacto que el cambio climático puede producir sobre la distribución y carga de enfermedad, especialmente en países que son más vulnerables a los efectos del cambio climático.

El Panel Intergubernamental sobre el Cambio Climático (IPCC, por su sigla en inglés), principal actor científico en la materia, señala a Centroamérica como el "punto caliente" más vulnerable de las regiones tropicales del mundo. Se trata de un área altamente sensible, tanto a los cambios en los patrones de temperatura y precipitación actuales, como

161

a los posibles aumentos en intensidad y recurrencia de eventos meteorológicos e hidrometeorológicos extremos que se derivan o son potenciados por el cambio climático.

Algunos de los países de la región se ubican en los primeros lugares a nivel mundial en términos de vulnerabilidad según el índice global de riesgo climático. Guatemala se ubica en cuarto lugar en dicho índice (MARN, 2007; conred, 2011; Harmeling y Eckstein, 2012).

Guatemala se localiza en el istmo centroamericano. Colinda al norte y oeste con México, al este con El Salvador, Honduras, Belice y el Mar Caribe y al sur con el Océano Pacífico. Por su localización geográfica y su topografía, Guatemala cuenta con una variedad grande de climas que van desde el cálido húmedo en las regiones costeras hasta el clima frío en el altiplano; incluso existen pequeñas áreas localizadas de clima seco que llegan a una condición semidesértica.

El 70 % de la superficie del país es montañosa y un 62 % selvática; las alturas varían desde 0 hasta 4,210 msnm. La cordillera que cruza el país del noroeste al sureste, lo divide en dos grandes cuencas: la del Pacífico y la del Atlántico. El país tiene costas en el Océano Pacífico y en el Mar Caribe, llanuras en el oriente, tierras bajas en el norte y un altiplano montañoso hacia el centro y oeste del territorio nacional(MARN 2001)

Las precipitaciones varían según la zona del país; en el altiplano la lluvia media anual fluctúa entre 1000 y 1200 mm y en las costas alcanza los 4000mm; el promedio anual de lluvia del país alcanza los 2200 mm. En la zona central el período de lluvias es de mayo a octubre; en la zona oriental que es la zona más seca, el promedio de lluvia es de sólo dos meses al año mientras que para la región noroccidental dura siete meses. Las temperaturas medias anuales para el período 1980-1990 son de 26.7°C para la zona del Pacífico, 18.7°C para la zona del Centro y 25.5°C para la zona Atlántica (MARN 2007)

Para Oxfam (2010) a nivel mundial, «las poblaciones que dependen de la agricultura son particularmente vulnerables al cambio climático, debido a que sus actividades son sensibles al clima y debido a la marginalización económica en la que se encuentran». Ello, además «se agrava en el caso de las mujeres debido a las desigualdades de género y debido a los impactos de la emigración de la población masculina en respuesta a los choques climáticos y la pérdida de cosechas».

162

Se prevé entonces que los eventos climáticos extremos tiendan a aumentar la vulnerabilidad social, especialmente en comunidades rurales cuyos medios de vida y subsistencia dependen directamente de los recursos naturales (Gutiérrez- Montes et al., 2012)

El cambio climático tiene efectos directos sobre la salud. Los efectos más importantes del cambio climático sobre la salud son el estrés calórico y la mayor prevalencia de malaria, dengue y el cólera, así como otras enfermedades transmitidas por el agua otras relacionadas con la variabilidad en las precipitaciones, la disponibilidad de agua potable y la calidad del aire. Los desastres provocados por el cambio climático, las sequías, la degradación del medio ambiente y las enfermedades que traen aparejados también pueden dañar a los alimentos y al rendimiento de los cultivos, afectar la nutrición y desencadenar la migración y el desplazamiento de las poblaciones, que, a su vez, pueden propagar enfermedades en formas inusitadas.

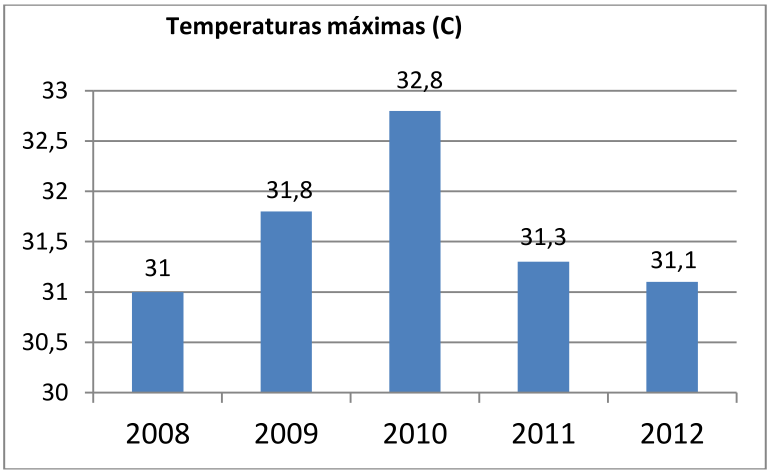
El presente artículo tiene como objetivo realizar una evaluación acerca del comportamiento climático en Guatemala para el período que abarca desde el año 2008-2012, relacionado con la ocurrencia de eventos climáticos extremos y la incidencia de algunas enfermedades vinculadas a los efectos de variación climática.

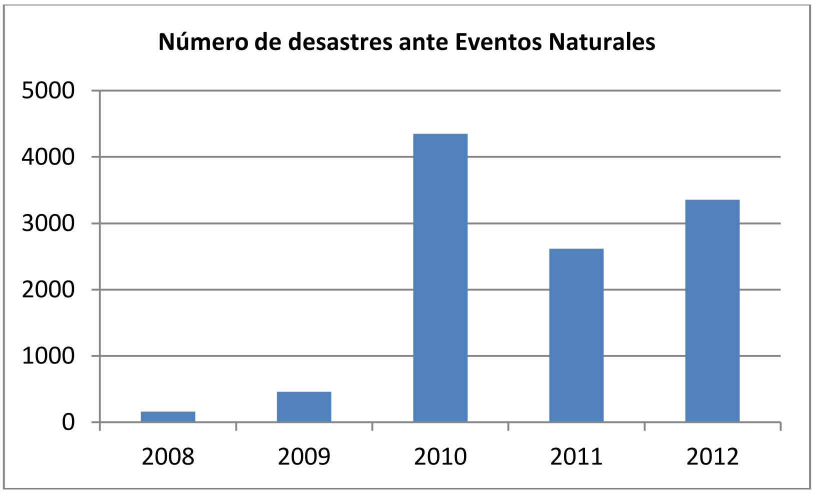
Método. Para realizar este estudio, se escogió el período que comprende del año 2008 al 2012. Se consultaron los datos del registro nacional de estadísticas (INE 2012), y se tomaron los datos referentes al comportamiento del clima, como son la Temperatura y el número total de desastres ocurridos ante eventos naturales.

El mayor número de desastres por eventos naturales para este período corresponde al año 2010 y coincide a su vez con el registro de temperatura más alta reportada para estos años.

El calentamiento incrementa el smog de ozono en las ciudades. El aumento del ozono y brotes de moho por la humedad pueden agravar las alergias y las enfermedades respiratorias como el asma y empeorar la salud de las personas que sufren enfermedades cardíacas o pulmonares. Las temperaturas más altas pueden hacer que la temporada de alergias por polen empiece antes, dure más y sea más intensa.

163



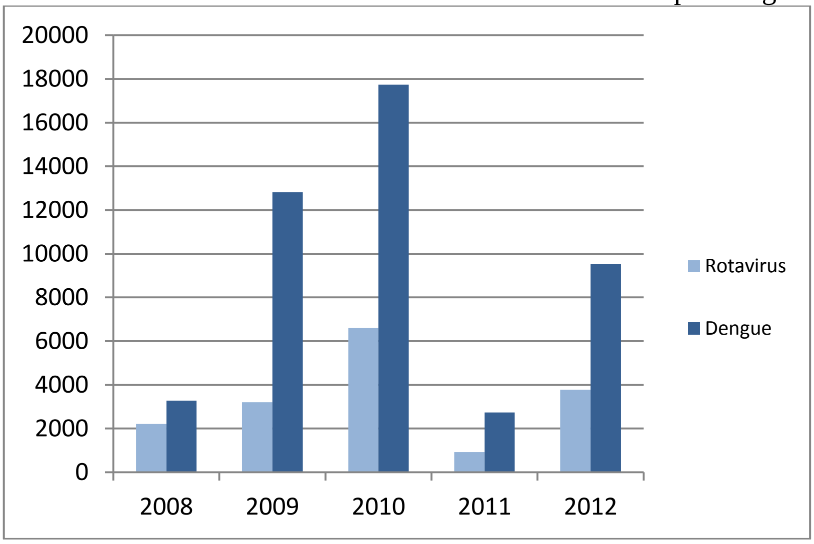


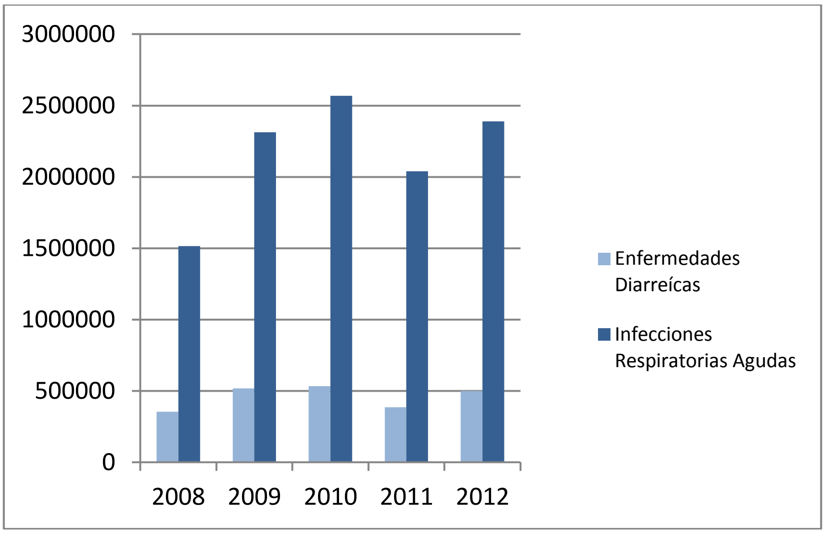
Y hay brotes epidémicos de diarreas transmitidas por agua, tanto por Giardiasis como por bacterias por las limitaciones para el tratamiento del agua.

Para el período a evaluar, las enfermedades diarreicas y las infecciones respiratorias agudas, presentan su valor máximo reportado para el año 2010. Aproximadamente el 60% de la población de América Latina y el Caribe vive en los estados o provincias costeros, y 60 de las 77 ciudades de mayor tamaño están en la costa. Entre 1970 y 1999, 30 desastres naturales se debieron a huracanes, inundaciones, sequías o

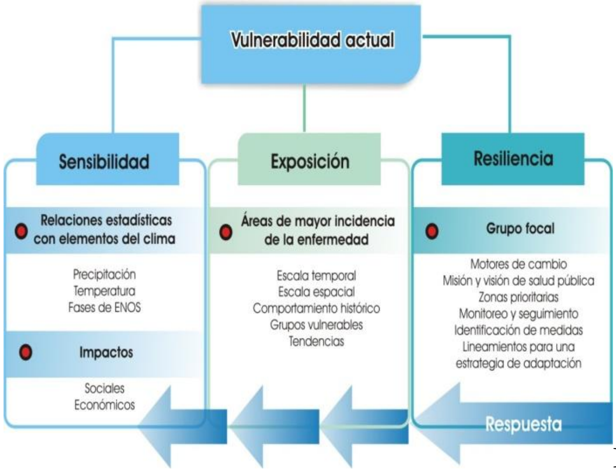
164

maremotos, todos los cuales, con su diversidad de efectos, pueden contribuir a incrementos en las enfermedades transmitidas por el agua.





A las posibles consecuencias de esta vulnerabilidad meteorológica se suma el hecho de que la mayor densidad de población se encuentra en las costas. En opinión de Jonathan Patz "la población se ve afectada cuando coincide la vulnerabilidad y el riesgo climático” lo que explica las consecuencias sobre la salud de las inclemencias del clima en América Latina y El Caribe. Por otra parte el Grupo Intergubernamental sobre Cambio Climático (IPCC) predice una mayor frecuencia de extremos climatológicos como consecuencia del cambio climático.



El calentamiento y el aumento en las precipitaciones de lluvia se relacionan con el aumento de casos y en el contagio de enfermedades transmitidas por insectos. Se afectan los patrones de enfermedades como la malaria y el dengue. El incremento del número de casos reportados para el Dengue coincide también con el año 2010.

Conclusiones.

Es importante fortalecer las intervenciones básicas de salud pública en áreas tales como el control de vectores, la protección de la salud ambiental y la vigilancia de enfermedades, y aumentar el énfasis en los determinantes ambientales y socioeconómicos de la salud.

Para hacer frente a un deterioro de la salubridad y a una mayor demanda de servicios, el Estado deberá aumentar el gasto destinado a la salud, el cual, en la actualidad, representa el ya altamente insuficiente 1% del PIB.

Además, podría aumentar la movilidad humana. Habrá zonas del país donde será difícil sobrevivir, sea porque no se puede cultivar, o porque la temperatura y eventos climatológicos lo desaconsejen.

166

El cambio climático, los fenómenos climáticos extremos y los desastres afectan en forma diferente a las mujeres y los hombres (UNDP 2008). Como las mujeres en las Américas ocupan en general posiciones socioeconómicas inferiores, tienen menos acceso a la información, menos control de las decisiones que las afectan y menos acceso a recursos y beneficios que les permitirían responder eficazmente al cambio climático y las perturbaciones que causa (Global Gender 2009). Las respuestas al cambio climático deben tener en cuenta estas diferencias entre los sexos.

Referencias

1. Benegas, L. (2006). Propuesta metodológica para evaluar la adaptación de los productores a la variabilidad climática, principalmente a la sequía en cuencas hidrográficas en América Central.
2. Gutiérrez-Montes, I., Soares, D., Thibault, M., Rivas-Platero, G., Pinto, G., Ramírez, F., Romero, R. y López, R. (2012). Vulnerabilidad social ante el cambio climático: retos y propuestas de políticas desde un enfoque de equidad social. Programa Agroambiental Mesoamericano-catie.
3. Global Gender and Climate Alliance. Gender & Climate Change [Internet]; 2009. Acceso: 18 de agosto de 2012
4. Harmeling, S. y Eckstein, D. (2012). Global climate risk index 2013. Who Suffers most from extreme weather events? Weather-related loss events in 2011 and 1992 to 2011. Fundación Germanwatch.
5. IARNA (2009). Perfil ambiental de Guatemala 2008-2009: las señales ambientales críticas y su relación con el desarrollo. Guatemala: Universidad Rafael Landívar, Instituto de Agricultura, Recursos Naturales y Ambiente
6. INE 2012. Caracterización Estadística . República de Guatemala 2012.
7. MARN (Ministerio de Ambiente y Recursos Naturales). (2007). Guatemala: compilación y síntesis de los estudios de vulnerabilidad y adaptación al cambio climático . Guatemala: Programa Nacional de Cambio Climático.
8. Ofxam (2010). Climate change adaptation. Enabling people living in poverty to adapt.: Oxfam
9. United Nation Development Programme. Resource Guide on Gender and Climate Change. New York, NY: UNDP; 2008.

167

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THE ENERGY SECTOR OF THE CRIMEAN PENINSULA: PROBLEMS, CURRENT SITUATION AND DEVELOPMENT PROSPECTS (RETROSPECTIVE ANALYSIS)

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Abstract: Historically, the Crimean peninsula has been heavily dependent on energy supplies from Ukraine. This has a negative effect on the population lives and on the energy and economic security of the region. The Crimea has a unique climate and energy resources and in the future can not only be able to provide itself with energy, but also to export it to the nearby areas.

Key words: energy security, the Crimea, energy-saving technology, thermal power, renewable energy.

The energy sector of the Crimean peninsula has been heavily dependent on electricity and petroleum products supplied from Ukraine. At the same time, the peninsula has its own significant reserves of fossil fuels and the potential of renewable energy sources. The economic development of the Crimea depends on the energy sector growth, and future energy self-sufficiency and security are important not only for the peninsula, but also for the country as a whole.

The energy sector of the Crimean peninsula is a unique phenomenon in the post-Soviet space. The uniqueness lies in the fact that about 74% of all generated electrical power is made by renewable energy sources - solar and wind power. Their total capacity is 384 MW. In addition the Crimean power generation is provided by 4 thermal power plants (TPP) with a total capacity of about 143 MW (Fig. 1).

168

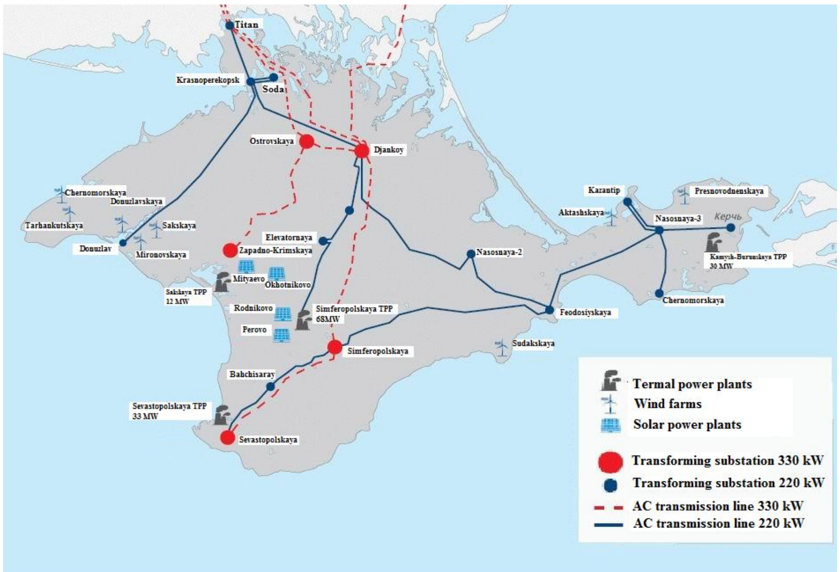

Figure 1. Power plants location on the Crimean peninsula.

Currently all the existing peninsula TPP are refitted to work on gas. Using gas instead of solid and liquid fuels is not only economically advantageous, but also has a minimal impact on the environment. The content of nitrogen oxides in the emissions in case of gas usage is several times lower than in case of solid and liquid fuels usage. Also when using gas there are no solid particles and sulfur oxides in emissions [1]. In 1991 the Glebovsky underground gas storage (UGS) was created on the basis of the worked-out Glebovsky condensed gas field. It was built in order to avoid critical situations connected with gas supply to Crimea, and also to regulate the seasonal and daily fluctuations of gas consumption on the peninsula.

The maximum amount of the working gas storage facility is approximately 1 billion cbm of gas with an annual consumption of gas on the peninsula being about 1.3 billion cbm. It is planned to carry out the repair and reconstruction of UGS to increase the amount of injected fuel [2]. Projects of the Crimean TPP reconstruction are in the process of negotiating as a part of the peninsula energy infrastructure construction in accordance with the federal target program "Socio-economic development of the Republic of the Crimea and Sevastopol until 2020". It is proposed to reconstruct the Simferopol TPP with the

169

installation of the 252 MW combined cycle gas turbine (CCGT), the Kamysh-Burunskaya TPP – with the installation of 126 MW CCGT and the Sakskaya TPP – with 84 MW CCGT. Thus, by 2020 it is planned to increase the installed capacity of the Crimean TPP by more than 3 times. Simultaneously investment projects of small distributed generation and cogeneration development are considered. In this direction the projects with a total capacity of 200 MW were announced [3]. In 2013, the peninsula consumed about 6.3 billion kWh of electricity with its own production of 1.15 billion kWh. Production of electrical energy from solar and wind power plants amounted to 0.34 billion kWh; 0.81 billion kWh were produced at thermal power plants [4]. It means that currently the Crimea covers its own power needs only by 19%. The dynamics of electricity production is presented in Fig. 2.

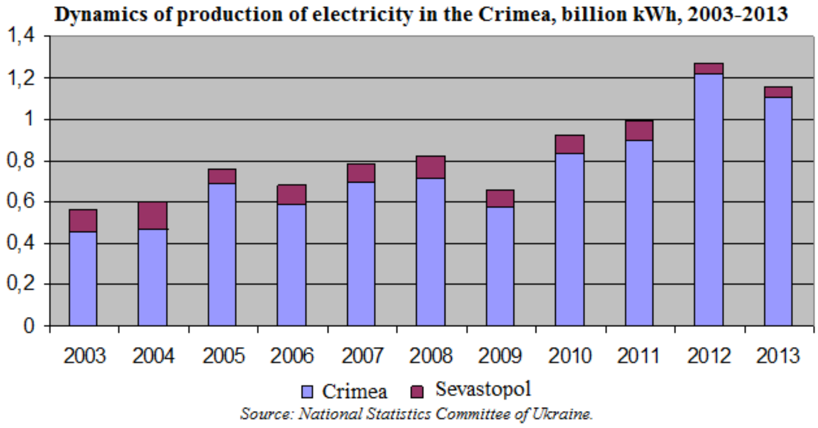

Figure 2. The dynamics of electricity production, billion kWh.

Historically, the main amount of the electricity consumed in the Crimea, was covered by revenues from Ukraine (from the Zaporozhsky TPP and NPP, from Nikolaevsky region's power system, etc.). Provision of the energy autonomy of the Crimea was planned in the USSR by the construction of the Crimean nuclear power plant near Shchelkino city. Its construction began in 1975. It was planned to install two nuclear reactors of 1000 MW each, followed by an extension of up to four reactors. Even now these capacities would be enough to satisfy the needs of the peninsula. Completion of the NPP construction was scheduled for 1989, however, after the disaster at

170

Chernobyl, the local community was categorically against the construction of the plant. At the moment of the construction stopping the completion of the first unit was 80 percent, the second one – 20 percent.

Renewable energy sources were being developed in the Crimea in the 1930s. In 1931 near Balaklava the mast with the height of 65 meters was built where the wind turbine with the wheel diameter of 30 m was installed. The installation power was 100 kW. It was unique at that time, as in other countries the power of the same plants did not exceed 60 kW.

The first solar power plant (SPP) appeared in the Crimea in 1986 and was built as a backup source of electricity for the Crimean NPP. But after stopping the nuclear power plant project and the collapse of the Soviet Union, the SPP was closed. The construction of solar power plants resumed in 2010.

The problem of shortage of power capacities was solved at the beginning of the 90s due to a significant reduction in industrial consumption. But at the same time, the struggle for the energy independence of the Ukraine from Russia began. It was manifested in the reduction of gas consumption and the replacement of its electricity generated by coal-fired and nuclear power stations. The situation worsened due to the introduction of gas consumption limits for boilers – this led to massive subcooling. Locals were forced to use electric heaters and water heaters. Reduced power consumption again started to increase [5].Soon another problem appeared – the growth of summer power consumption. To attract tourists, in houses located close to the sea, the owners began installing air-conditioning systems. Because of this, the power consumption peak on hot days became closer to the winter peak.The project of creation of the energy bridge across the Kerch Strait was made to compensate the Peninsula's energy deficit. It is assumed that the bridge will connect the Crimea with the Rostovskaya NPP. At present the Rostovskaya NPP operates two power units of 1000 MW each. According to the draft of the energy bridge, the end of the first 350 MW construction is planned by the end of 2016 and full completion of the construction – at the beginning of 2018 [6].

As it has already been mentioned, the promising area of the Crimea energy development from the point of view of its geographical location, climatic characteristics and topography, is the development of

171

the existing renewable energy sector (RES). Let us consider some aspects of these perspectives. An important feature of solar power plants is dependence on weather conditions. A SPP can only work during the day, while the peak of consumption is 9 p.m.. In addition, the basic problem of solar cells today is the low efficiency of energy produced. There are various types of solar cells, which are different from each other (information about their efficiency is shown in Table 1).

Table 1. Efficiency of different types of solar cells, produced on an industrial scale [7].

Type of cell	Efficiency (%)
Monocrystalline silicon	25,6 ± 0,5
Multicrystalline silicon	20,8 ± 0,6
Amorphous silicon	10,2 ± 0,3
Cadmium telluride	21,0 ± 0,4
CIGS cell	20,5 ± 0,6
Organic thin-film	11,0 ± 0,3

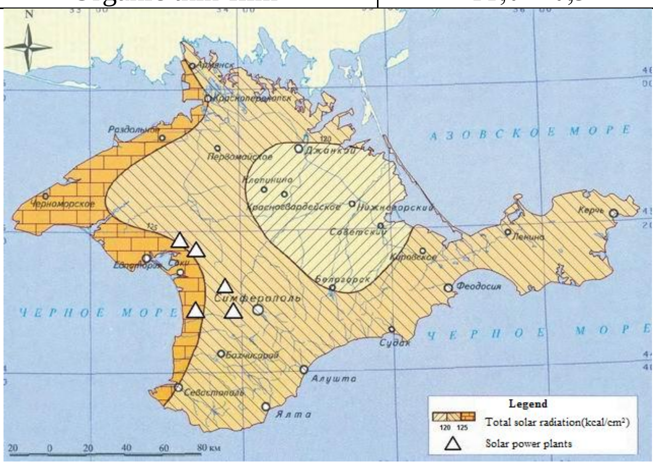

Figure 3. Total solar radiation.

At all the Crimean SPP, which have been built since 2010, multicrystalline solar cells are used [8]. The choice of this technology results in high efficiency and a relatively low cost. The Crimean SPP are concentrated in the southwestern part of the peninsula (the map of the total solar radiation with the indicated SPP is shown in Figure 3).

172

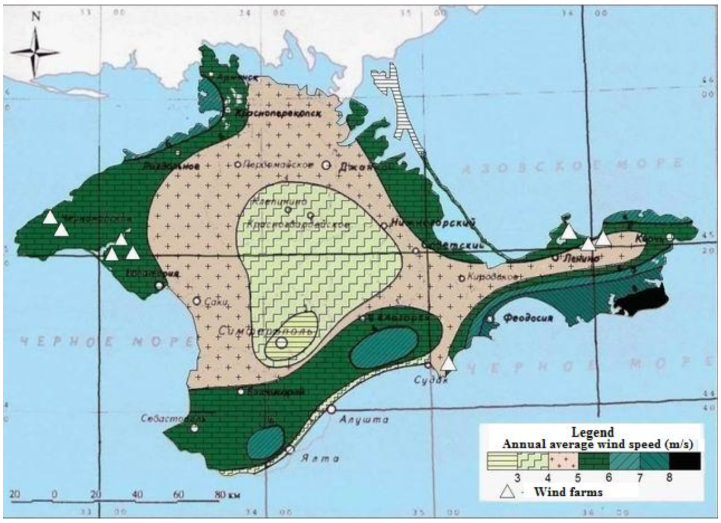

Figure 4. Average wind speed.

Wind power plants depend on the prevailing wind direction and speed. Modern large wind turbines typically use rotors which begin to extract energy from the wind when the wind speed is about 3-4 m/s (the minimum acceptable speed).

In addition, there is the problem of generated electricity delivery to the final consumers. Areas with constant winds, which are suitable for the construction of wind power plants, as a rule, are located away from population centers, requiring the construction of long power lines. That is why the efficiency of electricity transmission falls.

Nowadays there are no saving technologies worked out by wind power electricity in sufficient quantities for the regular power supply of cities and towns.

Table 2. Emissions of fossil fuel power plants [9].

Group	Emission, g/kWh						
	CO	NO_2	CH	C	SO_2	Formaldehyde	Benzo(a)pyrene
Low-powered (less than 72,6 kW)	8,6	9,8	4,5	0,9	1,2	0,2	1,6·10-5
Medium-powered	7,4	9,1	3,6		1,3	0,15	1,5·10-5

173

(from 73,6 to 736 kW)				0,65			
	Emission, g per kg of fuel						
Low-powered (less than 72,6 kW)	36	41	18,8	3,75	4,6	0,7	6,9·10-5
Medium-powered (from 73,6 to 736 kW)	31	38	15,0	2,5	5,1	0,6	6,3·10-5

On the territory of the Crimea WPP are concentrated in the eastern and western parts of the peninsula, mostly in the areas with an average wind speed from 5 to 6 m/s (the average wind speed map is shown in Figure 4).

Thus, to ensure the energy independence of the peninsula it is required to provide sufficient spare capacity, working on fossil fuel. To achieve this goal, in 2014, Russia exported to the Crimea liquid fuel power plants which remained after the Olympic Games, with a total capacity of about 500 MW. But diesel is expensive, and in terms of the impact on the environment it is dangerous.

Emissions from diesel power plants contain polyaromatic (PAH) and other hydrocarbons, sulfur dioxide, nitrogen and carbon oxides (the analysis of emissions depending on the power plants' capacity is shown in Table 2), besides their work is accompanied by noise and vibration. Therefore, the solution is temporary.

The following main problems existing today in the energy sector of the Crimea are:

1) historically formed energy dependence of the peninsula and the lack of electricity;

2) the obsolete equipment of thermal power plants and grids;

3) the permanent increase in electricity tariffs (primarily for private households).

On the other hand, a coordinated set of measures, taking into account the specifics of the territory and the structure of the energy sector, in the short term can significantly improve the current situation.

These features include:

1) a high level of solar radiation, increasing the profitability of solar plants using;

174

2) availability of areas, mainly in the coastal and steppe regions, with a high potential for the wind energy using;

3) practical experience of the successful use of renewable energy;

4) a significant number of potential investors in the economy and the power of the Crimea;

5) a high demand among the population and businesses for usage of solar equipment.

Summing up, it can be said that for the successful development of the Crimea's energy sector the State program of energy development, including the preferential taxation for investors is required.

The problem can be solved by the construction of new energy sources including the new TPP working on cleaner gas fuel. However, the serious modernization and overhaul are necessary for the existing TPP, which were built in the 30-50s of the twentieth century.

Nowadays the promising directions of energy development of the Crimea are the development of the wind and solar power industry and the development and implementation of modern energy-efficient thermal solar plants in small business, individual and urban residential areas.

References

1. *Normativy udel'nykh vybrosov zagryaznyayushchikh veshchestv v atmosferu ot kotel'nykh ustanovok: Uchebno-metodicheskoe posobie* [Norms of Specific Emissions of Pollutants into the Atmosphere from Heating Plants: the Study Guide]. Moscow, 2013.

2. Samofalova O. *Poluostrov s gazom* [The Peninsula Has Gas]. The Business Newspaper "Sight", Moscow, 2014. Available at: http://vz.ru/economy/2014/3/11/676565.html.

3. *V Krymu zaplanirovana rekonstruktsiya teplovykh elektrostantsii* [Reconstruction of Thermal Power Plants Is Planned in the Crimea]. The Government of the Republic of the Crimea, Simferopol, 2015. Available at: http://rk.gov.ru/rus/index.html/news/296790.htm.

4. *Problemy i riski predprinimatelei Kryma: Doklad Upolnomochennogo pri Prezidente RF po zashchite prav predprinimatelei Prezidentu RF* [The Problems and Risks of the Crimean Entrepreneurs: the Report of the Commissioner for

175

Entrepreneurs' Rights Under the President of the Russian Federation to the President of the Russian Federation]. 2014, 29 p.
5. Semenov V. *Kak izbavit' Krym ot pikov* [How to Save the Crimea from the Peaks]. The magazine "Expert Online", Moscow, 2014. Available at: http://expert.ru/expert/2014/30/kak-izbavit-kryim-ot-pikov/.
6. *V Krymu nachaty raboty po stroitel'stvu novoi LEP, kotoraya soedinit poluostrov s energosistemoi Rossii* [Construction of a New Transmission Line That Will Connect the Peninsula with the Russian Energy System Started in the Crimea]. Information Agency "Kryminform", Simferopol, 2014. Available at: http://www.c-inform.info/news/id/12850.
7. Martin A. Green, Keith Emery, Yoshihiro Hishikawa, Wilhelm Warta and Ewan D. Dunlop. Solar Cell Efficiency Tables (Version 45). Progress in Photovoltaics: Research and Applications, 2015; 23:1–9, Published Online in Wiley Online Library (wileyonlinelibrary.com). DOI: 10.1002/pip.2573.
8. Completed PV Projects. Go Solar, Vienna, 2015. Available at: http://www.activsolar.com/ru/products.
9. *Metodika rascheta vybrosov zagryaznyayushchikh veshchestv v atmosferu ot statsionarnykh dizel'nykh ustanovok* [The Methodology for Calculating Emissions of Air Pollutants from Stationary Diesel Plants]. St. Petersburg, 2001.

176

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DISCREPANCY BETWEEN THE FUR FARM «AS BALTI KARUSNAHK», THE ESTONIAN NATIONAL LEGISLATION AND INTERNATIONAL STANDARDS

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Abstract: The analysis of the conformity of the Estonian farm with national law and international standards and the ways of solving this problem.

Key words: fur, farming, legislation, laws, violations, license, investment, environmental.

As we know the most practical and comfortable clothing is genuine. Therefore, the demand for furs is high enough and fur farming is a very profitable business.

As the industry, farming began to develop in 1928-29 [4, p. 6]. Currently, in Europe there are more than 6000 fur farms [1].

However, life and suffering of animals are put on the scales of luxury and profit.

It is not even due to the fact that animals live in captivity and do not die of old age, in most cases at the age of 8 months when they are still cubs, but due to the malpractice of fur farms, which do not meet the standards and norms of farming legislation and regulations [5, p. 38].

The largest Estonian farm breeding mink has been acting without authorization for many years. Besides, the decree regulating the operation of such farms which was issued in 2008 has not been implemented yet. Animals, nature and Estonian residents suffer from that.

However, the farm – in the territory of which there are no visible signs – contains about 150,000 American minks, 22,000 foxes and 1,500 raccoon dogs [2].

Since the demand for furs is large enough and there is no substitute for natural clothes, it is almost impossible to ban the production around the world. Therefore, it is necessary to competently deal with violators and punish those companies which do not comply

177

with the relevant legislation and make both animals and people suffer from that.

Such methods will at least make people treat animals more humanely, and as little as possible pollute the environment and reduce the health risk to employees as well as the population of the country.

First, we shall find out the way the farm works and study the legal-normative documents that regulate the activity of the farm.

The main objective of our work is to identify all the violations made by the investigated farm and to analyze the degree of its compliance with both the Estonian legislation and international standards and laws.

The analysis of the organization of production, legal and regulatory documents showed that the fur farm «AS Balti Karusnahk» in Estonia does not comply with the requirements to keeping fur-bearing animals, and has a strong negative impact on the environment, which, in turn, influences health and living conditions of the local population [3].

The farm operates without a license.

Obtaining a license, in turn, is impossible because of numerous violations of veterinary control. In Estonia, veterinary practice without a license results in paying a fine, but according to the established practice in the country, the payment of a fine is more profitable than investment in the environmentally sound production.

The farm «AS Balti Karusnahk» and similar facilities ought to be burdened with considerably larger fines.

Owners of farms regularly and flagrantly violating legal norms of fur farming ought to be liable not only to administrative, but also criminal charges.

The state authorities should morally and financially support public organizations, which can counteract the farmers who violate the legislation regarding environmentally safe fur farming.

In the future, it is necessary to reduce the demand for the products of farming.

Doing that it is advisable to develop a garment that will not be worse than a natural one in terms of quality and comfort rather than to use animal fur skins for making natural fiber.

178

In Estonia, like in many other European countries, it is necessary to create the conditions for widely spread environmental education of population.

This process should involve kindergartens, schools and universities.

References

1. Pushnoye zverovodstvo Estonii [Fur Farming of Estonia] Available at: http://www.etll.ee/Karusloomakasvatus.

2. Offitsialnyy sayt zverovodcheskoy fermy «AS Balti Karusbahk» [Official Site of the Fur Farm «AS Balti Karusnahk»] Available at: http://baltikarusnahk.ee/.

3. Zakon estonskoy respubliki o plemennom razvedenii selsko hozyaystvennykh zhivotnykh [Law of the Republik of Estonia on Breeding, Cultivation of Farm Animals] Available at: http://estonia.news-city.info/docs/sistemse/dok_iegopi.htm.

4. Antonyuk V.S. Osnovy zhivotnovodstva [Fundamentals of Fur Farming]. Minsk, 1997. 396 p.

5. Chuyko N.M. Razvedeniye, soderzhaniye I ispolzovaniye pushnykh zverey [Cultivation, Maintenance and Use of Fur Animals]. Moscow, 2014. 388 p.

179

WATER RESOURCES AND ECOLOGY: MONITORING, POLLUTION AND RESTORATION

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ECOLOGICAL PROBLEM OF USING WATER RESOURCES FROM THE RIVERS AMU DARYA AND SYR DARYA

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Abstract: The Middle Asia water resources decrease. The main goal is to know how using water from these two rivers of the Aral basin influences the recession of water level.

Key words: rivers, ecological problems, Middle Asia, the Amu Darya, the Syr Darya, water resources.

Introduction. The Amu Darya and Syr Darya rivers are the two Aral Sea tributaries [1]. The Amu Darya is the largest river in the Middle Asia. Its length is 1415 m. It flows crossing the territories of Afghanistan, Tajikistan, Turkmenistan, and Uzbekistan. The basin area covers 309 sq. km. It has mountain and flat parts. The source of the Amu Darya is located in Afghanistan and it ends in the Aral Sea. The water regime is summer flood, so the river is also fed by snow. The Amu Darya is a very troubled river. Besides, it has a huge erosive activity. The Syr Daria river is the longest in the Middle Asia (2212 km) and the second after the Amu Darya full-flowing river in the region of Kyrgyzstan, Tajikistan, Uzbekistan and Kazakhstan. The basin area is 219 000 sq.km interweaving by rivers and artificial currents, canals (about 50 canals and collectors).

The source of the Syrdaria is in Fergana valley and then it flows to the Aral Sea. The river's feeding is mixed, but mainly the river is fed by snow. The flood-time is spring-summer, which begins in March-April, and ends in August-September. The regime of the river is broken in flats. The sum of the river flow near the mountains is 37.8 sq. km.

180

Ecological problems. The issue of the day on the Amu Darya is return waters, because they are the main polluters of the basin [3]. The drain waters have pesticides, nitrogen and phosphorus compounds. Most of these compounds get into the soil of the fields and their MAC is more than almost 10 times. The amount of salt transfered by drainage water is several million tons. However, the main damage to the river is irrigation. A big scale of irrigated agriculture in the basin shows a well-developed irrigation and drainage facilities, it is a unique project: Karshi steppe, the Amu-Bukhara canal, the Karakum canal; and older systems: Karakalpakstan, Khorezm. Irrigated agriculture used about 92% of all water resources in the basin in the 90-s. After the dissolution of the Soviet Union, the demand for water has increased in other economic sectors: inside and industrial. More than 35 water reservoirs were built on the Amu Darya, the majority were built upstream because of more suitable hydrological conditions. It is diffucult to find the reliable data about the total capacity of this multi-reservoir system now, as these transboundary water resources are used for irrigation purpose uncontrolled.

The Amu Darya's coordinated hydroelectric system has a very interesting regulation scheme of the flow of the river: the Nurek reservoir provides a long-term water supply to the Kerky power site.

And the Tuyamuyun reservoir is seasonal, omissions from it occur in February-March. The watersheds in the main fluid ports agreed with the omission of the Nurek reservoir: in the Karakum at shallowness,in the Karshi and in the Amu-Bukhara during floods. Endogenous reservoirs are important for seasonal water storages, because some of them are built on the stages of pumping stations: the Talimardjan reservoir is built on the Kashira canal. Several water reservois are built on small rivers too. With the stream of the river the water flow is undergoing some changes, which depends on the inflow of groundwater into the river in the upper watersheds, return flow of transit water. The part of the loss is due to evaporation and filtration in reservoirs. There are lots of losses in riverbeds too, so the lower reaches of the Amu Darya River constitute 20-40% of the total catchment area.

The Syr Darya is the river river that is very actively used. The Syr Darya's irrigation possibilities are less than that of the Amu Darya, but it is also a great river in the desert. Crossing the arid Fergana valley,

181

the river irrigates it, so this place becomes known as Central Asian oasis. In these lands cotton, and rice, grapes, melons are cultivated.

Of course, there are some reservoirs. Chardara Dam (Kazakhstan), is an earth-fill embankment reservoir with an associated 100 MW hydroelectric plant named the Shardarinsk hydroelectric power station. The Farkhad HPP (also known as Dam-16) on the Syr Darya River, (in Sirdaryo Province, Uzbekistan, and in Sughd Province, Tajikistan) is a part of the Naryn-Syr Darya Cascade. The dam is controlled by Tajikistan, while the Farkhad HPP is operated by Uzbekenergo. The Koksaray balancing water reservoir is recently built in Kazakhstan. The Toktogul artificial lake (located in the territory of the Kyrgyz Republic) is created for compensating long-term regulation of the flow. And the Kairakkum reservoir is created to provide irrigation.

References

1. Froebrich J, Olsson O., Bauer M., Normatov, Petrov G. Improved dam operation in the Amu Daria river basin including transboundary sapects // Dams and Reservoirs, Societies and Environment in tthe 21st Century – Berga et al(eds) – 2006. pp. 96-103.
2. http://www.unece.org/fileadmin/DAM/env/water/meetings..worksho p/pdf/breakout_session/surface/Amudarya_overview_rus.pdf
3. Savoskul O., Shevnina E. Perziger F., Baburin V., Danshin A. How much water will be awailable for irrigation in the future? The Syr Darya Basin (Central Asia) // Climate change in Contrasting River basins. CAB International 2004. pp. 93-114.

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DEEP-SEA ORGANISMS AND THEIR ADAPTATION FOR LIVING

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Abstract: Marine life can be diverting not only near the surface of the oceans but at the great depth too, because at great depth the living conditions remained as they were millions years ago. So the deep-sea

182

organisms have an amazing exterior and their adaptations for living in severe conditions are very interesting.

Key words: deep-sea organism, great depth, conditions and adaptations for living.

The deep-sea fauna has been forming bit by bit since the ancient geological epochs and it's developing now too. Thereby there are very ancient and young species in the oceans. Probably the fauna was forming in frigid and temperate zones. Great depths are habitat of crustaceans, mollusks and echinoderms. They usually live alongside some species of fish [1].

The organisms live in very severe conditions at a depth of 200-6000 meters. There is almost no light, a big pressure, very little food, low temperatures (about 2-4°C) and concentration of oxygen [2]. So these conditions have determined the primary features of these creatures. Their adaptations for living are very diverting and various.

Sunlight is permeated only to a depth of 1000 meters. Thus some species of the deep-sea organisms have big eyes which are very sensitive. It provides them to trap the weakest light waves. Other species don't have vision but they have very developed senses [2].

The pressure increases with the depth. In this way the creatures have a big internal pressure which allows them to exist in these conditions [2]. The example is fish of the family Ogcocephalidae (Lat.). It is called the Seabat. It is adapted to big pressure, so it can't practically swim, moving along the bottom on its modified fins which have become to look like legs of land organisms [3].

Also there is little food at the great depth but it isn't obstacle for creatures to live here. They have a slow metabolism, so they can live without food for a long time because it helps them to economy energy. The most famous fish is Orange Roughy which can live up to 150 years. It has a sedentary lifestyle and grows very long [3].

A lot of the deep-sea organisms are carnivores. Usually they have big head and relatively small body. So they can capture a prey of a bigger size than they are. The example is Snaketooth Fish which have very elastic stomach and do not have ribs. It allows them to swallow the fish easily which is four times longer and ten times heavier [3]. For attracting a prey some organisms have special organs which produce

183

light. This phenomenon is called bioluminescence. For example Anglerfishes have a luminous organ, which is placed on the top of a small outgrowth above the upper lip. When the prey swims closer they capture it with their large jaws [4].

If compare the deep-sea organisms we can see that they have rather perceptible differences. The organisms which live in the heigh layers of bathyal zone (the depth from 1000 to 4000 meters) have a strong skeleton, body shape and sensitive eyes. Also they swim fast and some of them have different colors. Whereas the organisms which live in the lower layers of bathyal zone and in the abyssal zone have a worse vision or do not have it at all. Because of big pressure they swim rather slowly or can wait their prey very long without motion. Also they do not have a strong skeleton. At great depths it is very difficult to get calcium carbonate which is so necessary for building a skeleton so their skeletal formations are depleted in some species. For example the Snailfish which lives at the depth of 6000 meters. It has an elongated body of gelatinous texture without scales [5]. It has taken several centuries for the people to study the oceans externally. For example during the expedition which took place in July of 2011 in the Mariana Trench large amoebas were founded by the experts from the Scripps Institution of Oceanography. They live only at great depths and their size reaches 10 centimeters [6]. So we continue to study new organisms but they still surprise us.

References

1. “Eshhe ot: Helen Valdes” [More by Helen Valdez]. Retrieved from http://animalru.ru/p/a3_37834.html (accessed 18 October 2015)

2. “Glubokovodny’e ry'by' – udivitel'ny'e predstaviteli mirovoj fauny' ” [Deep-sea fish – amazing representatives of the world fauna]. Retrieved from http://fb.ru/article/40651/glubokovodnyie-ryibyi-udivitelnyie-predstaviteli-mirovoy-faunyi (accessed 18 October 2015)

3. “Glubokovodnye ryby” [Deep-sea fishes]. Retrieved from http://www.inokean.ru/animal/fish/deep?limit=12 (accessed 26 October 2015)

4. “Glubokovodnaya fauna” [Deep-sea fauna]. Retrieved from http://www.seapeace.ru/population/abissal/72.html (accessed 18 October 2015)

184

5. “Glubokovodnye morskie zheloba i ih fauna” [Deep-sea troughs and their fauna]. Beljaev G.M., 1989 (accessed 26 October 2015)
6. “Gigantskie ameby iz Marianskoj vpadiny” [The giant amoebas from the Mariana Trench]. Retrieved from http://www.gazeta.ru/science/2011/10/24_a_3810838.shtml (accessed 26 October 2015)

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DEPENDENCE OF MANGROVE BIOMASS ON COASTAL WATERS SALINITY

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Abstract: The article shows the influence of salinity changes on the stability of mangrove forests and their individual species as a result of climate change, human impact on water management systems. It was found that the biomass of Bruguiera gymnorhiza falls with the increasing salinity of coastal waters. Statistical analysis of the data revealed a strong dependence of the biomass on the salinity and strong inverse correlation. Consequently the salinity of coastal waters is one of the key factors affecting the biomass of mangrove forests.

Key words: mangroves, salinity, biomass, sustainable development, water management systems, climate change, the limit of tolerance

Nowadays in all parts of the world people need more and more water for economic activity and other kinds of activities. Uncontrolled water discharge from the rivers that feed the mangroves leads to salinization of plant habitats [1-4]. Reaching the salinity tolerance limits the biomass is reduced, which in turn increases the risk of death of the plant. The reduction of biomass and biodiversity of the ecosystem is likely to result in the death of mangroves and coastal seas are deprived of natural protection against catastrophic exogenous

185

natural processes involving destruction of coastal infrastructure of many countries and the victims among the population. [4] Mangroves are able to pay off the power of the wind and waves of the tsunami.

The purpose of our study is the data analysis to identify the dependence of the biomass of mangrove forests on the salinity of the surface waters of coastal marginal seas. The objectives of the study is to collect information on the biomass of mangrove ecosystems and species at different latitudes and changes in the salinity of coastal waters in areas of growth; the analysis of the mechanisms of plant response to the excess of the tolerance limits; the analysis of samples obtained by statistical analysis; the evaluation of the results of the statistical analysis.

The mangrove forests, especially their spread across the globe over the years were studied by such researchers as: Christensen in 1978, Coronado-Molina in 2004, Ong 1982, Tamai 1986, Putz and Chan in 1987, Fromard, F ., Puig H., Ross E., JJ, Shimmi, O., Amarasinghe MD, Balasubramaniam S. in 1992, Sneager P. and Snedeaker S. in 1993, Fromard F., Puig H., Mougin E. and others in 1998, Ross JJ, Shimmi O., Vilmos P. in 2001, Le Cong Chinh, Nekrasova M., Bolgov M. in 2013-2015 and others [3-8].

The objects of the study depending on the biomass salinity were selected from several species families: Soneratia, Avicennia, Rhizophora, Kandelia, Lagucularia, Bruguiera, Ceriops. They grow at latitudes 38ºS - 0 - 38 ºN on the shores of the Indian, Pacific and Atlantic oceans. The salinity of coastal waters of the marginal seas is 31,8 - 36,4 ‰ [3-8]. The research was based on the salinity of the coastal waters of the marginal seas, defining the limits of growth in salinity due to climate change and the growth of consumption of fresh water.

The analysis of the stability of mangrove families showed that the tolerance ranges of the studied species allowed their existence in the range of 7-30 7 oS .-15 eht si lower limit of salinity of the most sensitive to this factor mangrove family (Bruguiera) and the most stable family (Avicennia) respectively. 15 - 30 fo timil reppu eht si salinity sensitive to this factor mangrove family (Bruguiera) and the most stable family (Avicennia) respectively.

Methods and materials

186

The study used modern techniques of statistical data analysis and processing, including two-factor analysis of variance, regression, correlation analysis, charting data of distribution of the plant biomass and the salinity of the surface waters. We analyzed the data sources of the biomass of mangroves at the period from 1969 to 2015 for 75 types of ecosystems and 11 types of woody vegetation and mixed mangrove forests. [3-4]. The salinity of the sea water in the coastal areas of marginal seas in the areas of mangrove habitat is given on the basis of the data of oceans salinity. [1, 2].

Data analysis was carried out in the package MS Excel for Windows 8.1 with add-ons package for statistical data analysis. Two models of growing forests were used in the research.

Results

In this research it was found that both models are significant but the second is more reliable because of the values of dependence.

The resulting correlation shows that increasing salinity of coastal waters is accompanied by a decrease in the biomass of all species of mangrove, but as the action of several defining species is not differentiated, the effect of salinity is compensated by climate and other factors contributing to the increase of immunity, tolerance limits of species and the stability of mangroves to human impacts of WMS.

The effect of salinity on the biomass can be better traced in the second model. During the statistical analysis it was revealed a linear dependence of biomass of Bruguiera gymnorhiza on the salinity of coastal waters characterized by a strong inverse correlation, an increase in salinity of surface water, ceteris paribus reduces the biomass.

In the regression analysis the graph of the dependence of the biomass of mangrove on the salinity of coastal waters was plotted. It showed a decrease in biomass with a slight increase in the salinity of surface waters. It is due to the difference in environmental conditions.

Thus, the salinity of the coastal waters of the marginal seas affects the biomass of mangrove forests. Especially strong is the influence of the points at the same latitudes with slight differences in climatic conditions. Consequently, within the tolerance to different types of mangrove habitat salinity water consumption has no significant impact on the change in their biomass, and when approaching the limits of tolerance of species it is necessary to introduce strict regulation of

187

water management of coastal areas to prevent the destruction of mangrove ecosystems.

To verify the model the studies will be continued, considering the conditions, which include using instruments of passive house as a method of reducing water to be taken for housing and utilities, because these conditions have certain influence on the salinity and biomass of water in mangrove areas.

References

1. Antonov, J. I., D. Seidov, T. P. Boyer, R. A. Locarnini, A. V. Mishonov, H. E. Garcia, O. K. Baranova, M. M. Zweng, and D. R. Johnson, 2010. World Ocean Atlas 2009, Volume 2: Salinity. S. Levitus, Ed. NOAA Atlas NESDIS 69, U.S. Government Printing Office, Washington, D.C., 184 pp.

2. Le Cong Chinh, Nekrasova M.A., M. Belov. Otsenka vozdeystviya vodopolzovaniya na mangrovyie lesa v basseyne reki Dongnay (Vetnam)(Assessing the impact of water use on the mangrove forests in the basin of Dong Nai (Vietnam)) / Vodnoe chozyajstvo Rossii (The Water Management of Russia) № 3, 2015,. 89-96

3. Seanger P., Snedaker S. Pantropical trends in mangrove above-ground biomass and annual litterfall // Oecologia. - 1993. - №96, p.293-299. [Internet resource]. - URL: http://epubs.scu.edu.au/cgi/-viewcontent.cgi?article=1647 &context=esm_pubs (accessed: 07.09.15)

4. Le Cong Chinh, Nekrasova M.A., M. Belov. Чинь Ле Конг, Некрасова М.А., Болгов М.В. Sohraneniya mangrovyih lesov v usloviyah intensivnogo razvitiya vodohozyaystvennoy sistemyi v basseyne reki Dongnay (Conservation of mangrove forests in the conditions of intensive development of water management in the basin of Dong Nai / Vestnik RUDN Seriya Ekologiya i bezopasnost zhiznedeyatelnosti (Bulletin PFUR Series Ecology and Life Safety) 2015, № 1 p. 73-79

188

Gatica K.A.

EVALUACIÓN DEL PROCESO DE REHIDRATACIÓN DE UNA RESINA DE INTERCAMBIO IÓNICO ELABORADA A PARTIR DE LA SULFONACIÓN Y ENTRECRUZAMIENTO DE LA MATRIZ POLIMÉRICA DE POLIESTIRENO EXPANDIDO DE ORIGEN RECICLADO

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Resumen: La investigación consistió en la evaluación del proceso de rehidratación de una resina de intercambio iónico elaborada a partir de la sulfonación de poliestireno expandido, utilizado en empaques y embalaje, para determinar si existe una disminución significativa en su capacidad de intercambio iónico. Se realizó una evaluación primaria a la resina, determinando los parámetros establecidos en la norma ASTM D 2187 – 94 (2004), para caracterizarla, creando un parámetro de comparación entre la resina inicial y la rehidratada. Asimismo, estas propiedades se compararon con los parámetros establecidos para la resina comercial, Purofine PFC-100, determinando que la resina elaborada presenta características similares a esta. Fueron realizados tres procesos de deshidratación y rehidratación consecutivos, evaluando entre cada proceso la capacidad total de intercambio iónico y estableciendo el porcentaje de disminución de la misma. Finalmente, se determinó que para todas las deshidrataciones el porcentaje de disminución de las propiedades de intercambio fue menor al uno por ciento. Recomendando como límite máximo óptimo, tres deshidrataciones por resina.

Palabras clave: poliestireno reciclado, hidratación, capacidad total de intercambio iónico, porcentaje de disminución.

Abstract: Fundamental research consists in the evaluation of the rehydration process of an ion exchange resin made from sulfonation of polystyrene, used in packaging and packing, in order to determine whether a significant decrease in ion exchange capacity exists. A primary evaluation to the resin, was performed, determining the parameters established in ASTM D 2187-94 (2004), to characterize it, providing a basis for comparison between the initial

189

resin and the rehydrated. Also, these properties were compared with the parameters established for Purofine PFC-100 commercial resin, determining that the made resin exhibit similar features as the commercial one. It was performed, three processes of dehydration and rehydration consecutive, evaluating within each process, the total ion exchange capacity of the resin and establishing the percent decrease thereof. Finally, it was determined that for all dehydrations made, the percent decrease in exchange properties was less than one. Three dehydrations of resin are recommended as the optimum maximum.

Key words: polystyrene recycling, hydration, ion exchange capacity, the percentage of reduction.

Introducción. Las resinas de intercambio iónico son cadenas tridimensionales de hidrocarburos, a las cuales se han adicionado grupos ionizables, a través de procesos de sulfonación, aminación o análogos; resultando de ellos resinas intercambiadoras catiónicas y aniónicas. Al someter los residuos de poliestireno expandido a un proceso de sulfonación y entrecruzamiento de su matriz polimérica; se logra ligar grupos sulfónicos y sulfonas a la unidad monomérica del estireno. Esto provee un carácter hidrofílico y capacidad de intercambio iónico al material obtenido. Obteniendo así, una alternativa al reciclaje del poliestireno expandido, generando un intercambiador catiónico de bajo consumo energético y bajo costo. En este proceso, se obtiene como resultado, una resina compuesta, en su mayoría, por agua. Esto representa una dificultad en su manejo. Por lo que, se considera de suma importancia, la evaluación del proceso de deshidratación y rehidratación de la misma. Así como, la regeneración de sus principales propiedades, determinando si existe pérdida significativa en su capacidad total de intercambio iónico.

La norma ASTM D2187 – 94 (2004) hace referencia a métodos de evaluación que cubren la determinación de las propiedades físicas y químicas de resinas de intercambio iónico usadas en tratamiento de agua. Estos métodos están destinados a la evaluación de material nuevo y regenerado; por lo que permiten determinar la disminución en la capacidad de intercambio de la resina debido al proceso de hidratación y rehidratación.

Metodología experimental. Se realizó la evaluación de las propiedades de la resina, utilizando como técnica cuantitativa, los parámetros establecidos en la norma ASTM D 2187 – 94 (2004). Se

190

determinó la densidad de retrolavado, retención máxima de agua, capacidad de fraccionamiento de una sal neutra y capacidad total de intercambio iónico de la resina, así como, la capacidad de regeneración de estas propiedades al momento de su rehidratación; evaluando tres rehidrataciones consecutivas.

Materiales

- *Material de estudio:* residuos de poliestireno expandido proveniente de las cajas de desecho del *kit* de la prueba de DQO del Proyecto FODECYT 47-2009, desechos provenientes del material de embalaje de dos televisores y perlas de poliestireno expandido virgen utilizadas en embalaje y empaque.
- *Material de control de la investigación:* iones metálicos en solución. Capacidad de intercambio iónico de la resina y su regeneración**.**

Procedimientos

1. *Reciclaje y pre tratamiento del poliestireno expandido:* se aplicó un pre tratamiento al material utilizado para elaborar la resina, que consiste en la desgasificación del poliestireno expandido, con el propósito de reducir el volumen de las esferas y optimizar el espacio disponible para la sulfonación.
2. *Sulfonación de la matriz polimérica y elaboración de la sal sódica de la resina:* se utilizó como agente sulfonante una mezcla de ácido sulfúrico fumante, óleum, en un diez por ciento y ácido sulfúrico concentrado en un noventa por ciento, aplicando dos horas de sulfonación; siguiendo las recomendaciones dadas en la investigación *Elaboración de una resina de intercambio iónico a partir de la sulfonación y entrecruzamiento de poliestireno expandido reciclado para la separación de iones metálicos en solución*. Tras la sulfonación, se neutralizó el poliestireno sulfonado en su forma ácida, utilizando una solución de hidróxido de sodio, hasta llevar el potencial de hidrógeno de la mezcla a un valor mayor a diez. Obteniendo así, la sal sódica de la resina. Se realizaron lavados con agua desmineralizada para eliminar el exceso de ácidos que pudiesen estar libres en la misma.
3. *Deshidratación y rehidratación:* para el proceso de deshidratación se utilizó un horno de convección, a una temperatura de 104 °C, durante 18 horas. Se realizó la reconstitución másica de la resina, agregando agua desmineralizada a la muestra deshidratada.

191

4. *Evaluación de la resina:* se realizó la evaluación de las propiedades de la resina, utilizando como técnica cuantitativa, los parámetros establecidos en la norma ASTM D 2187 – 94 (2004). Se determinó la densidad de retrolavado, retención máxima de agua, capacidad de fraccionamiento de una sal neutra y capacidad total de intercambio iónico de la resina, así como, la capacidad de regeneración de estas propiedades posterior a su rehidratación.

Resultados e interpretación

En el proceso de sulfonación y entrecruzamiento de la matriz polimérica del poliestireno expandido, se obtiene como resultado, una resina compuesta, en su mayoría, por agua. Esto representa una dificultad en el manejo de la resina y un incremento en el costo de la misma. Lo que disminuye su factibilidad económica y posibilidad de comercialización. Por esta razón, se considera de suma importancia, la evaluación del proceso de deshidratación y rehidratación de la resina.

Tabla I. Capacidad total de intercambio iónico de la resina inicial obtenida mediante la sulfonación del poliestireno expandido

Capacidad de intercambio iónico	
Por masa de resina húmeda, (meq/g)	9,716
Por masa de resina seca, (meq/g)	149,253
Por mililitro de material sedimentado y retrolavado, (meq/mL)	10,002

Fuente: elaboración propia.

Tabla II. Determinación de las características de la resina obtenida mediante la sulfonación del poliestireno expandido

Densidad de retrolavado (g/mL)	1,03
Porcentaje de retención máxima de agua (%)	93,49
Capacidad de salt-splitting por masa de resina húmeda (meq/g)	0,137
Capacidad de salt-splitting por masa de resina seca (meq/g)	2,101
Capacidad de salt-splitting por mililitro de material sedimentado y retrolavado (meq/mL)	0,141

Fuente: elaboración propia.

La evaluación de la resina se orientó en la determinación de la capacidad total de intercambio iónico de la misma, y el efecto producido por el proceso de deshidratación y rehidratación. Para

192

cumplir con este objetivo, se determinó la capacidad total de intercambio iónico de la resina inicial en miliequivalentes por gramo de resina húmeda, por gramo de resina seca y por mililitro de material sedimentado y retrolavado; estos resultados se muestran en la tabla I.

Con el objetivo de establecer un parámetro de comparación de la resina rehidratada respecto a la inicial, se realizó la caracterización de la resina elaborada con los parámetros establecidos como óptimos en la investigación precedente. Los resultados se muestran en la tabla II.

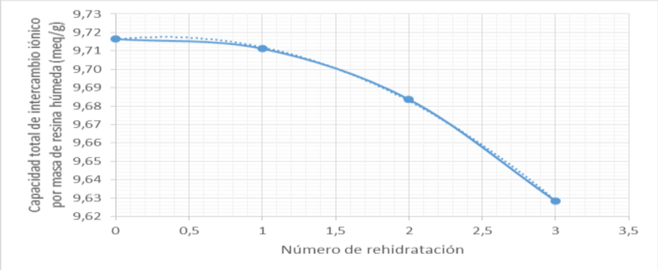

Figura 1. Comportamiento de la capacidad total de intercambio iónico por masa húmeda de la resina rehidratada respecto a la inicial

Color	Modelo matemático	Coeficiente de correlación	Intervalo de validez
	$C_W = -0{,}0125R^2 + 0{,}0083R + 9{,}7161$	0,9997	[0,3] R

Fuente: elaboración propia, con Microsoft Excel 2013.

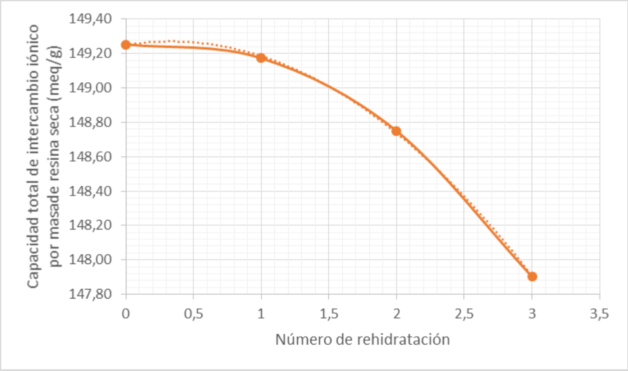

Figura 2. Comportamiento de la capacidad total de intercambio iónico por masa seca de la resina rehidratada respecto a la inicial.

193

Color	Modelo matemático	Coeficiente de correlación	Intervalo de validez
	$C_d = -0,192R^2 + 0,1281R + 149,25$	0,9997	[0,3] R

Fuente: elaboración propia, con Microsoft Excel 2013.

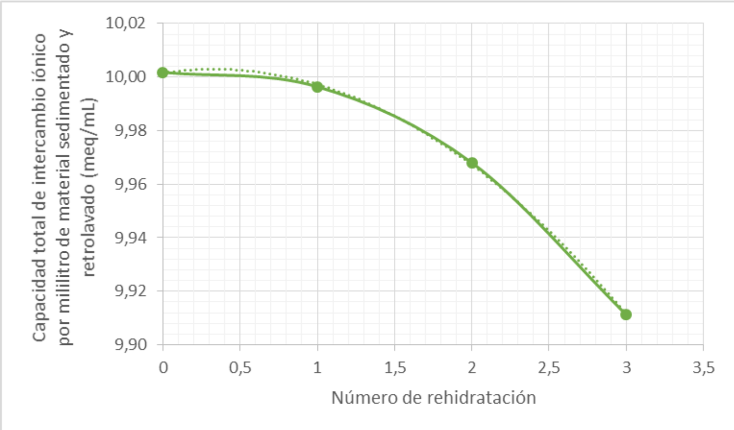

Figura 3. Comportamiento de la capacidad total de intercambio iónico por mililitro de material sedimentado y retrolavado de la resina rehidratada respecto a la inicial

La evaluación se realizó con base en los métodos descritos en la Norma ASTM D 2187 – 94 (2004), *Métodos estándar de evaluación de las propiedades físicas y químicas de resinas de intercambio iónico de partículas*. En las figuras 1, 2 y 3, se modela el comportamiento de la capacidad total de intercambio iónico por gramo húmedo, por gramo seco y por mililitro de material sedimentado y retrolavado de la resina rehidratada respecto a la inicial. Este modelo se ajusta a un comportamiento polinomial de segundo orden, que presenta un extremo máximo en la resina inicial y una tendencia decreciente al mínimo.

Color	Modelo matemático	Coeficiente de correlación	Intervalo de validez
	$C_b = -0,129R^2 + 0,0086R + 10,002$	0,9997	[0,3] R

Fuente: elaboración propia, con Microsoft Excel 2013.

194

Número de regeneración	Porcentaje de disminución
1	0,05%
2	0,34%
3	0,91%

Tabla I. Porcentaje de disminución en la capacidad total de intercambio iónico de la resina ante la deshidratación y rehidratación. Fuente: elaboración propia.

Se evaluó el porcentaje de disminución de la capacidad total de intercambio iónico en la resina debido a cada rehidratación. Este porcentaje de disminución es, para todos los casos, menor al uno por ciento, esto demuestra que la hipótesis de investigación planteada, que expone que es posible realizar el procedimiento de deshidratación y rehidratación de una resina obtenida a partir de la sulfonación de poliestireno expandido de origen reciclado, sin que exista pérdida significativa en la capacidad de intercambio iónico, es afirmativa. Asimismo, la hipótesis correlacional, que enuncia que la capacidad total de intercambio iónico de la resina disminuye en un diez por ciento en cada regeneración, ha sido comprobada.

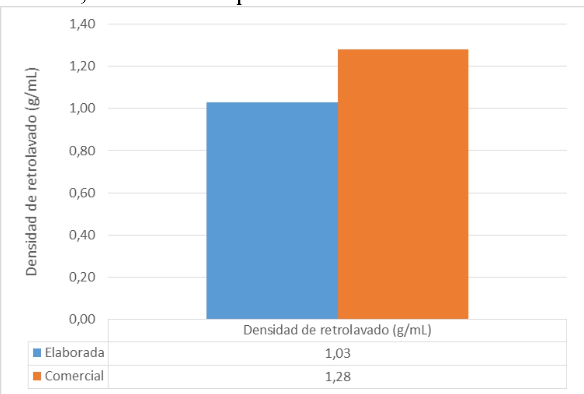

Figura 4. Comparación de la densidad de retrolavado de la resina de elaborada a partir de poliestireno expandido de origen reciclado, respecto a la resina comercial Purofine PFC-100. Fuente: elaboración propia, con Microsoft Excel 2013.

195

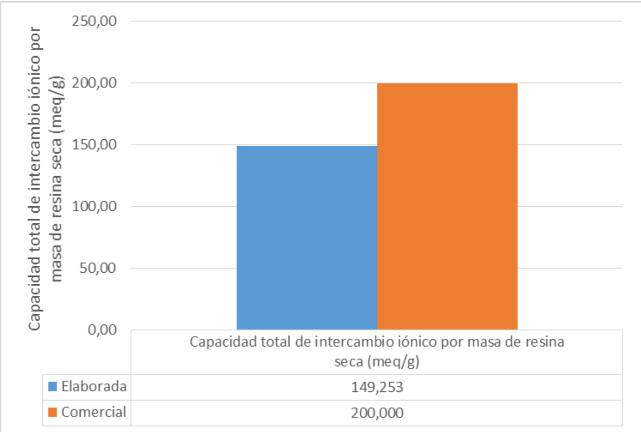

Figura 5. Comparación del porcentaje de retención máxima de agua de la resina de elaborada a partir de poliestireno expandido de origen reciclado, respecto a la resina comercial Purofine PFC-100. Fuente: elaboración propia, con Microsoft Excel 2013.

Las propiedades determinadas se compararon con la resina de poliestireno sulfonado comercial Purofine PFC-100. Tanto la densidad de retrolavado, como la capacidad total de intercambio iónico, figura 4 y 6, son menores en la resina elaborada que en la comercial, esto se debe a que los coágulos presentes en el gel, disminuyen la densidad del retrolavado, ya que aumenta la cantidad de agua retenida en la red polimérica. La capacidad de intercambio iónico disminuye debido a la disminución del área superficial de contacto de la resina con el medio de intercambio de iones. La densidad de retrolavado determina la densidad del material en su máxima retención de agua, el valor de esta es mayor que la densidad promedio del agua a las condiciones en las que se realizó el experimento; esto favorece la circulación del material resinoso en el retrolavado, mejorando a su vez la regeneración de la resina.

Se observa en la figura 5 que la retención máxima de agua, a diferencia de las otras propiedades, es mayor para la resina elaborada que para la comercial. Si la resina posee mayor cantidad de grupos sulfónicos aumenta la solubilidad del material y disminuye el porcentaje de retención máxima de agua. Dado que la resina se elaboró a escala laboratorio, la sulfonación es más débil que la utilizada para la

196

resina comercial; lo que genera una menor proporción de grupos sulfónicos presentes en la red polimérica.

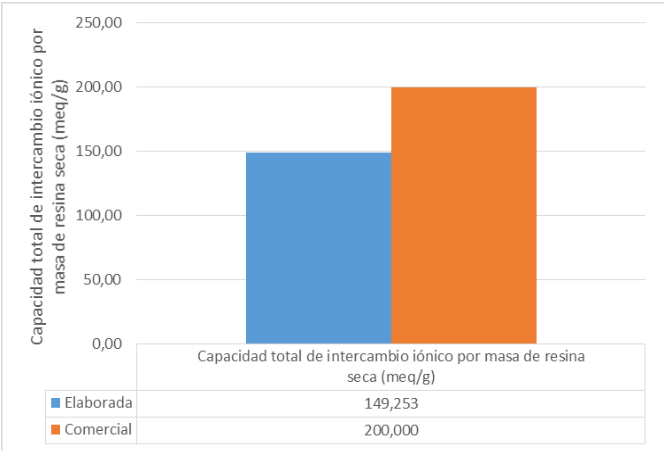

Figura 6. Comparación de la capacidad total de intercambio iónico de la resina de elaborada a partir de poliestireno expandido de origen reciclado, respecto a la resina comercial Purofine PFC-100Fuente: elaboración propia, con Microsoft Excel 2013.

Conclusiones

1. La capacidad total de intercambio iónico por masa húmeda de la resina inicial obtenida mediante la sulfonación del poliestireno expandido es de 9,716 meq/g.
2. La capacidad total de intercambio iónico por masa seca de la resina inicial es de 149,253 meq/g.
3. La capacidad total de intercambio iónico por mililitro de material sedimentado y retrolavado de la resina inicial es de 10,002 meq/g.
4. Los valores obtenidos para la capacidad total de intercambio iónico de la resina elaborada a partir de la sulfonación de poliestireno de origen reciclado, corresponden al valor promedio establecido en la norma ASTM D 2187 – 94 (2004).
5. La capacidad total de intercambio iónico de la resina rehidratada presenta un comportamiento polinomial de segundo orden respecto a la inicial, que presenta un extremo máximo en la resina inicial y una tendencia decreciente al mínimo.

197

6. El porcentaje de disminución en la capacidad total de intercambio iónico de la resina ante la deshidratación y rehidratación es menor al uno por ciento, para la totalidad de ensayos realizados.
7. La densidad de retrolavado es menor para la resina de intercambio iónico elaborada a partir de la sulfonación del poliestireno expandido de origen reciclado, que para la resina de poliestireno sulfonado comercial PUROFINE PFC-100.
8. El intercambiador iónico elaborado posee menor proporción de grupos sulfónicos que el comercial, por ende, su capacidad de intercambiar iones es menor.
9. La resina elaborada presenta mayor porcentaje de retención máxima de agua, en comparación a la resina comercial evaluada.
10. La densidad de retrolavado media de la resina elaborada es de 1,03 g/mL.
11. La resina elaborada permite en promedio una retención máxima de agua del 93,49 %.
12. La capacidad de partición de una sal neutra por masa húmeda de la resina inicial obtenida mediante la sulfonación del poliestireno expandido es de 0,137 meq/g, por masa seca de la resina inicial es de 2,101 meq/g y por mililitro de material sedimentado y retrolavado es de 0,141 meq/g.

Recomendaciones Establecer como límite de regeneración de la resina de intercambio iónico, tres deshidrataciones. Verificar que la temperatura del proceso de deshidratación de la resina, no supere los 104 °C. Evitar el fraccionamiento de esférulas al realizar el proceso de retrolavado, utilizando una columna que posea la altura correspondiente al volumen de resina a evaluar.

Agradecimientos. A Dios, mis padres, familia, amigos y a todos los que contribuyeron al éxito de este proyecto.

Referencias

1.ASTM International. Standard Test Methods for Physical and Chemical Properties of Particulate Ion-Exchange Resins. D 2187 – 94. USA: American National Standard, 2004. 19 p.
2.CAREY, Francis. *Química orgánica*. Velázquez, Jorge (trad). 6a ed. México: McGraw-Hill, 2006. 1245 p. ISBN-10: 970-10-5610-8.
3.CJUNO, Américo; et al. *Síntesis de un intercambiador catiónico a partir de poliestireno comercial / residual.* Perú: Universidad Nacional

198

Mayor de San Marcos, Facultad de Química e Ingeniería Química, 2005. Vol. 8 Núm. 1.
4.CÓRDOVA RECINOS, Óscar Giovanni. *Elaboración de una resina de intercambio iónico a partir de la sulfonación y entrecruzamiento de poliestireno expandido reciclado para la separación de iones metálicos en solución.* Trabajo de graduación de Ing. Química. Universidad de San Carlos de Guatemala, Facultad de Ingeniería, 2012. 152 p.
5. LEÓN, Reynaldo; et al. *Síntesis caracterización y aplicación del PS entrecruzado a partir de residuos de PS.* Tijuana, México: Universidad Autónoma de Baja California Facultad de Ciencias Químicas e Ingeniería. Revista Iberoamericana de Polímeros. 2007. Vol. 8 Núm. 2.

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THE IMPACT OF THE ZHIGULYOVSKAYA HYDROELECTRIC STATION ON THE SARATOV RESERVOIR WATER COMPOSITION

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Abstract: The article presents the results of some researches of the Zhigulyovskaya Hydroelectric Station impact on the water composition of the Saratov Reservoir. To reveal this impact the results obtained are compared with the water composition of the Kuibyshev Reservoir.

Key words: The Zhigulyovskaya Hydroelectric Station, water, the Saratov Reservoir, electric power, pollutants.

The article presents the results of some researches of the Zhigulyovskaya Hydroelectric Station impact on the water composition of the Saratov Reservoir.

Currently, the Design and Research Institute "Hydroproject" named after S.Y. Zhuk is inspecting the reservoirs of the Volga cascade. This work includes the assessment of the environmental aspects associated with the operation of hydroelectric power plants. It is very important to study the chemical composition of the water because

199

these water bodies are supplies of fresh water; they are used for navigation and fishing; they also have a recreational function.

To reveal this impact the results obtained are compared with the water composition of the Kuibyshev Reservoir.

The Zhigulyovskaya Hydroelectric Station is a company of the fuel and energy complex. The main function of the station is to generate electricity. Its construction started in 1950 and was completed in 1957. The total installed capacity of the station is 2372.5 MW; the average annual production is 11,700 GW. It is the sixth stage of the Volga-Kama Cascade of dams, and the second of them by installed power.

The Zhigulyovskaya Hydroelectric Station refers to the run-of-river type. It is located 1465 km from the estuary of the Volga River, on the territory of the city of Zhigulevsk. The area of this facility is 53.6 hectares.

The Saratov Reservoir is located on the east side of the dam, and the Kuybyshev reservoir is located on the west side. The dam is crossed by the federal highway M5 "Moscow - Chelyabinsk." And the national park “Samarskaya Luka” (or “Samara Bend”) is located to the west of the dam.

Currently, the condition of the water body and the water protection zone are being monitored. To this end, from 2010 to 2014 water samples were taken every month in the upper (Kuybyshev) reservoir and lower (Saratov) reservoir, downstream, behind the dam, after the spillway.

While studying the water composition, the components which determine the surface water contamination rate were analyzed. The analysis includes defining the content of zinc, manganese, ammonium ion, NH4, oil products, copper, total iron, suspended solids, COD and BOD5.

Using the data on the surface water contamination rate of the upper and lower pools, we calculated a specific combinatorial water pollution index (SCWPI). It allows estimating the surface water contamination rate objectively enough. SCWPI was calculated for each pool and for each year separately. The calculation was made in view of critical indicators of contamination. The obtained values of SCWPI and the characteristic of the contamination rate of the Kuibyshev and Saratov Reservoirs are shown in the table below.

200

Period of time	Upper pool (the Kuibyshev Reservoir)			Lower pool (the Saratov Reservoir)		
	SCW PI	Class and rank	Contamina-tion rate characteristic	SCW PI	Class and rank	Contamination rate characteristic
2010-2014 гг.	1,98	2	slightly contaminated	2,45	3а	polluted
2010	1,75	2	slightly contaminated	2,04	3а	polluted
2011	1,95	2	slightly contaminated	2,17	3а	polluted
2012	0,28	1	relatively clean	0,30	1	relatively clean
2013	2,00	2	slightly contaminated	2,00	3а	polluted
2014	2,01	3а	polluted	3,15	3б	very polluted

As can be seen from the table, the value of SCWPI in the lower pool is higher than in the upper pool. It means that the treatment facilities are not effective enough.

Due to some leaks of turbine oil minor leaks can occur downstream in the lower pool.

But at present old hydraulic units are being replaced by more environmentally friendly ones.

References

1. Metod kompleksnoi otsenki stepeni zagryaznennosti poverkhnostnykh vod po gidrokhimicheskim pokazatelyam: RD 52.24.643-2002: utv. Rosgidrometom 03.12.2002 g. [The method of integrated assessment of surface water pollution by hydrochemical indicators] G.D. 52.24.643-2002 approved by Roshydromet 03.12.2002 г.

201

2. Deklaratsiya bezopasnosti gidrotekhnicheskikh sooruzhenii Zhigulevskoi GES, 2010. [Declaration of safety of hydraulic structures Zhigulevskaya hydropower station,], 2010
3. JSC «Institute Hydroproject». Available at: mhp.rushydro.ru (accessed 20 October 2015).

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GROUNDWATER POLLUTION BY PAHS

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Abstract: Groundwater is the main source of drinking water. Currently contamination of this source by polycyclic aromatic hydrocarbons is global. PAHs have chemicals, mutagenic and carcinogenic properties. The properties of these substances are dangerous for the environment and for human life.

Key words: PAHs, underground waters, refinery, contamination.

Refining processes of crude oil generates a lot of solid, liquid, gaseous wastes which get to the environment.The liquid wastes,called effluents,as a rule, are dumped into nearby water bodies by operators. The polynuclear aromatic hydrocarbons (PAHs) - one of the toxic components of crude oil. PAHs are usually formed during the incomplete combustion of coal, oil, gas, wood or other organic substances and are the most widespread of the main hydrocarbons, which are found in crude mix of oil.[1] The basic source of drinking water in Okrika Mainland are underground waters, which are pumped out from the wells drilled on the water-bearing horizons. Recently, there have been public complaints about odorous of drinking water as well as observation of the formation of oil film on the surface of water mainlanders.The porous soil and high level of ground waters in the settlement, and also ecologically adverse way of discharge of waste oil-containing waters in the nearby oil refinery could provide a footprint to the contribution of the suspected contaminants to source of underground waters. This pollution, unknown to the consumers, may

202

contain some PAHs and represent a risk for health.Data showed that activity of oil refinery can cause potential harmful consequences for health through underground waters pollution. The presence of these polycyclic aromatic hydrocarbons in concentration, higher than the stipulated maximum level of pollution demands intervention to rescue ignorant inhabitants from wearisome problems with health [2].

Effluents of oil refinery have to be properly treated and disposed of using environmentally friendly practices that are in line with regulatory standards and guidelines.The next study was carried out with the purpose to define existence of PAHs in underground waters of Chennai, Tamil Nadu, India. It is an industrial area where petrochemical tanks are stored.Underground sampling were carried out in 2001, 2011 and 2012 to understand changes in the maintenance of PAHs in this area. Concentration of major ions, pH and EC were measured during the year 2001. From 24 tests of the underground waters collected in 2001, the majority of them there were alkaline and 62,5% were not permissible for drinking on a basis of pH and the EU. Seawater affected NA-CL dominating nature of underground waters. TPH and PAHs analysis of groundwater carried out in 2001 and 2011, and physical inspection of underground waters in 2012 indicate the increased pollution level in the eastern part of the studied territory. Contamination in the eastern part persists because groundwaters flow to the east, also because of storage of petrochemical tanks near the coast.Thus this area is affected by PAHs pollution which has endured over the past 50 years. An underground tank for storage which functions in this area was closed about 50 years ago, and leakage of PAHs from this tank was reported in 1993. Though this research indicates a decrease in the field of the pollution zone because of natural flushing of underground waters [3]. Researches indicate that oil is the main source of aromatic hydrocarbons. Also results of these researches prove that PAHs are cancerogenic.Besides, it is necessary to study the soil and sediment samples on the existence of PAHs.

References:

1. Polycyclic aromatic hydrocarbon – Retrieved from: https://en.wikipedia.org/wiki/Polycyclic_aromatic_hydrocarbon [asseced 30 October 2015]

203

2. C. G. Okoli, D. H. Ogbuagu, C. L. Gilbert, S. Madu, R. F. Njoku-Tony. Proximal Input of Polynuclear Aromatic Hydrocarbons (PAHs) in Groundwater Sources of Okrika Mainland, Nigeri.Journal of Environmental Protection, 2011,no. 2, pp. 848-854.
3.K.Brindha,L.Elango.PAHs contamination in groundwater from a part of metropolitan city India: a study based on sampling over a 10-year period.Environment earth science, 2013.

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THE ROLE OF ERISTALINAE LARVAE IN BIOLOGICAL TREATMENT OF WATER

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Abstract: It is a well-known fact that aquatic organisms are filter feeders. Particularly, Eristalinae larvae purify water by filtering toxic substances. That's why it is important to explore the use of these insects in cleansing structures.

Key words: cleansing structures, biological treatment, water, filtering, insects

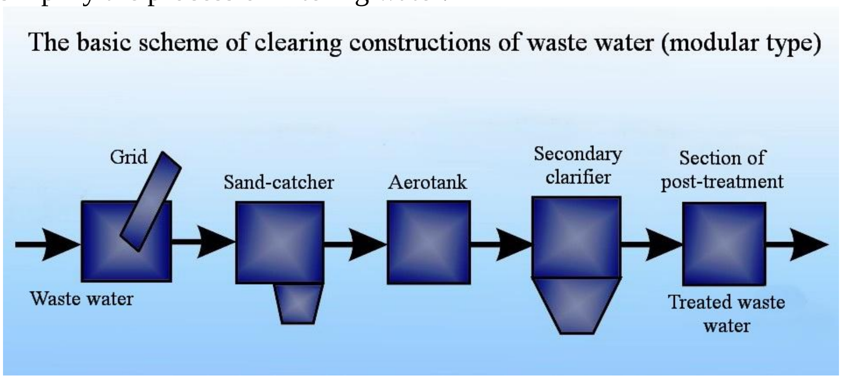
At the present time many scientists explore the ways of water purification with the enforcement of microorganisms. To apply these methods in cleansing structures it is necessary to investigate different species of insects. This issue is studied closely by such Russian scientists as Lobkova L. E., Barinova E.S., Kuzyakina T. I., Dulov L. E. Their scientific surveys constitute the basis of main research written by Lobkova L.E. [1, p. 4]. Lobkova L. E. was the first to establish an extraordinary property of Eristalinae larvae. By introducing her new ecological mean of biological water treatment into practice the scientists are able to recover contaminated reservoirs. This work was published in journal 'Eurasian Union of Scientists №8 28-29.11.2014'.

To begin with, Eristalinae larvae were found in the thermal reservoirs of volcanoes of Kamchatka Region by Russian

204

entomologists. These insects are saprophagous organisms [2, p. 4]. They occur in still and slow-flowing waters, often within highly polluted or low oxygen environments of volcanic reservoirs. In this connection it is interesting to consider that Eristalinae larvae assimilate both decaying organic debris and poisonous substances of post-volcanic activity. However, the larvae shed their toxic skin with sulphides of metals it is composed of. [3, p. 4]. It is clear from these observations that these insects fill in the ecosystems of volcanic reservoirs due to their ability of purification of water.

Under those circumstances, the idea of applying Eristalinae larvae in cleansing structures of water is regarded by scientists. These larvae may be used in the most important stage of water purification, I mean, biological stage. The insects are placed into the aerotank [4, p. 4]. The aerotank is a capacitive hydraulic construction equipped with aeration system and separate sections. In these sections waste water contacts with active sludge which contains different microorganisms including Eristalinae larvae. In this case the larvae absorb a great number of toxic substances. Thus, I reckon that this procedure can simplify the process of filtering water.



Picture 1. The general scheme of the biological treatment of water

To sum it up, I would like to say that different microorganisms may render great assistance to us in the restoration of waste water. Their tremendous ability of adaptation to extreme conditions gives scientists a chance to save water reservoirs on our planet more carefully.

205

References

1. Lobkova L.E. *Rol' lichinok eristalin (Diptera, Syrphidae, Eristalinae) v ekosistemakh termal'nykh vodoemov kal'dery vulkana Uzon i Doliny geizerov* [The role of eristalin larvae (Diptera, Syrphidae, Eristalinae) in ecosystems of the thermal waters of the caldera Uzon and the Valley of Geysers]. *Sokhranenie bioraznoobraziya Kamchatki i prilegayushchikh morei: Materialy III nauchnoi konferentsii* [Biodiversity of Kamchatka and adjacent seas: Proceedings of the III conference]. Petropavlovsk-Kamchatsky: KamchatNIRO Publ., 2002, pp 254-257;
2. Miranda G.F.G, Young A.D., Locke M.M., Marshall S.A., Skevington J.H., Thompson F.C. (2013). Key to the genera of nearctic Syrphidae. *Canadian Journal of Arthropod Identification 23, pp 1-351*;
3. Lobkova L.E. *Kamchatskie nasekomye-ekstremaly mogut pomoch' chelovechestvu* [Kamchatka extremal insects can help the humanity]. Available at http://www.poluostrov-kamchatka.ru/pknews/detail.php?ID=103053 (accessed 21 August 2015);
4. *Biologicheskaya ochistka stochnykh vod – samyi vazhnyi etap vsego protsessa* [The biological treatment of water is the most important stage of the whole process]. Available at http://okanalizatsii.ru/biologicheskaya-ochistka-stochnyx-vod-samyj-vazhnyj-etap-vsego-processa.html;

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POPS POLLUTION ASSESSMENT IN THE AMUR RIVER BASIN AFTER 2013 CHINA–RUSSIA FLOODS

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Abstract: POPs are a serious threat for water bodies. It is shown that the catastrophic flood in 2013 played an important role in purifying water in the transboundary water bodies of the Amur River Basin.

206

Key words: persistent organic pollutants (POPs), Specific combinatorial water pollution index (SCWPI), the degree of self-purification.

Introduction. Persistent organic pollutants (POPs) represent the most dangerous group of chemicals with specific properties.

These are organic chemicals quite resistant to environmental degradation through chemical, biological, and photolytic processes [1, p.7]. Some POPs arise naturally, from volcanoes or biosynthesis, but most are man-made [2, pp.2-3]. Many of them were produced as pesticides, solvents, pharmaceuticals, and industrial chemicals [1, pp.9-10]. Because of their persistence, bioaccumulate, toxicity, high lipophilicity POPs significantly impact human health and the environment [3, pp.40-41]. And these chemicals are characterized by transboundary movement and low but significant saturated vapor pressure.

Therefore, POPs are a serious and increasing threat for water bodies. In the Amur River Basin this POPs problem is especially important taking into account the specificity of the region, it is a boundary river, the Chinese and the Russians are co-riparians. And they suffered from the diluvian catastrophic Far East flood of 2013 together. The whole Amur River Basin ecosystem and local people health were damaged two years ago.

Materials and Methods

The Amur River Basin is located in the temperate latitudes of East Asia. It includes the territory of Russia, China, Mongolia and North Korea. 9 monitoring sections on the Argun, the Amur, the Ussuri, the Razdolnaya Rivers and Lake Khanka were considered in this research. The assessment of water quality was performed in accordance with the method of SCWPI (Specific combinatorial water pollution index). The list of test substances included: petrochemicals, polychlorinated biphenyls (PCBs), dichlorophenol, trichlorophenol, DDT, DDE, 2,4-D (2,4-dichlorophenoxyacetic acid), lindane, benzene, toluene, ethylbenzene, xylene, dibutyl phthalate, atrazine, hexachlorobenzene, hexachlorane.

In addition, the self-purification coefficient for all water bodies was calculated. The self-purification coefficient is

207

$$Csp = \left(1 - \frac{SCWPI_i}{SCWPI_{base}}\right) \times 100\%$$

where C_{sp} is the self-purification coefficient, %; $SCWPI_i$ is the value SCWPI for arbitrary year; $SCWPI_{base}$ is the value SCWPI for the base year. It may be noted that 2008 was adopted as the base year.

Results

On the basis of the Russian data, the quality of water in many monitoring sections was worse in 2013 in comparison with 2012. Note that the worst situation was detected in the Argun and the Razdolnaya Rivers and the Lake Khanka.During the flood the main pollutants were petrochemicals, 2,4-D, PCB and DDT. The situation in all water bodies, except the Razdolnaya River, improved in 2014**.** The level of pollution went from «dirty» to the «very contaminated». Figure 1 and Figure 2 1illustrate the situation of water quality in water bodies.

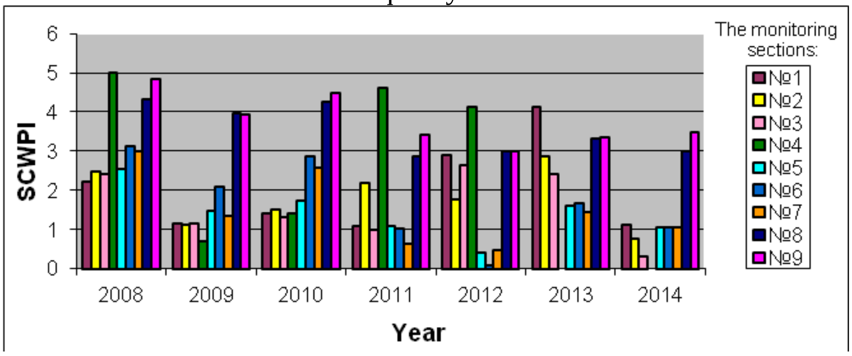

Fig. 1. The dynamics of change of water quality in the transboundary water bodies of the Amur River Basin over the period 2008-2014 (on the basis of the Russian data)

If you look at Figure 2., you will see another picture.

208

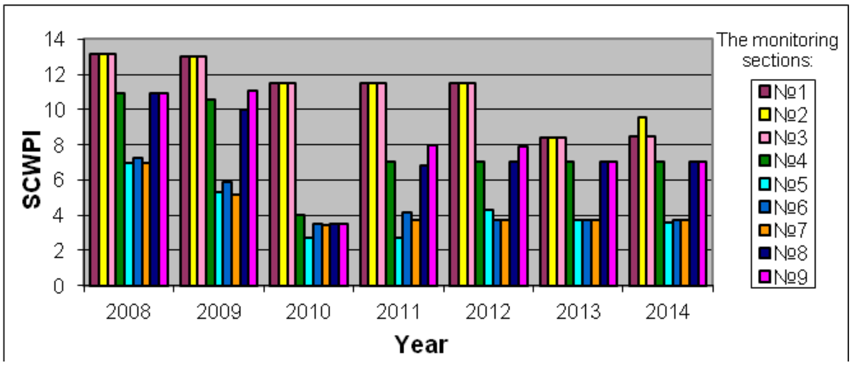

Fig. 2. The dynamics of change of water quality in the transboundary water bodies of the Amur River Basin over the period 2008-2014 (on the basis of the Chinese data)

On the basis of the Chinese data, the quality of water in many monitoring sections was similar in 2013 and 2014. Due to the differences in research methods and conditions of analysis in Russia and China calculation data are inconsistent. Also an increase of self-purification potential may be noted caused by a flood. So, in 2014 for the Argun River the self-purification coefficient went to average 68% in comparison with 2008.Next, for the Amur and the Ussuri Rivers the self-purification coefficient rose to average 74% and 64% accordingly in comparison with 2008.At last, for the Razdolnaya River and Lake Khanka the self-purification coefficient rose to average 30% and 28% respectively in comparison with 2008. Nevertheless, the negative trend of indicator for the Razdolnaya River after 2013 is observed.

Discussion

A conclusion based on the results of the investigation, may be made: the catastrophic flood in 2013 played an important role in purifying water in the transboundary water bodies of the Amur River Basin. This is confirmed by the values of the SCWPI. Besides, I want to stress that the SCWPI can be used as an indicator of the degree of self-purification of water bodies. In general, a positive dynamics is observed: the self-purification coefficient for all water bodies, except the Razdolnaya River, after 2013, is confirmed.

209

References

1. Ritter L; Solomon KR; Forget J; Stemeroff M; O'Leary C. Persistent organic pollutants. United Nations Environment Programme. Retrieved from
http://www.chem.unep.ch/pops/ritter/en/ritteren.pdf
2. El-Shahawi, M.S., Hamza, A., Bashammakhb, A.S., Al-Saggaf, W.T. (2010). An overview on the accumulation, distribution, transformations, toxicity and analytical methods for the monitoring of persistent organic pollutants. Talanta. 80, 1587–1597. doi:10.1016/j.talanta.2009.09.055.
3. Stockholm Convention on Persistent Organic Pollutants.
pp. 1–43. Retrieved from
http://chm.pops.int/Portals/0/Repository/convention_text/UNEP-POPS-COP-CONVTEXT-FULL.English.PDF

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RETTET DEN BAIKALSEE!

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Annotation: Baikalsee ist der größte Ader des Frischwasser .Jetzt wird Baikalsee aktiv verschmutzt. Sehr wichtig die unberührte Natur den Baikal unterstützen, denn nächste Generation auch Möglichkeit hatten, reines Süßwasser zu trinken.

Stichwörter: Baikalsee, Baikalschwamm, biologische Entwicklung, Qualität des Wassers, Darmbakterien in die Biomasse, hydrolischen Regimes

Abstract: Baikal is one of the biggest fresh water reservoirs. Now Baikal is actively polluted. It is important to save the nature of Baikal untouched, for the next generation to have the possibility to drink pure fresh water.

Key words: Baikal lake, Baikal sponge, biological development, quality of the water, intestinal bacteria in the biomass, hydrological regime

210

Es ist kein Geheimnis, dass Baikalsee der größte Ader des Frischwassers. Sehr wichtig ist, die unberührte Natur den Baikal zu unterstützen.

Im Baikalsee wohnen verschiedene endemische Mikroorganismen, Pflanzen und Tiere, wie: Baikalringelrobbe, Fisch «Gololjanka», Omul, Quappe und Baikalschwamm Baikalschwamm ist mehr ähnlich der Pflanze. Sie wohnen auf den Tiefen von 15 bis 20 Metern und erfüllen die wichtigste Funktion- sie reinigen den See. Das heißt, er funktioniert wie ein natürlicher Filter. Zum 2015 wurde dieses Problem sehr akut, weil es schon 90% von Schwämmen ausgestorben ist. Das ist mit der aktive Tätigkeit verschiedenen Betriebe und nicht nur verbunden. Große Anzahl der Abwässer mit den schädlichen chemischen Stoffen wird in den Baikalsee abgeflossen.

Sehr negativ beeinflüßten den See das Papierkombinat. Jetzt baut man das Kombinat nach der Bereicherung der Bergarten. Das ist auch negative Wirkung auf biologische Entwicklung solchen Schatz wie Baikalsee. Existiert noch ein großes Problem. Das ist die Senkung des Wasserstands im See infolge der Arbeit des Wasserkraftwerks Bogutchanskaja. Dabei wird noch der Bau eines Wasserkraftwerks Schurenskaja. Im Jahre 2014 war die riesige Invansionen der Wasserpflanze Spirogira auf den See aufgedeckt. Diese Wasserpflanze wirkt sehr negativ auf chemisches Zustand und die Qualität des Wassers. Gibt es auch eine Drohung des Massensterben oder der Verdrängung endemischen Tiere und der Pflanzen. Die Felder der verfaulenden Wasserpflanzen ziehen die Massen der Möwen heran und mit ihren Fekalien geraten die Darmbakterien in die Biomasse. Sie können ganz einfach während der Stürme in den See geraten. Deshalb wird das Wasser in der Nähe von Dörfern und verschiedenen Erholungszonen untauglich für Getränk.

Noch eine Seite der Frage ist komfortabler Tourismus am Ufer des Baikalsees. Die Entwicklung des touristischen Business auf dem natürlichen Baikalterritorium wird negativ auf dem ökologischen Lagen des Sees gesagt. Die Entwicklung des Wassertransportes und die Kürzung der Fläche der Wälder können zur Veränderung des hydrologischen Regimes des Sees bringen. Meiner Meinung nach kann man die Wanderungen bleiben. Das ist notwendig für Wissenschaftler, die verschiedene Forschungen verbringen und für anderen Menschen, wer kann zur Natur vorsichtig verhalten. Heute gibt es schon Problem

211

wegen der Schiffe. Ofiziell existieren nur 2 Orte der Aufnahme durchgearbeiteten Wassers von den Schiffen – in Sewerobaikalsk und dem Hafen der Baikalsee. Dabei bis heute in der Mehrheit des Ortes, wo die Leute wohnen, fehlen die Reinigungsbauten.

Bis im Land fehlt ökologisches Amt, das für den Zustand der Umwelt verantwortlich ist, bleibt die Drohung des Verlustes des Baikalsees, wie ein einzigartiges Objekt. Baikalsee ist ein Objekt des weltweiten Niveaus, das für das Land die strategische Bedeutung hat.

Laut den Prognosen, schon nach 30-40 Jahre werden wir die Schwierigkeiten mit Süßwasser haben. Ich will nur sagen, dass dieses Problem jeden betrifft wird. Ich denke, niemand davon, wer heute noch jung ist- will in Alter für das Glas reinen Trinkwassers zu überzahlen.

Literaturverzeichnis

1. V.G.. Posdnjakov das Ökologische System des Baikalsees befindet sich heute in der Zone des hohen Risikos, ONLINE\URLhttp://kprf.ru/dep/gosduma/activities/14301 Zugriffsdatum: 30.10.15

2. Der Bikalsee in der Gefahr, die Fachkräfte schlagen Alarm ONLINE\URL http://scientificrussia.ru/articles/baikal-v-opasnosti Zugriffsdatum: 30.10.15

3. Die ökokatastrophe auf fem Baikalsee können nicht, die Oberteile wollen nicht ONLINE\URL http://articles.ircity.ru/6475/ Zugriffsdatum: 30.10.15

4. ONLINE\URL http://beaplanet.ru/vodorosli/zelenye_vodorosli/spirogira.html Zugriffsdatum: 30.10.15

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HYDROLOGICAL FEATURES OF THE MOZHAISK RESERVOIR

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212

Abstract: The Mozhaysk Reservoir was created primarily for improvement of Moscow water supply and long-term regulation of the Moscow River flow, as well as for recreation and energy generation purposes. Therefore, it is vitally important to monitor and study its hydrochemical and hydrobiological characteristics.

Key words: reservoir, hydrological and geochemical survey, measurements of depth, hydrobiological characteristics.

The Mozhaysk Reservoir is the largest young water body, located in the west of the Moscow Region, on the territory of the Mozhaisk District. It is the largest reservoir in the region. It was created in 1960-1962 as a result of damming the Moscow riverbed by hydroelectric facilities upstream Mozhaisk. It is a channel type reservoir. The actual volume of it is 227 million m^3, the area is 30,7 km^2, the width is 3,5 km, its length is about 47 km and depth is 22,5 m. The hydroelectric power station capacity is 2.5 MW and its annual output is 8 million kW • h per year. The Moscow River and the Lusyanka River flow into the Mozhaysk Reservoir in the north-west; the Koloch River and the Bodnya River flow into it in the south-east. Freeze-up occurs in late November, and it opens in late April. [1].

The reservoir was created primarily for the improvement of Moscow water supply and for long-term regulation of the Moscow River flow, as well as for energy generation purposes. The reservoir is a popular recreation zone (there are fishing and sport facilities).

Taking this into account, it is necessary to study hydrochemical and hydrobiological characteristics of the reservoir. A long-term monitoring of these characteristics has been carried out at the Krasnovidovskaya research station of the Moscow State University. The station is located in the village of Krasnovidovo, the Moscow region, on the northern shore of the Mozhaisk Reservoir, on the Moscow River, 15 km north-west of the town of Mozhaisk. [2]

A hydrological and geochemical survey of the reservoir was carried out in the summer of 2014 in the course of a complex research. Data of one vertical transect – Station № 47 – was analyzed. There is a direct thermal stratification at this station, which is typical for water column in the summer. The thermocline layer was well observed at a depth of 6-9 m. [3]

213

Analyzing the data of conductivity distribution in the water column one can see that it increases with depth, due to an increase of mineralization. This is because of the diffusion of a mineralized river water mass in the bottom layers, and of the arrival of confined waters of carbon deposits which can be discharged in springs. [3]

A steady reduction of the oxygenation was registered. This is because the processes of oxygen production occur in the surface levels where phytoplankton dwells. The aeration (exchange of oxygen between the water surface layers and the air) takes place in these layers. Further the oxygen content decreases, with the amount of solar energy necessary for photosynthesis declining. Such distribution of hydrogen ions is associated with the processes of photosynthesis (when CO2 concentration decreases) and dissociation of hydrocarbons Ca (HCO3)2 and Mg (HCO3)2 in the surface layers, thereby the concentration of HCO3 increases. These processes result in a decrease in H+ (hydrogen ions) concentration and an increase in pH. These processes are more active in the surface horizons than in the bottom layers. [3]

Table 1. Hydrological and hydrochemical characteristics of the water column at the station № 47

h, m	æ, mS/m	T, °C	O_2, mg/l	pH	CO_3^{2-}, mg/l	HCO_3^{1-}, mg/l	Ca^{2+}, mg/l	Mg^{2+}, mg/l
0,1	261	17,7	10,5	-	-	-	-	-
0,5	261	17,7	10,5	8,2	6	167,8	44,1	10,9
1	261	17,7	10,5	-	-	-	-	-
2	261	17,6	10,5	-	-	-	-	-
3	261	17,6	10,5	-	-	-	-	-
4	261	17,6	10,4	-	-	-	-	-
5	260	17,4	10,3	-	-	-	-	-
6	259	17,2	10	8,1	1,5	170,9	44,1	12,2
7	259	17	9,3	-	-	-	-	-
8	258	15,9	6,9	-	-	-	-	-
9	255	14,8	6	-	-	-	-	-
10	239	12,3	0,8	7,65	0	180	44,1	12,2
11	234	11,4	0,4	-	-	-	-	-
12	232	10,9	0,3	-	-	-	-	-

214

13	228	10,2	0,3	-	-	-	-	-
14	227	9,9	0,2	-	-	-	-	-
15	227	9,8	0,1	7,56	0	189,2	44,1	15,8
16	227	9,7	-	-	-	-	-	-

Comments on Table 1: h, m - the measurement depth in meters; æ – the water conductivity, mS/m; T – the water mass temperature at the measurement depth, ° C; O^2 - the oxygen content of the water mass at the measurement depth, mg / l; pH - the water mass acidity at the measurement depth.

As follows from Table 1 the content of bicarbonate ion increases with depth and, correspondingly, CO_3 ion content decreases. The obtained values are consistent with the pH values. The pH increase correlates with the carbonate ion increase and bicarbonate ion reduction in water samples. It should be noted that the content of calcium ion (44.1 mg/l) is higher than the magnesium ion content (10.9 mg/l). Moreover, the content of the magnesium ion increases with the depth, which can be explained by discharges of confined groundwater of carbon deposits into the reservoir.

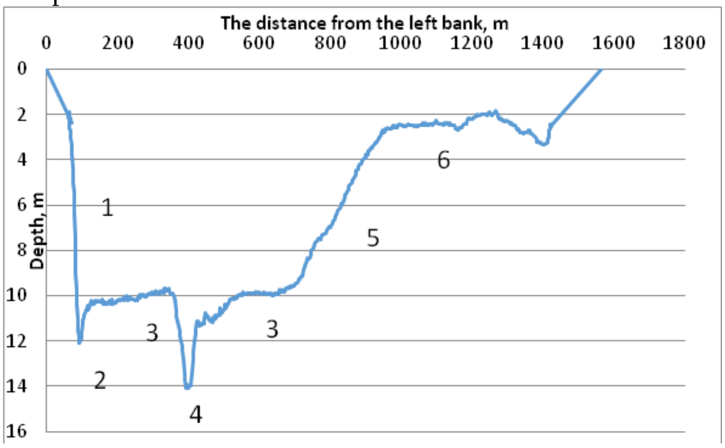

Fig. 1. Cross-section of the bottom relief of Krasnovidovsky Reach

During complex investigations the measurements of depth were made in the cross alignment from the left bank to the right. For ease of processing and analyzing the information the crosssection of the bottom relief was built. There are six forms of relief: 1) native slope, 2) oxbow decrease, 3) high floodplain, 4) watercourse, 5) the slope of terrace above the floodplain, 6) the 1st terrace above the floodplain (Fig. 1). [4]

215

Table 2. The distribution of phytoplankton biomass in the Mozhaisk reservoir, mg/l

Group	Gorki	Bestuzhevo	Dam
Diatoms	1,67	2,21	0,65
Dinophyte	-	0,29	0,47
Green	0,66	0,36	0,18
Blue-green	0,12	-	0,00
Euglenophytes	0,57	0,07	0,02
Total	3,03	2,93	1,32

Along with the hydrological characteristics the hydrobiological characteristics of the Mozhaisk reservoir were analyzed. Table 2 shows that biomass tends to decrease as we move from the upper reservoir to its lower parts. It can be explained by the fact that in the upper reaches of the Mozhaisk reservoir the depth is much smaller, and therefore the temperature of the water mass and the amount of incoming sunlight are higher creating favorable conditions for photosynthesis.

At all the stations phytoplankton biomass content was significantly less than 5 mg/l (Table 3). These values are usually observed in mesotrophic waters. The diagram shows that blue - green alga makes up a very small part of the total biomass at Stations 1, 2 and 4, and at Station 3 they are absent. A large amount of blue-green alga results in bloom, so we can conclude that the water in the Mozhaisk reservoir must have been relatively clean at the time of the study. [5]

Table 3. The distribution of phytoplankton biomass within the area of the Krasnovidovskiy Reach, mg/l

Group	Station: 1	Station: 2	Station: 3	Station: 4
Diatoms	0,27	0,52	0,58	0,26
Dinophyte	0,24	0,00	0,53	0,43
Green	0,60	0,95	0,11	0,45
Blue-green	0,02	0,00	0,00	0,03
Euglenophytes	0,38	0,09	0,02	0,24
Total	1,52	1,58	1,25	1,41

Daphnia are predominant in the structure of the zooplankton, they are natural filter feeders. They pass large amounts of water through their bodies, thereby purifying it. Since at the time of the study

216

Daphnia were dominating, you can make the assumption that the quality of water in the reservoir is at an acceptable level.

Table 4. The distribution of zooplankton biomass at the stations within the area of the Krasnovidovskiy Reach, mg/l

Station	Daphnia	Other filter feeders	Cyclops
2	0,59	0,25	0,14
3	0,24	0,44	0,14
4	0,14	0,14	0,07
5	0,27	0,16	0,07

Table 5. Distribution of benthos biomass at the stations within the area of the Krasnovidovskiy Reach, mg/l

station	Oligochaeta	Chironomidae	Others	The total
1	320,0	440,0	280,0	1040
2	80,0	980,0	880,0	1940
3	360,0	5160,0	0,0	5520
4	1680,0	10106,5	280,0	12066,5
5	1118,0	6333,5	20,0	7471,5

Table 5 shows the distribution of benthos biomass. Benthos biomass tends to increase with increasing depth, which is logical. With depth, the sediment layer increases, its composition changes, this causes increase in zoobenthos. Representatives of this species use the bottom sediment as food (these are typically mud, muddy sand or plant debris). Large amounts of sediment are accumulated in the deepest areas. [5]

Conclusions.

Observations at Station 47 show straight temperature stratification, which is typical for summer. A temperature leap is well traced at a depth of 6-9 m.

Phytoplankton is represented by diatom and green algae. There is not much blue-green alga, so it is favorable for water quality. Zooplankton biomass content is low and corresponds to the values observed in mesotrophic waters. Benthos biomass increases with depth as the amount of mud goes up.

The data obtained indicates that the Mozhaisk Reservoir is a basin with a high productivity of benthic fauna, and the average

217

biomass values for each species indicate a favorable state of nutritive base for fish in the reservoir.

References

1. Vagner B. B., Dmitrieva V. T. Ozera i vodokhranilishcha Moskovskogo regiona [Lakes and reservoirs of Moscow region].– M.: MGPU [Moscow State Pedagogical University], 2006. – 76 p.
2. Krasnovidovskaya station. Available at: http://www.geogr.msu.ru/practics/stations/krasn/
3. Khil'chevskii V.K., Osadchii V.I., Kurilo S.M. Osnovy gidrokhimii [Basics of hydrochemistry]. - Kiev: Nika-Tsentr [Kiev: Nika-Center], 2012. - 312 p.
4. About Bathymetry. Encyclopedia, National Geographic Society. Available at: http://education.nationalgeographic.com/encyclopedia/bathymety
5. Alimov A.F., Bogatov V.V., Golubkov S.M.; pod red. V.V. Khlebovicha ; rets.: N.V. Maksimovich, I.V. Produktsionnaya gidrobiologiya [Production Hydrobiology]. RAN, Zoologicheskii in-t RAN, Biologo-pochvennyi in-t Dal'nevostochnogo otdeleniya RAN, Gidrobiologicheskoe obshchestvo pri RAN [Russian Academy of Sciences, Zoological Institute of Russian Academy of Sciences, Biology and Soil Institute of the Far Eastern Branch, Russian Academy of Sciences at the Hydrobiological Society]. - SPb.: Nauka, 2013. – 344 p.

Rios V.N.

EL CONTENIDO QUIMICO DE LOS MANANTIALES DE ALTAY

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Resumen: Los manantiales son las salidas naturales de las aguas subterráneas a la superficie de la tierra. Las aguas subterráneas del territorio de la República de Altai estan difundidas extremadamente con

218

desigualdad. El agua de las fuentes minerales contiene la cantidad considerable de las sustancias disueltas químicas.

Palabras clave: los manantiales, la República de Altai, el contenido quimico

Abstract: Springs are natural remedies of groundwater on the earth's surface. The Altai Republic groundwater resources are extremely unevenly disturbed. Its springs contain a significant amount of dissolved chemicals.

Key words: springs, the Republic of Altai, chemical content

Introducción. La república de Altai es una región montañosa en el centro de Eurasia con el clima moderadamente-continental, es el territorio más montañoso del sur de Siberia. Una de las riquezas naturales esenciales de la república de Altai son sus recursos hídricos. El agua aquí es pura, tiene el gusto insólito y posee propiedades medicinales. [1, p. 9]

La red de los ríos de la República de Altai es muy grande. Por el régimen todos los ríos de la República correponden al tipo "Altáico". Para ellos es característica la alimentación mezclada. El agua se cae a los ríos cuando se derriten los glaciares, la nieve, y también, cuando llueve. Los glaciares juegan un papel importante en la alimentación de los ríos de las regiones alpinas de la Altai Central al mantenet un alto nivel del agua durante todo el verano.

En total en la República de Altai hay más de 6000 manantiales naturales. En la actualidad en el territorio de la República de Altay son estudiadas solo 1500 fuentes naturales. Ahora mismo se estudia la composición química del agua de 270 manantiales [2]. El trabajo se realiza sistemáticamente en los centros de investigacion. La mineralización del agua de todas las fuentes inquiridas está dentro de los límites de 0,01-0,5 mg/dm3. Solamente en la región Kosh-Agachsky se descubrieron 2 fuentes con la mineralización más alta (1,0 mg/dm3).

Métodos y materiales. Este verano, yo con el grupo de los estudiantes de la universidad de Gorno-Altaisk visitamos algunos de los

219

manantiales e investigamos su composición química y los parámetros hidrológicos.

Todos los manantiales que se encuentran se diferencian por la génesis, las condiciones de la salida del agua a la superficie y los rasgos hidroquímicos [3, p.43].

Resultados

Además, los dividimos en siete grupos, en vista del grado de su mineralización y la composición química.

Primer grupo. Las fuentes con la mineralización del agua 0,01 – 0,1 mg/dm3. Son las aguas de la mineralización muy baja, su dureza está dentro de los límites de 0,12-0,58 mg-ekv/dm3, los significados pH componen 6,5-7,5. Son las aguas dulces únicas.

Segundo grupo. Las fuentes con la mineralización del agua de 0,11 a 0,2 mg/dm3. Más a menudo se encuentran en la región Ust-Koksinsky. Los índices de la dureza del agua son 1,4-1,9 mg-ekv/dm3, el nivel de pH está dentro de los límites de 6,7-7,6.

Tercer grupo. Las fuentes con la mineralización del agua de 0,21-0,3 mg/dm3. Están situados en las regiones Ongudaysky y Ust-Kansky. El agua de estas fuentes es más dura: (2,74-3,68 mg-ekv/dm3). Los significados pH son de 7,5 a 8,1.

Cuarto grupo. Las fuentes con la mineralización del agua 0,31-0,4 mg/dm3. Más a menudo se encuentran en las regiones Mayminsky y Ust-Kansky. A este grupo pertenecen las aguas de las fuentes populares en la república: «Arzhan-Suu», «Kyzyl-Ozeksky», «Manzherok», «Cheremshansky», etc.

Quinto grupo. Las fuentes con la mineralización del agua 0,41-0,5 mg/dm3. Estas fuentes en la República se estudian poco. Se encuentran solamente en tres regiones: Mayminsky, Shebalinsky, Kosh-Agachsky.

Sexto grupo. Las fuentes con la mineralización del agua 0.51-1,0 no son caracteristicas para esta república y componen 2,5% de las fuentes estudiadas. Se encuentran en general en las regiones Shebalinsky y Kosh-Agachsky. En el agua de estas fuentes se encuentran más metales, como, por ejemplo, hierro, y por eso, el sabor del agua es peor.

Séptimo grupo. Las fuentes tienen la mineralización más alta: 1,0 mg/dm3. Son extraordinariamente raros en el territorio de la

220

república y se encuentran solamente en la región de Kosh-Agachsky. La dureza está dentro de los límites 16,3-23,85 mg/dm3.

Conclusión

Revelamos que las fuentes termales tienen la más alta mineralización, porque las reacciones químicas allí transurren más intensamente debido a las temperaturas altas.

Referencias

1. Kats, V.E. Rodniki Gornogo Altaya/V.E. Kats // Zvezda Altaya .- 2001. - 23 marta.
2. Yarkina T.V., Volkotrub L.P. Kachestvo pit'evoi vody i zdorov'e naseleniya Respubliki Altai // Byulleten' Sibirskoi meditsiny. – Tomsk, 2009. – T. 8. – № 2. – S. 123-126.
3. Aleinikova V.N., Bol'bukh T.V., Yarkina T.V. Otsenka prigodnosti vodnykh ob"ektov dlya pit'evogo vodopol'zovaniya na territorii basseina r. Katuni // Sotsial'nye protsessy v sovremennoi Zapadnoi Sibiri: materialy nauchno-prakticheskoi konferentsii. – Gorno-Altaisk: RIO GAGU, 2005. – 300 s.

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THE PROBLEM OF WATER SCARCITY

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Annotation: This article is about the problem of shortage of fresh water in developing countries and unlimited consumption in developed countries, consequences of consumption of a huge amount of water and the ways of decision of this problem.

Key words: fresh water, developed countries, developing countries, irrigation, arid zones, water pollution, saving fresh water

Water is the most important resource on Earth. About 70 % of our planet is covered with rivers, lakes, seas and oceans. But 96,5% of it is salty and isn't suitable for drinking and using in economic activities. Only 3,5 % of water is fresh. About 80 % of fresh water is

221

contained in glaciers. And only 1 % of fresh water is easily accessible for people [1].

Fresh water is vital to human. That is why the problem of fresh water in the world every year becomes more and more actual. Water scarcity has been familiar to humanity since ancient times. It became the cause of crises and social disasters. But now the problem has become global. It sweeps almost all countries and continents [2].

Over the past 100 years the consumption of fresh water has increased by 17 times and every year this number rises by 7 %. People use the water for domestic, agricultural and industrial needs. In industry, the use of water is three times higher than its consumption in municipal services. The basic amount of fresh water is consumed by agriculture. The world's population is growing and requires more farm products to feed all the people. The norms of irrigation have increased, because water has to be delivered to the distant places, which contributes to the loss of water. In recent years, only 60% of the amount of water, which is removed for irrigation was used.

Water on Earth is unevenly distributed. About one third of the land area is occupied by the arid zone. Today, North Asia, the Middle East, most of Africa, north-east of Mexico, most of the western states of America, Argentina and Chile, the Australian continent have an unstable supply of fresh water. More than eighty countries in the world feel the lack of fresh water. Often, because of this political tensions are going on between states. Developed countries such as Saudi Arabia and Israel are desalinating seawater and pumping water from underground sources. But incorrect use of groundwater leads to the depletion of their reserves, decreasing the speed from 0.1 % to 0.3% a year. If this rate of consumption of resources remains, after 20 years, some areas will become unproductive.

Surface water of rivers and lakes is the main source of fresh water. The largest consumers of water are India, China, USA, Pakistan, Japan, Thailand, Indonesia, Bangladesh, Mexico and Russia. But even in these regions the problem remains actual. However, in many parts of the world the consumed volume of water has exceeded the permissible value. For example, in the southwestern part of the USA the consumption of water is equal to the average annual flow of the rivers. Almost the entire flow of the Yellow River in China is spent on agricultural irrigation and so it does not fall into the Yellow Sea 260

222

days a year. Similar problems are also observed in other countries. Water ponds in which these rivers flow will dry up and it can lead to the destruction of ecosystems [3].

But most of all the developing countries are affected by the lack of water. Almost one-fifth of the world's population lives in areas where there is a shortage of drinking water. According to the World Health Organization (WHO) in developing countries only 25% of the rural population has reasonable access to the water supply. For example, in Africa in the South of the Sahara almost 340 million people are deprived of the access to safe drinking water. The effects of water shortages can be very different from the deterioration of the living conditions and development of the disease up to dehydration and death. Lack of clean water is forcing people to use drinking water from unsafe sources, which are often dangerous for health. In addition, due to the lack of water people keep water in their homes, which can increase the risk of pollution and creating favorable conditions for the breeding of harmful bacteria. One of the major problems is the problem of hygiene. People can' t bathe, wash their clothes and keep their homes clean. It can lead to the appearance and spread of epidemics, which can be very dangerous for people's lives. Every year almost 3 million of people in the world die from the diseases, connected with the unsafe water [4].

At the same time in developed countries people don`t save water. The average person in the developed country everyday uses about 200 liters of water for personal needs.

Also one of the most important problems is water pollution. Currently, the water pollution in large river basins has reached the critical exponents. The main reasons of pollution are industrial emissions and waste water runoff of fertilizers from the fields, penetration of salt water in coastal zones into aquifers because of pumping groundwater [5].

Scientists say that in the next 25-30 years, the world's reserves of fresh water will be reduced by half. According to estimates, in 2030 approximately 47% of the world's population will be threatened by water shortages. It is expected that in the future water scarcity will cause international conflicts and mass migration [6].

As a result, we need to make efforts to preserve freshwater sources, and to search for possible economically less costly ways to

223

address the lack of fresh water in many countries, both in the present and in the future.

References

1. Zapasy i problemy presnoy vody [Stoks and problems of fresh water] http://www.watermap.ru/articles/zapasy-problemy-presnoj-vody (accessed 20 October 2015)
2. Globalnaya problema deficita presnoy vody [Global problem of deficif of freshwater] http://www.socionauki.ru/journal/articles/129824/ (accessed 20October 2015)
3. Globalnay problema nehvatki presnoy vody [Global problem of water shortage] http://old.rgo.ru/2011/09/globalnaya-problema-nexvatki-presnoj-vody/ (accessed 20 October 2015)
4. Deficit presnoy vody: problemy i sposoby resheniya [Deicit of freshwater: problems and ways of solutions] http://thewallmagazine.ru/lack-of-fresh-water/ (accessed 20 October 2015)
5. Problema nehvatki presoy vody v mire [Problem of freshwater shortage in the world] http://traveltimeonline.com/novosti/problema-nehvatki-presnoy-vodyi-v-mire (accessed 21 October 2015)
6. Zapasy i problemy presnoy vody [Stoks and problems of fresh water] http://www.watermap.ru/articles/zapasy-problemy-presnoj-vody (accessed 20 October 2015)

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HYDROGEOLOGICAL CONDITIONS IN THE TERRITORY OF THE KIZEL COAL BASIN

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Abstract: Spouting of mine water causes environmental pollution on the territory of the Kizel coal basin as acid mine water contains a variety of elements the amount of which is higher than the threshold limit value for water bodies.

Key words: coal, mine water, groundwater, threshold limit value.

224

The Kizel Coal Basin is situated on the territory of Perm region, the western Ural. The area of the basin is about 200 sq. km, the geological folded area is formed of the Middle Devonian, Carboniferous and Lower Permian rocks. This region contains karst deposits, including rocks of the Silurian, Devonian, Carboniferous and Lower Permian periods. The total thickness reaches 4,000 m. Geologic deposits are situated inside the depressions of karst and erosion. They are also connected with the overlapping of different kinds of karst, mainly suballuvial. The deposits of limestone, sandstone, quartz and dolomite are forming the geological structure of the depressions near mines [1, p. 215].

Hydrodynamic conditions of the surface and underground waters have been changed due to introduction of circulating water supply systems and exploitation of the hydraulic units. Bogging and underflooding of the territories are determined by the spillage of underground waters. Chemical suspension can change both the river course profile and the granulometric content of the bottom sediments. In addition, these processes contribute the current of the surface and underground waters to the underlying aquifers within river valleys in karst zones. The ecological situation of the region becomes worse as the contamination of the surface and groundwater is connected with mining and extraction of coal. Moreover, intensive weathering of the minerals is observed in the excavation dumps as physical and chemical conditions are changing. The interaction between the rock dumps and atmospheric precipitation forms chemicals that reach the underground water [1, p. 216].

A characteristic feature of the Kizel basin during its operation is the formation of large volumes of acid mine water containing a variety of contaminants in amounts many times higher than the threshold limit value (TLV) for water bodies. All surface water bodies in the basin and major rivers in Perm region were polluted by the spillage of mine waters [2, p. 1].

The coal horizons in the Kizel Coal Basin differ from other basins in the region as they contain high levels of sulphur (mainly as pyrite) (5.8%) and ash (21.5%). The mine water chemistry is largely dependent on the levels of sulphur, carbonate, and trace elements found within the carboniferous strata. The concentration of more than 4% pyrite results in high acidity (pH=2-3) and sulfide chemistry [1, p. 218].

225

The composition of mine waters and runoffs from dirt piles to the river network is rather close to each other. The content of chemical substances such as hydrocarbonate calcium and mineralization is about 250 mg/l, pH = 6-8. These features describe the natural condition of the water in the river. In the area of contamination the water mineralization reaches 2 g/l, the content of sulphate-ion is increased and the potential of hydrogen decreases.

Wastes of mining from spoil tips are stored on river banks and fall into the bottom resulting in the presence of minerals not typical of alluvium under the natural conditions. In the area of the waste bank the composition of chemicals is the following: pyrite (3-13%), jarosite (up to 4%), geothite (up to 4%), magnetite (up to 4%). Also magnetite (1-2%), haematite (1%) were found below the mining boundary. The process of carbonization predominantly occurs in the estuary of the rivers. The presence of siderite and alluvium is also found in the rivers of Kizel. The secondary water pollution is characterized by accumulation of technogenic bottom sediments.

Therefore, the Kizel Coal Basin mining as well as coal processing industry development results in the remarkable change of water chemical composition and bottom sediments of local rivers [3, p.143].

One of the methods to reduce the negative consequences of acidic mine waters spouting is usage of artificial geochemical barriers. For purification of mine water in natural conditions it is proposed to use the wastes of soda production. When acid discharge reacts with alkaline waste, pH increases due to reaction with carbonate and hydroxide of calcium. This in turn decreases the concentrations of Fe, Al, Mn, Co, Zn, Cu, Ni, Pb, Cd, Ti, and other elements resulting in the neutralization of the acid water [1, p. 219]. Studies have shown that using alkaline waste can increase pH of mine water to neutral values. The content of other pollutants is reduced to allowable concentrations.

The most widespread method of reducing the negative impact of spoil dumps on the environment in the coal industry is planting of greenery on a dirt pile. There are also some methods of microbiological reclamation of spoil heaps. However, these methods require additional measures because of intensive development conditions of the sulfuric acid process in the Kizel coal basin. It is necessary to decrease the

226

acidity, and localize spread pollutants from the surface runoff and groundwater.

The laboratory method of mine water neutralization is based on the addition of 5% lime solution to samples of acid mine waters, which are bottled in measuring cups of 500 ml or 1000 ml. Samples of mine water were taken from spouting of Gubakha and Gremyachinsk towns, “Lenin” and “ 40 l. VLKSM” mines. The volume of lime solution increased in each following sample of mine water. Preliminary research on mine water of Gremyachinsk town determined the optimal amount of added lime solution in the mixture.

The results of the experiment and the dynamics of the neutralization process determine the necessity of studying the composition of the mixture and the precipitate after the decantation. This data would assess the efficiency of the neutralizing method of the acidic waters of the Kizel field.

References

1. Maximovich N.G., Khayrulina E.A. Geochemical Barriers and Environmental Protection. 2011, pp. 215-219.
2. Imaykin A.K. The Main Directions of Research on Hydrosphere of the Kizel coal basin. 2014, p. 1.
3. Maximovich N.G., Blinov S.M., Menshikova E.A. The Influence of the Kizel Coal Basin on the River Ecology Conditions. 2010, p. 143.

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CAMBIO CLIMÁTICO Y SUS EFECTOS EN GUATEMALA

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Resumen: Guatemala al igual que todos los países del istmo centroamericano contribuye en mínima parte a la emisión de gases de efecto de invernadero (GEI), que se consideran la causa del calentamiento global. Sin embargo, es una de las regiones más vulnerables al cambio climático, debido a que está sufriendo los efectos de fenómenos hidrometereológicos, que cada vez son más frecuentes e

227

intensos, provocando sequías e inundaciones y disminuyendo la disponibilidad de agua.

Palabras clave: hidrometeorológicos, gases de efecto invernadero, cambio climático.

Abstract: Guatemala as all Central American countries contributes a minimum part in the emission of greenhouse gases (GHG) that are considered the cause of global warming. However it is one of the most vulnerable regions to climate change, suffering from the effects of hydro meteorological phenomena that are increasingly frequent and intense, causing droughts and floods, and therefore water availability decreases.

Key words: hydrometeorology, greenhouse gases, climate change.

Con el calentamiento global, quien es más afectada con los efectos de los eventos extremos, es la agricultura, ya que más del 80% depende de la lluvia. De acuerdo con los cálculos de la CEPAL , se estima que los daños que provocó el huracán Mitch (1998) fueron de 748 millones de dólares; 40% son daños directos al sector productivo concentrados en su mayoría en la agricultura. La tormenta Stan (2005) dejó pérdidas por unos 837 millones de euros. Y según el informe presentado en el marco de la XVII Conferencia de Naciones Unidas sobre Cambio Climático por Germanwatch, la tormenta Agatha (2010) y la erupción del volcán de Pacaya dejaron perdidas económicas por Q 12 mil millones equivalentes al 4.1 de ingreso al Producto Interno Bruto –PIB-. Asimismo, el informe contiene los daños causados por la tormenta 12-E (2011) con más Q 500 millones. A esto se debe sumar las perdidas por los centenares de personas fallecidas y los millones de personas damnificadas.

Desde 1998 a la fecha, cuatro fenómenos naturales han afectado al país, dejando pérdidas económicas de aproximadamente Q 23 mil millones, lo que refleja el incremento en la frecuencia de eventos como tormentas y huracanes, causando daños al sector social (salud, educación y vivienda), al sector productivo (agricultura, ganadería, comercio, industria y turismo), de infraestructura, al medioambiente y al patrimonio cultural; poniendo en duda la viabilidad económica y social del país. Los efectos del cambio climático impactan más a la economía campesina, ya que con lluvias, heladas, vientos huracanados

228

o sequias pierden sus cosechas, como sucede en el presente año en el cual ha ocurrido el fenómeno de canícula extendida y se perdieron las cosechas en el oriente del país que es altamente dependiente de la lluvia, afectando la generación de empleos y poniendo en riesgo la seguridad alimentaria.

En el corredor seco se estima que más de 1 millón de familias viven de la agricultura de subsistencia y por lo tanto, están menos preparados para enfrentar los efectos extremos, como la sequía de este año. La capacidad de resiliencia del área rural es menor, según datos de la Comisión Nacional para la Reducción de Desastres (CONRED) indican que más de 170,000 personas continúan viviendo en zonas de alto riesgo que se han visto afectadas por eventos extremos como huracanes. Debido al empobrecimiento de los suelos causada por los eventos extremos los campesinos buscan nuevas tierras para cultivar talando bosques, y esto aumenta los riesgos cuando ocurren eventos extremos.

El cambio climático ha ocasionado disminución en la producción y en los rendimientos de la agricultura. El cambio climático y la variabilidad climática han alterado los patrones de precipitación, afectando directamente al sector agrícola, pero aún más a la agricultura familiar que es dependiente del agua pluvial, perdiendo productos por la fuerte actividad de la lluvia, como el año pasado y por la sequía, como el año en curso. La población más pobre es la primera en sufrir los efectos, aunque toda la población es víctima de estos sean directos o indirectos. La situación se debe básicamente, a la desregularización del ciclo hídrico, el acelerado proceso de pérdida de cobertura forestal, la agricultura migratoria, la producción de agro combustibles y de otros productos de exportación.

Muchos no ven el cambio climático como un problema, mas sí como una oportunidad de negocio para la industria química; manifestando que la industria química ayudará a crear un mundo mejor, que esta industria será la más importante, ya que estará en el corazón de la economía, innovación y la tecnología. Al estar en riesgo la seguridad alimentaria de la población, se hace necesaria la búsqueda de opciones tecnológicas y prácticas que permitan hacer frente a los retos que impone el cambio climático y la variabilidad climática, y crea la necesidad de impulsar una transición a una economía que contamine menos, haciendo uso eficiente y adecuado del agua. El cambio

229

climático está a las puertas de una nueva revolución industrial, el desafío de esta generación es la disminución de CO2, cambiar el tipo de energía que se utiliza, garantizar la seguridad alimentaria, evitar la deforestación y lograr un desarrollo humano más equitativo.

Para lograr mayor efectividad es necesario que todos los sectores de la sociedad tengan objetivos comunes y superar las barreras que los separan, pero mientras esto llega es urgente implementar medidas de adaptación al cambio climático, ya que no se puede dejar de lado la desnutrición que la sequía ha provocado en el corredor seco del país, específicamente en los municipios de Jocotán y Camotán, debido a los cambios que experimenta la temperatura que durante el día es de aproximadamente 25°C y por las noches presenta fuertes lluvias.

La eterna primavera está desapareciendo, debido a que el país verde con excelente clima todo el año, es uno de los más vulnerables a los efectos del cambio climático que afecta a nivel global. Sin contribuir significativamente en las emisiones de GEI estamos recibiendo sus efectos con más frecuencia, con una tendencia a agudizarse en los próximos años causando el deterioro de nuestra riqueza natural y belleza de paisajes, pero sobre todo a sufrir eventos extremos causando pérdidas de seres humanos que no cuentan con lo necesario para enfrentar sus efectos. Por lo que insto a los países que participaran próximamente en la COP en Francia a reconocer que nuestro país es uno de los más afectados por el cambio climático, a brindar apoyo para fortalecer las instituciones y prepararse para enfrentar los efectos de los eventos extremos provocados por el calentamiento global. Si todos somos parte del problema todos debemos ser parte de la solución.

Referencias

[1] Informe presentado en el marco de la XVII Conferencia de Naciones Unidas sobre Cambio Climático por Germanwatch. Durban

[2] Resumen de los daños extraído del Informe Guatemala: Evaluación de los daños ocasionados por el huracán Mitch, 1998. Naciones Unidas. Comisión Económica para América Latina y el Caribe–CEPAL, México, febrero, 1999.

[3] XXVIII Congreso Colombiano de Ingeniería Química, Bogota. Octubre de 2015.

230

SOIL CONTAMINATION AND LANDSCAPE RESEARCH

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PROTECTION OF THE GREAT BARRIER REEF

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Abstract: The efforts of the Australian government for conservation of the Great Barrier Reef are considered. Attention is drawn to the necessity of implementing the Reef 2050 Long-Term Sustainability Plan.

Key words: Australia, the Great Barrier Reef, Reef 2050 Plan, Australian Government, the World Heritage List.

The Great Barrier Reef is the greatest coral reef ecosystem on Earth. We can say that the Great Barrier Reef is one of the best managed marine areas in the world. At 348 000 square kilometers, the reef is one of the wealthy and most diverse natural ecosystems on Earth. 3000 coral reefs produce a maze with 1050 islands, which stretches for 2300 kilometers along Australia's north-east coast.

It is the largest complex of coral reefs in the world. It consists of some 400 species of corals in 60 genera. The difference of depths comprises vast shallow inshore terrains, mid-shelf and external reefs, and beyond the continental shelf to oceanic waters over 2,000 meters deep. The latitudinal and cross-shelf diversity, combined with diversity through the depths of the water column, contains a globally unique set of ecological communities, species and habitats. There are 4000 species of mollusk, about 400 species of coral, some 240 species of birds, over 1500 species of fish, plus a great diversity of anemones, crustaceans, marine worms, sponges, many species of marine algae and mangroves. Waters of the Great Barrier Reef are feeding grounds for populations of the threatened dugong. In addition, these waters are home for 30 species of whales and dolphins, and it is the area for humpback whale calving. [1] It is home to six species of marine turtles. Green turtle

231

breeding site is at Raine Island. The Australian government is taking a number of steps to ensure water quality; coastal development; fishing; collection of marine debris. [2]. There was a restoration of algae in some regions. Saving the Great Barrier Reef is possible only with concerted international efforts and Australian government action to build reef resilience by reducing impacts. Huge funds were aimed at studying the unique nature of the reef. The collection of scientific information about the environmental safety of the Reef are undertaken by various organizations, including research institutions and government agencies such as the Australian Institute of Marine Science, the Centre for Marine Studies at the University of Queensland, CSIRO, and the Queensland Department of Agriculture, James Cook University, the ARC Centre of Excellence for Integrated Coral Reef Studies, Fisheries and Forestry. The Australian government has developed a long-term sustainable development of the Reef 2050 Plan. It includes cooperation with science, industry and the community. The Plan has seven overarching themes reflecting the priorities for action – ecosystem health, water quality, economic benefits, biodiversity, community benefits heritage, and governance. The Plan envisages that the improvement of water quality and biodiversity of the Great Barrier Reef will be achieved by reducing the harmful effects of climate change and anthropogenic factors. Managers have a critical role in ensuring that commercial and recreational fishing are ecologically sustainable in the Great Barrier Reef. [3]

Recreational fishing is one of the most significant recreational activities undertaken in the Great Barrier Reef. Ecosystem effects and cumulative impacts of this activity are poorly understood, but are likely to be most concentrated in inshore areas close to major population centres. Specific programs to collect fisheries information are in place including biological monitoring, stock status process, recreational surveys, log books for Species of Conservation Interest (including turtles and dugong), quotas, vessel monitoring systems, licencing, and Performance Management Systems. In addition, the government has tightened measures against poaching, thereby increasing protection of marine turtles and dugongs, developed program additional funding to reduce marine debris.

Over recent years Australians have halted and reversed the decline in water quality in the Reef's catchments. The Reef Water

232

Quality Protection Plan plays a fundamental role in securing the health and resilience of the Great Barrier Reef and adjacent catchments. Improving water quality builds resilience in inshore coastal and seagrass areas which support significant biodiversity such as turtles and dugongs, and drive fisheries productivity. Water quality is a major stressor to the reef that can be addressed at a local scale to improve its resilience to other stressors such as climate change and increasing intensity of extreme weather events. Based on monitornig average annual pesticide load decreased by 28%, the load of total nitrogen by 10%, of dissolved inorganic nitrogen by 16%, the sediment load was reduced by 11% compared with 2009 base year. [4] In the framework of the implementation of the Reef 2050 Plan Australian Government has committed $140 million to the Reef Trust to provide innovative, targeted investment focused on improving water quality, restoring coastal ecosystem health and enhancing species protection. The main activity of Reef Trust is to develop mechanisms to assist in the delivery of the Reef 2050 long term sustainability plan and will focus on known critical areas for investment such as: improving water quality and coastal habitat along the Great Barrier Reef; protection of threatened and migratory species, particularly dugong and marine turtles; monitoring the current outbreak of crown of thorns starfish which destroy the coral. [5]

The implementation of the New Reef 2050 Plan will preserve for future generations the unique biota of our planet. Joint activity of the Australian Government, the scientific community, industry, traditional owners, community will strengthen and sustain the ecological health of the Reef and to ensure its sustainable development.

References

1. Woolf A. Sailing the Great Barrier Reef, 2014
2. Milman O. Clive Palmer's nickel refinery pumped toxic waste into Great Barrier Reef park, 2014
3. WWF – The Great Barrier Reef. Retrieved from: http://www.wwf.org.au/our_work/saving_the_natural_world/oceans_and_marine/priority_ocean_places/great_barrier_reef/
4. The Great Barrier Reef | australia.gov.au Retrieved from: http://www.australia.gov.au/about-australia/australian-story/great-barrier-reef

233

5. The Great Barrier Reef World Heritage Area, Queensland – Overview. Retrieved from: http://www.environment.gov.au/heritage/places/world/gbr

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ASSESSMENT OF CHEMICAL CONTAMINATION OF PLAYGROUND SOIL IN MOSCOW

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Abstract: Soil in large cities is one the components which are most exposed to the negative impact of environment. It accumulates a variety of pollutants, particularly petroleum hydrocarbons (PHC) from fixed (plants) and mobile contamination sources (vehicles).

Keywords: assessment of contamination, chemical contamination, soil, sand, playgrounds, petroleum hydrocarbons, infrared spectrophotometry.

According to the Mosekomonitoring data, in 2013 the average content of PHC in Moscow soils was 332.5 mg/kg; the maximum content was 2872 mg/kg of dry soil [1], while the standard content (calculation of economic damage of lands) is 300 mg/kg [2]. The aim of the research was to analyze the degree of PHC contamination of playground territories located in three administrative districts of Moscow. Playgrounds were selected as areas of high risk for human health [3], because PHC contaminated soil may have allergenic, toxic and carcinogenic effects, especially on children. Petroleum hydrocarbons can get into children's organisms with soil particles during their games on playgrounds and in sandboxes. From 2012 to 2014 the Department of Housing and Public Utilities and Amenities of Moscow held a reconstruction of playground areas - the soil was replaced by a soft rubber coating on the basis of crumb rubber. This

234

was done to reduce the intensity of soil contamination and accumulation of PHC on open ground areas. With regard to the sand, according to the regulatory documents, sand of sandboxes must be replaced regularly (3 times a year) for the prevention of pollution [4]. However, this rule is often ignored in real life. Therefore sand in sandboxes is potentially dangerous for children. Sampling sites were established on the territory of 3 administrative districts of Moscow characterized by a different kind and intensity of human impact. Khamovniki District of the Central Administrative Area (CAA) is characterized by a high traffic density. Kapotnya District of the South-Eastern Administrative Area (SEAA) has a stationary source of PHC - Moscow Oil Refinery (MOR). Voronovsky District of Troitsky SA (TAO) was selected as a conditionally clean residential territory where the above factors are excluded. Totally we screened 9 sites and selected 11 samples of sand and sandy soils: 8 samples of sand from sandboxes, two soil samples and one sample of relatively clean sand as a control one from a quarry in Mozhaisk, free from human impact of any kind. If soft rubber coating was absent on the playground soil samples were taken from the places children were most likely to contact with (descent from the hills, around the swing). All playgrounds were located at different distances from the roads - from 10 to 50 meters.

Analytical research was conducted at the Laboratory of Soil Hygiene, FGBI "Scientific-Research Institute of Human Ecology and Environmental Hygiene named after A.N. Sysin" of the Ministry of Health of the Russian Federation.

Measuring PHC content in the samples was conducted by the method of infrared spectrophotometry.

The results obtained showed that the sands and soils of all the playgrounds in question were contaminated by PHC, though the degree of PHC contamination varied. Thus in almost all the samples the content of toxic agents does not exceed the limit values (300 mg/kg), but is significantly higher than the control sample.

The highest concentration of PHC (706.5 mg / kg) was found in the soil of the playground, situated at 12, the2nd Quarter of Kapotnya, SEAA. It is the only sample where the pollutant content was significantly higher than the MPC, almost 2.4 times, which can be explained by the close proximity of the playground to the Moscow Oil Refinery (MOR) and a sufficiently long period of the exposure.

235

It should be noted that the ground soils are much more polluted by PHC than the sand from the sandboxes on the territory of the same playground. Thus, in the Central Administrative District contaminant concentration in soils was 173 mg/kg, which is 15.2 times higher than in the sandbox. A similar pattern is observed in the SEAA where PHC excess in soils is 6.4 times higher as compared to the sand.

In general, the high content of PHC in the sand in comparison with the control value can be explained by the proximity of playgrounds to highways and parking lots, and emissions of pollutants from vehicle exhaust gases.

We have also observed considerable impact of barriers (houses, green areas) on PHC concentrations in soil and sand. If a playground is protected from the nearby highway or parking lot the content of PHC in the sand would be several times lower than on a similar site without any barriers.

References

1. Doklad o sostoyanii okruzhayushchei sredy v gorode Moskve v 2013 godu [The report on the state of the environment in Moscow in 2013] Pravitel'stvo Moskvy, Departament prirodopol'zovaniya i okhrany okruzhayushchei sredy goroda Moskvy [The Moscow City Government, Department of Natural Resources and Environmental Protection of Moscow City] under the total. Ed. A.O. Kulbachevsky, Moscow: «LARK LTD» Publ., 2014, 222 p.

2. Postanovlenie Pravitel'stva Moskvy ot 22 iyulya 2008 g. N 589-PP "Ob utverzhdenii Metodiki otsenki razmera vreda, prichinennogo okruzhayushchei srede v rezul'tate zagryazneniya, zakhlamleniya, narusheniya i inogo ukhudsheniya kachestva gorodskikh pochv" [Resolution of Moscow Government of July 22 2008 N RG-589 "On approval of the assessment methodology the amount of damage caused to the environment due to pollution, littering, violation and other degradation of urban soils"] Moscow, 2008.

3. MU 2.1.7.730-99 Metodicheskie ukazaniya "Gigienicheskaya otsenka kachestva pochvy naselennykh mest" [MI 2.1.7.730-99 Methodical instructions " Hygienic evaluation of soil in residential areas"] Minzdrav Rossii [Ministry of Health of Russia] Moscow, 1999.

4. Sanitarno-epidemiologicheskie pravila i normativy SanPiN 3.2.3215-14 "Profilaktika parazitarnykh boleznei na territorii Rossiiskoi

236

Federatsii" [Sanitary-epidemiological rules and norms N 3.2.3215-14 "Prevention of parasitic diseases on the territory of the Russian Federation"] Minzdrav Rossii [Ministry of Health of Russia] Moscow, 2014.

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LANDGEWINNUNG NACH DER ÖLVERSCHMUTZUNG

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Annotation: Ölverschmutzung beeinträchtigt die Umwelt. Um das Problem zu lösen, gibt es Landgewinnung.

Stichwörter: Autonomer Kreis der Chanten und Mansen, Kohlenwasserverschmutzung, Landgewinnung, Ölverschmutzung

Abstract: Oil pollution negatively affects the environment. Land recultivation could be an appropriate solution of this problem.
Key words: Khanty-Mansi Autonomous Area, man-made pollution, oil pollution, recreation.

Der Zweck dieser Arbeit herauszufinden, worin die Gefahr von Ölverschmutzungen besteht, und welche optimale Möglichkeiten es gibt, um die etstehende Verseuchung des Bodens zu beseitigen. Es wurden folgende Aufgaben gestellt: zu bestimmen, wie die Ölunfall passiert, indem ich eigene Erfahrung verwende; negative Auswirkungen der Ölverschmutzung auf Ökosysteme; die Methoden der Sanierung verseuchten Bodens vorzulegen. Unter der Ölpest ist gemeint, Öl in die Umwelt zu gelangen. Dazu gehören auch Unfalltanker, Ölplattformen, Bohrinseln, Brunnen, Emissionen von nach der Ölraffination entstehenden Stoffen. Einer der Hauptgründe von Überläufe in der Öl- und Gassektor nehmen den zentralen Platz [2]: ein hohes Maß an Verschleiß der Produktionsanlagen; ungenügende Qualität der Projektdokumentation; Mangel an Erfahrungen; Nicht genüg Geld zur Verfügeung stellen, um die Unfälle rechtzeitig zu beseitigen.

237

Es gibt Ölverschmutzungen verschidener Art. CMA Kohlenwasserverschmutzung - eine der wichtigsten Umweltprobleme des Regions. Ölflecke befinden sich sowohl an Gewässern als auch auf dem Boden. Darunter leiden jeweilige Ökosysteme. Verletzt werden Nahrungsketten, Lebenszyklen von Tieren, Pflanzen, Fische, etc. Es wird auch Gewohnheiten von Lebewesen geändert. Fische leiden darunter besonders. Nach Angaben von "Rosneft" AG tretenÖlunfälle ständig auf. Das Öl wirkt auch sich auf die Flora, die Atmosphäre und etc.[3]. In diesem Zusammenhang möchte ich eine Statistik zeigen, die während des Praktikumsbei der Sanirung verseuchten Bodens in der CMA gewonnen wurde. Es ist notwendig, auf die Tabelle 1 Aufmerksamkeit zu schenken [1].

Tabelle 1 Sanierung von kontaminierten Flächen von Öl-und Gasunternehmen in der Autonomen Regions, ha [1]

Betrieb	Kumulierte verschmutzte Flächen im 01.01.2014		Gegründet verschmutzte Flächen im Jahr 01.01.2014		Kommission im Jahr 2014 angenommen und saniert	Kumulierte verschmutzte Flächen am 01.01.2015	
	Erdöl und Erdölprodukte	Auftriebwasser	Erdöl und Erdölprodukte	Auftriebwasser		Erdöl und Erdölprodukte	Auftriebwasser
OAO "LUKoil	160,8	12	1,9	0,2	32,4	137,7	9,4
OAO "Surgutneftegaz"	4,6	0,11	0,5	0,05	0	5,1	0,16
OOO "RN-Yuganskneftegas	1089,7	583,5	110,7	119,5	3,6	1200	703
Filial «RN-	1939	498	25,5	8,2	118	1881	505

238

Management» «West-Sibirien»							
OAO "NK-Slavneft	7,6	0,003	1,4	0,85	1	8	0,9
OAO "Tomskneft"	52,4	0,23	17,9	0,24	2,8	70,4	0,38
OAO "Gazprom Neft"	20,7	0,15	0	0	0	10,74	0,15
OAO NK "RussNeft"	30,5	0,11	0,226	0	3,3	28,6	2,3
Andere Unternehmen	108	0,02	0,05	0	5,2	103	0,02
Insgesamt für den CMA	3414	1094	158	129	166	3445	1222
	4508		287			4668	

Bei langfristigen Zeitraum von maximalen Akkumulationsbereiche von Altlasten (7045 Hektar) auf dem Territorium von Autonomer Kreis von Chanten und Mansen wurde im Jahre 2006 beobachtet. Weiter kommt eine Abnahme bis zum Jahr 2015. Heute ist es 34%. (2377ga).

Auf dem Gebiet des Kreises passiert Renaturierung ab Baubeginn von Ölanlagen. Spricht man über Rohrleitungen, sollten Pipelinetrasse saniert werden. Dies wird volgenderweise durchgeführt: die fruchtbare Bodenschicht entfernt wird und in einem temporären Deponien entlang des Streifens der Konstruktion innerhalb der vorgegebenen Entladungsstandards gespeichert befindet und zur Rückgewinnung nach dem Ende der Bau- und Planungsarbeiten verwendet wird. Maßnahmen sind: Baumaterialienentfernung, Entfernung auf dem Baugebiet aller Einrichtungen; Rückkehr des Bodens für das Schaffen einer glatten Fläche; die Zerstreuung der restlichen Böden auf den rekultivierten Flächen oder Transportierung

239

ihn in speziell ausgewiesene Gebiete laut dem Projekt; Maßnahmen, um Erosion zu verhindern; Deckung der rekultivierten Flächen mit der fruchtbaren Bodenschicht. [2] Beim Bohren von Brunnen müssen Wasserreservoir zum Speichern von Waschflüssigkeiten und Akkumulieren ersten Ölproben und Kondensat erzeugt werden. Die Reservoire, die in der Bodenvertiefung sein müssen, müssen ekraniert werden. Dann müssen folgende Maßnahmen gertoffen werden: Die Entfernung von Brunnenbau, Bauschutt, Erdölprodukte und die bei der Bohrung verwendete Materialien in der vorgeschriebenen Weise; Befüllen von Reservoiren und die Oberflächeplanung; Durchführung der notwendigen Meliorasations- und Erosionsschutzanlagen; Bedeckung der Oberfläche mit einer fruchtbaren Schicht des Bodens; Bei der Landgewinnung von Bodenflächen, die von Erdöl, Erdölprodukte und Ölfeldabwasser verunreinigt wurden, muss man notwendige Maßnahmen zum Umweltschutz treffen: den Abbau von Erdölprodukten beschleunigen; Kochsalzlösung und alkalischen Böden beseitigen. Alle Prozesse entsprechen dem Staatlichen Standard, und zwar[2]: 17.5.3.04-83, 17.4.3.02-85

Literaturverzeichnis

1. OAO "RN-Nyaganneftegaz" Teil des Berichts von 2014 bis 2015 Jahr.
2. [2] S. Chernyaev Arbeitssicherheit, M: Russische Universität für Völkerfreundschaft, 2008 - 431 s.
3. [3] Chaustow A.P, M.M Redina Operations Management in der Öl- und Gassektor, M: Russische Universität für Völkerfreundschaft, 2008 - 255s.

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ENVIRONMENTAL ASSESSMENT OF SOILS FROM THE STATE NATURE RESERVE "VISHERSKY"

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Abstract: The results describing the state of the soils of «Vishersky» reserve are presented. The assessment of heavy metal content and soil

240

acidity was conducted within the research. The bioassay tests on Daphnia magna and Chlorella vulgaris were performed as well. The data from geochemical analysis and bioassay tests along with cumulative soil contamination level was acquired. The results of correlation analysis between determined parameters are depicted and the correspondences between some of them were determined. The conclusion is that there is no significant anthropogenic impact on the soil cover of the reserve, and that on the total index of pollution values are at an acceptable level.

Key words: bioassay, geochemical analysis, correlation analysis, soils, heavy metals, ecological monitoring, Chlorella vulgaris, Daphnia magna

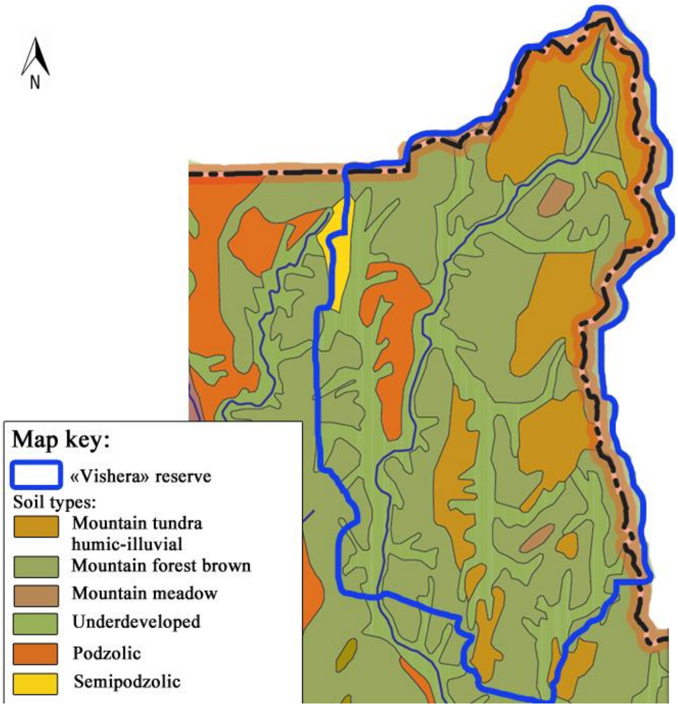

Figure 1. The soils of the reserve «Visherskiy»

The specially protected natural area of the State natural reserve (SNR) «Vishersky» is located in the extreme North-East of the Perm Region, in the upper reaches of the Vishera River. According to the soil map of the Urals [4, p.10] the following types of soils are distributed in the reserve: mountain-tundra soil in combination with mountain forest tundra soil, mountain-meadow-forest soil and typically meadow soil, mountain forest acid nonpodzolized soil, mountain podzolic soil. Map of soils [2, p.38], published in the Atlas of the Perm Region in 2012 distinguishes 6 types of soils: mountain tundra humic-illuvial, mountain forest brown, mountain meadow, underdeveloped, podzolic and semipodzolic soils (Figure 1). The largest area is covered by mountain forest brown and mountain tundra humic-illuvial soils. It is necessary to organize systematic observations for the state of the protected areas [1, p.3], an important part of monitoring is assessment of the state of the soil cover. Soil is a very specific component of the biosphere because it not only accumulates pollution components, but also acts as natural buffer controlling the transfer of chemical elements and compounds in the atmosphere, hydrosphere and living matter [3, p.15].

The purpose of the study was to assess the ecological state of soils of the SNR «Vishersky» using the methods of geochemical analysis and biotesting

Materials and methods. The experimental part of the work includes several stages: selection, preparation, sample analysis and processing of obtained results. Route of the study was maped through the ecological trail of the Vishersky nature reserve from the cordon Lyp'ya to the top of the Tulymskiy stone. The reserve «Vishersky» is of special scientific interest for soil quality investigation and has practical importance for development of recommendations for future use of bioassays during an environmental assessment and its combination with the geochemical analysis of soil.

Sampling plots were laid on the territories of different plant communities. All of them were laid on 9 testing sites (Figure 2). Preparation of samples for analysis, bioassay, determination of heavy metals and the reaction of soils was carried out with standard methods [6,7] on the basis of the laboratory of ecology and nature protection PSNRU. During the bioassay we used two test objects: *Daphnia magna* and *Chlorella vulgaris*. From the results of biotesting the value of toxic dilution ratio (TDR) and the value of harmless ratio of dilution in 48-

242

hour experiment with 10% death rate (HRD) were calculated for *Chlorella vulgaris* and *Daphnia magna* respectively. Determination of heavy metals content in soil samples was carried out with the wavelength dispersive X-ray fluorescence spectrometer "SPECTROSCAN MAX G". Reaction of the soils was measured with multi-parameter instrument Multi 350i.

Results and discussion**.** Table 1 presents the results of analysis of heavy metals content. The results of biotesting showed that in all experiments with *Chlorella vulgaris* as a test object more than 30% growth stimulation was observed. The index of the percentage deviation from the control has a negative value in all cases. It was found that *Daphnia magna* as the test object did not reveal toxicity of the soil samples studied in all experiments.

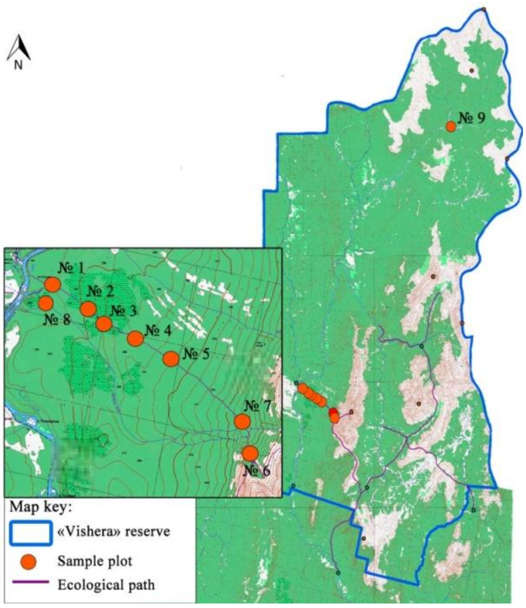

Figure 2.The map of the sampling sites in the reserve «Vishersky»

243

Table 1 The content of heavy metals, mg/kg

Sample plot	Sr	Pb	As	Zn	Cu	Ni	Co	Mn	Cr	V	Ti
№1	72	17	6	92	45	35	13	550	135	107	8373
№2	106	23	8	68	42	34	13	627	131	80	6963
№3	106	18	7	59	47	30	12	545	143	89	9380
№4	122	21	10	50	47	29	9	384	129	96	9130
№5	89	13	7	47	46	29	11	522	128	102	9387
№6	50	16	3	25	44	32	33	116	165	51	7533
№7	46	12	6	23	44	16	1	142	118	71	8857
№8	68	11	9	79	45	35	13	479	139	113	9257
№9	73	24	5	64	47	34	10	396	162	128	1234

The contradictory character of the data received should be noted: the aqueous extract had no toxic effect on *Daphnia magna* and, on the contrary, toxic effect of more than 30% growth stimulation was observed in varying degrees in all experiments on *Chlorella vulgaris*.

Thuswise, comparable values of the TDR and the HDR were found only in soil samples from sampling sites № 2-5 (Figure 3). It is important to emphasize that the difference in the results of biotesting is addressed to the fact that the test objects belong to different groups of organisms, different test functions and test reactions. For biotesting on *Chlorella vulgaris* the reproductive function is considered, and the test response is its inhibition (20%) or stimulation (30% and more). For biotesting on *Daphnia magna* the test function is the viability of these crustaceans, and the test reaction is expressed by their mortality (less than 10% - toxic effects, more than 50% - acute toxic action) due to their exposure to hazardous substances.

The study on identification of the degree of toxicity of soil samples taken on the territory of the state nature reserve «Vishersky» showed that their aqueous extracts exhibit toxic effects on *Chlorella vulgaris* in the form of stimulating growth (more than 30%), with the greatest toxicity and magnitude of the TDR in marked test areas №1 and № 4. The lowest TDR is marked on the sample plots № 3 and № 5. In contrast, this toxic effect has not emerged during testing the water extracts of studied soils on *Daphnia magna* that may be due to its greater resistance to chemical substances. According to the data of

244

heavy metals content in the soils obtained the coefficients of concentration

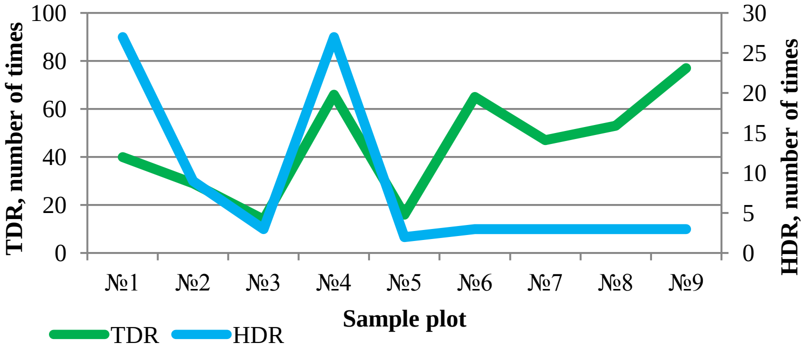

Figure 3. Ratio between TDR and HDR

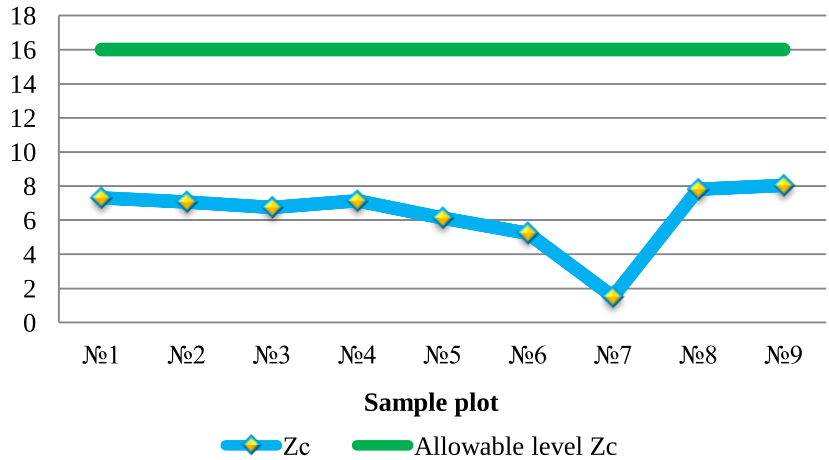

Figure 4. The total pollution index (Zc) of the reserve «Vishersky» soil (Kc) and summary indicators of soil pollution (Zc) were calculated.

The total index of pollution (Zc) demonstrated a permissible level of contamination (less than 16) from 1.52 on test site №7 to 8,03 at test site №9 (Figure 4) at all trial sites.

Characterizing the soil acidity of the state natural reserve «Vishersky», the relevant (pH(H2O)) and potential (pH(KCl)) acidity were evaluated, whose values are presented in Figure 5.Overall, it can be noted that all soils are acidic. The difference between actual and

245

potential acidity was determined, which is approximately equal for all investigated soils.

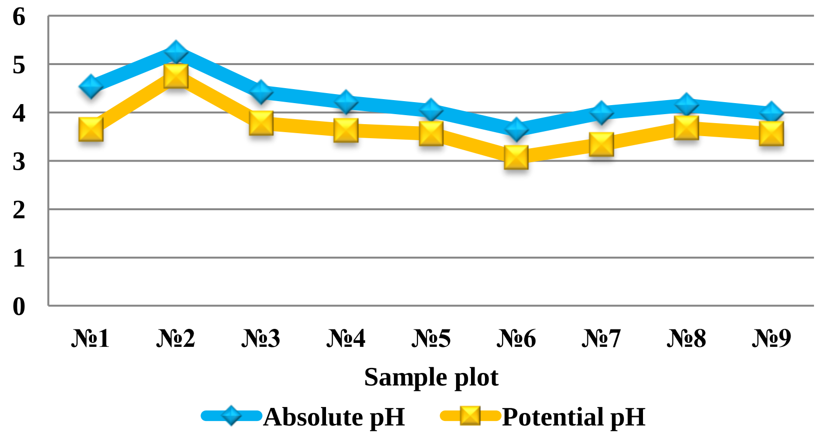

Figure 3. The acidity of the soil at the reserve «Vishersky»

As a result of the analysis of soil samples, taken at 9 sample plots on the territory of the state nature reserve «Vishersky» the toxicity values, the content of heavy metals and the values of absolute and potential acidity were acquired on which further correlation analysis was carried out.

Correlation relationship of the TDR from the bioassay on *Chlorella vulgaris* and HDR from biotesting on *Daphnia magna* wasn't identified during the correlation analysis. In the correlation analysis between indicators of toxicity and content of heavy metals in the soils a moderate negative relationship between the TDR value and the content of Mn was revealed. A weak positive correlation between the TDR value and the content of Pb, Cr and Ti, in soils was determined. Also weak but negative relationship is observed in relation to Sr and As, when with increasing its amount in the soil decreases the values of the TDR. In relation with the HDR value a weak positive correlation with the contents of Sr, Pb, As, Zn, Cu, Mn, and a weak negative correlation with the content of Cr and Ti were observed.

The analysis also revealed a weak negative relationship between absolute and potential acidity and value of the TDR. With increasing soil acidity (the numerical value of pH decreases) the TDR value

246

increases. Additionally, in the case of HDR indicator, with increasing acidity (a numeric pH values indicator decreases) it decreases, what is positive relationship. During the analysis of the relationship between the total index of soil contamination and their toxicity a weak positive correlation with the index of HDR was identified.

Conclusion. According to the results of the research it was revealed that the pollution level of soils of the reserve «Visherskiy» is within tolerance. It follows from the data of geochemical analysis, from the content of heavy metals in soils in particular. Toxicological analysis also showed that the soils are not hazardous, so far as the reciprocal dilution in the bioassay for *Chlorella vulgaris* and *Daphnia magna* did not exceed 100, although the potential application of *Chlorella vulgaris* for biotesting of soils can be questioned [5]. The overall analysis showed a slight degree of anthropogenic impact on investigated soil of the state nature reserve «Vishersky» and an allowable level of total pollution.

References

1. Andreev D.N. *Ekogeokhimicheskaya diagnostika antropogennoy transformatsii osobo okhranyaemykh prirodnykh territoriy* [Ecogeochemical diagnostics of anthropogenic transformation of specially protected natural reservations]. *Vestnik Udmurtskogo universiteta. Seriya Biologiya. Nauki o Zemle* [Bulletin of Udmurt university. Biology & Earth Sciences], 2013, no. 3, pp. 3-9 (in Russian).

2. Tartakovskiy A.M. (Ed.) *Atlas Permskogo kraya* [Atlas of Perm region] Perm: Permskiy. Gos. Nats. Issl. Univ, 2009, 124 p.

3. Bagdasaryan A.S. *Biotestirovanie pochv tekhnogennykh zon gorodskikh territoriy s ispol'zovaniem rastitel'nykh organizmov*. Diss. kand. biol. nauk [Biotesting of soils of cities' man-caused zones with use of plant bodies. Cand. biol. sci. diss.]. Stavropol, 2005. 159 p.

4. Bogatyrev K.P., Nogina N.A. *Pochvy gornogo Urala* [Mountain Ural's soils]. *Tr. Pochv. in-ta AN SSSR* [Proc. of Soil Inst. AS USSR], 1962, pp. 5-48.

5. Dzyuba E.A. *Primenenie biotestirovaniya dlya kachestvennoy otsenki sostoyaniya okruzhayushchey sredy i ee otdel'nykh komponentov* [Application of bioassay for evaluation of the

247

environment and its components] *Vestnik molodykh uchenykh PGNIU, sbornik nauchnykh trudov* [Bulletin of young scientists of PSNRU, collection of studies], Perm, Permskiy. Gos. Nats. Issl. Univ, 2014, pp. 369-379.

6. *PND F T 14.1:2:3:4.10-04 (PND F T 16.1:2:2.3:3.7-04) Metodika izmereniy opticheskoy plotnosti kul'tury vodorosli khlorella (Chlorella vulgaris Beijer) dlya opredeleniya toksichnosti pit'evykh, presnykh prirodnykh i stochnykh vod, vodnykh vytyazhek iz gruntov, pochv, osadkov stochnykh vod, otkhodov proizvodstva i potrebleniya* [An optical density of chlorella culture *(Chlorella vulgaris* Beijer*)* measurement technique for determination of toxicity level of drinking water, natural and waste waters, aqueous migrates from natural grounds, soils, wastewater's sediments, production and consumer waste], Moscow, 2014, 36 p.

7. *PND F T 14.1:2:3:4.12-06 (PND F T 16.1:2:2.3:3.9-06) Metodika izmereniy kolichestva Daphnia magna Straus dlya opredeleniya toksichnosti pit'evykh, presnykh prirodnykh i stochnykh vod, vodnykh vytyazhek iz gruntov, pochv, osadkov stochnykh vod, otkhodov proizvodstva i potrebleniya metodom pryamogo scheta* [A technique of *Dapnia magna* Straus number direct count for determination of toxicity level of drinking water, natural and waste waters, aqueous migrates from natural grounds, soils, wastewater's sediments, production and consumer waste], Moscow, 2014, 39 p.

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RADIOACTIVE WASTE AND TERRITORY INACTIVATION METHODS

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Abstract: The article deals with the problem of radiation accidents, sources of radioactive waste, RAW categories, and inactivation methods. The statistics of radiation contamination is analyzed. A special attention is paid to the decontamination methods and ways of territory regeneration.

248

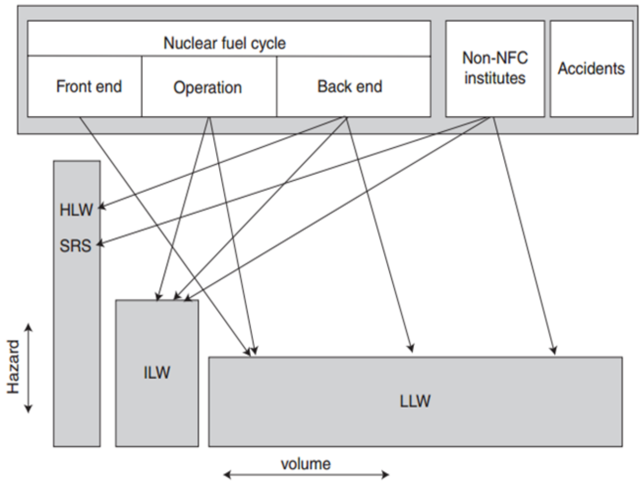
Key words: radiation accidents, radiation inactivation, radionuclide migration, RAW categories.

Radioactive contamination of the biosphere means a concentration growth of radioactive substances in living organisms and in the habitat as a result of human activities [1, p.236]. The increased intensity of industrial production in the second part of the twentieth century led to the emergence of a large group of anthropogenic radionuclides. Radioactive waste contamination can have a number of sources. The majority of waste originates from the nuclear fuel cycle and nuclear weapons reprocessing. Other sources include medical and industrial wastes, as well as naturally occurring radioactive materials (NORM) that can be concentrated as a result of processing or consumpting coal, oil and gas, and some minerals [2, p.6].

Contamination of settlements, objects and territories by radioactive substances can occur as a result of radiation accidents at enterprises of nuclear fuel cycle, activities of companies, organizations and institutions that use ionizing radiation sources based on radioactive substances of natural and artificial origin, as well as the use of nuclear warheads.

Waste from the front end of the nuclear fuel cycle is usually alpha-emitting waste from the extraction of uranium. It often contains radium and its decay products. The back end of the nuclear fuel cycle, mostly spent fuel rods, contains fission products that emit beta and gamma radiation, and actinides that emit alpha particles, such as uranium-234, neptunium-237, plutonium-238 and americium-241, and even sometimes some neutron emitters such as californium. These isotopes are formed in nuclear reactors [3, p.235].

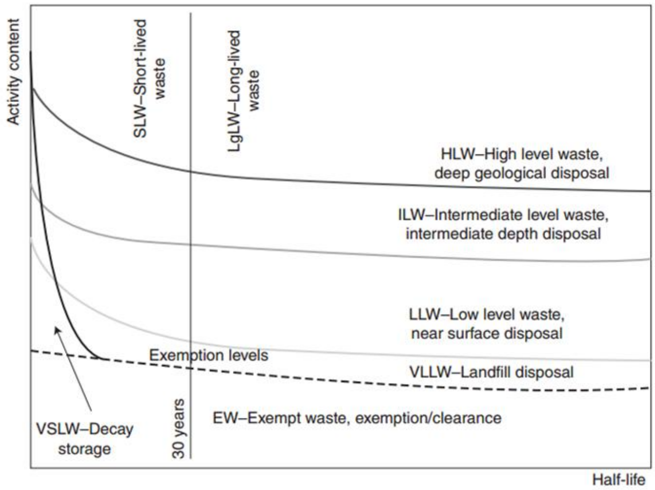
RAW categories**.**



Picture 1. Sources of radioactive waste

Classification of radioactive waste in the UK is the following:
HLW = high level waste, ILW = intermediate level waste, LLW = low level waste, SRS = sealed radioactive sources.
VLLW - Wastes which can be disposed of with ordinary refuse, each 0.1 m3 of material containing less than 400 kBq of beta/gamma activity or single items containing less than 40 kBq.
LLW – Wastes containing radioactive materials other than those suitable for disposal with ordinary refuse, but not exceeding 4 GBq/te of alpha or 12 GBq/te of beta/gamma activity.
ILLW - Wastes with radioactivity levels exceeding the upper boundaries for LLW, but which do not need heating to be taken into account in the design of storage or disposal facilities.
HLW - Wastes in which the temperature may rise significantly as a result of their radioactivity, so this factor has to be taken into account in designing storage or disposal facilities.

250



Picture 2. Schematic classification of radioactive wastes

The principles of gravity play an important role as concentrating mechanism. Radiation substances penetrate into the soil using dust particles, rain drop and flow, contaminated leaves.

The inactivation methods can be divided into three groups: 1) mechanical; 2) physico-chemicals; 3) biological.

Skim and burial ploughing. [4]This method is very useful for large territories. For example, it can be used in parks and in urban environment. A plough skims off the topmost layer of soil (about 5 cm) and buries it at a depth of some 40-50 cm without inverting the intermediate layer. The removal of only about a 5 cm layer of topsoil rarely affects the fertility of the land, and poorer quality subsoil is not brought to the surface. Overall, skim and burial ploughing greatly reduces radiation levels at the ground surface, the resuspension hazard is eliminated, most of the contamination is made inaccessible to plant roots, and soil quality is unaffected. The effect of the procedure, which has been tested in the former USSR, has been found to be a reduction of the dose-rate by some 94%, but in very sandy soils it may be difficult to achieve the objective with this method.

Triple digging. Triple digging is an excellent method to reduce the dose in people, both where the uptake of plants is considered, and for external dose reduction. This method can be used in gardens and

251

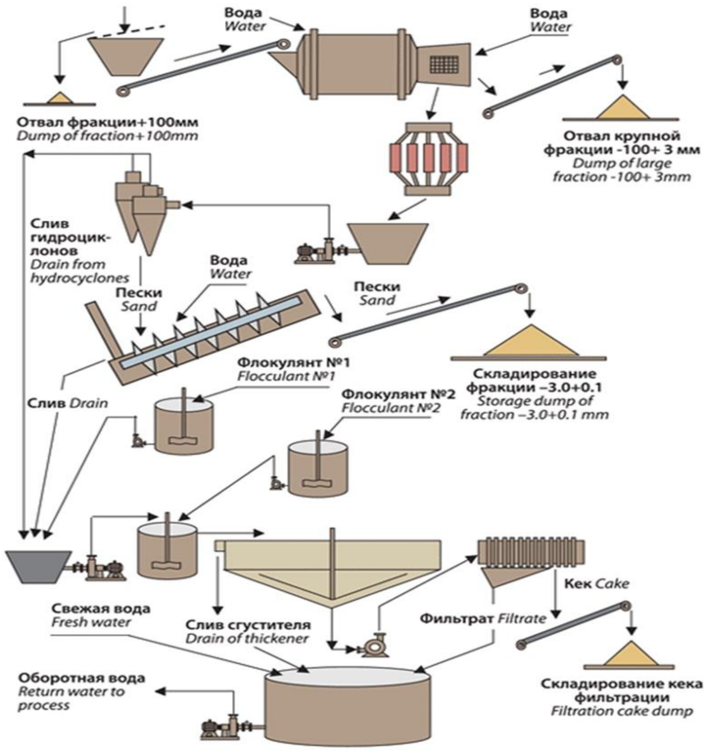
other places where it is impossible or expensive to use skim and burial ploughing. It can be seen that if the initial contamination is in the uppermost 10 cm of soil, the dose reduction factor will range from 0.08 to 0.5, depending on the size of the plot and the initial distribution.

Method of topsoil removal. This method of decontamination of polluted sites involves removing the top layers of soil to a depth of 10 – 15 cm with subsequent burial sections at cemeteries for radioactive waste. Topsoil removal was widely used on contaminated territories after the Chernobyl accident and allowed reducing the dose several times.

Screening method. The technology of this method offers covering the infested areas by special "screens". Usually, it is applied after the topsoil removal to achieve the greatest effect. The screens absorb the flow of ionizing radiation from contaminated soils. Gravel, sand and asphalt are part of these “screens”. The application of this method gives a decrease of dose rate 10-fold.

Hydro separation method. According to the “Mayak” research center and “RosAtom” [5], most of the radioactivity accumulates in the smallest soil particles. Dividing the soil into several fractions, it is possible to allocate and accumulate the largest part of polluting participles, which could then be disposed as radioactive waste. Hydro separation is one of the most effective methods for isolating a fraction. By carrying out the processes of hydro separation we remove the top layer of the soil, separate big inclusions (over 10 mm in size), fragment large soil particles into smaller ones in aqueous solution. Then, in the solution they are further split into mineral and organic components. Inactivated soil has to be returned to the selection place, and the “dirty” part of soil has to be buried as radioactive waste. The technological scheme made it possible to increase the cleaning efficiency of the primer 5-10 times.

252



Picture 3. Hydro separation

Sowing tall trees. Migration of radionuclides can be prevented and localized by planting tall trees [6, p.187] of mixed type such as birch, oak, aspen, alder, pine, et cetera. It is important that further using of wood is prohibited. The main part of radionuclides takes shallow root system located at a depth of 15 cm and performs a major role in providing mineral nutrition of the forest. The most active of them are captured 90Sr, accumulating in the trunks and large branches of trees. The cycle of radionuclides is repetitive, iterative process stabilizes after 4 to 5 years in deciduous and 10 - 12 in coniferous forests after environment contamination. Special attention is paid to polluted forest fire risk due to high possibility of massive re-pollution causing by burning wood. Of non-timber forest products the most dangerous are berries and mushrooms.

253

Leaching method. Method of decontamination of radioactive materials involves a number of successive operations. Leaching of radionuclides from the solid phase with mineral acid and subsequent neutralization of the solution with alkali to pH 5,8-5,9. The precipitate is separated by sedimentation and the clarified solution is treated with alkali to a pH of 9-10 and is subjected to redox treatment in electrolysis with soluble electrodes made of manganese steels at saturation of solution with oxygen in the air. The products of co-precipitation of radionuclides with collectors and coagulants are removed by sedimentation. The solution is filtering, adjusting with acid to a pH of 8.5-9.0, is passed through the sorbent with the subsequent processing solution dialysis membrane or regeneration of reagents decontamination.

Conclusion. To sum up ideas, firstly, decontamination activities usually do not use one method, and it is necessary to use methods in the complex. Secondly, in each case of contamination an individual approach with a set of measures is needed. Thirdly, it is necessary to monitor the territory even after inactivation.

References

1) Yaroshinskaya A.A. *Yadernaya entsiklopediya* [Nuclear encyclopedia], Moscow, Blagotvoritel'nyi fond Yaroshinskoi [Yaroshinskaya's charitable Foundation], 1996, 236 p.

2) W. E. Lee, M. I. Ojovan. *Fundamentals of radioactive waste. Radioactive waste management and contaminated site clean-up.* Woodhead Publishing Limited. 2013, 6 p.

3) C. M. Jantzen, W. E. Lee. *Radioactive waste conditioning, immobilization, and encapsulation processes and technologies. Radioactive waste management and contaminated site clean-up.* Woodhead Publishing Limited. 2013, 235 p.

4) *Decontamination of soil.* Available at: http://www-ns.iaea.org/downloads/rw/projects/emras-urban-decontamination-of-settlements-zlobenko.pdf (accessed 5 October 2015)

5) Mikheikin S. V. *Ochistka gruntov metodom gidroseparatsii* [Cleaning the soil by hydroseparation]. Available at: http://www.atomic-energy.ru/articles/2008/10/03/434 (accessed 23 September 2015)

254

6) Timofeev-Resovskii N. V., Savich A. V., Shal'nov M. I.. [Introduction to molecular radiobiology]. Moscow, Meditsina, 1981, 187 p.

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Аннотоация. Экологическая система современного города находится под постоянным влиянием многочисленных источников загрязнения. Цель работы – определить, используя метод биоиндикации, суммарную фитотоксичность почв на примере г. Грозного. Установлено, что наименьшей фитотоксичностью отличается почва, взятая с улиц с минимальной интенсивностью транспортного потока, в ней загрязняющие вещества находятся в количествах, не представляющих опасности для экосистемы.

Ключевые слова: фитотоксичность, биоиндикация, редька дикая, транспортный поток.

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PHYTOTOXICITY ASSESSMENT OF SOILS IN GROZNY

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255

Abstract: The ecological system of a modern city is under a constant influence of numerous sources of pollution. The objective was to determine, using the method of bioindication, the total soil phytotoxicity by the example of Grozny. It was determined that soil samples from the streets with the minimum traffic intensity have the lowest phytotoxicity level.

Key words: phytotoxicity, bioindication, wild radish, traffic flow.

Экологическая система современного города находится под постоянным влиянием многочисленных источников загрязнения. Уровень транспортного загрязнения нарастает, достигая 80 % от всех загрязняющих атмосферу веществ.

Цель работы – определить, используя метод биоиндикации суммарную фитотоксичность почв на примере г. Грозного.

Объективные факты свидетельствуют о существовании тесного влияния факторов среды на биотические процессы экосистемы [1, 3].

Изменение состояния городской среды оказывает существенное влияние на рост и развитие тест-растений.

Мониторинг состояния растительности необходим при определении реакции живого организма на изменения состояния окружающей городской среды.

Растительность – основной компонент экосистемы, который обеспечивает жизнедеятельность других элементов экосистемы, изменение ее состава в результате воздействия многочисленных факторов среды влияет на состояние экосистемы в целом и, следовательно может быть использовано как диагностический признак [2].

В ходе оценки фитотоксичности почвы необходимо принимать во внимание вероятность аккумуляции в верхнем слое остатков различных загрязняющих веществ.

Метод дает возможность установить интегрированное влияние загрязняющих веществ [4].

С целью определения степени аккумуляции загрязняющих веществ в верхнем слое почвы заложен лабораторный опыт. Тест-растение: редька дикая, сорт Сударушка. Производили отбор проб из поверхностного (0-5 см) слоя почвы, наиболее подверженного воздействию загрязняющих веществ (таблица).

256

Таблица 1. Оценка фитотоксичности городских почв г. Грозного (биоиндикатор – редька дикая, сорт Сударушка)

Варианты	1	Отношение к контролю, %			
		2	3	4	5
Контроль (лесной массив)	100	7,5	120,0	9,5	310,0
Перекресток ул. Маяковского и Сайханова	86,6	84,9	79,1	77,5	82,3
ул. Заветы Ильича	93,9	86,3	84,9	86,7	80,4
ул. Жуковского	90,3	91,7	92,6	90,2	85,0
ул. Л. Яшина	98,2	93,9	94,6	83,4	85,4
ул. Чайковского	97,3	95,0	95,5	84,8	87,6

Примечание: 1 – всхожесть семян, %; 2 – длина корня, см; 3 – вес корней, мг; 4- высота ростка, см; 5 – вес ростка, мг

При посеве дикой редьки на контроле всхожесть семян тест-растения была 100,0%. При посеве в почву, взятую с различных по интенсивности транспортного потока улиц г. Грозного этот показатель снизился и составил 86,6-98,2%.

Аналогичная закономерность наблюдается по остальным показателям (длине, массе корней, высоте и массе ростка). Почва, взятая на перекрестке улиц Маяковского и Сайханова: длина корня – 84,9 %; масса корней 79,1 %; высота ростка 77,5 % , масса ростка соответственно 82,3%.

Почва с улиц с менее интенсивным движением (ул. Заветы Ильича и ул. Жуковского) была более благоприятной для роста и развития тест-растений: длина корня – 86,3-91,7 %; масса корней 84,9-92,6 %; высота ростка 86,7-90,2 % , масса ростка соответственно 80,4-85,0% (таблица).

Почва с улиц с минимальной интенсивностью движения (ул. Л. Яшина и ул. Чайковского) была самой благоприятной для развития тест-растений: длина корня – 93,9-95,0 %; масса корней 94,6-95,5 %; высота ростка 83,4-84,8 % , масса ростка соответственно 85,4-87,6%.

В ходе лабораторного опыта установлено, что наименьшей фитотоксичностью отличается почва, взятая с улиц с минимальной интенсивностью транспортного потока, в ней загрязняющие вещества находятся в количествах, не представляющих опасности для экосистемы.

257

Библиография

1. Гогаева И.А., Кадзаева О.Э., Оказова З.П. Биоиндикация как метод исследования экологических систем. Сборник научных трудов «Наука и образование в жизни современного общества». Тамбов. 2015. С. 29-30.
2. Методические указания МВИ интегрального уровня загрязнения почвы техногенных районов методом биотестирования. РД 52.18.344-98. – М.: Федеральная служба России по гидрометеорологии и мониторингу окружающей среды, 1983. – 45 с.
3. Назаренко Н.Н., Корецкая И.И. Биоиндикация загрязнения почвы транспортных зон г. Воронежа. Вестник Воронежского государственного университета. 2015. № 1. С. 46-50.
4. Политыкина Ю.В., Бенько А.А., Мамеева В.Е. Биоиндикация загрязнения почв по изменению видового биоразнообразия. Мат. Международной конференции «Агроэкологические аспекты устойчивого развития АПК». 2014. Брянск. С. 332-333.

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DYNAMICS AND PERIGLACIAL FORMATION OF LANDSCAPES OF THE ELBRUS AREA FOR THE LAST 15-20 YEARS

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Abstract: Lichens, such as *Rhizocarpon geographicum,* can be used for determining the sediment age. Using this method in the Elbrus area we can calculate the age of moraines. It also allows determining ecological changes in the area – the lifetime of these lichens depends on the ecological conditions.

Key words: lichens, landscape mapping and profiling, lichen metric shooting, sediment age, moraines, and natural-territorial complexes.

This practical research work was conducted in the Elbrus Scientific Centre of Moscow State University. The centre is situated

258

near Mount Elbrus within the national park “Prielbrusye”. The place has a lot of advantages due to its geographic position – students can observe a lot of natural processes that are typical for this area. The absolute height of the centre is 2326 meters.

The national park has an area of 128, 32 hectares. It is situated in the Central Caucasus, within the Main and Side Ranges of the Caucasus Mountains.

The main methods of this field researches were field landscape mapping and profiling. I conducted my own studies and then compared the obtained results with the previous researches [1]. During landscape mapping, complete descriptions of natural-territorial complexes were held. 43 complete descriptions were made. At each point of the complex description the parameters of tree and grass layers were measured.

Picture 1. The moraine of 1950.

For determining the sediment age the method of lichen metric shooting of moraines was applied. This method is based on the growth of lichen that is called Rhizocarpon geographicum[2]. The lifetime of such lichens depends on the local ecological conditions. We measure the maximum diameters of lichens and, knowing the annual increment, can calculate the sediment age.

Lichens can serve as indicators of the moraine age under the following conditions:

259

1) The moraine age varies from 10 years to several hundred years.

2) The landscape has not been transformed by any anthropogenic activities.

To determine the moraine age a maximum number of lichens were measured and then lichens of the largest size were selected. The minimum sediment age was determined by measuring the maximum diameters of lichens. As a result about 250 lichens were measured [3].

While selecting lichens the following factors were taken into consideration: their lithology, size, the sunny or shady side of sediments, the exposure of the slope, the distance from water bodies, the position on the slope (up or down). This method allowed selecting lichens most accurately. Further, five larger lichens were picked out and from this number the biggest one was selected.

References

1. Avessalomova I.A., Petrushina M.N., Khoroshev A.V. Funktsionirovanie i dinamika gornykh landshaftov // Geografiya, obshchestvo i okruzhayushchaya sreda. Funktsionirovanie i sovremennoe sostoyanie landshaftov. M.: Izd. dom “Gorodets”, 2004. – T. 2. – P. 154-170.

2. Akif'eva K.V., Kravtsova V.I., Turmanina V.I. Dinamika vysokogornykh landshaftov Tsentral'nogo Kavkaza // Trudy Tbil. ZakNIGMI. – L., 1970. – V. 45(51). – P. 103-114.

3. Aleinikova A.M., Petrushina M.N., Popovnin V.V. Formirovanie i dinamika prilednikovykh landshaftov doliny reki Adyl-su (Priel'brus'e) // Vestnik un-ta, 1999. – Ser. 5, Geografiya, № 2. – P. 55-62.

260

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CHARAKTERISTIK DER BÖDENEIGENSCHAFTEN LGOWER REGION VON KURSK IN ZUSAMMENHANG MIT WIRTSCHAFTLICHEN ENTWICKLUNG

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Annotation: In Lgower Region ist der Abbau einer Autobahn geplant. In diesem Zusammenhang wurden der Bodenerforschungen durchgeführt. Davon ist die Rede in diesem Artikel.
Stichwörter: setzungsempfindliche Lehmböden, Korngrößenverteilung, Einsenkvermögen, Wassergehalt, Meßuhr.

Abstract: The article is about researches of Kursk region`s grounds, that is used to plan the building of the highway on this territory.
Key words: loam, subsidence, water content, measurement mechanism.

Als Hauptobjekt der Forschung wurden die Bodenproben aus Region Kursk ausgewählt. Die Ursache der Forschung dieses Territoriums ist künftiger Abbau einer Autobahn. Auf diesem Territorium sind setzungsempfindliche Lehmböden vorwiegend, die sich in die Tiefe bis 5 Meter befinden. Die Bodenproben wurden in Kunststoffrohr ausgewählt, die mit der technischen Vaseline geölt wurden. Der Boden enthält natürliche Struktur und Feuchtigkeit. Die Proben stellen einen halbfesten Lehmboden in brauner Farbe mit der Einsetzung von Karbonaten dar. Im Kornbestand herrschen die Teilchen von größeren und mittleren Stauben (31,3 und 15% beziehungsweise) bei Gehalt Lehmteilchen 32%. (sieh die Tabelle) vor. Bestimmung von Einsenkvermögen wurde durch die Methode von zwei Grafiken im Gerät KPR-1 durchgeführt. Aus der Bodenprobe wurde ein Metallring ausgeschnitten (die Höhe 2 cm und die Fläche 40cm2), die innere Fläche wurde auch mit der Vaseline geölt.

Mit Kopf des Arbeitsrings wurden ein Papierfilter gepasst, danach wurde er mit einem umlenkring zusammengesetzt und in dem Gerät eingekapselt. Formänderung wurde Stämme von Meßuhr

261

gemessen. Skalenteil war 0,01 mm. Bestimmung der Formänderung in einer natürlichen Faltung wurde bei Belastungen von 0,05, 0,1, 0,2, 0,3 und 0,4 MPa durchgeführt. Die Ergebnisse des Experiments wurden zweimal pro Tag um 9:00 Uhr und 17:00 Uhr fixiert. Wenn in 16 Stunden Einsenkvermögen nicht höher als 0,01 mm war, wurde dann zusätzliche Last beigegeben, und neue Laststufe geschaffen. Der Versuch dauerte 14 Tage lang. Für die Untersuchungswirkung von Durchfeuchtung auf die Formveränderung wurde der vorbereitete Boden von unten direkt im Kompressionsgerät gefeuchtet. Nach voller Durchfeuchtung laut der hochbeschriebene wurde die Formveränderung des untersuchten Bodens bestimmt. Die Ergebnisse dieser Untersuchungen sind in der Tabelle 1 dargestellt.

Tabelle 1. Korngrößenverteilung und den physikalischen Eigenschaften des ursprünglichen Bodens.

№	Tiefe Auswahl m	der Name des Bodens	Korngrößenverteilung Der Gehalt an Teilchen von unterschiedlicher Größe (mm)% 1,0-0,5	0,5-0,25	0,25-0,1	0,1-0,05	0,05-0,01	0,01-0,005	0,005-0.002	0,002-0.001	< 0,001
1079	1,0	Lehm halbfesten	0,4	2,5	3,6	7,1	31,3	15,0	3,2	4,9	32,0

Wassergehalt, %	Dichte, g / cm3	Dichte trockenen Boden, g/cm^3	Dichte Bodenteilen, g/cm^3	Koeffizient Porosität	der Grad der Feuchtigkeit
23,10	1,65	1,34	2,70	1,01	0,62

Die durchgeführten Studien haben gezeigt, dass die untersuchten Böden durch Einsenkvermögen unter Last von 0,2 MPa charakterisiert sind. Es heißt, nötig zu sein, die Dichtung des Bödens durchzuführen, um die Zerstörungen und Formveränderung der Fahrbahn von der künftigen Autobahn zu beseitigen.

Literaturverzeichnis

1. SNiP 2.02.01-83 Osnovaniya zdanii i sooruzhenii. [SNIP 2.02.01-83 grounds and buildings.] M .: Russian State Building in 1995.
2. Anan'ev A.D.. Inzhenernaja geologija: Uchebnik dlja vuzov. [Engineering geology: Textbook for Universities] Izdatel'stvo: Vysshaja shkola God izdanija: 2002 Stranic: 511

262

3. N. B. Vassoevich Spravochnik po litologii [Reference lithology] /– M.: Nedra, 1983. 509 s.

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KARST RISK ASSESMENT DURING GEOLOGICAL ENGINEERING SURVEYS UNDER NPP CONSTRUCTION

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Abstract: A number of karst risk assessment methods have been developed for the regions where the most significant hazard is presented by karst sinkholes. For this particular application karst risk is understood as specific probability of sinkhole development on an area unit per a unit of time span.

Key words: karst, risk, sinkhole, antikarst protection

The problem of karst risk assessment is very important for Russia. About 30% of the cities and towns in Russia experience considerable negative influence of karst processes. Industrial facilities and residential buildings in Moscow, Nizhny Novgorod, Dzerzhinsk, Kazan, Ufa, Tula, Bereznyaky and some other cities, towns and settlements have been affected by karst processes causing damage or destruction [1].

A wide range of important problems arise in case of nuclear power plant (NPP) construction on karst territories. Collapse risk is understood as probability of sinkhole development on a given area during a given time period resulting in the damage of economic, social and environmental types. The survey helps to evaluate the probability of sinkhole development on a particular area during a given time span. Risk assessment for the purposes of engineering and constructional development of karst terrains and use of karst risk concept in engineering and environmental protection activities allows us to minimize inevitable damage. In the Federal law of the Russian Federation "On technical regulation" the concept of risk is understood as a probability of hazard to health and safety of the population and

263

damage to property and the environment, with the account of heaviness of all hazards and damage [2].

Karst collapse risk here is understood as a probability of karst sinkhole development on a certain area per a certain time span which may lead to economic (A), social (B) and/or environmental (C) loss. If we define the probability of sinkhole development on a unit area A (supposedly A = 1 ha) per a unit of time span (supposedly 1 year or 100 years), we get a specific risk value (Pr). In most practical cases, for the purposes of civil engineering the time unit T is 100 years, because (according to Russian national building specifications) it conforms to the predicted service life for the majority of constructions. The distribution parameter is intensity ratio of sinkhole development л (specific average number of sinkholes developed on the area of 1 ha per 100 years) [2]. Distribution of sinkhole diameters d on vast territories (with the area of several km^2) is close to a lognormal type, and on small territories (with the area of several ha) it is close to a normal type. The distribution parameters enable objective assessment of average and maximal sinkhole diameter values (d_{mid}, d_{max}). Parameters л, d_{mid}, d_{max} can be considered to be the most important results of the performed exploration [3]. Additionally, investigation must obtain data on some particular relevant engineering and geological conditions as well as anthropogenic effects which may exert influence upon intensity of sinkhole development on the area where the construction is to take place [4].

Engineering and constructional development of karst-prone territories entails a number of important issues to be considered: need in constructional protection measures, validity of protection design parameters, minimization of economic, environmental and social components of damage, need in insurance of the particular construction, check list for construction site selection, specification on the mode of operation of the construction exposed to karst risk, etc. Solution to the related problems is simplified by comparison between karst risk (Pr or Prb) and the corresponding acceptable risk (Rn or Rnb). Acceptable risk is understood as acceptable probability of certain negative effects. In many practical cases specific values Pr and Rn are compared. Acceptable risk levels must be specified alongside with acceptable levels of economic damage (class A), social damage (class B) and environmental damage (class C). In design practice damage is often

264

defined as loss caused by destruction of buildings or facilities by karst deformations. Economic loss is conventionally corresponded to the cost of the damaged buildings or constructions and other property, social loss – to probable loss of life or health hazard, environmental loss – to probable contamination of the environment [3]. Comparison between a real specific risk of pollution of the geological environment at waste disposal landfills in karst lands and corresponding specific risks helps plan a system of nature-conservation activities in order to prevent pollution of the geological environment. An improved version of the method of constructional antikarst protection of buildings and facilities has been developed on the basis of «Guide to geological engineering surveys in areas of karst» by I.A.Savarenskiy and N.A.Mironov. The method described above has been applied in projects in Nizhny Novgorod Region.

References

1. Tolmachyov V.V. Metody ocenki karstovoj opasnosti dlya stroitel'nyh celej: sostoyanie i perspektivy // Geoehkologiya, 2012, № 4. – P. 354-363.
2. Mahnatov S.A., Utkin M.M. (2012). Sposob opredeleniya parametrov proektirovaniya konstruktivnoj protivokarstovoj zashchity // Materialy Rossijskoj konferencii «Geotekhnicheskie problemy proektirovaniya zdanij i sooruzhenij na karstoopasnyh territoriyah» 22-23 maya 2012 g. – Ufa: BashNIIstroj, 2012. – P. 72-77.
3. Filipponi, M, Jeannin, P.-Y., & Parriaux, A. (2010). A scientific based karst risk assessment for underground engineering. Proceedings of the Regional symposium of the International Society for Rock Mechanics, Dubrovnik, Cavtat, Croatia, 29 – 31 October 2009 “Rock Engineering in Difficult Ground Conditions – Soft Rocks and Karst”. Boca Raton, London, New York, Leiden: CRC Press/Balkema. P. 103 – 108.
4. Fischer J.A., Whorter J.G. A nuclear power plant on karst terrane? // Proc. of ninth multidisciplinary conference, 2011, ASCE (USA).

265

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ROLE OF MICROORGANISMS IN ORGANIC FARMING

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Abstract: Using special microorganisms for improving the growth of plants helps to avoid chemical fertilization.

Key words: plant growth promotory (PGP) microbes, biofertilization, biocontrol, phytostimulation.

Plants are involved in a complex network of interactions with microorganisms; some of those are beneficial, others are detrimental, but the former are by far the largest and still widely unexplored part.

Soil-born microorganisms interact with plant roots and soil constituents at the root-soil interface, where root exudates and decaying plant material provide sources of carbon compounds for the heterotrophic biota [1]. The number of bacteria in the rhizosphere (a narrow area of soil that is directly influenced by root secretions and associated soil microorganisms) and rhizoplane (external surface of roots together with closely adhering soil particles and debris) is higher than in soil devoid of plants; this happens because soils devoid of plants are poor in many substances secreted from roots. As soon as a seed starts to germinate, a relatively large amount of carbon and nitrogen compounds, i.e. sugars, organic acid, aminoacids, and vitamins, are excreted into the surrounding environment. This attracts a large population of microorganisms inducing vigorous competition between different species. Moreover, rhizosphere microbiomes typically differ between plant species [2].

Plant associated microorganisms (PAMs) play a number of very important roles to better the life of their host plant. It is believed that the origin of plant microbe interactions is as old as the arrival of plants on land, and both the mutual partners selected each other after a long evolutionary process. These useful microbes provide the plants with nutrients, battle pathogens, combat abiotic stresses, and can play several other roles in the plant ecosphere. Plant-microbe interactions in

266

tandem can perform acts such as reclamation of barren soils, degradation of recalcitrant pollutants, and removal of dangerous compounds from the ecosystems [3].

Injudicious use of chemicals in agriculture and industries has led to major environmental and health related issues for humans and other organisms inhabiting the planet. These chemicals accumulate in the food chain and ecosystems. In fact, many of them get into our food products. The indiscriminate use of chemicals is responsible for the reduced fertility of soils by killing several important and useful PAMs. In case of microorganisms we even do not know what we have lost over the years. But one thing is certain that in barren soils the population of useful plant growth promotory (PGP) microbes is very low or even more alarmingly they may altogether be absent from such soils. Hence there is an urgent need to reintroduce these beneficial microbes in the soil along with their compatible plants [4].

But using chemical fertilizers and pesticides to increase plant growth is still leading in agriculture. It causes contamination of groundwater and surface water, deterioration of the general condition of soils and the quality of the product. In connection with the trend of switching to organic farming, the trend of using microorganisms as biological agents is increasingly important and should be developed.

Plant diseases need to be controlled to maintain the quality and abundance of food, fodder, and fiber around the world, but beyond good agronomic and horticultural practice, growers often rely heavily on chemical fertilizers and pesticides. But some pest management researchers have focused their efforts on developing alternative inputs for controlling pests and diseases. Among these alternatives are those referred to as biological controls. Microorganisms can be used to suppress plant’s diseases, named «biocontrol». Scientists are developing consortium of antagonistic strains to deal with bacterial and fungal diseases of plants [5].

The second way for plant growth promotion is enhancement of nutrient availability, or «biofertilization». The most important direction here is developing schemes of combination of microbes able to decompose phosphorus-containing compounds, making them available for absorption by plants. Biofertilizer contains microorganisms which promote an adequate supply of nutrients to the host plants and ensure their proper development. Living microorganisms with specific

267

functions to enhance plant growth and reproduction are used in the preparation of Biofertilizers.

There are different types of microorganisms which are used in the biofertilizers. Some are capable of nitrogen fixation such as Azotobacter, Blue green algae Rhizobium and Azospirillum. Rhizobium is used to increase the capacity of nitrogen fixation in the leguminous plants. Azotobacter is used as Biofertilizers for the development of various vegetable plants such as mustard, maize, wheat, cotton etc. Azospirillum is applied in the millets, sorghum, sugarcane, maize, and wheat field. Anabaena and Azolla fix atmospheric nitrogen and enrich the soil fertility [6].

Phosphate solublizing bacteria are also developed as biofertilizers. Pseudomonas putida, Pantoea agglomerans strain P5 etc. are the examples of phosphate solublizing bacteria. Their major work is to solubilize phosphates from both organic and inorganic sources. Those phosphates are taken as nutrients by plants. Phosphate solublizing bacteria are also developed as biofertilizers. Microorganism converts complex nutrients into simple nutrients for the availability of the plants. Biofertilizer containing those microorganisms can play a great role in crop improvement. Crop yield can be increased by 20-30%

Vesicular-Arbuscular Mycorrhizae (VAM) fungi are often used as Biofertilizer. They are widely found in both aquatic and desert soil environments. VAM provides significant amount of nutrients to the plants such as copper, zinc, phosphorus and sulphur by making their widely extended hyphal network on the upper or lower side of the soil layer. VAM is commercially used in the fields of India [7].

Bacteria, similar to other groups of organisms are able to stimulate their development by producing particular substances - phytostimulants. One of the most famous groups is gibberellins. For the first time they were isolated from the fungus *Gibberella* by Japanese scientists, but later were also found in some bacteria.

In view of the extreme complexity of their molecular structure, their chemical synthesis is very complicated and is impossible at present. In addition to gibberellins, in the process of life microorganisms form substances of a different chemical nature, which have a significant stimulating effect on plants. They are often referred to as gibberellin compounds. Such substances which accelerate the growth and development of plants were isolated from actinomycetes

268

and other groups of microorganisms. Their synthetical production (unlike gibberellin) has already been established [8].

The difficulty of using microorganisms is that a bio-inoculant should have a long shelf life and compatibility with the traditional methods of agriculture, as well as fit the local environment and the local population of microorganisms. So, introducing these methods requires a thorough study and modelling the effects of bio-inoculants.

References

1. Adesemoye, H. Torbert, J.W. Kloepper. Plant growth-promoting rhizobacteria allow reduced application rates of chemical fertilizers. Microbial Ecology, 58 (2009), pp. 921–929.

2. J. Barea, N. Ferrol, C. Azcon-Aguilar, R. Azcon Mycorrhizal symbiosis P. White, J. Hammond (Eds.), The Ecophysiology of Plant-phosphorus Interactions, Springer, Dordrecht (2008), pp. 143–163.

3. R. Bottini, F. Cassan, P. Piccoli Gibberellin production by bacteria and its involvement in plant growth promotion and yield increase Applied Microbiology and Biotechnology, 65 (2004), p. 497.

4. M. Figueiredo, L. Seldin, F. de Araujo, R. Mariano. Plant growth promoting rhizobacteria: fundamentals and applications in: D. Maheshwari (Ed.), Plant Growth and Health Promoting Bacteria, Microbiology Monographs18, Springer-Verlag, Berlin Heidelberg (2010), pp. 21–43.

5. W. Fernando, S. Nakkeeran, Y. Zhang Biosynthesis of Antibiotics by PGPR and its Relation in Biocontrol of Plant Disease Z. Siddiqui (Ed.), PGPR: Biocontrol and Biofertilization, Springer, Netherlands (2006), pp. 67–109.

6. Johansson JF, Paul LR, Finlay RD.2004. Microbial interactions in the mycorrhizosphere and their significance for sustainable agriculture. FEMS Microbiology Ecology48, 1–13.

7. Lucy M, Reed E, Glick BR.2004. Application of free living plant growth-promoting rhizobacteria. Antonie van Leeuwenhoek International Journal of General and Molecular Microbiology86, 1–25.

8. R. Bottini, F. Cassan, P. Piccoli. Gibberellin production by bacteria and its involvement in plant growth promotion and yield increase. Applied Microbiology and Biotechnology, 65 (2004), pp. 497–503.

269

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MODERN TECHNOLOGIES OF REMOVING HEAVY METALS FROM INDUSTRIAL WASTEWATER (REVIEW)

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Abstract: This article deals with the recent development of various treatment methods for the removal of heavy metals from industrial wastewater. The new methods are based on physical and chemical removal processes such as: adsorption on new adsorbents, membrane filtration, electrodialysis, and photocatalysis.

Key words: heavy metals, wastewater treatment, adsorption, filtration, electrodialysis, photocatalysis.

Introduction. Nowadays industries discharge large amounts of metal-contaminated wastewater. The most hazardous among metals are heavy metals, for example Cd, Cr, Cu, Ni, As, Pb, and Zn. They can be absorbed by living organisms and can be accumulated in the human body. And, of course, they lead to serious health diseases. [1, p.223] Therefore, it is necessary to adapt metal contaminated wastewater to avoid damage to the environment. Heavy metal can be removed from inorganic effluent by conventional treatment processes, for example, chemical precipitation, ion exchange, and electrochemical removal. But these processes have considerable defects, such as, incomplete removal, high-energy requirements, and toxic sludge production. [2, p.105] Not long ago, some approaches have been studied for the engineering of cheaper and more useful methods, both to reduce the amount of wastewater produced and to upgrade the quality of the treated effluent. This article gives a short review on various modern physical and chemical treatment methods of heavy metal removing from industrial wastewater.

270

Methods. Adsorption on new adsorbents. Sorption is transfer of ions from the solution phase to the solid phase. Sorption includes some interdependent processes, which apply adsorption and precipitation reactions. Not long ago, adsorption has become one of the alternative methods of treating wastewater laden with heavy metals. Generally, adsorption is a mass transfer technique by which a substance is transferred from the liquid phase to a solid surface, and becomes connected by physical and chemical interactions. Actually, there are three main stages of contaminant sorption onto solid sorbent:

- the pollutant transport from the bulk solution to the surface;
- the particle surface adsorption;
- transport in the sorbent particle. [1, p.234-235]

There are some various low-cost adsorbents which have recently been developed and applied for heavy metal removing from industrial wastewater.

a. *adsorption on reformed natural materials*

Natural zeolites got a significant interest, at most due to their ion exchange capability. There is high selectivity for some heavy metal ions, for example, Pb(II), Cd(II), Zn(II), Cu(II). The cation-exchange capability of clinoptilolite rides on the pre-treatment process and that conditioning increases its ion exchange ability and removal efficiency. The pH is very significant for the selective adsorption of various heavy metal ions. [1, p.236]

b. *adsorption on industrial by-products*

Industrial by-products, for example, fly ash, waste iron, iron slags, hydrous titanium oxide, can be chemically reformed to improve their removal efficiency for metal wastewater treatment.

As an example, scientists investigated bagasse fly ash, a solid waste from sugar industry, for Cd(II) and Ni(II) removal from synthetic solution. Sometimes, sorbents based on iron (ferrosorp plus and synthetic nanocrystalline akaganeite) were used for simultaneous removal of heavy metals. [3, p.364-365]

c. *adsorption on modified agriculture and biological wastes (bio-sorption)*

The main point of this kind of adsorption is to utilize passive (non-living) microbial biomass to bind and concentrate heavy metals from waste flows by clean physical and chemical pathways of uptake. Modern kind of resources, for example, hazelnut shell, rice husk, maize

271

cob or husk may be used as an adsorbent for heavy metal uptake after chemical changing. [3, p.366]

Technical availability and cost-effectiveness are the major factors in the selection of the most corresponding adsorbent to treat inorganic effluent.

<u>Membrane filtration</u> has become popular for inorganic effluent treatment, due to its ability to remove of inorganic contaminants, such as heavy metals. It depends on the particle size that can be held. Therefore, there are various types of membrane filtration: ultrafiltration, nano-filtration and reverse osmosis.

Ultrafiltration (UF) is a pressure-driven technique for removing macromolecules, metal colloids, suspended solids and heavy metals from inorganic solution. An ultrafiltration filter has a pore size around 0.01 micron. The advantage of UF over conventional treatment is its considerable tolerance to feed water quality. Moreover, the reduction in UF process due to membrane obstruction has not allowed it to be widely used in wastewater treatment.

Reverse osmosis is a method which deionizes water by stressing it under pressure through a semi-permeable membrane. Reverse osmosis filters have a pore size around 0.0001 micron. Reverse osmosis separates monovalent ions of desalinating water.

A nanofiltration filter has a pore size around 0.001 micron. Nanofiltration extracts divalent ions, so it softens hard water. Moreover, nanofiltration was able to remove more than 90% of the copper ions in the feed water (Figure 1). [4, p.560]

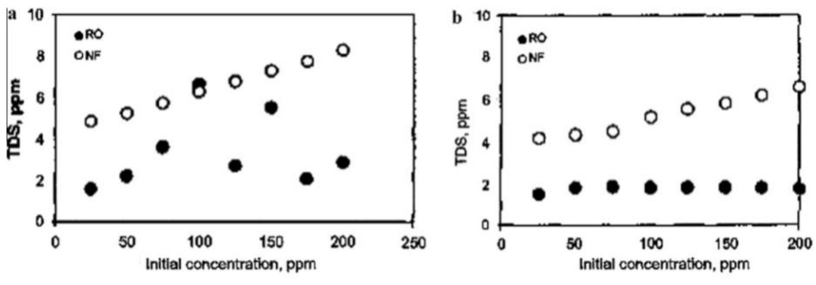

Figure 1. Concentration of (a) Cu(II) and (b) Cd(II) ions in the permeate from reverse osmosis (RO) and nanofiltration (NF) [2, p.106].

There are some complex methods using membrane filtration. For example, recently, polymer-supported ultrafiltration (PSU) process has

272

proved to be a perspective variant for removing heavy metal ions from industrial wastewater. This technique applies water polymeric ligands to connect metal ions and the ultrafiltration method to accumulate the formed macromolecular complexes and release an effluent (Figure 2). Advantages of the PSU process are low-energy requirements in ultrafiltration, very fast reaction kinetics. [5, p.17]

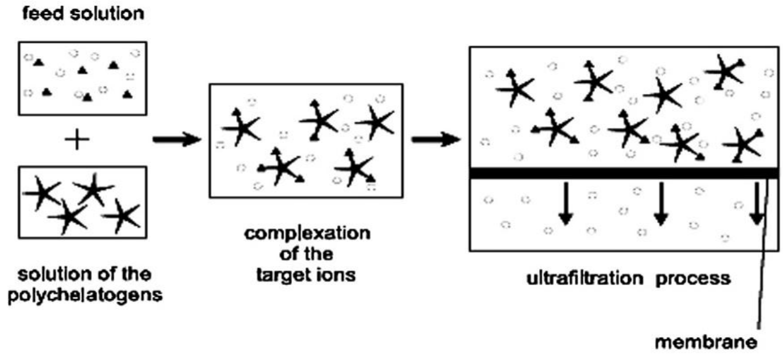

Figure 2. Principles of polymer-supported ultrafiltration (PSU) technique [5, p.17].

Another method, complexation–ultrafiltration, is based on precipitation and ion exchange. The application of water-soluble metal-binding polymers in combination with ultrafiltration is a hybrid process to accumulate selectively and to extract such valuable elements as heavy metals. In the complexation–ultrafiltration method cationic forms of heavy metals are first complexed by a macroligand to gain their molecular weight with a size larger than the pores of the collecting membrane. It can result in purifing water from heavy metals.

The advantages of the complexation–filtration technique are a considerable separation selectivity and low-energy requirements. [6, p.487]

<u>Electrodialysis</u> (ED) is membrane divisions in which ionized species in the solution get through an ion exchange membrane by an electric potential. The membranes are thin plastic sheets with anionic or cationic characteristics. When a solution which has ionic species gets through the cell compartments, the anions pass toward the anode and the cations toward the cathode, crossing the anion exchange and cation-

273

exchange membranes. [7, p.32] Figure 3 shows the principles of electrodialysis.

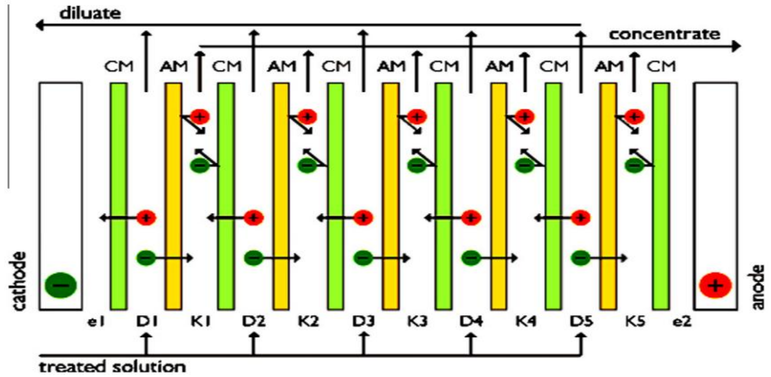

Figure 3. Electrodialysis principles. [7, p.32] CM – cation-exchange membrane, D – diluate chamber, e1 and e2 – electrode chambers, AM – anion exchange membrane, and K – concentrate chamber.

Electrodialysis has some advantages for the wastewater treatment, for example, the ability to bear a concentrated flow for reduction and the rejection of unsuitable contaminants from water. Furthermore, valuable metals such as Cr and Cu can be recovered. Since electrodialysis is used like a membrane process, it demands clean feed, accurate operation, periodic maintenance to prevent any stack failures. [7, p.33]

Photocatalysis. Recently, photocatalytic process in aqueous suspension of semiconducting material has played an important role in solar energy conversion. Modern photocatalytic process was developed for quick and efficient environmental pollutant decomposition. Generally, the best photocatalytic efficiency factor and the highest quantum yields are always got with titanium dioxide.

Immobilization of TiO_2 on diffetent substrates is an important research sphere with its photocatalytic water treatment applications. The main aim of making it is to avoid the post separation troubles with the powder form of the TiO2 catalyst. However, there are some advantages including higher surface area, superior adsorption properties. And, of course, this treatment process will be cost effective because solar photocatalysts can be recovered and reused. [3, p.371]

274

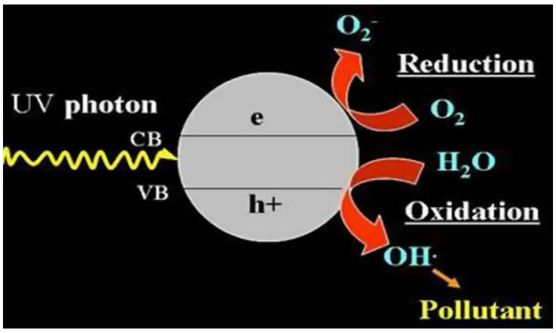

Figure 4. The conceptual reaction path of photocatalysis over TiO2 [8, p.118]

Discussion. All of these modern technologies have advantages and disadvantages. They are shown in Table 1.

Table 1. Advantages and disadvantages of technologies

Advantages	Disadvantages
Adsorption on reformed natural materials	
1. Unsophisticated technology 2. Applicable for intermittent processes 3. Easy to maintain 4. Easy to place	1. Dust can result blockages 2. Mixes of elements may reduce to early malfunction
Adsorption on industrial by-products	
1. Easy to apply 2. No increase in salinity of the fermenting substrate 3. No impairment of the fermenting residue considering material recycling and waste management 4. Easy to maintain 5. Easy to place	1. the requirements for storage and handling of iron salts due to their water hazard class restrictions 2. Dust can lead to blockages 3. Component mixes may lead to early malfunction 4. Polymerisation risk for unsaturated hydrocarbons on the activated carbon
Bio-sorption	
1. Low cost; 2. High efficiency; 3. No additional nutrient	1. high sludge production, 2. high cost, 3. technical constraints

275

requirement;	4. environmentally sound technique
Ultrafiltration	
1. Low operating pressure required; 2. Low energy consumption; 3. Few manual actions required; 4. Relatively cheap; 5. Disinfection through removal of bacteria.	1. Only removes suspended matter and bacteria; 2. Sensitive to oxidative chemicals 3. Damage during trying to prevent hard and sharp particles > 0.1 mm; 4. Membrane damage at pressure > 3 bar.
Reverse osmosis	
1. Softens hard water; 2. Chemical-free; 3. High retention for salts and particular univalent ions 4. Disinfection, including viruses.	1. High energy costs; 2. High discharge volumes; 3. High operating pressure; 4. Membrane deficiency and expensiveness 5. Membranes sensitive to free chlorine.
Nanofiltration	
1. Low discharge volumes; 2. Softens hard water; 3. Chemical-free; 4. pH of water after nanofiltration is normally non-aggressive; 5. Disinfection.	1. High energy consumption; 2. Pre-treatment is needed for some heavily polluted waters 3. Membranes are expensive; 4. Membranes are sensitive to free chlorine
Electrodialysis	
1. The energy loss due to over-voltage 2. Essential components recycling feasibility 3. Low energy consumption. 4. Particularly suitable for separating non-ionised components.	1. Expensive materials; 2. Organic matter, colloids and SiO_2 are not removed. 3. Feedwater pre-treatment is necessary to prevent ED stacks fouling. 4. Elaborate controls are required

276

Photocatalysis	
1. Stable catalysts 2. Low cost of photocatalysts, 3. Possibility of using solar energy to drive the process	1. Not selective 2. Limited selection of operating conditions 3. Energy costs

According to these materials, we can say the most effective wastewater treatment is accomplished by complex methods. In each case, combination of several wastewater treatment methods is selected for a specific current production. It depends on thebranch of industry, the cost and power consumption of the cleaning procedure, the book value of equipment, the availability of working area, and waste recycling.

Conclusions

In recent years, environmental regulations have become exacter, demanding an improved quality of treated effluent. Today, a wide spectrum of treatment technologies of heavy metal removing from pollution wastewater (chemical precipitation, adsorption, membrane filtration, electrodialysis, and photocatalysis) has been developed. Modern adsorbents and membrane filtration are widely investigated and mostly used for the treatment of heavy metal-contaminated wastewater. Photocatalysis is a perspective innovative method for a pure and efficient treatment. In conclusion, technical workability, plant simplicity and cost-effectiveness are the main factors that play primary roles in the selection of the most appropriate treatment system for inorganic effluent. All the factors can be taken into consideration in picking out the most effective and cheapest treatment technique in order to protect the environment. [3, p.373]

References

1. Babel, S., Kurniawan, T.A., 2004. Low-cost adsorbents for heavy metals uptake from contaminated water: a review. J. Hazard. Mater. B97, 219–243.
2. Abu Qdaisa, H., Moussab, H., 2011. Removal of heavy metals from wastewater by membrane processes: a comparative study. Desalination 164, 105–110.
3. Barakat M.A. New trends in removing heavy metals from industrial wastewater. Arabian Journal of Chemistry 2011, Volume 4, Issue 4, Pages 361–377

277

4. Lv, J., Wang, K.Y., Chung, T.S., 2008. Investigation of amphoteric polybenzimidazole (PBI) nanofiltration hollow fiber membrane for both cation and anions removal. J. Membr. Sci. 310, 557– 566.
5. Rether, A., Schuster, M., 2003. Selective separation and recovery of heavy metal ions using water-soluble N-benzoylthiourea modified PAMAM polymers. React. Funct. Polym. 57, 13–21
6. Trivunac, K., Stevanovic, S., 2006. Removal of heavy metal ions from water by complexation-assisted ultrafiltration. Chemosphere 64 (3), 486–491.
7. Chen, G.H., 2004. Electrochemicals technologies in wastewater treatment. Sep. Purif. Technol. 38 (1), 11–41
8. Herrmann, J.M., 1999. Heterogeneous photocatalysis: fundamentals and applications to the removal of various types of aqueous pollutants. Catal. Today 53, 115–129

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BIOKRAFTSTOFFE IN DER LUFTFAHRT

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Annotation: Luftfahrt ist eine der größten Verbraucher von Kraftstoffen und Schmiermitteln. Zunahme des Luftverkehrs verursacht schwere Schäden für die Umwelt. Eine der alternativen Energiequellen in der Luftfahrt kann Biokraftstoffe sein, die aus erneuerbaren Naturressourcen erhalten werden kann. Die Verwendung von Biokraftstoffen kann der CO2-Reduktion zu gewährleisten und die Nutzung von fossilen Brennstoffen zu verringern.

Stichwörter: Biokraftstoffe, Biokerosin, Luftfahrt, alternative Energiequellen, Lufthansa.

Abstract: Aviation is one of the largest consumers of fuel and lubricants. The increase in traffic is causing serious damage to the environment. One of the alternative energy sources in the aviation is biofuel derived from

278

renewable biological resources.The use of biofuels can provide a reduction in CO_2 emissions and reduce the use of fossil fuels.

Key words: biofuel, fly, energi alternative, Lufthansa.

Der Luftverkehr wird auch in den nächsten Jahrzehnten weltweit weiter wachsen. Das bedeutet, dass die Fluggesellschaften auch immer mehr Treibstoff benötigen werden. Kerosin, die in den Luftfahrt-Motoren verwendet ist, basiert auf Erdöl, dessen Vorräte fast erschöpft sind und in 50-70 Jahren enden können. Zudem in jeder Branche, einschließlich in der Luftfahrt, muss man CO_2-Emissionen reduzieren, die bei der Verbrennung von Kerosin entstehen. Aus diesem Grund verbringt man Forschungen nach alternativen Kraftstoffen in der Luftfahrtindustrie, um die Abhängigkeit vom Erdöl abzusenken und um eine Balance zwischen Ökonomie und Ökologie zu finden.

Die Kosten von Kerosin beträgt für eine Fluggesellschaft rund ein Drittel ihrer Gesamtkosten. Erdöl wird immer knapper und damit künftig teurer, In diesem Zusammenhang werden die Kosten für Kerosin auch eher noch steigen. Somit gibt es auch ein finanzieller Anreiz die Möglichkeit, der Verwendung von Biokraftstoffen, als Alternative Energiequelle für die Luftfahrt zu erforschen.

BioKerosin als der Alternativtreibstoff für Flugzeuge. Quelle für Biokerosin, wie für alle Biokraftstoffen, sind die Pflanzen. Wissenschaftler experimentieren derzeit zum Beispiel mit Jatropha- oder Rapsöl. Als beste Alternative haben sich aber inzwischen Algen herausgezeigt, die einen hohen Pflanzenölanteil besitzen. Algen werden von lebenden Organismen gebaut, die in dem Prozess der Photosynthese teilnehmen und Kohlenhydrate produzieren. Algen bestehen aus lebenden Organismen, die am Prozess der Photosynthese teilnehmen und Kohlenwasserstoffe produzieren. Diese Art von Alge existiert sowohl in Süß- als auch in Salzwasser.

Herstellung von Bio-Kerosin auf Algenbasis. Der Rohstoff muss als eine Aquakultur angebaut werden. Die entsprechende Infrastruktur ist bereits vorhanden, weil auch für andere Bereiche - so zum Beispiel die pharmazeutische Industrie und Fischzucht. Es gibt zwei Arten der Anbau von Algen: in Freibädern und in den Bioreaktoren.

Nach der Bergung der Algen werden die enthaltenen Öle mit der Hilfe von Hexan extrahiert und abgepresst. Aus den im Algenöl

279

enthaltenen Terpenen können dann mit Hilfe von Produktionsverfahren, die auch für die Herstellung von Biogas oder Ethanol verwendet wird, Treibstoffe wie Bio-Kerosin gewonnen werden.

In der Theorie ist alles optimistisch. Derzeit ist Biokerosin bereits verfügbar, zumindest als Zusatz zur normalen Kerosin und in einigen Ländern wird als der Standard-Kraftstoff. So soll Bio-Kerosin schon ab 2015 nicht nur zumindest als Beimischung zum normalen Kerosin, sondrn auch als vollwertiger Regeltreibstoff verfügbar sein. Erste Testflüge fanden bereits statt.

Schritt für Schritt zum Bio-Kerosin. Der komplexe Prozess läuft wie folgt ab: aus Biomasse werden die Acetone, Butanole und Ethanole gewonnenen , um Ketone herzustellen. Bei der Verwendung zwei Katalysatoren, Niob-Pentoxid (Nb2O5) und Magnesium-Aluminium-Oxid (MgAlO) in Kondensationsreaktionen gehen jene Verbindungen dann ein, in denen sie sich zu Zwischenprodukten verbinden, sogenannte Dimer und Trimer, von denen der aliphatische, naphthene, ungesättigte Kohlenwasserstoffe empfangen können werden.

In Bioraffinerien wird Biomasse zu verschiedenen Produkten verarbeitet. Von diesem Prinzip her ähneln sie den Erdölraffinerien: Ein komplexer Rohstoff wird in seine Einzelteile bzw. Komponenten zerlegt, anschließend umgewandelt und aufbereitet.

Gerade diese Ketone, sind ein Merkmal dieser Methode. Die bekommenen Vereinigungen können unterschiedliche Länge und Struktur haben, z.B. zyklische. Ausschlaggebend ist der spätere ihr praktische Verwendungszweck. So kann aus Biomasse nicht nur Bio-Kerosin produziert werden, sondern zum Beispiel auch für industrielle Basis-Öle und Schmiermittel, die eine gänzlich andere Struktur und Eigenschaften aufweisen.

Lufthansa - ein Pionier in der Verwendung des Biokerosin. Die Fluggesellschaft Lufthansa begann Biokraftstoffe im Jahr 2011 benutzen. Es ist erwähnenswert, dass nur für die Prüfungszeit, die CO_2-Emissionen in die Atmosphäre auf 1500 Tonnen gesunken wurden. Da Biokerosin die gleichen Eigenschaften wie herkömmliche Brennstoffe hat, kann es um alle Arten von Luftfahrzeugen ohne Modifikation des Flugzeugs oder seine Motoren benutzt werden. Die Lufthansa hat sich weltweit die erste Fluggesellschaft, die Biokraftstoffe bei der Ausführung der täglichen Linienflügen. Das Unternehmen setzt die Umsetzung der Strategie für nachhaltige Entwicklung, das bereits seine

280

Wirksamkeit zeigte. Die Nutzung von Biokerosin mit dem Ziel der Verringerung der CO2-Emissionen ist eine der vier-Stufen-Strategie Umweltschutz, verkauften die Lufthansa.

Bei der Produktion von Biokraftstoffen führen die USA, Brasilien und Deutschland. Jedoch ist der Anteil der Biokraftstoffe von der Rohöl-Produktion in Deutschland ist fast 145%, in Brasilien 20% und in den USA 11%.

Perspektiven für die Produktion von Biokerosin in Russland. In unserem Land ist die Produktion von Biokraftstoffen in der Anfangsphase. Russland kann sich zu internationalen Programmen in die Herstellung von Biokraftstoffen verbinden. Die Fluggesellschaft Lufthansa gemeinsam mit Airbus ist bereit, mit Russland an der Entwicklung von Biokraftstoffen zusammen zu arbeiten. Im Sommer 2012 besuchten Experten aus beiden Firmen landwirtschaftliche Wolga-Betriebe. Als ein Experiment wurden einige Felder dieser Betriebe unter «Energiepflanzen» verschenkt, die als Rohstoff für Kraftstoff verwenden werden können. Früher wird in diesen Ländern Weizen gewachsen, jedoch aufgrund der regelmäßigen Probleme mit Erträgen, wurde ein Teil der Felder aus der Fruchtfolge abgeleitet. «Lufthansa» und «Airbus» hoffen darauf, in Zusammenarbeit mit den lokalen Behörden und den Landwirten nicht nur wieder die Erde in der Verwendung zurückzugeben, sondern auch profitabel zu sein.

Schlussfolgerungen

1. Die breite Verwendung von Biokraftstoffen für Fluggesellschaften ist eine Aufgabe für die Zukunft. Es reduziert erheblich die CO2-Emissionen in die Atmosphäre.

2. Biokerosin ist ein äquivalent zu herkömmlichen Kraftstoff: Biokerosin sollte auf alle physikalisch-chemischen und betrieblichen Kennziffern (außer Dichte) den Anforderungen und Normen unbedingt, die für das aus dem Erdöl bekommene Petroleum entwickelt sind.

Literaturverzeichnis

:

1. «Lufthansa setzt erstmals Biokraftstoff im Linienflugverkehr ein» von Internet-Quellen, Online im Internet/URL: http://www.lufthansagroup.com/de/presse/ Zugriffsdatum: 10.10.2015

281

2. *Nachhaltige Biokerosin-Produktion auf Basis von Biogas* aus unterschiedlichen. Quellen in der südlichen Metropolregion Hamburg/ in Niedersachsen.
3. The U.S. Energy Information Administration (EIA) von Internet-Quellen, Online im Internet/URL: http://www.eia.doe.gov Zugriffsdatum: 09.10.2015
4. Aviation Initiative for Renewable Energy in Germany e.V.: Klimafreunlicher fliegen: Zehn Prozent alternative Flugkraftstoffe bis 2025, Broschüre, Berlin 2012
5. Aviation Initiative for Renewable Energy in Germany e.V. von Internet-Quellen, Online im Internet/URL: http://www.aireg.de/ Zugriffsdatum: 13.10.2015
6. Pressemitteilung Biokraftstoff-Konferenz der Luftfahrt: Energiewende im Verkehr braucht Anschubfinanzierung Berlin, den 19. Mai 2014
7. Bundesverband der Deutschen Luftverkehrswirtschaft e.V. von Internet-Quellen, Online im Internet/URL: http://www.bdl.aero/ Zugriffsdatum: 09.10.2015
8. Air Transport Action Group von Internet-Quellen, Online im Internet/URL: http://www.atag.org/ Zugriffsdatum: 09.10.2015

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PETROTHERMAL RESOURCES

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Abstract: The geological and geophysical, methological, and economic aspects of extraction and utilization of petrothermal resources ("hot dry rock thermal") for thermal and electric energy production were considered in this work. If the technical problem of a rapid drilling of wells 6-10 km deep could be solved, petrothermal energy would compete with conventional forms of energy production and supply.

Key words: petrothermal resources, petrothermal energy, deep wells, heat collectors, geophysical survey methods.

282

The extraction of thermal energy from the "dry" rocks of the crystalline basement is of great significance for energy production in the future. This petrothermal energy accounts for about 99% of the total resources of underground heat. Massifs with temperatures of 250–300°C can be found within active geodynamic provinces at depths of less than 5–6 km. But terrestrial temperature values of 100–150°C occur at these depths almost everywhere in Russia. At this temperature, the utilization of petrothermal resources for the purpose of energy, especially for heat, becomes both topical and profitable.

Of course, the object of the direct interest is the part of the geothermal energy potential that can be utilized using the modern tools for penetration into the Earth's interiors, rather than the general potential. With advances in traditional and perspective technologies for deep and ultra-deep drilling taken into consideration, the technically reachable resources of geothermal energy can be localized within the upper 10–12 km layer of the continental crust. The average thermal capacity of the rocks in this layer can be assumed to be 1000 J/(kg · K); the average geothermal gradient, at 20 mK/m. With these parameters, we obtain a total value of accessible renewable geothermal resources of 1.4 × 1016 tons of coal equivalent. Natural vapors, waters, and brines within the uppermost 10–12 km of the Earth's crust concentrate only 0.01 of these resources (1.4 × 1014 tons in coal equivalents). These figures are enormous and they exceed the total estimates of all the known resources of organic fuel on the planet several thousand times. However, a more grounded estimation of real (available for effective exploration) geothermal resources is possible only on the basis of geological–geophysical investigations, both regional and local, in specific regions of projected petrothermal stations and with an economic analysis taken into account.

The advantages of petrothermal energy sources are common distribution, inexhaustibility, proximity to consumers, relatively low capital and labor demands during exploration, lack of waste, safe exploitation, and ecologic cleanness. The disadvantages are the requirement to drill several deep wells, the inability to transport the energy, the impossibility of storage, and the lack of experience in industrial exploration in Russia.

The first Russian concept of extraction of the main geothermal resources contained in hard rocks was described in 1915 by K.E.

283

Tsiolkovskiy. In 1920, V.A. Obruchev described a geothermal circulating system (GCS) in a granite massif at a depth of 3000 m in his unfinished story “Heat mine.”

The effective functioning of a petrothermal station requires a sufficiently extended heat exchange interface, which should either be found in a natural state, or created artificially. Such an interface may be found in porous strata or naturally cracked zones occurring at different depths. To increase permeability, induced filtration of the heat carrier should be organized and this heat carrier must have a more effective heat exchange parameter and an increased extractability of thermal energy of rocks, in this case. For this purpose, the method of hydraulic fracturing (hydrofracturing) in massive crystalline rocks can be used.

The theoretical foundations of hydrofracturing mechanics in the Soviet Union were elaborated by Academician S.A. Khristianovich with his colleagues and followers. The most extensive use of hydrofracturing was in exploration of oil and gas beds. Hydrofracturing sharply increases the debit of extracting wells and oil and gas recovery. In the last 30–35 years, about 800000 hydrofracturings were performed in the United States; they cover more than 40% of all wells and yield an increase in extraction of about one billion tons. Hydrofracturing has been actively used in Russia as well. For the fields situated in the Nefteyugansk area of Western Siberia oil extraction increased by 2 to 12 times as a result of hydrofracturing [1,c.16-21].

The creation of artificial collectors in the zone of hydrofracturing is the most efficient high end process during the formation of petrothermal circulating systems (PCS). All the stages of this process must be controlled using a complex of geophysical methods. For example, the formation of hydrofracturing cracks is accompanied by micro seismicity and by an increase in the circulation speed of mineralized fluids. These processes can be controlled by the methods of seismic and electric surveying, respectively. As a collector runs, irreversible processes of strengthening or weakening filtration can occur in it. The role played by electric survey methods in monitoring PCS operation is obvious. The creation of an optimal complex for geo physical monitoring is a task that demands special developments, as well as theoretical and modeled research.

A great contribution to the elaboration of ideas on the extraction and use of petrothermal resources was made by Yu.D. Dyad’kin, a

Professor of the Plekhanov Leningrad Mine Institute, A.N. Shcherban' and O.A. Kremnev, academicians of the Academy of Sciences of the Ukrainian SSR, and the members of the scientific schools created by them. They set the foundation of a new scientific field (geothermal physics) and created the technological basis and engineering solutions for the extraction of geothermal energy.

A PCS for the extraction of underground heat consists of the following principal elements: an injector (pressure) well; an underground "heat cauldron" (collector that includes a zone of natural or artificial cracking); and a production well, through which fluid is transported to the surface. In addition, the system should include a turbine room, cooling towers, condensers, intermediate heat exchange installations, pipelines, and, if possible, installations for the extraction of useful chemical elements from the pumped water, which is then pumped into the pressure well again.

For the construction of petrothermal heat plants (PetroHP) for the heat supply of domestic and industrial objects, the temperature of a vapor or vapor–water mixture on the surface should be up to 150°C. This temperature can be achieved for water pumped to a depth of 3 km only for a very high geothermal gradient (up to 50 mK/m). Such high gradients are rare on the territory of Russia, in the North Caucasus (the Stavropol dome, the East CisCaucasus Region), some areas of Western Siberia, the Tunka Depression in the CisBaikal Region, and in the Kuril–Kamchatka Region. [2, pp.19-20] At a background temperature gradient of 25 mK/m, which is observed almost everywhere, the temperature of 150°C can be achieved if the depth of the well is at least 6 km [3].

To generate electric energy at a petrothermal heat electric plant (PetroHEP), the temperature at the bottom of a well should be 250–280°C and the well should be 10 km deep. Model estimates carried out in the United States have shown that construction of a geothermal well 3 km deep with the use of traditional technologies of drilling costs about 4 million USD; 6 km – 10 million USD; and 10 km – 20 million USD. These values can be adapted to Russian conditions in the first approximation. According to Savchenko [4,c.43-48], drilling a production well in Eastern Siberia costs 4 million, and an exploratory well costs 7.5–8 million USD.

285

Thus, construction of PetroHP and, especially, PetroHEP on the basis of existing techniques of mechanic drilling of wells is not competitive compared to the traditional heat and electric plants. Therefore, the highest priority task is creation of new techniques for deep drilling, which would make the process of penetration into the Earth's depths significantly less expensive. The traditional mechanical drilling of deep wells takes years and is very expensive. This is the reason why construction of deep PCSs and petrothermal plants on their basis via traditional drilling is economically inefficient.

A group of Russian scientists and specialists has designed several types of boring header. They have no analogues in the world: the speed of drilling of hard rocks with an average density of 2500–3300 kg/m3 was up to 30 m/h for one of the first boring headers (BS01) and this value is higher by an order of magnitude than in the case of traditional mechanical drilling. This significantly reduces the time of drilling and cost of a PCS. Another boring header is characterized by even higher values of running parameters. The BS01 boring header has passed industrial tests. It can make wells 200–500 mm in diameter and at up to a 10 km depth; a PCS thermal production of 200 Gcal/h can be produced under favorable conditions of permeability. [5,c.24]

At the temperatures that can exist at the bottom of deep wells, special demands are placed on drilling and casing pipes, cement, drilling technologies, strengthening, and pumping of water into wells, as well as for measuring instruments. Modern Russian drilling machines and equipment are intended to function at temperatures 150–200°C. Therefore, petroenergy implies a problem for metallurgists to elaborate heat resistant well pipes.

The efficiency of a PCS consisting of two wells at up to a 10 km depth is sufficient for a vapor supply to the turbines of an electric plant PetroHEP at a volume of 83.3 Gcal/h at an average temperature of 250°C. For this power level of a supplied vapor, the working power of a PetroHEP can exceed 25 MW. It can be equipped with Russian manufactured low-inertia turbines with a power of 25 MW. To provide consumers with heat, a PetroHP with a power of 50 Gcal/h (at an average PCS temperature of 150°C) would be sufficient.

In the last decade Russia has increased the production of petrothermal energy [2, p.3] Development of petrothermal energy

286

makes it possible to considerably reduce the consumption of fossil fuel resources for the production of electric energy and heat.

That would mean a significant reduction in ecological risks, due to decreased fuel combustion; therefore, harmful emissions to the atmosphere and discharges to water and soil would be reduced too. The role of the ecological factor is constantly growing and can be estimated in billions of dollars in losses as a result of damage to human health and harmful effects on biogeocoenoses.

References

1. Gnatus', N.A. and Nekrasov, A.S., SocialEconomic Efficiency of Using of the Deep Heat of the Earth in Russia, Novosti Teplosnabzheniya, 2008, no. 10, pp. 16–21.

2. Ruggero Bertani (2010). Geothermal Power generation in the World 2005–2010. Update Report. Proceedings World Geothermal Congress 2010. Bali, Indonesia, 2010, 25-29 April. Retrieved from http://www.geothermie.nl/fileadmin/user_upload/documents/bestanden/IGA/Geothermal_electricity_in_the_world_2010_report_Ruggero_Bertani.pdf

3. Karta teplovogo potoka i glubinnykh temperatur territorii SSSR i sopredel'nykh raionov masshtaba 1: 10000000, Smirnov, Ya.B, Ed., Moscow: GUGK SM SSSR, 1980.

4. Savchenko, S.I., Exploration of East Siberia: Who if not us? Neftegazovaya Vertikal', 2008, no. 12, pp. 43–48.

5. Gnatus', N.A., Burovoi snaryad: the Device Having no Analogues in the World Energetics, ElektroInfo, 2007, no. 6, pp. 24–27.

287

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ACCELERATED BIOTIC DECOMPOSITION OF PLASTIC WASTE

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Abstract: The article describes a technique of accelerated biotic degradation of plastics. The end product of biotic degradation of plastic waste is compost that can be used in the agricultural industry. The article describes the process of plastic waste preparation for biotic degradation and a rapid method of biotic degradation to prepare raw material.

Key words: bio-degradation, plastic waste, sorting plastics, processing ultrasound, plastics depolymerization.

Modern methods of packing products have created an acute problem of irrevocable elimination of plastic waste. Strength, water resistance, chemical and biological stability cause difficulties in its recycling. Thus, we need safe, simple and low-cost technologies for processing plastics into other forms of matter and energy. Biodegradation - or biotic degradation - is a process in which a polymer material is decomposed under the influence of biotic components (living organisms) [1]. Biotic decomposition begins when the molecular weight of the polymer is reduced sufficiently (depolymerization) at the preliminary stage. The main advantages of rapid biotic degradation of plastics: 1. Low-cost, environmentally friendly way to reduce the amount of plastic waste; 2. Preparation of the final product, the compost, that can be used in the agricultural industry. The general scheme is disposal of a large amount of waste plastics composed of materials of various types and sizes.

Plastic bags need from 10 to 20 years to be decomposed; plastic containers need hundreds of years. Recycling of plastics by burning significantly affects the sanitary and environmental conditions. [5]

The initial grinding is carried out using shredders.The most secure types of plastics to undergo processing are the followings: high-

288

density polyethylene (HDPE); low density polyethylene (LDPE); polypropylene (PP). Their density is less than water. Separation of metal, stones, sand, glass, and plastics that emit hazardous substances (PET, PVC, PS), from safe PP, HDPE and LDPE is carried out in an aqueous medium - flotation baths. Granulation is required to obtain size fractions, which may be further extruded. Molten plastic is produced using an extruder. Plastic granules obtained of raw materials at the preparation stage are placed in the hopper load. Processing molten plastics is performed using ultrasound unit UZGM 1.5, manufactured by LLC "KRIAMID" (Moscow). The principle of UZGM 1.5 is creating cavitation field in the melt, which flows around the emitter. Exposure to ultrasonic waves leads to rupture of macromolecules and molecular weight reduction of the starting polymer that allows its rapid biodegradation.

The final stage of recycling plastic is depolymerized biotic decomposition of the raw material. The process by which organic material such as a polymer with a low molecular weight, is converted to an inorganic substance is called mineralization. Bio-decomposition demands a selection of microorganisms able to cleave polymers of low molecular weight. Fungal microorganisms like *Phanerochaete chrysosporium*, degrade lignin in vivo. It is a reseachers' task of today [5] as well as determination of the optimal conditions for biotic degradation in a short time like biothermal aerobic composting "Pilot Plant mechanical processing of waste (MPBO)" in the Leningrad Region.

The final stage of biodegradation depends on the level of mineralization. The method for monitoring the biodegradation is measuring the amount of carbon dioxide generated in the closed system of compost. It is placed in a greenhouse under the ground.

New biodegradable plastics can replace conventional in some areas of application.

References

1. Krzhan A. Biorazlagaemye polimery i plastiki [Biodegradable polymers and plastics] Available at: http://www.plastice.org/fileadmin/files/RU_Biorazgradljiva_ plastika_in_polimeri_Krzan.pdf (accessed: 30 November 2014).

289

2. Khmelev V.N. et al. Primenenie ul'trazvuka vysokoj intensivnosti v promyshlennosti. Kurs lekcij [Application of ultrasound with high intensity in the industry. Lecture course]. Biisk, Publ. ASTU, 2009, 178 p.
3. Okunev P. A. Vydelenie nekotoryh shtammov mikroorganizmov-destruktorov polimernyh materialov iz mikroflory Kirovskogo poligona tverdyh bytovyh othodov [Allocation of certain strains of microorganisms-destructors of polymeric materials of the microflora of the Kirov landfill] Available at: http://www.rusbio.biz/ru/nb2006_28.shtml (accessed: 30 November 2014).
4. Publikacii po problemam pererabotki i utilizacii othodov i ispol'zovaniju vtorichnogo syr'ja [Publications on the problems of processing and recycling of waste and the use of recycled materials] Available at: http://www.solidwaste.ru/publ/view/574.html (accessed: 30 November 2014).
5. Polijetilen[Polyethylene] Available at: https://ru.wikipedia.org/wiki/Полиэтилен (accessed: 30 November 2014).
6. Plastmassy i polimery[Plastics and polymers] Available at: http://traditio-ru.org/wiki/Пластмассы_и_полимеры (accessed: 30 November 2014).
7. Shul'pin G. These different polymers. Nauka i zhizn' [Science and Life], 1982, no. 3, pp. 80–83 (in Russian).
8. Jekstruzija (tehnologicheskij process) [Extrusion (process)] Available at: https://ru.wikipedia.org/wiki/Экструзия_(технологический_процесс) (accessed: 30 November 2014).
9. Ul'trazvukovaja jekstruzionnaja ustanovka dlja intensifikacii processov v rasplave polimera [Ultrasound extrusion plant for process intensification in the polymer melt] Available at: http://criamid.ru/product/121-prib.php (accessed: 30 November 2014).

290

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ECOLOGICAL WINEMAKING

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Abstract: Wine is one of the most popular products in the history of mankind. Nowadays ecological winemaking becomes popular, and because of that, all advantages and disadvantages of this process should be considered.

Key words: ecological wine and winemaking, ecological safety, Freshcare Environmental Winery, ecological grape

Agro-ecological assessment of land.

The production process of wine begins with the selection of grape or other agricultural products and ends with packaging wine. Although most of wines are made of grape, wine can be made of other fruit or vegetable material. Fruit can be brought from vineyards (farms), which belong to winery or bought in other places. Nevertheless, it should begin with grape growing or rather the environmental part of that process both traditional and modern. Monuments of painting, sculpture, literature and relics (like amphora), which have survived to our times, and other archeological finds of grape seeds and wineries show, that the areas near the Caspian Sea, the Black Sea and the Mediterranean Sea are the ancient centers of culture of grapes and wine. Today Italy, France, Spain, Algeria, Argentina and Portugal are the most important countries in winemaking. These countries produce over 80% of all wine production. [1] The majority of vineyards (~ 95%) are concentrated in the northern hemisphere. Grape grows in dry and relatively cold areas of the Earth. People have selected varieties, which give the best product, for each climatic zone. Climate also affects the occurrence of pests and diseases. The wet and warm climate is favorable for the growth of fungi; the dry climate contributes to the spread of pests.

The main climate factors are temperature, light and moisture. One and the same variety grown in different areas, gives a completely

291

different product in size, quality and taste. Ecological optimization of wine growing consists in removing varieties of grapes that are not resistant to a range of negative environmental factors specific to a particular area, in reducing the impact of chemical plant protection, maintenance and improvement of soil fertility through the use of natural fertilizers (compost, green manure), and phasing out minerals. In several countries, a program called "ecological grapes" has started. [2] The technology involves the use of fertilizers and pesticides handling.

Ecological viticulture provides the recovery, preservation and improvement of soil natural fertility with the help of annual change of crop and soil treatment, phasing out chemical-synthetic fertilizers, growing healthy, resistant plants without using fungicides, reducing water and soil pollution by eliminating nitrates, phosphates and plant protection products.

Process of winemaking.

In 2003, in California a code titled "Freshcare Environmental Winery" was created.[3] The Code spelled out those wine-growing practices that do not harm the environment and satisfy the needs and interests of society, such as: reducing the use of pesticides, economical use of water and energy, waste management, control of soil erosion, the use of "good bugs" to kill the "bad" ones, creating and maintaining conditions for wildlife around the vineyards and beyond them. The term "organic" is a common term that is usually present on the labels of products produced without using chemicals in agriculture and winemaking. "Freshcare Environmental Winery " is more than organic farming, it is one of the most important components of the environmental sustainability.

Environmental risks in winemaking.

1) Wastewater. People spend large amounts of water in the production of wine at all stages, large volumes are used in washing and cooling. Usually this water is discharged into the sewer, where it can be cleaned and reused in the production. Wastewater carries risks in connection with the following factors: presence of toxic substances, a high concentration of organic substances that will reduce the content of oxygen in the water. High acidity or alkalinity depends on the type of detergent and other contaminants, such as pesticides, from the initial washing of fruit.

292

2) Power consumption. Some wine productions need a large amount of energy. The quantity of consumed energy in the production process (gas, electricity or oil) increases with using equipment for cooling and heating.

3) Risks of explosion. Fermentation vessels, which are designed to operate at high pressure, are used in the production of wine. Improperly regulated pressure increases the risk of explosion that can cause serious personal injury.

4) Solid waste: grape marc (peel and seed); the filter precipitate; sludge treatment plants and sludge in tanks.

Improper handling of the above wastes can cause serious environmental problems, such as emissions of greenhouse gases and alcohol vapor, unpleasant odor, pollution of soil and surface water, the danger of propagation of parasites and fires. These products must be processed to produce a marketable product, and the remainder must be used as animal feed or compost. Hazardous waste includes waste oil and solvents used during maintenance.

5) Refrigerants. Used refrigerants can relate to, "chemicals that deplete the ozone layer." There is a growing use of ammonia as an alternative refrigerant. Serious risks to health and safety are associated with the storage (and accidental leakage) of a large amount of ammonia. Ammonia is toxic if it is inhaled in high concentrations and it can cause frostbite if it is released into the atmosphere.

6) Packing. Most of it falls into the waste (glass, tetra-pack, film, plastic). If it is possible, companies should strive to take back packaging, or to provide such a package that is easy to recycle and reuse.

7) Carbon dioxide is used in the production of wine. Improper storage can cause inhalation of toxic substances. So, nowadays ecological winemaking becomes popular. Unfortunately, it is more expensive, than common wine, but there is intention to work towards price reduction.

References

1. Chitatov M.R. Formirovanie kachestva vinograda I vina v zavisimosti ot klimaticheskikh factorov ekologicheskikh zon viraschivanija [Formation of quality of grapes and wine, depending on climatic factors of ecological zones of cultivation]. Doctoral dissertation, Krasnodar, 2007. Available at:http://www.disserc

293

at.com/content/formirovanie-kachestva-vinograda-i-vina-v-zavisimosti-ot-klimaticheskikh-faktorov-ekologiche (accessed 16.10.15).
2. Avidzba A.M., Palenko N.M. Sostoyanie mirovogo vinogradorstva I perspective napravlenija razvitija nauki I tekhniki v etoi otrasli [The State of World viticulture and promising areas of science and technology in the industry] Trudi Nauchnogo centra vinogradorstva I vinodelija «Magarach» [Proceedings of the Scientific Center of of viticulture and winemaking "Magarach"]. Yalta, 2001,p.5-6.
3.Environmental–Winery. Available at: http://www.freshcare.com.au/COPWin (accessed 16.10.15).
4. Rucovodstvo po ekologicheskim I socialnim voprosam po otrasljam vinodelie. [Guidance on environmental and social issues for the wine industry]. European Bank of Reconstruction and Development. Available at: http://www.ebrd.com/downloads/policies/environmental/winer.pdf (accessed 16.10.15).

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HYDROELECTRIC POWER STATIONS OF KARELIA: PERSPECTIVES OF DEVELOPMENT AND IMPACT ON THE ENVIRONMENT

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Abstract: The article elaborates on hydroelectric power stations of the Republic of Karelia. The impact of hydroelectric power stations on the environment is considered. Some measures of environmental control and protection are proposed.

Key words: power engineering, water resources, development, environmental pollution

Power engineering has become the particular object for forecasting of its further evolution lately. According to the prognoses the global energetic crisis is really able to turn out into one of the most

294

serious problems the humanity may face already in the immediate future. The main reason for that will be the extensive excavation of the deposits as a result of the irrational nature management that consequently will be changed by the complete depletion of the reserves of natural resources, which refer to the non-renewable category. As the results of the investigations have shown for a period of up to 2040 year the indices of the most intensive development will be shown by those branches of the electroenergetics, in which renewable sources of energy are involved. At present from all the sources of this category the leading position belongs to the water resources [1].

Hydroelectric power stations produce the electric power as a result of transformation of the water flux energy. Hydro resources belong to the group of renewable resources that give the real opportunity to save the mineral fuel.

In contrast to the other types of the electric power stations hydroelectric ones have a less harmful contaminating influence on the environment. They cope with the changes in the amount of electricity being produced comparatively easy so they are suitable for using in the maximum-demand moments when the requirement of extra energy appears. Although the present type of power stations demands the considerable investments under construction and the long term of building but the produced electric energy is notable for its cheapness, and the building itself – for the lengthy spell of the exploitation [2].

At the same time the functioning of the hydroelectric power stations in some cases is able to disturb the ecological balance. First of all it is associated with the flooding of the surrounding territories and the rising of the underground water level. The hydraulic structures, in particular, the dams and the storage ponds contribute to the climate changes, the surface and soil modifications and sometimes affect the local ecological systems.

Nowadays Russia is considered to have the 2-nd most powerful hydropotential in the world (China taking the 1-st position) which was estimated at 825 milliard kilowatt-hour per year in 2011 (9% of all world's reserves). However only 20% of it is used. For all that the distribution of hydropotential on Russia's territory is quite irregular [3].

Among the best-provided with water-resources regions of the European Russia the Republic of Karelia stands out against other areas' backgrounds. About ¼ territory of the republic is related to the lake-

295

river systems and water areas. The number of rivers is usually estimated at 27 thousands, lakes – at more than 60 thousands [4].

The power supply of Karelia is generated mostly by the hydroelectric power stations of Territorial generating company number 1 or TGC-1, branch “Karelsky”, which at the same time is the main distributor of electric energy in the area.

The electric-power industry of Karelia has made out a long way of development. The date of its establishment is considered to be June16, 1931, when the Karelenergo, the system in control of the power stations and the networks of the Karelian ASSR’s energetic industry, was founded. Its aim was to conduct energy production and the processes of the electrification of the region. Nevertheless the very first hydroelectric station appeared there even earlier. It was Kondopozhskaya power station on the Suna River, which was under construction already in 1926. This station was put into operation on January 29, 1929. At that time it was destined to become the largest power station in Russia.

In 1957 the Republic of Karelia had three energetic areas: South-Karelian, Central Karelian and Priladozhsky. In this connection energy-producing complexes had been functioning in isolation until they were joined together with the high-voltage power line in the direction Petrozavodsk-Svir in 1959.

Nowadays there are 16 hydroelectric power stations which are united in three cascades: Vygsky, Kemsky and Sunsky. The present station system belongs to the branch “Karelsky” developed in 2005 [5].

Although the hydroelectric power stations are less harmful for the environment especially in contrast with the steam power plants, there is a certain ecological risk connected with their work. Unlike steam power plants which require mineral fuel and subsequently emit contaminating particles into the atmosphere in a great volume, the hydroelectric power stations do not affect the environment in such a harmful way. Nevertheless the production of energy at this type of power stations is directly connected with the consumption of the natural resources, the water resources in this case. Industrial processes are accompanied by the formation of waste and the drain of the contaminated waters straight into the unique river systems which are the main peculiarity of the Karelian nature. Also it is possible to witness thermal pollution of water objects caused by the unplanned

296

water warming because of the emission of the heated aqueous torrents. As a result it leads to the transformation of the ecosystems in the water bodies, for instance, the substitution of one kind of plankton for another. Regarding the fact that plankton is the main food for many species of fish, the conclusion can be made about the possibility of shortening the food chains. Some water creatures will not be able to adapt to the new conditions or to the substitution of the local species.

It results in greenhouse gase emissions, in other words the main role here belongs to the thermal pollution. The gas effluent in the estimation of most scientists is a real reason of global warming. So it is evident that the aims of the energy producing companies should include not only the production and the distribution but also taking measures to protection the environment and to prevent the ecological emergencies [2].

Karelia as a unique natural system needs the decreasing of the industrial-caused impact. Firstly, it depends on the reorganization of the power stations. The installation of the modern economical power-generating units can promote the reduction of the contaminant emission into the environment. Another solution can be the introduction of using utilizable water waste for prevention of thermal pollution. Besides that, another effective way is putting into service materials with heat-insulated features. And, of course, probably the most classical way of water purification is the construction of treatment facilities.

Another problem is that water ponds are able to change the microclimate and overflood the fertile territories; as a result the soil will be swamped and salted. The destruction of buildings and roads is also possible.

Moreover, we should take into account that Karelian water ecosystems are reaching a rather high level of development. As hydroelectric power stations can be harmful enough for the integrity of these ecosystems (for instance, they are barriers for fish moving for spawning), it is necessary to install protecting constructions in order to prevent the nature damage [6; 7].

On the other hand we also have the alternative of developing thermal power stations or the so-called small hydros. The peculiarity of this type of power stations is confined in the possibility of using the waters of small rivers and the essential differences in the levels of overfalls.

297

Karelia possesses its own system of 6 small hydro power stations. Their advantages are small demands for power of torrents, so they are possible to be placed even in the hard-to-reach regions and solve in this way the problem of uninterrupted energetic supply; also because of their size the small hydros do not damage the ecological systems so much. However, this station type is not wide-spread in Russia.

References

1. Prognoz razvitiya energetiki mira i Rossii do 2040 goda [Prognosis of the energetic development of the world and Russia up to year 2040]. M., INEI RAN, 2014, p.173.

2. Elektroenergetika Rossii. Chast' vtoraya. Gidroenergetika [Electroenergy of Russia. Part 2. Hydroenergetics]. Geografiya [Geography], 2005, no. 9. Available at: http://geo.1september.ru/article.php?ID=200500907 (accessed 25 September 2015).

3. Khaziakhmetov R.. Pora menyat' turbiny. Ob"ekty gidroenergetiki trebuyut masshtabnoi rekonstruktsii [Time to change the turbines. The elecroenergetic objects require the vast reconstruction]. Rossiiskaya Biznes-gazeta (Russian Business-newspaper), 2011, no. 829. Available at: http://media.wix.com/ugd/e3a11d_965d042f1a7f49c7ab93616119553a53.pdf (accessed 28 September 2015).

4. Programma perspektivnogo razvitiya elektroenergetiki respubliki kareliya na period do 2018 goda [The program of perspective development of Karelian electroenergetics up to year 2018]. Available at: https://docviewer.yandex.ru/?url=ya-serp%3A%2F%2Fwww.gov.karelia.ru%2Fgov%2FLegislation%2Fdocs%2F2013%2F06%2F410r-p_2.docx&name=410r-p_2.docx&c=562ce96c47d1 (accessed 28 September 2015).

5. TGK-1 v Respublike Kareliya [TGK-1in the Republic of Karelia]. Available at: http://www.tgc1.ru/production/complex/korelia-branch/ (accessed 21 September 2015).

6. Ekologicheskaya politika TGK-1[Ecological policy of TGK-1]. Available at: http://www.tgc1.ru/fileadmin/Ohrana_prirody/EHkologicheskaja_politika_TGK-1.pdf (accessed 21 September 2015).

298

7. Plotnikova E. Malye GES: vygodno li eto Rossii ? [Small Hydros: is it profitable for Russia?] Live Energo, 2012. Available at: http://live-energo.ru/articles/11648 (accessed 3 October 2015).

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GEOTHERMAL POWER AS A WAY TO REPLACE FOSSIL RESOURCES

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Abstract: Geothermal energy is clean and environmentally friendly. It may be noted that the so called 'ring of fire' of the Earth envelopes the Pacific rim. Though there are over 300 hot springs sites in India, this form of energy is to be tapped. California is the largest state that produces the highest amount of electricity through Geothermal energy.

Key words: geothermal energy, fossil resources, electricity, renewable resources.

The future of geothermal energy depends on three factors: its competitiveness, demand, supply and other renewable resources in terms of cost, reliability, availability etc. Demand for geothermal energy is going to rise as well as other non-renewable sources. Moreover, today the government also support the resources which are cleaner and do not pollute the environment.

Supply of geothermal energy is limited and confined to certain areas. The total amount of geothermal energy resources is sufficiently larger than that of the coal, oil and gas. Geothermal energy could be more widely available, if the methods and technologies used to extract it werebe improved. Geothermal energy has not fully explored yet. [1].

A large amount of fossil fuels is burned every day at electro power stations to heat up water, to produce steam which spins turbines to generate electricity. Power transmission is more effective than transporting coal or petroleum over the same distance. Because of this, many thermal power plants are installed near coal or oil fields. We have been using natural resources since ancient times. Scientists have

299

calculated that coal supplies are going to last for 180 to 300 years, oil - for 40 years, and gas – for 80 years. It istime for us to think about the next generations. [2]

The core temperature of the Earth is approximately 7,200 degrees Fahrenheit. It is connected with the decay of radioactive material millions of years ago. The high temperature at the earth's surface can produce huge amounts of energy that can produce gigawatts of electricity. Technically, geothermal energy is a renewable source of energy that can produce energy as long as the earth exists. Geothermal energy is a type of energy that can actually make it easy for companies to get what they need, without using a lot of fossil fuels [3].

This heat is brought to the upper surface by thermal conduction and the invasion magma originating from a great depth to the earth's crust. As groundwater is heated, geothermal energy is produced in the form of hot water and steam.

When magma comes close to the earth’s surface it heats up the ground water which was located in porous rocks. They may also flow along fractured rock surfaces. [1] The pros of geothermal energy. First of all, it is renewable: geothermal energy is extracted from the earth's crust and will be available as long as Earth exists. Therefore, while fossil fuels are deplitable this source of energy can last for about 4-5 billion years. Secondly, geothermal energy is environmently friendly: It does not harm environment and, so it is green in all aspects of its use and production! It has been scientifically proved, that geothermal energy has the least impact on the environment. Geothermal energy is virtually emission free, when it comes to the process of developing and making it. When it comes to the production of this type of power, no carbon is used. Third, there is abundance of geothermal power: there is no shortage or other problems that sometimes occur with other types of power. It is not subject to the issues typical for wind and solar energy. And last but leastadvantage is the smallest land footprint: geothermal energy does the least harm to the natural environment in comparison with any other form of energy. But there is one big disadvantage: it is a widespread source of energy, as this type of energy is not widely used, equipment, staff, infrastructure, monitoring are not available. Skilled personnel is not easy to find or rather should trained, which demands funding [3].This limitless form of energy can onlyonly be used in

300

equatorial or in extremely hot region. Many homes can tap it. Traditionally, tunnels pull out underground vertically or horizontally with using geothermal power to heat your home; it can be useful both for cooling or heating the temperature in buildings. The setting of these tunnels isn't cheap but when the energy production begins the effective price becomes lower. It doesn't matter what the temperature is like outside, because the temperature deep down would always be about 50 degrees Fahrenheit [4]. It is to maintain the warmth of your home without spending much money. Finally, this geothermal source of energy saves almost 40% of what is spent on cooling and heating systems.

References

1. Geothermal Energy (2012). Available at: http://www.conserve-energy-future.com/GeothermalEnergy.php (accessed 5 October 2015).
2. Thermal Power Plant (Thermal Energy) (2011). Available at: http://www.tutorvista.com/content/science/science-ii/sources-energy/thermal-power-plant.php (accessed 8 October 2015).
3. Geothermal Energy Pros and Cons (2012). Available at: http://www.conserve-energy-future.com/pros-and-cons-of-geothermal-energy.php (accessed 11 October 2015).
4. The Guide to Home Geothermal Energy (2009). Available at: http://www.popularmechanics.com/science/energy/a4597/4331401/ (accessed 12 October 2015).

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INNOVATIVE ENVIRONMENTAL TECNOLOGIES IN RUSSIA AND IN THE WORLD

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Abstract: It is an essay on the study of new ecological innovations.

Key words: ecological innovations, green technologies.

301

Today the vast majority of the countries in the world have the technogenic type of economic development. This type of development can be characterized as a nature destroying one, based on the use of the artificial means of production created without considering ecological restrictions.At modern growth rates of the population and production even to keep the anthropogenic impact on the biosphere invariable, without allowing its growth, it is necessary to lower the average global load of the environment falling on the GNP unit, several times during the next decades.The problem of ecologization of the equipment and technologies and its coordination with natural processes is faced by the society [1]. Ecological innovations include new nutrition products, new technologies, new production organization methods and social programs which provide cooperation between economic development and environmental preservation, society development according to principles of the sustainable development theory [2]. In order to provide national innovative systems development it is important to implement ecological innovations, which include everything causing a positive effect on ecology. These innovations may be represented by multiple products (for example, environmentally friendly food, biosafe materials, various filters, "green" houses), technologies (new methods of waste recycling and fighting against pollution) and the new methods of production organization providing environmental protection. Besides, it is about complex implementation of ecological management, ecological marketing, the ecotechnologies allowing systematical interaction between economic development and environment protection at the company level.

For the Russian Federation the ecological orientation of economic development is especially significant considering general inefficiency of natural resources usage and the low level of energy saving today. The Russian strategy of innovative development till 2020 provides technological achievement of economically acceptable parameters by alternative power engineering (hydrogen power, green technologies; wind, solar and inflow power and other renewable sources); improvement of ecological parameters of thermal energy, coal energy [3].

Purposeful and systematic ecologization of national scientific and technical programs takes place in North America, the European Union, Israel, Japan, China and other countries [4, p. 105]. In the USA

302

there are laws on urgent economic stabilization (Polson Act, 2008), economic and new investments recovery (American Recovery and Reinvestment Bill, 2009), providing, in particular, support of the innovations concerning energy efficiency (including transition to net power sources), researches into environmental protection, investments into commercialization of ecological innovations, upgrade of transport infrastructure, development of local innovative systems.

In 2010 the European Union adopted the innovative strategy till 2020 (European Commission, 2010), which planned new political directions in this sphere. The EU, realizing global responsibility for threat of the global warming, made the decision to gradually reject hydrocarbon power in general, having assumed an obligation to reduce emissions of carbon dioxide in the atmosphere by 20% and to bring a share of solar and wind energy in the energy consumption to 20% in the next decade. At the same time Europe is heading for toughening of the ecological legislation and environmental standards, developing non-hydrocarbon technologies, expanding luminescent lamps usage instead of glow lamps, equipping all new buildings with solar batteries, partial transition of transport to biofuel.

Nowadays intense processes of economic greening take place in South Korea, which, according to the UN of 2014, has the 26th place taking into account standards of living in the rating of 186 countries (Russia is on the 50th place) [5]. Seoul officially declared "the green growth" as the main state strategic objective, which meant growth of economy due to the use of the modern ecologically adjusted and power effective innovations.

To sum up, in order to preserve nature and let it recover itself, first of all, we need to use natural resources reasonably.

References

1. Zemcova L.V. Jekologicheskie innovacii i ustojchivoe razvitie. Available at: http://pozdnyakov.tut.su/Seminar/a0102/a024.htm (accessed 22 October 2015).

2. Innovacionnyj centr jekodevelopmenta. Innovacii. Available at: http://www.ecoestate.tv/inn/) (accessed 22 October 2015).

3. Gohberg L.M., Kuznecova T.E. Strategija-2020: novye kontury rossijskoj innovacionnoj politiki. Forsajt, 2011.

303

4. Aminov I.I. Social'noe gosudarstvo: opyt stran Severnoj Evropy. Gosudarstvenno-pravovaja politika v Severo-zapadnom regione. Sbornik materialov Mezhdunarodnoj nauchno-prakticheskoj konferencii (3–4 dek. 2009 g.), pp. 104-106.

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GASHYDRATE - EINE ALTERNATIVE ZU ERDGAS

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Annotation: Im Massenbewusstsein der alternativen Energien sind ausschließlich erneuerbare Energiequellen - Solarenergie, Windenergie , Biomasse, Meeresbrandung und dergleichen. Es gibt jedoch noch eine andere sehr vielversprechend, wenn auch nicht erneuerbare Energien: Methan aus dem Meeresboden. Allerdings ist es dort in gebundener Form - in der Form von festen Hydrate.

Stichwörter: Gashydrate, alternative Energiequellen, Methan, Öl, Gas und energiesparende Technologien.

Abstract: Alternative energy sources such as solar, wind, energy and biomass of the sea, have long been known. However, another source has recently been discovered - methane from the bottom of the seas and oceans, called gas hydrates. This is a very promising non-renewable energy source, whose reserves exceed the sum of all the world's known hydrocarbon.

Key words: Gas hydrates, an alternative source of energy, methane, oil, gas, energy-saving technologies.

Die Entwicklung von Gashydraten ist die vielversprechendsten Zukunftstechnologien bezeichnet. Herkömmliche Gasreserven befinden sich in ca. 250 Billionen Tonnen geschätzt. Die Internationale Energieagentur (IEA) im Jahr 2009 veröffentlicht die Informationen über 1 000-5 000 Billionen möglichen Ablagerungen von Gashydraten. Der Gehalt an Methan in Hydrate ist sehr hoch: ein Kubikmeter

304

Gashydrat kann 160 Kubikmeter erzielt werden. Auf den Inhalt von Energie (Brenn) Gashydrate sind vergleichbar mit Öl und bituminösen Ölsand [1; 94 S.]. Künstliche Hydrate können in herkömmlichen Absauganlagen das Erdgas gebildet werden. Natürliche Hydrate können Cluster bilden oder im dispergierten Zustand. Sie werden in Bereichen, die die niedrige Temperatur und hohem Druck zu kombinieren, wie zum Beispiel tiefes Wasser und Permafrost gefunden. Die Tiefe der Gashydraten am Meeresboden von 500 bis 1 500 m, und in der Arktis - 200-1 000 m.

Die Bildung von Methanhydrat treten unter hohem Druck auf und niedriger Temperatur. Große Vorkommen von Hydraten in Russland sind in Bereichen des Permafrosts in Jakutien, Westsibirien und Alaska. [2]. Bestehende Technologien zur Erfassung Gashydrat-Lagerstätten sind von den Eigenschaften der Hydrate und Hydrat-Spezies (wie hohe akustische Leistung, hohe elektrische, niedrige Dichte, eine geringe Wärmeleitfähigkeit, geringe Durchlässigkeit für Gas und Wasser) auf der Basis. Verfahren zum Nachweis von Gashydrat-Lagerstätten sind seismischen Erkundungs, gravimetrische Methode, Messung der thermischen und diffusiven Flüsse auf der Lagerstätte, um die Dynamik des elektromagnetischen Feldes im Untersuchungsgebiet, und andere zu studieren. In der laufenden Periode werden diese Verfahren aktiv weiterentwickelt und verbessert.

Standard-Seismik wird bei Frequenzen von 30 bis 120 Hz durchgeführt wird, und hat eine Auflösung von bis zu 12-24 m; Hochfrequenz - wird bei Frequenzen von 250 bis 650 bis 1200 Hz bei einer Auflösung von 1-2 m durchgeführt Nach der zweidimensionale seismischen Untersuchungen in Gegenwart von freien Gashydratbildung durch die untere Position Hydrat Arten bestimmt. Umfassende Analyse der Öl-und Gas-Systeme können als das modernste Technik beschrieben. Es umfasst die Untersuchung von Sedimentgesteinen, auch Log-Analyse, qualitative und quantitative Interpretation von seismischen Daten und die Analyse anderer Daten über Öl- und Gassystem.

Ein vielversprechender Neben seismischen zerstörungsfreien Nachweis von Gashydrat in porösem Gestein ist elektromagnetische Prospektion. US-Energieministerium plant, es im Jahr 2015 zu verbringen.

305

Die wichtigsten Methoden der Gewinnung von Methan aus Hydraten: Entspannung, Heizung, Entry-Inhibitor.

Bisher Dekompression - ist die vielversprechende Technologie für die Entwicklung von Gashydrat-Lagerstätten. Sein Wesen besteht darin, das künstliche Verringerung des Drucks in der Formation um das Bohrloch, das durch Absenken des Drucks in dem Bohrloch oder durch Reduzieren des Drucks auf der Gashydrate oder wasserfreie Gas nach einer teilweisen Entleerung erreicht wird. Die Technologie ist am effektivsten, wenn die Lage in der Nähe des Gashydrat-Reservoir der freien Gas. Vorteile der Technologie: relativ geringen Kosten; Einfachheit des Verfahrens Gasförderung (erfolgt automatisch, wenn der Differenzdruck); die Möglichkeit, relativ schnelle Produktion von großen Mengen [3; 169-177 S.].

Bis heute hat die Welt mehr als 220 Einlagen von Gashydraten eröffnet.

Allerdings deuten vorhandenen Daten, dass die Entwicklung der Einlagen von Gashydraten ist teurer im Vergleich zu herkömmlichen Entwicklung von Erdgasfeldern aus den folgenden Gründen: niedrige Skaleneffekte, die Notwendigkeit für die Komprimierung von Erdgas vom Anfang der Entwicklung, die höheren Kosten für Entwicklungsbohrungen

Großes Interesse an der Arbeit der Klimaforscher und Geophysiker zeigen. Sie glauben, dass Methan - nicht so sehr wertvolle Energie als einer der Hauptschuldigen der globalen Erwärmung. Umweltschützer glauben, dass die globale Erwärmung kann spontanen Zerfall von Hydrates in einigen Bereichen des Planeten auslösen. Zusätzliche Emissionen von Treibhausgasen zu einer weiteren Erwärmung führen, die Beschleunigung des Zusammenbruchs der Hydrate und Freigabe Treibhausgase

Die Suche nach Methanhydrat werden in verschiedenen Regionen der Welt Ozean durchgeführt. Es ist bemerkenswert, dass, während Geophysik keine Mühen scheuen, um die benthische Flora und Fauna zu studieren. Die Bewohner des Meeresbodens kann als Indikator, die das Vorhandensein von Gashydrat-Lagerstätten in den Eingeweiden zu dienen. Zwischen Kalksteinblöcken, die am Boden als Folge der geologischen und tektonischen Prozesse, die Abfluss von Methan-Flüssigkeiten, die die Grundlage für die Existenz einer bestimmten Art von Schalentieren sind auftreten, entstanden sind. Das

306

Vorhandensein dieser Weichtiere ist ein sicheres Zeichen, das sofort zeichnet sich aus den Tiefen des Methan. Schalentiere nicht Methan essen als solche - ist es für sie so giftig wie es für den Menschen. Wir werden Symbiose: Methan-Flüssigkeit wird durch spezielle Bakterien in den Mantel der Mollusken absorbiert. Und sie selbst auf Schalentiere Verschwendung von Leben dieser Bakterien, die ihnen in einer Tiefe existieren, wo das Sonnenlicht dringt kaum ermöglicht füttern. Schalentiere sind in der Regel zu leben so nah wie möglich an die Quelle der Nahrung, das heißt, jene Risse und Spalten in den Kalksteinvorkommen, deren Ablauf erfolgt methan Flüssigkeiten. Wenn es eine große Kolonie von lebenden Muscheln gefunden, es gibt Grund zu der Annahme, dass es erhebliche Methanquellen. Wenn es keine Muscheln oder sind nur leere Hüllen, dann loslassen Methan intensive Fluide werden, wahrscheinlich, wird nicht beobachtet [4].

Neben der Hauptgründe - Effizienz, gibt es ein zweites Problem - Sicherheit. Gashydrat-Lagerstätten sind an steilen Hängen in Tiefen von 300 bis 1000 Metern und sind ein Faktor bei der Stabilisierung des Meeresbodens in dieser geologisch aktiven Regionen. Großbergbau können Unterwasser Erdrutsche verursachen und als Ergebnis, den verheerenden Flutwellen - Flutwellen. Darüber hinaus ist es notwendig, die Möglichkeit, die unbeabsichtigte Freisetzung von riesigen Massen von Methan in die Atmosphäre, die voller immense ökologische Katastrophe ist zu prüfen, nicht, um die Bedrohung für die Gesundheit und das Leben von Personal, das Bergbaumaschinen erwähnen.

Zusammenfassend kann man sagen, daß trotz der Anwesenheit von großen Mengen an Meer Hydrate, als alternative Quelle von Erdgas, sie können nur langfristig betrachtet werden.

Literaturverzeichnis

1. [1] Groisman A.G. Teplofizicheskie svoistva gazovykh gidratov. Novosibirsk: Nauka, 1985. 94 s.
2. [2] Vasil'ev A., Dimitrov L. Otsenka prostranstvennogo raspredeleniya i zapasov gazogidratov v Chernom more Geologiya i geofizika. 2002. №7, s. 43.
3. [3] Sofiiskii I.Yu., Pukhlii V.A., Miroshnichenko S.T. Gazovye gidraty i energosberegayushchie tekhnologii. Sbornik nauchnykh trudov SNUYaEiP, Vypusk 1(37), 2011. S. 169-177.

307

4. [4] Thakur N.K., Sanjeev R. Exploration of Gas Hydrates: Geophysical Techniques / Springer, 2013.

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PERSPECTIVES OF ENERGY AND RESOURCE SAVING IN NATURAL GAS AND ASSOCIATED GAS PROCESSING

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Abstract. This paper is devoted to the review of the problem of energy and resource saving in processing natural and associated gases. Special attention is paid to the aims and purposes of companies' resource saving. Comparison of the natural and associated gas composition is carried out and special features of their processing are considered here. Also, the value of saving fuel and energy resources in the implementation of energy saving measures is calculated.
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Key words: energy saving, resource saving, natural gas, associated gas, processing, hydrocarbon crude.

Energy and resource saving is one of the most crucial problems of the 21 century. The position of the Russian Federation in the world and the standards of living in the country depend on the results of this problem solution. Russia has not only all the necessary natural resources and intellectual potential to successfully address its energy problems but is actually a resource base for many European and Asian states. It exports oil, oil products, natural gas in huge volumes. However, the abundance of energy resources in our country does not mean that these resources can be used wastefully; only energy-efficient management is the most important factor of Russian goods and services competitiveness in an open market system.

308

Energy saving should be a strategic task of the country [1] being both a main method of providing energy safety and the only real way to maintain high revenues from the hydrocarbons exports.

The main resource saving purpose is improvement of energy efficiency of technological and auxiliary industrial processes based on realization of economically sufficient energy saving technologies, reduction in energy intensity of production, reduction in the fuel and energy component in the cost of production, as well as optimization of the use of material and technical resources and labor supplies. Moreover, the main priorities of the state policy are: economy and energy saving efficiency; fuel and energy country balance and fuel and energy complex structure improving; improving energy security. Gas and chemical production has become very important due to the reduction of natural hydrocarbon reserves. These raw materials provide the hydrocarbon crude processing. For example, natural gas processing gives many valuable final and semi-finished products such as synthetic fuels and lubricants and methanol. In its turn, methanol is a raw material for the production of other chemicals: formaldehyde, acetic acid, insulating substances, varnishes, paints, glues, and additives for fuels. The upcoming trend of associated gas use is a complex processing to yield a concentrate of aromatic hydrocarbons (a high-octane additive), benzene and dry gas simultaneously. The energy policy of companies in the field of natural gas and associated gas processing represents a set of corporate strategic measures focused on increasing effectiveness of the company on the world market and providing the required level of competitive sustainability in the current and future conditions. While processing savings of natural and associated gas can be achieved by: thermal power equipment modernization; major repairs of process furnaces; replacement of existing insulation material; performance fixing tests of boilers; technology equipment (energy technology) reconstructions; optimization of technology equipment operation gas utilization while blowing factory flare collectors, absorbents airing, and preventive maintenance of technology equipment carrying out. The gas composition and its oil content vary within a wide range and differ depending on the specific features of the field.

Under normal conditions associated gas is light, gasiform hydrocarbons (methane, ethane, propane, butane, isobutane and some

309

others) which are under pressure and dissolved in oil in geological conditions. When oil is extracted to the surface the pressure falls to the atmospheric level and the gas "boils away" of the oil. An additional amount of associated gas can be obtained by crude oil heating up.

As to natural gas, it contains methane (its main component which usually makes 82-98%) and some other hydrocarbons. To this effect natural gas is less rich in C2+ fractions (a mixture of substances with two or more carbon atoms) than the associated gas of the oil fields. Besides, volumes of natural gas extraction are higher. And this fact is very important for gas chemistry [2]. For example, ethane content in natural gas varies from 4% to 8%, propane – up to 3%, butane – up to 2,5 %.

The chemical composition of the main gas components is shown in Table 1.

Table 1. The chemical composition of natural and associated gases

Composition	Natural gas	Associated gas
CH_4	70-98%	40%
C_2H_6	0,5-4%	20%
C_3H_8	0,2-1,5%	20%
C_4H_{10}	0,1-1%	20%

Beneficial use of oil-associated gas (OAG) has not been among the priorities of oil and gas companies until recently. OAG was separated from oil when preparing it for transportation and burnt in flares right on the field. The flame of these flares was illuminating the night sky over mining regions and it was one of the symbols of the Russian oil industry for decades. The situation has been changing in the recent years. Mining companies are introducing various methods of OAG application as fuel for small power plants. And petrochemical companies use it as a raw material for valuable petrochemical products.

Associated gas processing is to separate a C2+ fraction from methane, acid (hydrogen sulfide) and inert (nitrogen) gases, as well as water and entrained solids [3]. These processes are based on two principles.

The first one is realized on low-temperature condensation (LTC) installations, where gases are separated according to their liquefaction temperatures. For example, methane becomes liquid under the atmospheric pressure at -161.6°C, ethane at -88.6°C.

310

Propane is liquefied at -42°C, butane - at -0.5°C. The liquid part of LTC plant production is called "the wide fraction of light hydrocarbons" (WFLH) because it is a mixture of C2+ fraction substances. And the gaseous part (methane and some ethane) is called "dry stripped gas" (DGS). This gas goes to the gas transport system.

The second principle is realized on low-temperature absorption (LTA) facilities and is based on the fact that different gases have different parameters of solubility in liquids. LTA columns can be filled, for example, with circulating liquid propane and the original gas is bubbled through it.

Thus, the target components dissolve in liquid propane, while ethane and methane - components of the dry gas - pass without absorption. Thus, liquid propane dresses "fatty" components after a series of cycles. Then propane is used as WFLH for final production. In some cases, hydrocarbons are applied as liquid absorbent. In that case, the term "oil absorption plant" (OAP), which is not entirely accurate but historically well-established, is used for the separating equipment.

As for the natural gas, the only reason for the extraction of a C2+ fraction from natural gas in Russia is the technical requirements for the content of these components for their transportation by the gas transmission system. In other words, the "fatty" component content is reduced to meet the requirements of technical conditions, after that the gas is sent to use. This "fatty" gas transportation does not make much sense, because the gas is burnt after the pipeline. Moreover, the "fatty" components begin to condense and accumulate on the bottom due to the pressure in gas pipelines, which entails additional costs for the operation of pipes and work of delivery systems.

Waste gas components are extracted purposefully if gas contains too much of them. That economically justifies its high-quality processing. The technical processing of natural gas with the separation of valuable fractions is similar to the processing of associated gas. It is based on the difference in the boiling points of gases.

Dried and desulphurized gas is cooled stepwise and releases its components gradually. The main methods of natural gas processing are [4]:

- chemisorption method of cleaning gases from hydrogen sulfide and carbon dioxide

311

- gas cleaning from hydrogen sulfide and carbon dioxide by physical and combined absorbers
- gas cleaning from thiols
- gas processing by low-temperature condensation
- extraction of heavy hydrocarbons using absorption processes
- absorption-desorption processes.

The introduction of technological improvements in the gas system processing can result in significant savings. Let us show this by the example of introducing a complex air-cleaning device system (CACS) at a gas processing unit (GPU). The methodology of calculating the value of saving fuel and energy resources in implementing energy-saving measures was used for the calculation of gas savings [5]. The calculation results of the GPU fuel gas saving after installing CACS (for a year) are shown in Table 2.

It follows that after the installation of CACS on GPA C-6.3 the annual savings of the fuel gas can reach 1265.9 thousand cu m, or 3.8% of base consumption.

Table 2**.** The calculation results of GPU fuel gas saving after installing CACS

Characteristics	1 quarter	2 quarter	3 quarter	4 quarter
GPU working time, h	2160	2184	1776	2208
The lowest gas heat value, kcal /m3	7990	7990	7990	7990
The actual efficiency of gas turbines in the base period, η_e	0,294	0,262	0,272	0,286
The actual efficiency of gas turbines after CACS introduction, $\eta_e^{КВОУ}$	0,295	0,263	0,275	0,290
GPU utilization factor, $k_{загр}$	0,969	0,676	0,780	0,884
The coefficient of technical condition of GPU fuel gas, $k_{тг}$	1,05	1,05	1,05	1,05
The GPU fuel gas saving	194,9	108,4	330,4	632,2

312

$\Delta Q_{КВОУ}^{гпа}$ thous. m3				

Thus, the estimated annual gas savings of the gas turbine are:

$\Delta Q_{КВОУ}^{гпа}$ =194,9+108,4+330,4+632,2 =1265,9 thous. m3.

Consequently, development of new technologies for energy and resource saving is one of the most actual tasks at the present time, especially in the field of the petrochemical industry. Modernization of existing methods of natural and associated gas processing as well as development of new processing technologies can provide real savings of raw materials and(or) energy. The calculations show the size of fuel savings after implementing energy saving measures.

References

1. Jenergeticheskaja strategija Rossii na period do 2030 g. Utverzhdena Rasporjazheniem Pravitel'stva ot 13 nojabrja 2009 g. № 1715-R [Energy Strategy of Russia for the period up to 2030 approved by the Government Decree November 13, 2009 № 1715-R]
2. Busygina N.V., Busygin I.G. Povyshenie izvlechenija celevyh komponentov v processe nizkotemperaturnoj absorbcii [Increasing the extraction of target components in the low-temperature absorption]//Tez. dokl. Vserossijskoj nauchno-tehn. konf. Himija, tehnologija i jekologija pererabotki prirodnogo gaza. [Report. All-Russian Scientific and Technical conference. Chemistry, technology and ecology of natural gas processing]. - 1996. – p. 48.
3. Kostina A. Populjarnaja neftehimija [Popular petrochemicals]. Moscow: JeKSMO Publ., 2011, p. 94.
4. Bekirov T.M. Pervichnaja pererabotka prirodnyh gazov [The primary processing of the natural gas] Moscow: Himija Publ., 1987, p. 256.
5. Metodika rascheta velichiny jekonomii rashoda toplivno-jenergeticheskih resursov pri vnedrenii jenergosberegajushhih meroprijatij: R Gazprom 2-1.20-819-2014 [The methodology of calculating the value of saving fuel and energy resources in implementing energy-saving measures R Gazprom 2-1.20-819-2014], 2014, p. 104.

313

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THE UPGRADING TECHNOLOGY "THE PALINGENESIS PROCESS" IN ORDER TO IMPROVE ENVIRONMENTAL SECURITY INDICATORS OF THE CONCRETE MATRIX

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Abstract: The Palingenesis Process allows to use solid communal and construction wastes as a filler in the production of concrete blocks. In order to improve tensile properties and solidity of environmental concrete it's possible to use a technology of capsulation of large fillers by laitance and perfection of composition of concrete matrix by adding nanoconcrete.

Key words: wastes, eco-concrete, nanocement, capsulation.

The problem of industrial wastes utilization and consumption is one of the most environmental management actual issues. The technology "The Paligenesis Process" allows using industrial wastes and consumption as a filler in the production of the concrete. Advantages of this technology are resource and energy savings, landfills reduction, increasing production of construction materials. Even today the issue of this material safety for humans and for environment in Russia has not been studied [1].

The presence of chemical substances and micro-organisms depends on a complex and not always predictable wastes composition used in the "The Paligenesis Process". The problem of this concrete is an ammonia emission, connected with using modificators and intensifiers of cement grinding aid, and this question can be only solved by using new technologies. Due to improvement of the concrete matrix it is possible to achieve improved product quality and improve its environmental safety.

314

Developed at the Moscow Institute of Materials and efficient technologies (Moscow IMET) cement nano-capsulation technology is the process of coating the cement grains by a solid-shell capsule, which thickness is about few tens of nanometers of a modified polymeric compound, which imparts radically new qualities to dispersed composite portland-cement. Obtained nano-cement has several advantages over ordinary portland-cement:

• Monolithic concrete products produced as a result of "sealing" concrete pores, thereby reducing almost to a minimum the possibility of allocating to the living spaces atmosphere chemical substances in toxic concentrations;

• Increased resistance to sulfates, chlorides and weak acids;

• Low consumption of cement as the binder component of the concrete mix and its high endurance [2].

Use of capsulation technology on fillers in this case on the waste contributes to reliable fastening of possible harmful elements inside the capsules. Due to intense physical pressure filler is covered by a laitance, which improves the mechanical properties and concrete monolithic qualities. The new technology allows you to adapt to different volume and toxicity of recycled wastes, to change their composition [3].

Upgrading technology "The Palingenesis Process" enables to obtain a wide range of environmentally friendly materials and manufacturing goods.

References

1. Klimakina A.V., Astapkovich M.P. Jekologicheskaja bezopasnost' stroitel'nyh materialov, pri proizvodstve kotoryh isol'zujutsja othody proizvodstva i potreblenija (na primere jekobetona) // Sbornik tezisov Mezhdunarodnogo nauchnogo foruma molodyh uchenyh «Nauka budushhego – nauka molodyh», tom 2. Sevastopol', 2015. – S. 152-154.

2. Bikbau M.Ja, Vysockij D.V., Tihomirov I.S. Betony na nanocementah: svojstva i perspektivy // Tehnologii betonov, 2011, №11-12, s.31-35.

3. Bikbau M.Ja. Morfologicheskie osobennosti, struktura, svojstva nanocementov i betonov na ih osnove //Tehnologii betonov, 2013, № 12, s.26-32.

315

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UNRESTRICTED EXPORT OF NATURAL RESOURCES: TRANS-NATIONAL CORPORATIONS IN WEST AFRICA

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Abstract: Contribution of West Africa’s mineral resources in developmental context and the underpinning factors in achieving economic growth are investigated. The presence of ‘natural resources in West Africa serve as a curse’ is overviewed. Several factors of West African countries failure to achieve sustainable development are brought out. The exportation of mineral resources in an unrestricted way has not been given proper attention by governments. The need for economic transformation to achieve sustainability of the economic sector is discussed.

Key Words: Dutch Disease, Development, Sustainability, natural resources, economic growth, economic transformation

Introduction. West Africa is rich in natural resources, especially oil, gas and other mineral resource deposits. And some of the countries are among the top thirty list of countries with proven large deposits of crude oil reserves [1]. Worldwide demand for petroleum has risen steadily over the past few years and is forecast to grow stronger, driven by population growth and increasing affluence in emerging economies [2]. West Africa, in particular, has seen a flurry of exploration and production activities since 2007, when one of Africa’s biggest oilfields was discovered off the coast of Ghana. Subsequent oil and natural gas discoveries in the region have further accelerated global interest and investment intent on exploiting these resources. The 625-mile petroleum-rich geologic formation along the West African coast has been termed one of the world’s ‘least-covered magnets for oil companies from around the world’ [2].

The figures of the table above are not specifically based on the revenues generated from Africa, but African resources contribute greatly with little benefits to the people of the continent.

Development as put forward by different academic scholars refers to the improvement of human welfare, quality of life and social wellbeing (using socio-economic indicators). In actual development practice, countries that are blessed with natural resources are said to be well developed than those without. Countries like Ghana are believed to have 5 billion barrels (790,000,000 m3) to 7 billion barrels (1.1×109 m3) of petroleum in reserves and Nigeria also has 37.2 billion barrels (5.91×109 m3) of proven oil reserve. But based on various researches done, it has been proven that most of the countries that are natural resource rich are still creeping in poverty.

This is evident from Gylfason's work [3] which noted that out of 65 countries classified as "natural resource-rich", just four managed to maintain a per capita GNP growth rate higher than 4% between 1970-98, and how the OPEC nations as a whole suffered an average 1.3% GNP per capita decrease between 1965-98, compared with an average 2.2% increase among low and middle income countries [3 p.848]. The exportation of these resources has not ultimately contributed to reduce poverty and hunger, or improve the health, education and energy sector. Corruption, degeneracy, depravation and putridness are all underpinning factors to such activities in West Africa. The table below exemplifies a simple fact that natural resources normally serve as a source of capital revenue if they are well exploited and given fair exportation. This increase in GDP is a result of the presence of the natural resources.

This can be related to a World Bank study; since the discovery of diamonds in Botswana, the country 'has been one of the fastest growing economies in the world and moved into the ranks of upper-middle income countries [4].

Table 1. Companies in Africa per sectors and revenue per year.

Name of company	Country of operation	Headquarter location	sector	Revenue earned / year
Devon Energy Corporation	Ghana	USA	Oil and Gas	$1.59B
Hunt Oil Company	Ghana	USA	Oil and Gas	$4B

317

Nexen Inc.	Nigeria	Canada	Oil and Gas	$6.7 billion
Mart Resources Inc.	Nigeria	Canada	Oil and Gas	$58 million
IAMGold Corporation	Burkina Faso, Mali	Canada	Mining	$321 million
Talisman Energy Inc.	Algeria	Canada	Oil and Gas	$7.528 billion
TransGlobe Energy Corporation	Egypt	Canada	Oil and Gas	$140.4 million
Madalena Ventures Inc.	Tunisia	Canada	Oil and Gas	$125 million
Semafo Inc.	Burkina Faso, Guinea, Niger	Canada	Mining	$289 million
Great Western Minerals Group Ltd.	South Africa	Canada	Mining	$1,727 million
LukOil	Ghana, Ivory Coast	Russia	Oil and Gas	
African Minerals Limited	Sierra Leone	UK	Mining	$869.1 m
Paladin Energy Ltd.	Malawi, Namibia, Niger	Australi a	Mining	$329.8 million

$5 bln

Table 2. Population growth and GDP ($) of few West African countries (Source: World Bank 2014)

COUNTRY	POPULATION	GDP ($)(billion)
Ghana	25,904,598	49.45
Guinea	10,500,000	6.19
Liberia	4,294,077	1.95
Nigeria	178,516,904	521.8
Sierra Leone	5,743,725	4.136

The natural resource curse has a great impact on countries that

318

are rich of it, especially when considering countries that are of low-income earnings due to the lack of government effectiveness. L. Stott [5] used empirical examples to examine both economic and political hypotheses that attempt to explain this relationship. Stott L. coined the term '*Dutch Disease'* in his research and used it based on an experience of Nigeria, who became entirely reliant on their oil exports. 'Dutch Disease' killed investment in the non-resource trade sector as both the 'resource movement effect' and the 'spending effect' diverted resources away from Nigeria's agricultural sector, in favour of the high-yielding resource sector.

In considering Sierra Leone, the relentless contributions by most non-governmental organizations have been in the forefront to fight corruption in the exportation of most of these resources.

Civil society organizations like Network Movement for Justice and Development (NMJD) and others have been contributing greatly in making sure that corruption is reduced in the exploration of Sierra Leone's nonrenewable natural resources. NMJD and other civil society organizations did a research on revenues generated from licenses.

In the findings, it was mentioned that Sierra Leone 'had 3% export tax in 2004 which was only US$5.2 million (out of total export of USD$126million) and in 2005 it was US$12million (for a total of US$141.9 million).

This excludes unaccounted revenue that went through the porous borders of Sierra Leone-[NMJD Sierra Leone 2012]'. These studies prove the role all civil society organizations could play in enhancing a corrupt free system through publications of their works and making it known to the citizens of the said country.

Though it is presumed that very few people will have time to read such findings but it can also be disseminated to the people through radio discussions. The natural resource curse was further looked at from a political angle as having 'three main branches of political explanation for the resource curse: cognitive, societal and statist explanations. Cognitive explanations for the resource curse propose that resource wealth induces a form of myopia amongst policy makers.

Societal explanations suggest that resource booms helped to increase the political influence of non-state actors (NSAs), who could be this constraining factor as they might favour growth-impeding policies. The statist proposes that as government revenue in resource

319

abundant countries is largely gathered through resource rents, less priority is placed on the collection of taxes from the domestic population.

The government focus on resource rents results in a failure to develop an effective set of institutions and bureaucracy with which to tax citizens' [5].

By connecting this work to that of Scott, in most scenarios governments of most countries give license to various 'foreign corporations' to operate due to the lack of technological capacity to harness the massive reserve of the natural resources. These companies will end up doing unrestricted exportation and the government in power remains silent about it as most of the earnings gained are used to maintain themselves in power. This makes most of the foreign exchange earnings in gross terms that are supposed to contribute to the economy of the different countries in West Africa not to be significant due to the bounteous incentives that are given to the mining companies.

These incentives lead the companies to be doing unrestricted exportation thereby giving them the opportunity to hold fiscal regimes to retain 75% of their mineral proceeds offshore which gives them the chance to do acquisition of machineries, spare parts, dividend payments and remittances to the expatriate workers. This has also made many mining companies in West Africa retain their earnings in offshore accounts and leave very little in local accounts for some operational cost thus bringing retardation in the growth of many countries economic status. But it is very improbable to improve on the transparency and accountability of the exportation of these resources.

Conclusion

The need for economic transformation that helps to achieve sustainability of the economic sector is of high priority. Doing a conclusion there should be a better oversight on trans-national cooperation which includes monitoring and control over the activities regarding the exportation. But the most unfortunate situation in West Africa is that over the past decades of natural resource exploitation, most of the countries still remain to creep in poverty with less development taking place. The inhabitants in most of these countries live on less than a dollar except for few countries. Although efforts are made by some countries with regard to their policies and regulations towards the exportation of these resources and the export earnings

320

gained, but the implementation is said to be deterrent especially when it comes to the need to create wealth from these natural resources and how they have the best distribution through inter and intra-generational equity.

Transparency initiatives are necessary and some of the partners that should be involved should include; government representatives, civil societies, volunteers and representatives from the companies that are engaged in the extraction and exportation of these resources. Furthermore, in achieving controlled trans-national cooperation's, some reforms need to be done especially in the mining sectors by enhancing a very good participation and regulations with regard to the implementation. The participation and regulations will help to gear towards achieving the buildup of skilled labor for the development of these resources, reverse the total dependence on foreign transnational corporations to enhance total sustainable development and provide complete utilization of the natural resources that will lead to economic development and also lead to the reduction of unregulated exportation of West African natural resources.

References

1. Bhushan, Aniket. Canada and Africa's Natural Resources. Available at: http://www.nsi-ins.ca/wp-content/uploads/2014/01/Report-Canada-and-Africa%E2%80%99s-Natural-Resources.pdf.
2. Bazilian M. et al. Oil, Energy Poverty and Resource Dependance in West Africa, 2013. Available at: https://gspp.berkeley.edu/assets/uploads/research/pdf/Journal_of_Energy__Natural_Bazilian_et_al_(2013)_Resources_Law_Bazilian-2013.pdf.
3. Gylfason, Thorvaldur. Natural resources, education, and economic development. Available at: https://notendur.hi.is/gylfason/pdf/eer2001.pdf.
4. The Africa Competitiveness Report. Available at: http://www.worldbank.org/content/dam/Worldbank/document/Africa/Report/africa-competitiveness-report-2013-main-report-web.pdf.
5. Stott, Lewis. Are Natural Resources More of a Curse than a Blessing? (Jul 3, 2015). Available at: http://www.e-ir.info/2015/07/03/are-natural-resources-more-of-a-curse-than-a-blessing/.
6. Investigation of tax payments and corporate structures in the mining

321

industry of Sierra Leone. Network Movement for Justice and Development Sierra Leone, 2012. Available at: http://www.resourcegovernance.org/sites/default/files/Not_Sharing_the_Loot.pdf.

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THE ENVIRONMENTAL ASPECTS OF POLYETHYLENE TEREPHTHALATE WASTE RECYCLING

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Abstract: PET products are the most widespread material in the household using. This article describes modern methods and ways of recycling PET waste. The problem of disposal and recycling of polymeric materials is one of the most urgent, since the issues of their return to the production and improvement of ecological conditions are particularly acute.

Key words landfill, PET, extrusion, injection molding, vacuum formation, radiation destruction, thermal decomposition, mechano-chemical method, synthesis.

Today a plastic pack is the most widespread in the World. But what do we do after using this product? It would be a great mistake if we just throw out this waste as a natural process of decay can last for 200 years. Recycling of plastic waste is precise decision.

High processibility and wide using of PET make waste to be the most recycling product in the world. Execution of primary products was higher than 20 million ton in 2013. According to the experts bottles production is higher than 500 billion pieces so it can cause detrimental effect on the environment through their physical inactivity and safety.

More of that, re-using of 1 ton of PET saves more than 5 cubic meters of waste landfill territory, reduces the carbon dioxide emission

322

because of energy usage reduction, and the price of recycled PET is 20-30% lower.

As the consumption of PET is growing the amount of its waste is growing too. Wastes of PET are formed during its synthesis and during all stages of the process of its processing into products by extrusion, injection molding, vacuum or blow formation of preforms. For example the process of vacuum formation from obtained by extrusion, accompanied by the formation of waste in quantity up to 10%.

Producers of PET fibrils and PET lines usually utilize their waste directly on the premises by mixing it with basic polymer or by its recycling into the products like spun fiber or bonded fabric. So almost all PET waste is reused in a closed circuit on the plants.

Before recycling we have another problem. How to collect this waste? Every country has its own view on the decision. For example in Switzerland and Germany the price of the product consists of the price of the product and its container. You can return your money by returning a container. In some countries there are special automates which return money for a container. In China there is a special profession: skimmer of plastic bottles.

So it is easy to realize the connection between ways of collecting PET and its recycling in the countries (figure 1) [1]. As a rule PET recycle process into small flakes consists of several steps: storage and submission; sorting; splitting up; the first vibroseparation; flotation; washing, rinsing and drying; breaking down into small flakes; the second vibroseparation; dust catching. This developed waste could be used for reprocessing plastics [2].

There are some ways of PET: recycling. Waste landfilling is an unexampled way as it needs huge areas. One more unexampled way of recycling is burning because waste calorific capacity is second after wood fuel. The next type of recycling is radiation destruction of polymer which can work under occurring hard ionizing radiation, accelerated ions and electrons. Chemical molecules are destroyed by neutrons, gamma-rays and beta rays. It helps formation of low-molecular products which can be taken to the biocycle process. The method of thermal decomposition means pyrolysis reactions, catalytical thermolysis leads to low-molecular products. This method is used in the USA with producing monomers- dimethyl terephthalate and ethylene glycol. [3]

323

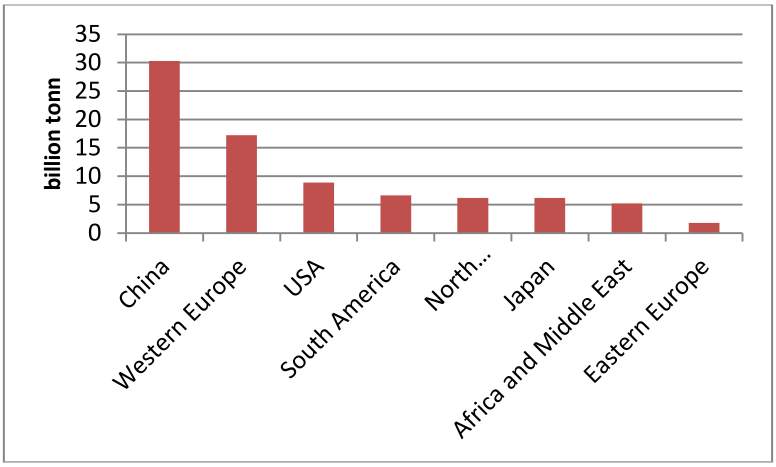

Figure 1: The distribution of pet-waste collection by countries and regions of the world in 2013 (bln.t)

Chemical recycling of PET: in such processes the PET is subjected to depolymerization by interaction with chemicals such as methanol (methanolysis to obtain the monomer - dimethylterephthalate); ethylene glycol (glycolysis with getting bacherolette); acids (hydrolysis with obtaining terephthalic acid) or alkali (saponification). These methods are energy intensive, they require high-tech equipment, however, they are enable to use raw materials –PET waste of the lower quality, such as chemical processes allow for additional cleaning. That assumes the process of PET waste depolymerization. Neutral hydrolysis to terephthalic acid and ethylene glycol, again reaching for the synthesis of PET. The most commonly used processes are continuous. These are relatively economical and environmentally safe methods of recycling PET waste. The known method of chemical recycling of PET is using glycolysis and subsequent polycondensation of recycled PET with the addition of unsaturated polybasic acids or their anhydrides in order to obtain a relatively inexpensive unsaturated polyester resins.

Degradation products of recycled PET waste can be used again in the synthesis of low molecular weight PET to obtain plasticizers, varnishes, coating materials. The last one is the mechano-chemical method. This is the most common and usually the most economical

324

method of processing the crushed and purified waste PET, representing a technological chain, whereby it is successively melt, homogenized, cleaned of contaminants and filtered in the extruder with degassing under vacuum. [4] In technologies of different companies are used one-, two - or alternative extruder (having a degassing zone). Producer of multispecific extruders justifies the appropriateness of their use for recycling PET because they provide extremely high phase boundary surface that intensifies the removal of impurities. After the extruder, the melt is filtered from mechanical impurities and is pelletized. According to the principle of "bottle to bottle" the so-called "layered technology" can be used, when recycled PET is between the two layers of virgin polymer. Multilayer bottles can contain up to 50 % or more of the recycled PET but the requirements can be somewhat lower. This technology is used today in several European countries. The method of entering the melt of recycled PET flakes from the extruder with subsequent filtration in melt conduit before the finish condensation polymerization reactor installation of the synthesis of a high-viscosity PET bottle is very promising too.

Melt recycled PET and main product flow approximately of the same viscosity have been homogenized to a high degree of uniformity and in a horizontal reactor with stirring under vacuum gaining the desired end viscosity. This technology provides the raw materials saving while maintaining the end product quality. The volume ratio of the primary and secondary polymers depends largely on the quality of the latter. According to different sources, its share may reach 20 to 50 %.

Gradation source quality of PET waste for processing into various end products can be approximately represented in the following hierarchy (in the order of decreasing quality requirements): bottles for provision; long-length threads, a packing strap, bonded fabric, spunbond and meltblown obtained by molding from a melt; bottles for technical applications , spun glass; casting materials, as of reinforced PET. [5] The highest requirements for PET waste are used in the process of "bottle to bottle" technology in the manufacture of PET containers for foods processes. The total number of collected and prepared PET waste – even with a separate collection system – the share of raw materials of such high quality is usually not very high. For

325

other applications (especially for most kinds of textile products) requirements are significantly lower.

Depending on the condition of PET wastes all the described processes of their processing may have the right to exist. The main principle when choosing a particular technology is to maximize the use of the specific recycled PET potential,which production needs the valuable organic raw materials and energy, with full security of its end-products. The latter is very important for Russia, therefore, the use of recycled PET for direct food contact appropriate major producers and processors with modern technologies and systems of quality control. The recycling processes of PET waste in the Russian Federation have promising prospects for their widespread implementation.

References

1. Oborudovanie predprijatij po pererabotke plastmass / Viktor Zavgorodnij, Jerik Kalinchev, Efim Maharinskij, Redaktor: Viktor Zavgorodnij // 2012.
2. Sistemnyj analiz upravlenija othodami / Sergej Kostarev, Tat'jana Sereda und Marija Mihajlova // 2012.
3. Fiziko-himicheskie osnovy pererabotki rastvorov polimerov / Sergej Papkov // 2009.
4. Pererabotka plastmass / O. Shvarc, F.-V. Jebeling, B. Furt // 2005.
5. Lit'e plastmass pod davleniem / T. Ossval'd, L.-Sh. Tung, P. Dzh. Grjemann // 2008.

326

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THE ROLE OF RUSSIA AND THE WORLD'S LEADING COUNTRIES IN THE GLOBAL ENERGY SECTOR.

Plenary report

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Abstract: The article analyzes the place of Russia in global leading competition of the leading countries when it comes to oil and gas production. Russia is in the third of the leaders but not the constant leader. It is a severe struggle between Russia, Saudi Arabia and the USA.

Key words: energy production, coal, oil and natural gas reserves, temporal dynamics of oil production

Energy plays a leading role in the global economy. The development of modern civilization in the twentieth century was based on the new energy sources exploration and was characterized by a continuous increase in its consumption.

According to Laverov N.P. et al. [1,2] the conventional and unconventional resources are $3{,}5 \cdot 10^{12}$tons of oil equivalent (toe). Among the unconventional resources the main part is the gas hydrate of land areas and dissoluted gases of the main lands [3].

The world has the uneven coal, oil and natural gas reserves distribution: so oil and gas may be exhausted in the XXI century, and coal in the XXII (Table 1).

Table 1. World stocks and oil, gas and coal production [6]

Energy carrier	Known reserves	Production year	Years of reserves
Coal, billion tons	892	7,7	270
Oil, billion tons	208	4,5	52
Gas, trillion cubic meters	194	3,4	59

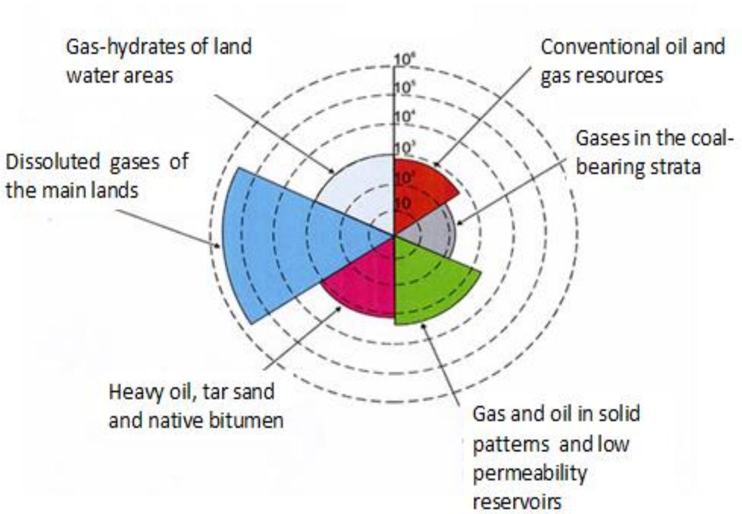

Figure 1. The geological resources of hydrocarbons billion (t.o.e) [1].

There is the continuous and severe competition for global leadership between the leading countries of the world. The results of graphical rating analysis of temporal dynamics of oil production in ten countries - the leaders of oil production in the world are presented in Figures 2-3. The USA in 2000 and 2001 was second after Saudi Arabia. In 2002 the USA took the first place, and then in 2004-2011 dropped to the third place after Saudi Arabia and Russia. During 2012, the United States ahead of Russia took the second place after Saudi Arabia. In 2013, the US surpassed Saudi Arabia's oil production, having produced an average of 12.3 million. в/d (13.67% of world oil production) against 11.7 million. в/d of Saudi Arabia (12.9% of world production).

328

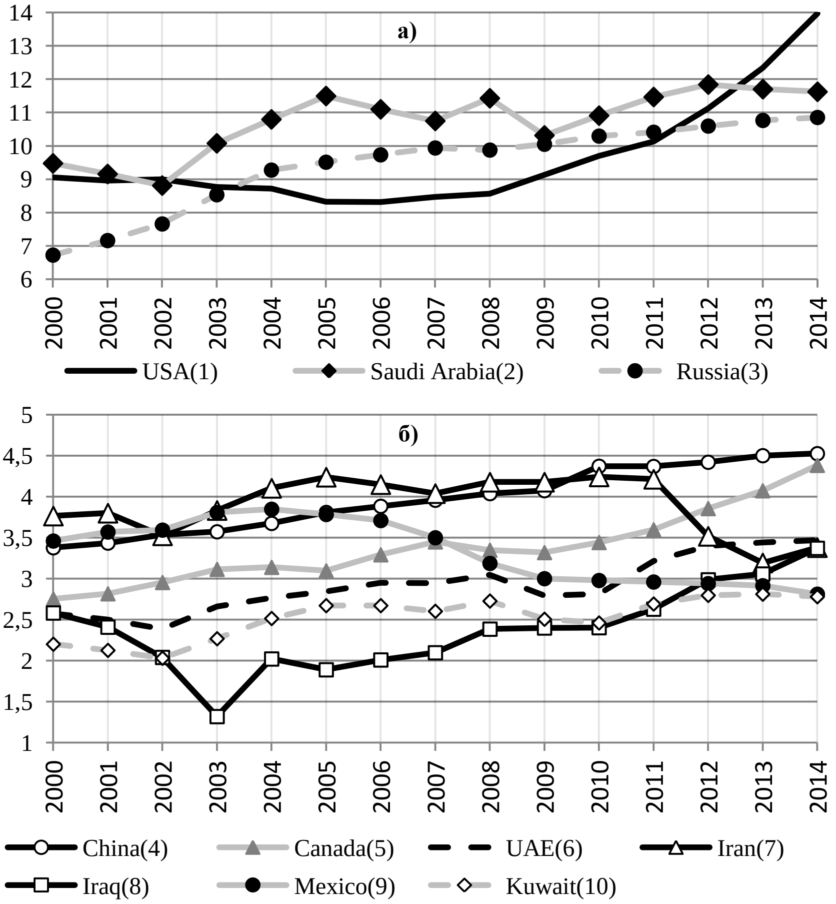

Figure 2: Temporal dynamics of oil production in the 2000-2014. (mln. b/d): a) of Russia, Saudi Arabia, the United States; b) Canada, China, Iran, Iraq, Kuwait, Mexico, the UAE; in brackets there are the growth rates in % for these years (calculations and drawings are made by the authors on the basis of data [4]).

Saudi Arabia - the superpower in the field of oil, is providing an average of 12.6% of world oil production (2000-2014). Saudi Arabia in 2002 was the second only to the United States and then has been a world leader for ten years (2002-2012). It lagged behind the United States in 2013, as it produced an average of 11.7 million b/d (versus

329

12.3 million b/d from the US). Saudi Arabia in 2013 and now is currently in the second place.

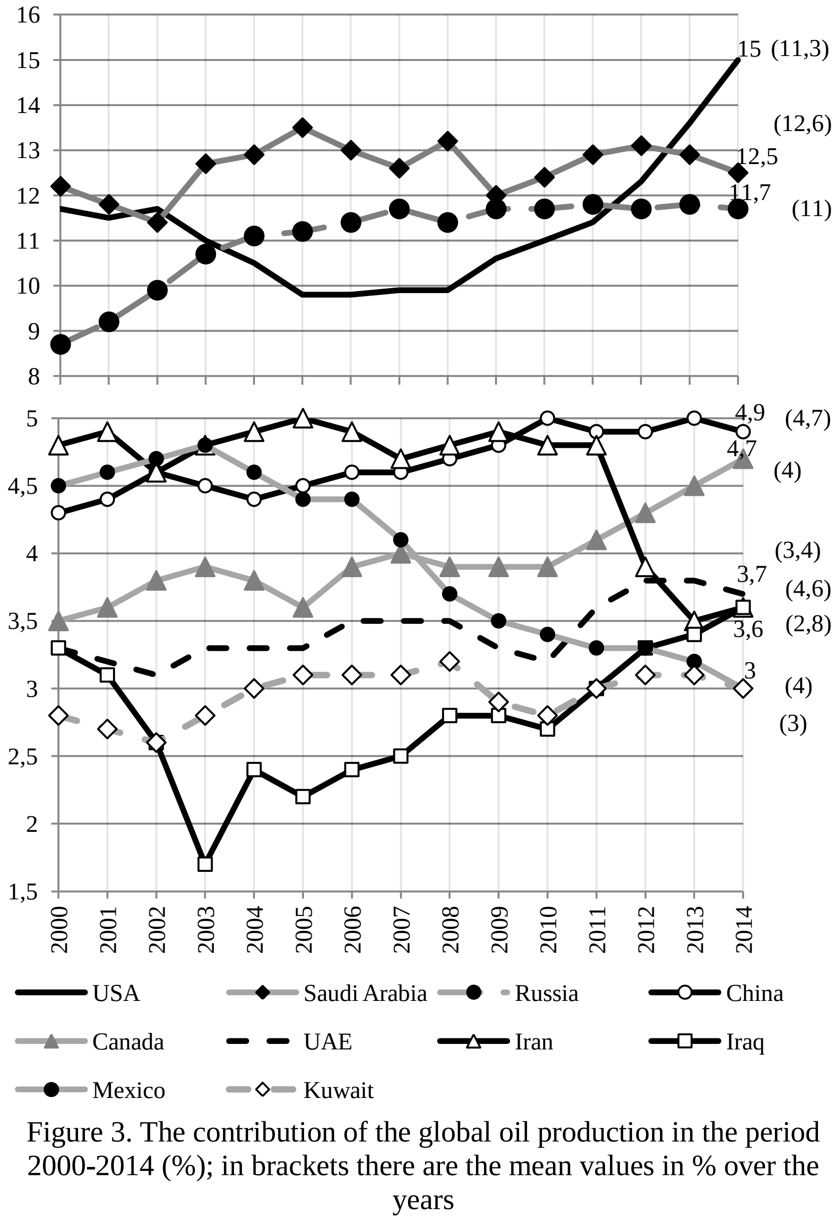

Figure 3. The contribution of the global oil production in the period 2000-2014 (%); in brackets there are the mean values in % over the years

330

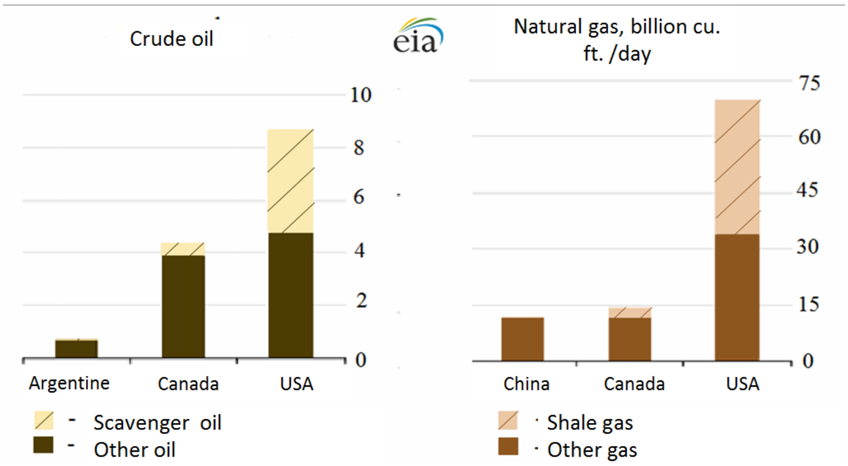

Figure 4. Types of natural gas and crude oil in the United States and Canada,
China and Argentina in 2014. China (0.25 billion b/d of shale gas); Argentina (0.02 million. b/d of scavenger oil) [6]

Russia remained one of the leading producers of oil: from 2000 by 2003. It ranked third in 2004-2011. Russia was in the second place after Saudi Arabia, and from 2012 till now has ranked third after the United States and Saudi Arabia. In 2014, the average annual production of Russia amounted to 10.7 million b/d (11.7% of world production). It should be noted that the average annual growth rate of Russia's production for the period 2000-2014 turned out to be the highest among the ten leaders. China, like the United States, consumes more oil than produces, which makes it a net importer. However, it is the fourth largest producer (2010-2013.) with an average production of 4.5 million b/d. Most of the Chinese production capacity is on land (81%), while the remaining 19% are in small offshore reserves. Canada from 2000 to 2007 ranked seventh, from 2008 to 2011 – the sixth place, but after 2012 in came to the fifth place with the production of 4.4 million b/d in 2014. The annual rate of oil production growth in 2000-2014 (3.1%) was second after Russia. According to forecasts, oil production in Canada could rise to 6.6 million b/d by 2035 [5].

Saudi Arabia, the United States and Russia are the undisputed leaders in the production of oil, which accounts for about 48.8% of world production (2014), and an average of 46.4% over the past five

331

years. Currently, only four countries have the commercial production of shale gas and oil from tight formations - the United States, Canada, China and Argentina.

The US and Canada extract either shale gas, or scavenger oil. China produces small amounts of shale gas, and Argentina - of hard oil. In 2014 the energy production increased in these countries. At the same time the production of shale gas and oil from tight formations grew faster than production of conventional oil and gas.

In Canada the mining of scavenger oil was doubled during 2011-2014 from 0.2 million b/d to 0.4 million b/d. Canadian shale gas extraction increased from 1.9 billion f^3/d (53.8 million. m^3/d) in 2011 to 3.9 billion f^3/d (110.4 million m^3/d) as of May 2014. In China the commercial quantities of shale gas fields basin totalled 0.163 billion. f^3/d (4.6 mln. m^3/d), or 1.5% of total natural gas production.

Argentina produces about 20 thousand b/d of scavenger oil. The nature of competition for world leadership in the gas sector is very different from the oil production.

Russia and the United States for the period of 2000-2013 alternated in the lead (fig. 5). In 2000-2001 the indicators of Gas Russia and the US were almost equal.

From 2002 to 2008 Russia leaded with confidence, and the United States from 2001 to 2005 reduced production of gas, and then began to increase the production of gas significantly.

In the gas sphere of Russia from 2009 to 2013 there was a positive trend. In spite of this the US in 2010 significantly outperformed the Russian figures by shale gas production and brought the total to 689.1 billion m^3. This annual growth rate in the gas sector in the US is almost 2 times higher than the Russian rate (1.7% vs. 0.9%).

Canada's gas sector from 2000 to 2007 virtually stagnated at a high enough level of 184.6 billion m^3, which was more than 3 times lower than the level of production in Russia and the United States.

For the majority of the countries surveyed there we can see the significant positive growth except Algeria (-0.3%). So, Iran and Qatar, with common gas field South Pars/North Dome in the Persian Gulf, have managed to increase gas production to 161.3 billion m^3 (Iran) and 158.5 billion m^3 (Qatar). To do this, they need to ensure the high growth rates of 7.3% (Iran) and 12.9% (Qatar), which are much higher than the growth rate of the US and Russia.

332

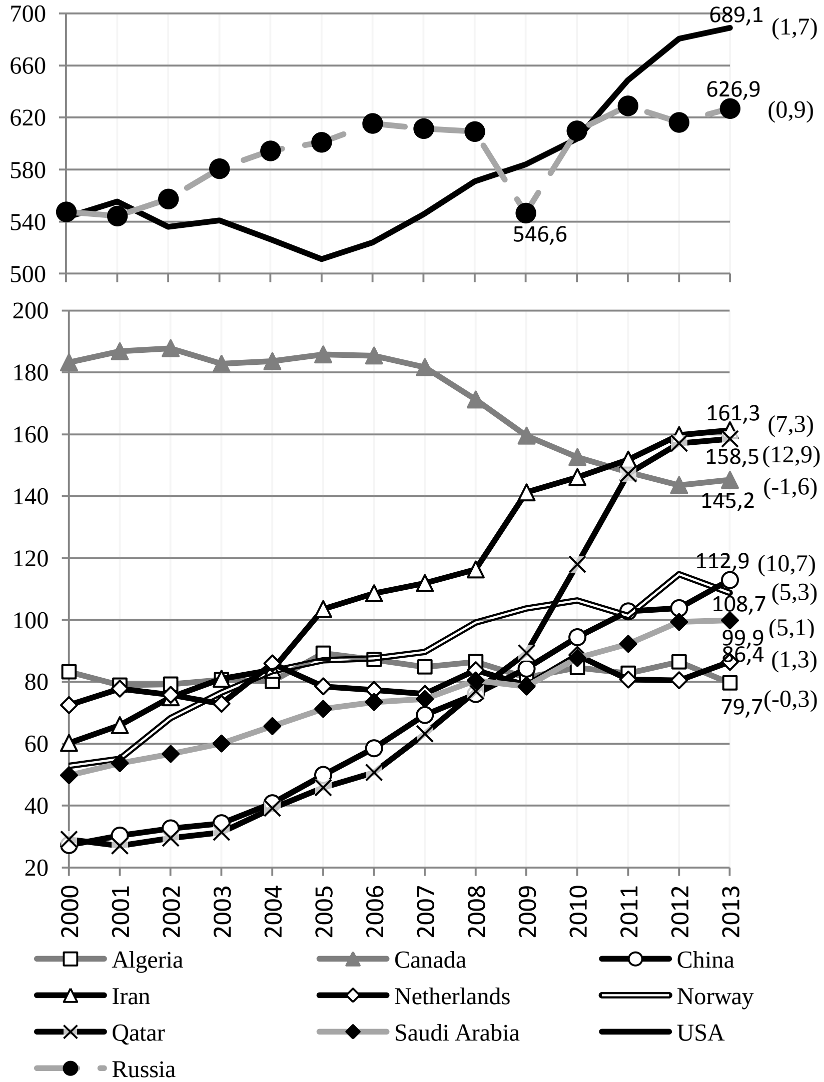

Figure 5. Temporal dynamics of natural gas production in the leading countries of the world in 2000-2013 (billion m^3); in parentheses are the average values in % for these years (calculations and drawings are made by the author based on the data [6])

333

We should specially mention the positive trend in the China gas sector, which has produced 27.3 billion m^3, and has managed to increase by 4.1 times due to growth of 10.7%.

References

1. Laverov NP Fuel and energy resources. // Scientific Session of the General Assembly of the Russian Academy of Sciences, 2002-2009 years. Science. M .: 2010. P. 247-262.\
2. Laverov NP, AN Dmitrievsky, Epiphany VI Fundamental aspects of oil and gas resources of the Arctic shelf of Russia. // W. Arctic. 2011. №1. S. 26-37.\
3. Bushuyev VV, Golubev VS, Tarko AM Structural energy as a potential for development: World and Russian 2014. - 160 p.
4. Energy Information Administration (Energy Information Administration) URL: http://www.eia.gov (date of treatment: 04/23/2014)
5. http://www.investopedia.com/articles/active-trading/100714/worlds-top-oil-producers.asp#ixzz3Yn2PaFQC
6. The journal "Oil and Gas Vertical" on materials of EIA. 24/7 Wall St. WordPress April 24, 2015, http://247wallst.com/special-report/2012/04/18/the-worlds-most-resource-rich-countries/

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PROVIDING TECHNOLOGICAL CONTROL OVER PRODUCTION AND TRANSPORTATION OF HYDROCARBON RAW MATERIALS AND PRODUCTS

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Abstract: The article deals with the issues of leakage control of hydrocarbon products, namely the method of using fluorescent markers based on superfine suspensions of gas-filled microparticles.

Key words: hydrocarbon fuel, pipelines, pumping products, control technology, fuel leaks, fluorescent markers

334

The problem of industrial and environmental safety of production and transportation of hydrocarbon products is acutely relevant under a constant growth in oil and gas production. Pipelines operate under high pressure; in case of their leakage there can be a significant release of pumped products. This entails both material damage (loss of pumped products, penalties, clean-up costs) and preconditions for environmental disasters [1]. One of the ways to control losses, as well as the quality of hydrocarbon production is chemical labeling of fuel.

In recent years, cases of unauthorized tapping have become more frequent. It results in depressurization of oil and gas facilities, shortens their operating life, causes significant economic damage, and leads to leaks of hydrocarbons. Damage from unauthorized tapping comprises the cost of the stolen product and the cost of restoring the damaged section of the pipeline and oil spill response [2]. Moreover, the cost of restoring the damaged sections and eliminating the oil spills may be ten times greater than the damage caused by stealing.

The oil control technology (OCT) is designed to monitor leaks while transporting oil and oil products, as well as for early detection of leaks during the theft of products. In addition, part of the security control of oil field facilities and pipelines is to collect evidence in case of a theft of oil and oil products for further investigations.

The nodal point of an oil transportation system (such as reception centers of oil, oil loading facilities, routes of oil tankers, etc.) and uncontrolled industrial activities of mini-refineries are most promising in terms of control. Therefore, monitoring (including qualitative or quantitative analysis) should be performed in these control points.

Nowadays, a wide range of devices and technologies are offered for monitoring transportation of hydrocarbon products.

The most common of them are [3]:

• Acoustic systems (register in the acoustic wave frequency range generated by leaks)

• The parametric system (based on measuring pressure and flow rate of pumped products)

• The system of vibro-acoustic monitoring (based on a fiber-optic cable)

• The infrasound pipeline monitoring system piping (IPMS)

• Labelling of fuel.

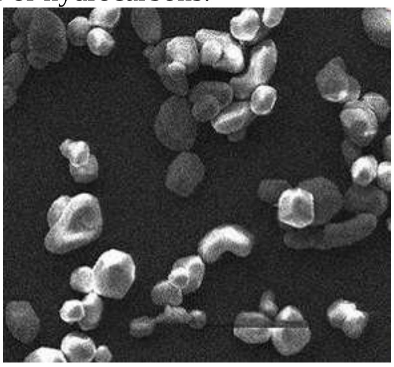
335

When comparing the systems, the main indicator is the cost of the equipment, including installation and maintenance per 1 km of the pipeline. And if the characteristics of the two systems are comparable, preference is given to the more economical one.

The most promising technology is the use of specific marker substances, which can guarantee getting information about the affiliation of petroleum or petroleum products to a particular mine, oil field facility, or a particular section of the pipeline.

A batch of fuel can be labelled directly at the facility or at any stage of its transport and distribution, which allows controlling and monitoring the movement of oil and oil products for the entire process chain: oil-producing plant - refinery - tank farm - filling station - the end user.

Markers of oil and petroleum products (fuel markers) are unique products, usually not present in oil and petroleum, inert and safe specialized chemical compounds added to oil or fuel in small concentrations (from one to several parts per million by volume). They are identified by suitable chemical, physical and physical-chemical methods of analysis. The markers are chemically inactive substances not soluble in water or hydrocarbons.



Picture 1. Markers under a microscope after filtration.

The main drawbacks of the existing methods of control are the following: high consumption of marker substances per unit of the liquid to be marked; lack of precision; lack of simple and reliable methods of rapid analysis for qualitative determination of the presence of the marker substance on site; the need to send samples to a laboratory; a long period of time required for the analysis, etc.

Innovative methods of monitoring the transport of oil involve the use of fluorescent markers based on superfine suspensions of gas-filled microparticles. The indicator substance is not in a molecular form, but in the form of quasi colloids - microscopic dispersed polymer particles of spherical shape with a diameter of about 100 microns; these particles do not stick to each other and have a density close to the density of oil, so they do not precipitate. This provides a high degree of similarity of the hydrodynamic characteristics of particles and medium. [4].

Furthermore, polymeric materials, from which dispersion indicators are prepared, are resistant to fluids under thermobaric conditions of transportation.

The main advantage of the proposed technology is the possibility to carry out express analyses for the presence of markers. Express analyses are performed on the sampling site with a minimum set of necessary equipment. A sample is filtered through filter paper, and then the number of particles in the sediment is determined visually using a UV light source (a standard UV lamp). For a more accurate determination of the amount of particles in a sample laboratory studies can be performed. At the same time, rapid analyses also help determine quantitative indicators, i.e. the number of particles in the sample, which is directly related to the amount of marked oil. This technique is highly sensitive (no less than the radioisotopic method).

Another important advantage of dispersive fluorescent indicators is the possibility of simultaneous use of several fluorescence markers of different colors that allows tagging sections of highways with markers of different colors; when streams are mixed both qualitative and quantitative analyses can be conducted.

Fluorescent indicators provide a low flow of tracer substances and environmental safety.

References

1. Vasilyeva N., Russia oil spills wreak devastation. The Associated Press. Available at: http://www.ap.org/ (Accessed 20 December 2011)

2. Grudz V. Ya., Zapukhlyak N. M.,Zapukhlyak V. B. Opredelenie mest nesanktsionirovannykh vrezok v truboprovod.[Definition of places of unapproved inserts in the pipeline]. Materialy VII mezhdunarodnoi nauchno-tekhnicheskoi konferentsii “Nadezhnost' i bezopasnost' magistral'nogo truboprovodnogo transporta”[Proc. of the

337

VII International Scientific and Technical Conference "Reliability and safety of the main pipelines"]. Novopolotsk. 2011, pp.18-20
3. Suprunchik V.V., Bezopasnost' truboprovodnogo transporta uglevodorodov[Safety of pipeline transport of hydrocarbons] Mineral'nye resursy Rossii. Ekonomika i upravlenie. [Mineral Resources of Russia. Economics and Management], 2007, № 6, pp. 51-54
4. Fedotov Yu. V., Matrosova O. A., Belov M. L., Gorodnichev V. A. Eksperimental'nye issledovaniya spektrov fluorestsentsii prirodnykh obrazovaniya i neftyanykh zagryaznenii [Experimental study of fluorescence spectrum of natural formation and oil pollution]. Nauka i obrazovanie. [Science and education],2011, Available at: http://technomag.edu.ru/doc/256187.html

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UTILIZACIÓN DEL SENSOR BIOQUÍMICO DURANTE EL SEGUIMIENTO AMBIENTAL

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Resumen: En el artículo se examinan las posibilidades de los sensores bioquímicos y sus ventajas ante los métodos fisicoquímicos de análisis tradicionales durante el seguimiento ambiental.

Palabras clave: biosensores, seguimiento ambiental, nivel de contaminación ambiental, detección de contaminantes orgánicos.

Abstract: The possibility of biological sensors and their advantages over traditional physical and chemical methods of analysis for environmental monitoring are analyzed in the article.

Key words: biosensors, environmental monitoring, level of environmental pollution, determination of organic pollutants.

Últimamente a causa de que la industria, medicina, los servicios medioambientales y los de conservación de la naturaleza necesitan los métodos de análisis modernos durante seguimiento ambiental, hay más

338

y más científicos-especialistas en electrónica molecular, que se dedican a la creación de los instrumentos analíticos baratos, simples en la utilización y métodos específicos de sensibilidad alta para detectar sustancias buscadas en el substrato examinado [1].

Así, recientemente han creado unos sensores bioquímicos, o biosensores, que pueden detectar moléculas determinadas, dar la información de su cantidad [2]. Entre esta clase de los métodos "universales" de análisis específico y de sensibilidad alta el sensor bioquímico no es innovador, pero, en comparación con los métodos de espectrometría de masas y espectrofotometría creadas más antes, los biosensores tienen sus ventajas: son bastante baratos, simples en utilización, diminutos, y, además, nos permite hacer el análisis en el régimen permanente [1].

La actividad humana cada vez con más intensidad aporta al medio ambiente elementos químicos y sus compuestos en tantas cantidades que no son típicos para sus concentraciones de fondo. Así que necesitamos utilizar los métodos express de sensibilidad alta para fijar el nivel de contaminación ambiental [3,4,5].

El objetivo de nuestro trabajo es estudiar la posibilidad de la utilización de biosensores para el análisis cualitativo y cuantitativo de detección de contaminantes orgánicos en los substratos diferentes. Como objeto de nuestra investigación hemos elegido el sistema de tres lagos "Kosinskoye trejozerie". El sistema de lagos está situado en este de Moscú a corta distancia de la autopista circular de Moscú (MKAD), incineradora de residuos, fábrica de cemento, fábrica de construcción metálica y otras empresas. Todo ello demuestra gran impacto humano al ecosistema.

Este trabajo es un trabajo interdisciplinar que se hace junto con la Facultad de las Ciencias Fisicomatemáticas y Naturales de la Universidad Rusa de la Amistad entre los Pueblos a base del Instituto de Física general de Prokhorov de la Academia de las Ciencias de Rusia.

Referencias

1. Karjakin A.A. Biosensory i biomolekuljarnaja jelektronika. Nano- i mikrosistemnaja tehnika. Novye tehnologii, 2001, №8, s. 33-36.
2. Varfolomeev S. D. Biosensory. Sorosovskij obrazovatel'nyj zhurnal, 1997, №1, s. 45-49.

339

3. Evtjugin G.A., Budnikov G.K., Ivanov A.N., Suprun E.V. Odnorazovye amperometricheskie biosensory v jekologo-analiticheskom kontrole. Nano- i mikrosistemnaja tehnika. Novye tehnologii, 2001, №7, s. 48-51.
4. Ermolaeva T.N., Kalmykova E.H., Lavrent'eva T.L. P'ezokvarcevye biosensory dlja opredelenija organicheskih soedinenij v vode i vozduhe. Nano- i mikrosistemnaja tehnika. Novye tehnologii, 2001, №9, s. 51-67.
5. Nikashina A.A., Purygin P. P. i Reshetilov A. N. Biosensory dlja jekologicheskogo kontrolja. Izvestija Samarskogo nauchnogo centra Rossijskoj akademii nauk. Samarskij nauchnyj centr RAN, 2009, t. 11, №1(6), s. 1355-1358.

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EL PROBLEMA DE LA CONTAMINACIÓN DEL AGUA Y DEL SUELO POR EL PETROLIO

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Resumen: El objetivo de este trabajo es analizar el problema de la contaminación atmosférica, del agua y de los suelos por el petróleo.

Palabras clave: petróleo, contaminación atmosférica, agua, suelos.

Abstract: The aim of this article is to analyze the problem of atmospheric pollution, water and soils by petrol.

Key words: petrol, responsibility for industrial safety, industry, state.

Cada año, 1,5 millones de metros cúbicos de petróleo y sus derivados derramen en el suelo y en el agua, y posteriormente afectan a los seres humanos. Además, la producción de petróleo está aumentando cada año.

En primer lugar, es necesario determinar ¿por qué el petróleo es un componente tan complejo? El petróleo es una mezcla de hidrocarburos, oleosa, combustible que tiene un color oscuro. Es

340

importante tener en cuenta que las diferencias en composición del petróleo afecta de distinta manera el medio ambiente.

En el petróleo hay diferentes grupos de hidrocarburos: De metano C_nH_{2n+2}; Nafténicos – C_nH2_{ni}; Aromáticos – C_nH_{2n-6}

El petróleo contiene numerosas impurezas tales como compuestos de azufre y metales. Por eso, los efectos tóxicos de los productos de petróleo y refinados en la biosfera son inusualmente amplia [4].

La contaminación del suelo. La vaporización de la luz en la atmósfera y la preservación de las partículas pesadas en la superficie del suelo es en un primer paso en contaminación del suelo. Luego, va la etapa de purificación a través de la filtración del suelo que sigue por la emisión y depleción del perfil del suelo. En la última etapa ocurre detención de sustancias nocivas, algunas partes de las cuales se filtran hacía abajo y pueden entrar en el agua subterránea [1, 55-60 pp.].

La contaminación del agua. Toneladas de petróleo y productos refinados cado años entran en los depósitos naturales debido a los accidentes en el transporte, roturas de tuberías, explosiones impredecibles y accidentes en pozos, obras de reparación de fugas. La contaminación de las aguas residuales es particularmente lo más peligroso debido a su conección con los ríos y lagos, que conduce a una contaminación generalizada del agua potable [2, 30 p.].

Además, los productos del petróleo entran en los depósitos de agua, porque la industria petrolera lo incluye en su ciclo de producción [3, 102 p.].

En 10 minutos, después de que 1 tonelada de petróleo se derrama en el agua, forma la marea negra de 12 km^2. Los vientos fuertes y tormentas aceleran la dispersión de la marea negra.

Sigún el Consejo Nacional de EE.UU, cada año 1,5 millones metros cúbicos de petróleo entran en el agua, alrededor del 45% de las fugas tienen causas naturales (por ejemplo, el petróleo de los estratos submarinos espontáneamente se derrame en el mar). Aproximadamente el 5% del petróleo entra en el mar, los océanos y lagos como resultado de la exploración y producción del petróleo. Los accidentes de transporte proporciona el 22% de este tipo de derrames [5, 202 p.].

El resto del petróleo entra en el agua como resultado de cientos y miles de pequeñas fugas y accidentes, de los que a menudo no se dan cuenta la prensa o el gobierno.

341

El problema de la contaminación por el petróleo de los suelos y el agua es muy grave. Por desgracia, la gente todavía no ha aprendido a hacer su trabajo de manera responsable, por lo que una de las principales razones de la descarga de hidrocarburos es un hombre irresponsable y equipos antiguos.

Referencias

1. Arens V.ZH, Saushin A. Z., Gridin O. M., Gridin A. O.: Ochistka okruzhayushchej sredy ot uglevodorodnyh zagryaznenij / V. ZH.. M.:«Interbuk»,2009. 371 s.
2. Vorob'ev YU. L., Akimov V. A., Sokolov YU. I. Preduprezhdenie i likvidaciya avarijnyh razlivov nefti i nefteproduktov. M.: In-oktavo, 2005. 368 s.
3. Evdokimov A.A. Zashchita vodoyomov ot neftyanyh zagryaznenij. Besstochnaya neftevodoochistka: Monografiya. - SPbGUNiPT, 2003. - 137s.
4. Kamenshchikov F. A., Bogomol'nyj E. I. Neftyanye sorbenty. M.; Izhevsk: NIC«Regulyarnaya i haoti-cheskaya dinamika», 2005. 268 s.
5. Patin A.C. Ekologicheskie problemy osvoeniya neftegazovyh resursov morskogo shel'fa. - M.:Izd-vo "VNIIRO". – 2007. 302 s.

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GREEN STEEL

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Abstract: Steel industry is very dirty, but modern society also knows that this perfect material can be clean and recyclable. Steel is the future of green economy.

Key words: foundry, green economy, recyclable materials, steel industry.

Steel is the engine of our modern way of life. The iron, the predecessor of steel, has been fed by industrial revolution, since 1750. Modern steel-melting was developed with the invention of the process

342

of Bessemer. There was a sustaining economic growth during the second industrial revolution. Today steel is one of the most widespread materials in the world [1] made by the domain furnace, oxygen and converter (BF converter) route and the arc electric furnace, a chipboard route. About 70% of steel is made with the usage of the BF converter route. Variations and combinations of production routes also exist. [2].

Key distinction between routes is the type of raw materials that they consume. For a BF converter route it can be mainly iron ore, coal, steel and repeatedly while the route of chipboard alloy steel is used. Depending on a configuration and existence of secondary steel works, other sources of metal iron, such as direct restoration of iron (DRI) or hot metal can also be used in the EDP route. First, iron ore is restored to iron, also called hot metal or cast iron. Then iron turns into steel in the oxygen converter. After casting and rolling, steel is delivered to the coil, plates, section or bars. For steel made in chipboard the electricity is used to melt the recycled steel. Additives, such as alloys, are used for adjustment necessary chemical composition. Electric energy can be added to the oxygen injected into EDP. The subsequent steps of the process, such as molding, repeated heating and rolling, are similar to what are found in a BF converter route. About 29% of steel is made along the chipboard route.

Environmental aspect. The durability of steel allows many products to be recycled. It expands the life cycle of a product and, therefore, can save resources. Therefore, many companies even more often preferred production of steel to development of products for reuse [3].

For instance:

1. Steel elements of a design - a roof in GAND of wall elements, beams are reused.

2. Steel barrels, or drums, have a typical life cycle of six months. If they are used by 10 times, however, that life expectancy can be prolonged till five years.

3. The automobile details of old vehicles are dismantled as spare parts for further use.

4. Railway tracks are regularly changed (the left and the right rails on the route). When isn't suitable to use them any more, rails can be used at secondary lines with low traffic. They can be also processed or summarized to expand the service life.

343

5. The vessel can be dismantled and steel details can be used as fittings constructions. Steel cargo containers can also be reused and transformed into buildings.

6. Old wind turbines which were replaced can be sent to other places for a reuse. Remanufacturing of the used wind-driven generator prolongs life of the wind turbine [4].

In the future, producers of steel products can also have an important role certifying second-hand steel products before they go to the market, ensuring integrity and safety of a product.

Program Break of CO_2. In 2003 the World association of steel (Worldsteel) released "Break of the CO_2 program", with an initiative of exchange of information about regional activity worldwide. Research takes place in: - The EU (ultra-low steel-smelting CO_2, or ULCOS) - the USA (the American metallurgical institute) - Canada (The Canadian association Producers became) - South America (Arselormittal Brazil) - Japan (COURSE50) - Korea (POSCO) - China (Baosteel) and Taipei (China steel) I-Australia (Bluescope / One became also HIsmelt). [5].

References

1. Carvalho, Anthony de. Challenges and opportunities for the steel industry in moving towards green economy. Available at: https://www.worldsteel.org/steel-by-topic/life-cycle-assessment.html (accessed 10 October 2015).

2. Adams M. Reusing the By-products of the Steel Industry, BlueScope Steel. Available at: http://www.bluescopesteel.com/sustainability/environment (accessed 10 October 2015).

3. Walters Nicholas. Sustainable Steel: at the core of green economy. World Steel Associated report. Available at: *https://www.worldsteel.org/steel-by-topic/climate-change.html* (accessed 10 October 2015).

4. Andersen D. Steel recycling. Available at: http://www.recycle-steel.org/recycling-resources/steel-recycling-rates.aspx / (accessed 10 October 2015).

5. Birat Jean-Pierre. Steel and CO2 – the ULCOS program. Available at: http://www.ulcos.org/en/docs/Ref01 - Birat_slag_finaal.pdf (accessed 10 October 2015).

344

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THE DESTRUCTION OF STURGEONS IN THE CASPIAN REGION
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Abstract: The importance and magnitude of the environmental problem of extinction of valuable marine species in the Caspian basin are shown.
Key words: sturgeons, Caspian region, sturgeon catch, reproduction, endangered species.

Since ancient times, humanity began to tame water when people built their first boats and ships. At the same time the industry of fishery started to develop. Over time, people began to understand the different types of fish to catch, which ones are the most delicious and useful. But that level of development in fishery could not severely threaten marine populations. At that time, there was still not much technology, which started to appear in our time, and, therefore, the amount of fish caught was not as huge as it is now.

The purpose of this article is to demonstrate the importance and magnitude of the environmental problem of extinction of valuable marine species, taking for example a species of sturgeon in the Caspian basin.

Sturgeons are a very valuable kind of fish, which are in strong demand on the consumer markets because of their taste and vitamin properties. This kind includes such species of fish as the sterlet, beluga, acipenser, bastard sturgeon and others. We can find these kinds of sturgeon in the waters of Caspian.

The XYII - XIX centuries were the time when sturgeon were actively caught in the Caspian Sea. At that time, the amount of sturgeon caught reached 50 thousand tons. For a long time this family of fish in the Caspian basin and farms associated with them, reached 90% of the world quantities. At the beginning of the twentieth century, the number of sturgeons dropped significantly, but still reached a high average figure of 29 800 tonnes. The record catch was reached in 1903 and

345

amounted to 39.2 thousand tons. For the period between the late 40's and early 60's, 8.5 to 17.9 thousand tons of russian acipenser were caught in the Caspian sea every year [1].

But in the end, the low reproductivity in the fish, the strong development of sturgeon industry, the enormous amount of precious caviar, the taste and useful qualities of the fish led to the fact that, by the end of the last century, the sturgeon figured in the red book, as one of the most protected endangered species. Caspian countries: these include Azerbaijan, Iran, Kazakhstan, Russia and Turkmenistan agreed to terminate the industrial catch of sturgeon in an attempt to stop the process of extinction

But only in 2014 the moratorium project appeared on fishing of valuable fish species at a meeting of the Commission on Aquatic Biological Resources of the Caspian Sea, which involved the above-mentioned Caspian countries. An agreement on the conservation and sustainable use of marine biological resources of the Caspian Basin was signed at the 4th Caspian Summit in Astrakhan [2].

A moratorium on the fishing of valuable species of sturgeon existed previously, but it was not particularly implemented. Now it is officially recognized by all the Caspian countries, however, it is unknown how well it is followed [2]. We must not forget about poachers, who are present in large numbers in every country, and who do not understand the importance of the current environmental situation in the region. If neither the country nor the general population stick to this ban, then the sturgeon may disappear from the waters of the Caspian Sea within 3-5 years [3]. The Convention on International Trade in species of wild fauna and flora has included all four species of sturgeon inhabiting the Caspian Sea: the beluga, the bastard sturgeon, the long-nosed sturgeon and the stellate sturgeon to the list of endangered fish. The aim of the convention is to guarantee the safety of international trade in wild animals and plants. It must ensure the safety of populations of rare wild animals and plants.

The smallest estimates show that the number of sturgeons has decreased by about 35-40 times over the past years which causes the environmentalists to get alarmed. Currently, it is only allowed to catch these valuable species for the purpose of their reproduction and research purposes [4]. The cause of slow reproduction in sturgeon lies in their puberty. It arises very late and considering the fact that these

346

fish are long-lived, puberty can only arise in a couple of decades in females and in 5-9 years in males. On top of that, fish of this family do not spawn every year. For example in male beluga puberty arises only at 18 year of age and females at 16-22 years and spawning occurs at intervals of 2-3 years, which is a very problematic period and an alarming situation for the environment. Puberty in bastard sturgeon comes much earlier, but still is not imminent, because males reach puberty by 6 to 8 years of age, and females are mature at 11-13 years. But even for such a period of time people can closely follow them in pools, especially to help them reproduce. But what can we do in wildlife? How to ensure the safe development of this fish at least until the first spawning? Now you can imagine how difficult it can be to solve this problem. In order to get out of this situation, we started creating hybrids of sturgeon, which often develop more rapidly and are more resistant to diseases (as compared to conventional sturgeon) [5].

References

1) Korobochkina Z.S. Osnovnye jetapy razvitija promysla osetrovyh v Kaspijskom bassejne [The main stages of the development of fishing of sturgeon in the Caspian Sea] Tr. VNIRO [VNIRO Publ.], 1964, T. 52, No. 1, p. 59-64.
2) Chetvertyj kaspijskij sammit [The 4th Caspian Summit]. Available at: http://www.kremlin.ru/events/president/transcripts/46689 (accessed 5 October 2015).
3) Abdusamanov A.S. Sovremennoe sostojanie i jekologo-jekonomicheskie perspektivy razvitija rybnogo hozjajstva v Zapadno-Kaspijskom regione Rossii [Current status and prospects of ecological and economic development of fisheries in the Western Caspian region of Russia]. Nauka Publ., 2004, pp.220-224.
morja [The main environmental problems of the Caspian Sea] Jekspertiza[Expertise].2002, -p.25.
5) Korobochkina Z.S. Ciklichnost' polovogo sozrevanija osetrovyh [Cycle puberty of sturgeon] Sbornik nauchno-tehnicheskoj informacii VNIRO [Collection of scientific and technical information VNIRO]. 1964, No.7, pp.3-6.

347

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POSSIBILITY OF ENERGY CROPS CULTIVATION FOR BIOFUELS IN RUSSIA

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Abstract: The purpose of this article is to present the basic energy cultures, which are capable to grow in Russia, taking into consideration foreign experience and natural and climatic conditions of Russia.

Key words: energy crops, biofuel, bioethanol, Miscanthus Sorghum.

Nowadays , the production of biofuels is a very acute problem. Fuel prices of petroleum products are rising much faster than the prices of food derived from crops. This fact makes the man consider non-food crops, as a material for fuel.

The most popular feedstocks for biofuels are corn, sugar cane and vegetable oils.

World biofuels production leaders are the United States, Brazil and the EU. About 90% of biofuel production capacity falls on the United States, Brazil and the EU. In the case of the successful implementation of government programs in Asia and South Africa the biofuel production could spread around the world.[1]. The most cost-effective production of biofuels is in the tropics, where the climatic conditions are better and hence yields of biomass are higher. Technological progress in the field of biofuels is aimed to obtain higher yields of biomass and to increase energy efficiency. Russia is an agricultural industrial country. The total state's territory is 402.6 million hectares and agricultural land is 23%. Because of the agro-industrial complex restructuring (transition from collective farm to private property), many lands were abandoned. Now there are about 76 million ha. of cultivated area and about 40 million ha. are abandoned [2]. There are the largest unused areas in the Altai Territory, the Krasnoyarsk Territory, the Omsk region and the Trans-Baikal region in the Siberian Federal District.

348

The climate of the Altai Territory is continental: winter is - cold and long, summer is - short and warm, sometimes hot. The annual range of air temperature reaches 90-95° C. The average temperatures are positive, about 0,5-2,1° above zero. The average maximum temperature in July is 26-28° above zero (extreme reaches 40-42°C) .The average minimum temperature in January is 20-24° below zero, the absolute minimum of winter is 50-55° below zero. The amount of precipitation - from 230 mm to 600-700 mm per year, depending on the territory. Unfavorable factors for agriculture are frequent droughts, winds, salinity, debris lands, distant sources of water supply [3].

The climate of the Krasnoyarsk Territory is harsh continental, characterized by strong temperature fluctuations during the year. The average January temperature is about 36° below zero in the north and about 18° below zero in the south; in July the temperature is about 10° above zero and 20° above zero. The amount of precipitation is about 316 mm [4].

The climate of the Omsk region is continental . The average temperature in January is 19 - 20° below zero, in July is 17 - 18° above zero .The distribution of rainfall is uneven: in the north is about 400-500 mm, in the extreme south of the region is less than 300 mm per year [5].

The climate of the Trans-Baikal region is harsh continental. Winter is long and harsh, with little snow, a large number of sunny days; the average temperature in January is about 20 ° below zero in the south and about 37,5° below zero in the north. The average temperature in July is 13 ° above zero in the north and 20,7 ° above zero in the south . The annual rainfall is from 200 mm to 600 mm per year, depending on the territory . Strong winds increase evaporation, drain the soil and dust storms often uplift [6].

Taking into account the natural and climatic conditions, the optimal crops for growing in the Altai Territory, Krasnoyarsk Territory, the Trans-Baikal territory and the Omsk region are sorghum and Miscanthus. Sorghum is a herb of the cereals family, its height is up to 2.3 meters.This culture is characterized by a high tolerance to salinity and drought. Leaves and stems are covered with a waxy coating, which reduces evaporation. Sorghum grows well on saline soils, and takes the form of phosphorus in a more affordable and readily available phosphate pulls from 1.5-2-meter soil layer to 30-50 cm layer. Crop

349

rotation is 3-5 years. The plant Miscanthus is the genus of perennial herbaceous plants of the family of grasses. There are three types on the territory of the former Soviet Union: saharotsvetkovy Miscanthus (Miscanthus sacchariflorus), blushing Miscanthus (Miscanthus purpurascens), Chinese Miscanthus (Miscanthus sinensis) [7]. For the last twenty years the scientists in many countries are actively engaged in breeding new varieties of Miscanthus. Due to the ruggedness of the grass the yields of biomass are extreme. Miscanthus is a typical power plant. Its rotation is 10-15 years. The plant requires almost no soil preparation and harvesting is carried out without high cost. Miscanthus can improve depleted soil. Deep roots (up to 2.5 m in depth) enhance soil structure, increasing the content of organic substances in it and serve as a kind of filters for groundwater. The lack of annual plowing also has a positive effect on the soil and reduces erosion. This culture is characterized not only by a rapid growth, especially in hot summer (for the third year yield is 10-16 t / ha), but also by satisfactory frost-resistance. The scientists of the Institute of Cytology and Genetics of the Russian Academy of Sciences are working on breeding this culture).

The following conclusions can be made:

1.Miskantus could be a priority among the energy-efficient crops in Russia, because it can grow in almost all climatic zones of the country on different soils with a limited watering.

2.Miskantus is a highly effective perennial grass from agricultural and environmental points of view. Growing of this crop on unused lands allows to obtain high yields and improves the quality and composition of the aerating soil depletion.

3. Miscanthus can be reworked into liquid biofuel - ethanol, as well as in solid form - pellets.

4.Results of the experimental cultivation of Miscanthus and its subsequent processing into biofuels provide a good basis for industrial production in Russia.

References

1. Perspektivi mirovogo rinka biotopliva. Avaliable at: http://www.cleandex.ru/articles/2008/07/07/biofuels-trends-2007 (accessed 07 October 2015).

350

2. Knoema Bank. Rossiskaya Federacia – selckohosyasvennya zemlya (ploshad). Avaliable at: http://knoema.ru/atlas/ (accessed 07 October 2015).
3. Encyclopedia climat Rossii. Climat Altaiskogo Kraya. Avaliable at: http://oklimate.com/countries/russia (accessed 07 October 2015).
4. Encyclopedia climat Rossii. Climat Krasnoyarskogo Kraya. Avaliable at: http://oklimate.com/countries/russia (accessed 07 October 2015).
5. Encyclopedia climat Rossii. Climat Omskoi oblasti. Avaliable at: http://oklimate.com/countries/russia (accessed 20 October 2015).
6. Encyclopedia climat Rossii. Climat of Zabaikalskogo kraya. Avaliable at: http://oklimate.com/countries/russia (accessed 20 October 2015).
7. Budaeva V.V., Mitrofanov R.Y., Zolotukhin V.N., Sakovich G.V. Polzunovsky Vestnik, №3, 2009, S. 328. Avaliable at: http://elib.altstu.ru/elib/books/Files/pv2009_03/pdf/328budaeva.pdf.

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LA EVOLUCIÓN DEL IMPACTO AMBIENTAL POR CONSTRUCCIÓN DE OLEDUCTOS Y GASODUCTOS EN RUSIA.

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Resumen: En este artículo se tendrá en cuenta el impacto de oleoductos y gasoductos en el medio ambiente. El impacto negativo del uso del subsuelo se manifiesta en el cambio del estado geomecánico y geo-energético de las cordilleras, en la indústria química, la contaminación física y biológica de la atmósfera, la hidrósfera, los suelos, la flora, la fauna y objetos diversos.
Palabras clave: Petróleo, gas, sistema de transporte de gas, consecuencias ambientales.

Abstract: This article will consider the impact of oil and gas pipelines on the environment. The negative impact of the subsoil use is expressed in changing

351

geomechanical and geo-energy status of mountain ranges, as well as in the physical, chemical, biological pollution of the atmosphere, hydrosphere, site soil, flora, fauna and various objects.

Key words: Oil and gas, gas transport system, the environmental consequences.

El problema de la gestión ambiental es una prioridad en la vida de la sociedad. Se devide en dos aspectos:

El aspecto ambiental – protección de la naturaleza de la destrucción, como resultado de las actividades humanas, y suministro de recursos económicos destinados a mejorar la eficiencia de la actividad humana [1].

Uso racional de los recursos naturales [2].

Las empresas de extracción con su mera actividad cambian la composición del medio ambiente al extraer los recursos. A lo largo plazo estos efectos llevarán consecuencias negativas e irreversibles que estarán acompañados de víctimas humanas y enormes pérdidas materiales. La construcción de sistemas de tuberías son ampliamente utilizados en casi todas las indústrias. Las tuberías se clasifican como instalaciones que consumen mucha energía y son especialmente peligrosos por posibles fallos que pueden ocurrir. Solo imaginemos que por la tuberías se transportan productos de riesgo de incendio y explosión, componentes venenosos y tóxicos, y ya entenderemos que daňos personales y públicos supone un accidente de tubería [1].

Tenemos como ejemplo la Region de Nefteyugansk – región productora de petróleo, la más grande de Janty-Mansisk Circunscripción Autónomo (Janty). Ya que petróleo y gas son las principales actividades económicas en la zona la calidad del aire, el agua, el suelo, la flora y la fauna son muy afectados allí [3]. De acuerdo con las autoridades de control, la concentración de aceite en los ríos y afluentes del distrito Nefteyugansk supera los MPC en 9-25 veces [2].

El proceso de envejecimiento de los equipos y aumento del número de accidentes son las causas de una serie de problemas sensibles, entre ellas: el crecimiento de los costes del transporte, alienación y contaminación de la superficie y el medio ambiente. De acuerdo con el año 2012, sólo en el distrito autónomo de Janty-Mansisk como resultado de la explotación de petróleo las emisiones superaron

352

siguientes cifras: 9 millones de toneladas de monóxido de carbono (CO), 1,3 millones de toneladas de hidrocarburos (CnHm), 1,6 mill. toneladas de óxidos de nitrógeno (NOx), 48 Cerdocyon. toneladas de carbono, toneladas de dióxido de azufre (SO2) (C), 219 Cerdocyon., 1,38 Cerdocyon. toneladas de plomo (Pb), que en total compuso 12 millones de toneladas de emisiones [1]. La mayor parte de los desechos tiene impacto nocivo en los recursos de tierras.

Una tarea importante para combatir este problema es el desarrollo de la base de recursos para mejorar el sistema de gestión ambiental de estas empresas.

Referencias

1. Otchet otdela okhrany okruzhayushchey sredy OAO «Yuganskneftegaz», 2010g.

2. Primeneniye metodov sistemnogo analiza dlya otsenki geoekologicheskikh riskov v gazovoy otrasli. K.t.n. R.O. Samsonov, d.t.n. A.S. Kazak, d.biol.n. V.N. Bashkin (OOO «VNIIGAZ») // Problemy bezopasnosti i chrezvychaynykh situatsiy. Moskva. №2, 2007.

3. Otsenka opasnosti uchastkov gazoprovodov, prokhodyashchikh cherez morskiye akvatorii. Ovsyanik A.I., k.t.n., professor, Peskov A.V., d.t.n. dotsent, Bryk D.I., Voyenno-inzhenernyy universitet. / Aktual'nyye problemy regulirovaniya prirodnoy i tekhnogennoy bezopasnosti. KH Mezhdunarodnaya nauchno-prakticheskaya konferentsiya. Moskva 2005, str. 262-267.

353

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THE ENVIRONMENTAL PROBLEM OF WASTE AND METHODS OF DISPOSAL
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Abstract: Russian enterprises produce a huge amount of waste every year; only 3% of the waste is subjected to industrial processing. The remainder of waste is transported to dumps and landfills for burial becoming the main source of pollution. The purpose of this article is to demonstrate the magnitude of the environmental problems of waste disposal.

Key words: human health, waste products, environment, population, materials, recycling methods.

Introduction. The growth of consumption over the last 50 years has led to a substantial increase in the volume of waste products (VWP). Solid industrial and domestic wastes (SI & DW) pollute the environment and the natural landscape. In addition, they are the source of harmful agents entering our environment. Finding a solution to process SI & DW has become a priority lately. The gradual depletion of natural sources of raw materials (oil, coal, ferrous and nonferrous metal ores) makes the full use of industrial and domestic wastes a priority.

Classification of waste products. Waste products are by-products from raw materials, semi-finished products, and other products that are formed during production or consumption, as well as goods (products) that have lost their consumer properties [1, p. 56].

For practical purposes, the following three classification methods are used more often: according to the aggregation state, according to the source, according to their effect on the environment and people. According to the aggregation state waste products are divided into: solid, liquid and gaseous ones. Their sources include: industrial, agricultural and household wastes. They can have the following effects on the environment and humans: toxic; radioactive, flammable, explosive, spontaneously combustible, corrosive, reactive ones, the waste which causes infectious diseases and hazardous wastes.

Hazardous waste includes one which contains harmful substances with hazardous properties (toxic, explosive, inflammable, highly reactive ones), or contains infectious agents. In order to assess how dangerous the waste product is for the environment, the following hazard classes were set: Class I – extremely hazardous wastes; Class II – highly hazardous wastes; Class III – moderately hazardous waste; Class IV – slightly hazardous waste; Class V – practically non-hazardous waste [2, p. 75].

The specification of waste formation defines the amount of waste products of a particular type during unit production.

In Russia the current situation of formation, use, neutralization, storage and disposal of hazardous waste leads to environmental pollution, unsustainable use of natural resources, serious economic damage and poses a real threat to the health of current and future generations of the country.

Every year, about 7 billion tons of waste products are produced in the Russian Federation, only 2 billion tons of which are re-used amounting to 28.6 percent. About 80 billion tons of solid wastes have accumulated on the territory of the country in dumps and stores.

The accumulation of toxic waste products in dumps and landfills, including those containing carcinogenic substances is particularly a cause for concern. An assessment of the situation suggests a steady increase in the amount of waste generated in the country. Due to the lack of economic incentives for companies, the poor technical level of applied technologies, the lack of funds and modern equipment for the recycling and use of waste products, only a few dozen types of waste products are a subject to processing and use.

Presently, waste products are simply gathered for burial in landfills and this leads to the alienation of vacant land in suburban areas and restricts the use of urban land for the construction of residential buildings.

Also co-disposal of different types of waste can lead to the formation of dangerous compounds. Rapid growth of urban population is one of the most important trends of the new century.

355

The amount of different waste products also increases in cities, especially solid domestic wastes, which require timely scavenging and safe disposal.

The main recycling methods. Collection and interim storage of waste products.

Waste collection is the most expensive component in the whole process of recycling and waste disposal. Therefore, the proper organization of waste collection can contribute to significant savings. In densely populated areas, it is often necessary to transport waste over long distances. The solution in this case can be a station for temporary storage of waste, from which waste can be transported in bulk on large lifting machines or by rail. The two-stage evacuation of solid waste using garbage trucks with large capacity removable press-containers develops further.

Waste burial. One of the main ways to remove solid waste worldwide is by means of burial in a near-surface geological environment. Before selecting the landfill site a number of issues need to be considered: the terrain, the relief, the geological structure of the earth layers in the intended place of burial and storage of solid waste, the prevailing wind and the specifications of the surrounding natural landscape. Due to the lack of landfills for the proper burial of industrial wastes, these wastes are often stored in illegal storage sites (illegal dumps), which can be very dangerous for the environment. The volume of toxic wastes on illegal dumps is constantly increasing [3, p. 12].

The main requirements for solid waste dumps are as follows: the landfill should not be flooded with water, the landfill must be surrounded by large forests, the landfill should not have groundwater at its base. Wastes are subjected to intense biodegradation on landfills. Burying the wastes forms anaerobic conditions in which the bioconversion of organic matter occurs, as a result of which, landfill gas is produced.

Incineration. Waste incineration is the most difficult option for waste management. Incineration requires pre-treatment of solid waste. Upon separation, large objects are tried to be removed from solid waste and further ground. Burning an undivided stream of waste is considered extremely dangerous nowadays. Thus, incineration may be only one component of the reutilization program complex. Incineration helps to reduce the weight of waste by a factor of three. Serious problems also

356

arise from the disposal of ashes from incineration, which weight is up to 30% of the original weight of the waste. In Russia, incinerators are not produced commercially, as it is too expensive for a city budget.

Recycling. Recycling is the processing of waste by means of activating its reactants. This method of disposal is very expensive. Options for the collection of secondary raw materials in different countries and territories may be different: waste bins near houses, specialized centers for the collection of secondary raw materials, payable collection points. The next stage is the selection of the type and capacity of the processing facility. After separating the solid waste into fractions, each fraction passes on to a subsequent process step = processing it into the final product [4, p. 112].

Glass is typically processed through milling and smelting. Steel and aluminum cans are melted to produce the respective metals. Paper waste is used to make raw materials for paper. The organization of the preparative process should begin with working with the population. A mandatory requirement is the precise organization of collection and step selection of secondary raw material.

Conclusion. In Russia the recycling industry is underdeveloped, little work is done on the preparation and education of the population concerning the way of waste separation, no system of secondary resource collection has been organized, the waste evacuation system can not be found everywhere and there is poor control over the formation of waste. This entails environmental degradation and has an adverse effect on human health. Technology itself is not the only problem of solid waste. Landfills still remain the main way to get rid (dispose) of waste in Russia. The primary goal is to improve the existing landfills, extend their lives and reduce their harmful effects.

References

1. Dobysheva T.Y. Koncepciya sovremennogo estestvoznaniya. Novosibirsk, 2002, 56 p.

2. Donchenko V.K. Ecologicheskay integraciya. SPb, 1995, 75 p.

3. Murray Robin. Nol othodov. Ecologia i zhizn, Edinburgh, 2004, p. 12.

4. Tarasov V.V. Ecologia, obrazovanie, nauka i promishlennost. Belgorod, 2002, 112 p.

357

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WELLENKRAFTWERK

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Annotation: Wellenkraftwerke sind eine Form kleinerer Wasserkraftwerke. Sie nutzen die Energie der Meereswellen zur Gewinnung elektrischen Stromes und zählen zu dem Bereich der erneuerbaren Energien. Bisher realisierte Anlagen sind Prototypen und dienen verschiedenen Versuchen und Testen.
Im Unterschied zum Gezeitenkraftwerk wird der Tidenhub nicht ausgenutzt, um die Energiedifferenz zwischen Ebbe und Flut zu nutzen, sondern die kontinuierliche Wellenbewegung.

Stichwörter: Wellenenergie, Wellenkraftwerk, Nutzung,, Seeschlange, Pneumatische Kammer, Rampe, WaveRoller, Strom, Wellenbewegung, Leistung, Nachteile, Vorteile.

Abstract: Wave power plants are a form of small hydropower plants. They use the energy of ocean waves for obtaining electric current and are among the field of renewable energies. So far realized systems are prototypes and serve various experiments and trials.
In contrast to the tidal power station tidal range is not exploited to take advantage of the energy difference between high and low tides, but the continuous wave motion.

Key words: Wave energy, wave power station, use, sea queue, pneumatic chamber, ramp, waveroller, stream, undulation, achievement, disadvantages, advantages.

Wellen haben eine viel höhere Energiedichte als Wind. Hinzu kommt, dass Energie aus dem Meer weit weniger schwankt, als die Leistung von Windkraftanlagen. Im Gegensatz zu Sonnen- und Windenergie, ist Wellenkraft nahezu immer verfügbar. Meeresenergie könnte bestehende regenerative Energiequellen ideal ergänzen. Sie liefert sauberen Ökostrom.

358

Wellenkraftwerk ist ein Wasserkraftwerk, das die Energie der Wellenbewegung in elektrischen Strom umwandelt. Hierbei die Nutzung der ständigen Wellenbewegung unterscheidet sich von einem Gezeitenkraftwerk Tidenhub des Gezeitenkraftwerks. Noch kann das Potenzial der Wellenkraft nicht bewertet werden, Gezeiten- und Wellenkraftwerke könnten nur bis zu 15 Prozent des weltweiten Strombedarfs decken.

Der nordöstliche Atlantik, Kap Horn, der nordöstliche Pazifik, der Pazifik südlich von Neuseeland sind besonders geeignete Standorte. Das sind z.B. die Atlantikküsten vor Schottland, Norwegen, Portugal oder Spanien. Im Juli 2011 ist das erste kommerzielle Wellenkraftwerk ans Netz in Mutriku (Nordspanien) gegangen. Die 16 Turbinen dieses Wellenkraftwerk versorgen mit ihrer Leistung von 300 Kilowatt gerade mal rund 250 Haushalte mit Strom. Zufolge Experten befinden sich die Anlagen, die sich die Energie der Weltmeere zunutze machen, noch in der Entwicklung.

Es gibt verschiedenen Prinzipien von der Nutzung der Wellenenergie:

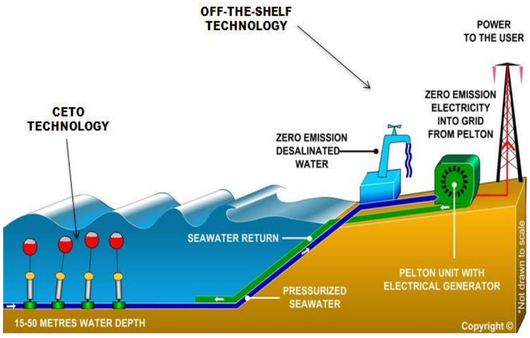

Bild 1. Aufbau eines Wellenkraftwerkes (WaveRoller)

1. Pneumatische Kammer. Die Elektrizität wird mittels der Nutzungen des Windgenerators erhalten. Dieser Windgenerator nutzt die ein- und ausströmende Luft in einer Kammer, in der sich der Wasserspiegel durch eine Verbindung zum Meer hebt und senkt.

2. Relativbewegung von Schwimmkörpern – sogenannte Seeschlange – zueinander oder zum Ufer. Die Bewegung wird dabei

359

meist über hydraulische Systeme umgesetzt, die den Generator antreiben;

3. Nutzung der potenziellen Energie (Höhenenergie) auflaufender Wellen auf eine Rampe (Projekt Wave Dragon);

4. Nutzung des ansteigenden Meeresbodens vor der Küste in Wassertiefen von 8–23 m (WaveRoller);

(+) Vorteile von Wellenwasserkraftwerken:

- die Aufregung des weltweiten Ozeanes ist die erneuerte Quelle der Energie;

- die Umgestaltung der Energie der Wellen in der Elektroenergie wird vom Auswurf des Kohlenoxyds (MIT), der Kohlensäure (CO2) und der Oxyde des Stickstoffes und des Schwefels, staubförmige Verunreinigungen nicht begleitet. Der Boden wird von anderen schädlichen Abfällen nicht verschmutzt;

- die Anlage und der Betrieb des Wellenwasserkraftwerkes sind verhältnismäßig preiswert, wenn die Entwicklung solcher Station, die den Stürmen gegenübersteht, ist technisch nicht zu kompliziert;

- die großen Wellenwasserkraftwerke können die Menge der Elektrizität erzeugen;

- die Wellenwasserkraftwerke sind unbemerkt. Sogar bei der starren Beobachtung werden sie mit der Landschaft befriedigend zusammengezogen. Andererseits kann es auch als Mangel gezeichnet (steht unten);

- die richtig entwickelten Wellenwasserkraftwerke leisten die schädliche Einwirkung auf die Meeresflora und die Fauna nicht.

(-) Nachteile von Wellenwasserkraftwerken:

- wenn die Oberfläche des Ozeanes ruhig oder fast ruhig ist, kann das Wellenwasserkraftwerk die nützliche Energie nicht erzeugen;

- die Bauplätze der Wellenwasserkraftwerke muss man sorgfältig auswählen, um die Einwirkung des Lärms von innen zu minimisieren. Dabei sollen sie sich gerade in jenen Bezirken befinden, wo die Windwellen das ausreichende Potential für die Leistung der Elektroenergie verfügen;

- der Sturm des Jahrhunderts – die Gesamtheit der Sturmkennziffern (die ständige Geschwindigkeit des Windes, die Höhe der Wellen usw.) kann das Wellenwasserkraftwerk zerstören, und ihre übermäßige technische Kompliziertheit, damit sie solchem Sturm

360

gegenübersteht konnte, wird dazu bringen, dass die Kosten für ihren Bau nicht gedeckt werden;

- unbemerkbare Wellenwasserkraftwerke können die Gefahr für die Navigation vorstellen, wenn sie auf den Karten nicht bezeichnet sind;
- beim Bau des Wellenwasserkraftwerkes kann die Anlage der Bojen oder anderer Signalindikatoren gefordert werden.

Die Schlussfolgerung. Sogar wird die Energie aus die Wellenkraft erzeugt. Aber die Erzeugung ist schwierig und teuer. Die Kraftwerke müssen sich weit von der Küste befinden und voll automatisiert funktionieren. Auch der Mechanismus, der die Wellenenergie in elektrische Energie umwandelt, zieht den starken Einfluss der Wellen unter.

Literaturverzeichnis

1. Zharkov S.V. Energiya morskikh voln i VLES // Energiya: Ekonomika, Tekhnika, Ekologiya [Energy: economy, equipments, ecology]. 2008. №4. P. 11- 18.;
2. Sichkarev V.I., Akulichev V.A. Volnovye energeticheskie stantsii v okeane. Lipetsk: Nauka [Science], 1989. 134 p.;
3. Nechaeva E.G. Problemy bezopasnosti ispol'zovaniya vodnykh resursov // Geografiya i prirodnye resursy. 2006. №3. P. 170-171.;
4. D'yakov A.F., Morozkina M.V. Problemy ispol'zovaniya energii voln. -Moscow: Energy of atom pbl.;
5. Enersy, Preimushchestva i nedostatki volnovykh GES. Available at URL: nersy.ru/energiya/preimuschestva-i-nedostatki-volnovyh-ges.html/ (accessed 22 Oktober 2015);
6. Wikipedia, Wellenkraftwerk Available at URL: https://de.wikipedia.org/wiki/Wellenkraftwerk/ (accessed 24 Oktober 2015);
7. Verivox, Wellenkraftwerk Available at URL: http://www.verivox.de/themen/wellenkraftwerk/ (accessed 24 Oktober 2015);
8. Energie-Tipp, Wellenkraftwerk: Energie aus der Kraft des Meeres. Available at URL: http://www.energie-tipp.de/neue-energie/wasser/3946313/ (accessed 24 Oktober 2015).

361

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ECOLOGICAL MODERNIZATION OF CEMENT PRODUCTION
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Abstract: The analysis of the ways of ecological modernization of cement production that can neutralize the negative human impact on the environment.

Key words: cement, emission, clinker, limestone, pulp.

Cement production, like any other production, is characterized by the extraction of natural resources, air pollution, wastewater discharges, as well as the impact on the territorial resources. In addition, cement production also affects human health and well-being. Cement industry releases into the environment more than 27 million tons of dust each year. The share of cement industry accounts for 2/3 of industrial emissions of solids and 44% of gas [2, p. 2]. The main pollutant in the operation of cement plants is dust, which affects all components of the environment. At the same time there is a combined contamination of plants composed of the direct sedimentation of aerosols and dust on the surface of leaves and roots, and of the absorption of solid metals that have been accumulated in the soil for long periods of inputs from the atmosphere. The volume and the intensity of exposure depend primarily on the production technology [1, p. 65]

There are two stages of the cement production process. The first step is preparation of clinker, the second one is the adjustment of clinker to the powder state with adding various additives thereto. At the first stage, the extraction of raw materials through the development of limestone deposits takes place. The second stage comprises several steps. At the beginning after sintering and cooling clinker is crushed, mineral additives are added and dried. Then the clinker is ground in a mixture with gypsum and active mineral additives. In the cement industry, there are several ways of production: wet, dry and combination methods [4]. In each method a certain type of equipment

362

and a strict sequence of operations are used. At the stages of crushing and grinding of raw materials, clinker firing, cement grinding and storage all major units are equipped with PGU. Collected dust by means of special equipment (dust-cleaning working in a closed circuit) returns into the process without contact with the atmosphere [3, p. 46].

Ecologization of cement production should be carried out in an integrated, systematic approach that combines a set of legal, organizational, technological, scientific, educational and other methods [6, p. 20].

Our analysis resulted in the fact that improvements of KZU can increase the amount of gas-air mixture which entered the clearance by 1.3 times, the velocity of the gas-air mixture in the filters has increased by 1.5 times. It is possible to achieve even greater results by replacing the filter and increasing the efficiency of cleaning from 96 to 99%. [5, p. 3] One of the most effective methods of reducing the discharges is the use of water recycling technology, in this case the amount of relief is reduced. In the process of scrubbing one of the types of waste, the pulp, is formed. Pulp is precipitated with water dolomite dust, which can be eliminated by the use of dry cleaning. The result is limestone sludge, which is then used to backfill the foot in the process of career reclamation. So as a result of the analysis it was found out that key areas of ecological modernization of cement production are the following: 1) reduction of the amount of polluting emissions by installing more modern gas and dust removal equipment; 2) reduction of the amount of polluting effluents by creating closed water systems; 3) reduction of the volume of waste to be placed, by returning the waste to the process, the use of methods of dry cleaning.

References

1. Mogalis Al'. Issledovanie i obosnovanie kompleksa meropriyatij po ehkologizacii cementnogo proizvodstva Jemena. Moscow, 2000.

2. Durov V.V. Ohrana atmosfernogo vozduha v cementnoj promyshlennosti. Cement i ego primenenie, 1998, no. 6, pp. 2-3.

3. Kaplan M.B. et al. Pererabotka strotel'nyh othodov. Stroitel'nye materially, 1998, no. 6.

4. Official website Evrocement grupp. Available at: http:// www.eurocement.ru (accessed 19 February 2014).

363

5. Pasport pyleulavlivayushchej ustanovki ochistki gaza cementnoj mel'nicy №204h13,5.
6. Petrov K.M. Obshchaya ehkologiya. Vzaimodejstvie obshchestva i prirody, Saint-Petersburg, Himiya, 1997.

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BIOFUELS PRODUCTION TECHNOLOGIES

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Abstract: Non-renewable fossil fuels are already close to exhaustion. The article discusses one of the most promising alternative fuels – bioethanol, namely, its preparation and use.

Key words: bioethanol, sustainable energy source, bioenergy, saccharification, fermentation

Nowadays the demand for energy consumption in the world is growing rapidly, while accessible global fossil fuel reserves are depleting. The main motivation of renewable energy (as well as bioenergy) development is to solve the problem of energy resource limitation.

Bioenergy is the fast growing sunrise industry of the world modern energy based on the generation of energy and biogenous fuel production, including from organic waste of animal and vegetable origin.

Today leaders of ethanol production the United States produce it from corn and Brazil from sugar cane. For biofuels production Russia cultivated a limited number of plants such as crops, potatoes, sorghum, corn, beets and beet waste production, turnip, canola, and soy. [1]

The cultivation of these crops exclusively for biofuels will lead to a reorientation in arable land and rising food prices rising. With this context it is necessary to use territories that are not suitable for food production and grow plants on fallow and abandoned lands. The sugar fermentation process mainly produces bioethanol.

364

There are technologies of bioethanol production. It is the technology of wet and dry grinding. The particular difference of the so-called "dry" and "wet" grinding, mainly involves the additional extraction of gluten, starches A and B in "wet" method.

The consecutive successive stages of bioethanol production are the follows (figure 1):

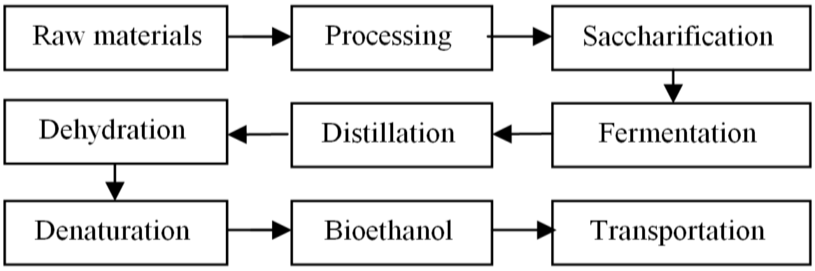

Figure 4. Bioethanol production technological scheme (created by the author)

At the beginning of the recycling process, raw materials entering the production of ethanol, are weighed and cleared from various impurities (sand, dust, chipped particles, etc.), then the raw material is fed to the stage of grinding. The enzymatic process efficiency depends on the homogeneous grinding with a specified particle size. [2]

In a wet grinding technology, the grain past the stage of cleaning is immersed in the warm water that allows breaking down proteins, to release the starch and to soften the grain for grinding.

Then the solution is separated from the germ and after drying is sent for storage or production of feed additives.

The remaining solution is chaffed again and more carefully and separated from the starch solution, gluten, vegetable gelatin and reduce the viscosity. The lower viscosity is known to reduce the reaction time and cost of electricity. The selected starch solution is sent to the stage of gelatinization and subsequent fermentation.

The dry milling process includes clearing and fragmentation of grains into small particles by shock-type devices. This gives wholemeal flour containing the germ, starch and fiber. For the production of sugar the mixture is hydrolysed by enzymes or dilute acids. And then heated and yeast is added for carrying out alcoholic fermentation. This technology is usually used in factories that produce annually less than

365

200 million liters of bioethanol. The product yield from 1 ton of wheat 0,624 tons of alcohol, and 1 ton of corn – 410 L. [3]

Affected by enzymes and high temperatures the molecules of starch break down into low and medium molecular dextrins and sugar.

The collected solution is cooled and is added to it saccharifying enzyme glucoamylase. Saccharifying enzymes convert molecules of dextrin into simple sugars that can be processed by yeast into ethanol. The yeast is added to the solution and the temperature is raised to 25-30°C and kept about 50-60 hours.

The yeast enzyme, called invertase, sucrose into glucose and fructose. The reaction occurs:

$C_{12}H_{22}O_{11} + H_2O \rightarrow C_6H_{12}O_6 + C_6H_{12}O_6$ (*glucose fructose)*

Then, by the action of starter culture glucose and fructose (the sum of the yeast enzymes of alcoholic fermentation) are converted into ethyl alcohol and carbon dioxide. The entire fermentation process takes place in about 3 days. [4] $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$ (*ethanol)*

The collected fermented mash contains up to 15% alcohol. Bioethanol, obtained in the fermentation process, contains a significant amount of water.

Then this water-alcohol vapor from distillation column comes to the dehydration under the elevated pressure through one of the adsorbents. Water molecules from the vapor are trapped in the pores of the molecular sieves, and dehydrated ethanol exits the adsorber.

The ethyl alcohol boiling point is about 78.3°C. Therefore it sublimates before water than it condenses. Alcohol strength not more than 96.0-96.2% could be obtained at the outlet of the distillation apparatus.

According to the technical requirements the absolute alcohol should be used for the preparation of mixtures with high (over 10%) content of ethanol in motor fuels.

In case of incomplete dehydration the ethanol denaturing substances (2-5% gasoline or other ingredients) are added to bioethanol. The ethanol turns to be a technical product, as a result of denaturation process.

The addition of bioethanol to gasoline results octane improvement and more completely fuel combustion. This leads to the contaminant concentration decrease in exhaust gases. EU countries

366

stipulate the mandatory use of ethanol as a component of motor fuel. [5]

We want to draw your attention to the benefits of bioethanol production. Ecological indicators are the doubtless positive exponent of biofuels production. Lower, compared with pure gasoline, contribution to the greenhouse effect, as allocated by burning carbon dioxide is the primary atmospheric origin.

Using bioethanol 5% concentration in motor fuels reduce carbon emissions by 3.5%, especial in E85 by 50%. Biofuel involving 15% of ethyl alcohol reduction in exhaust gases CO for 25%, hydrocarbons and nitrogen oxides for 5–15% as the bioethanol burns up harmful emissions of gasoline. In comparison bioethanol and fossil fuels identified that bioethanol is a biodegradable and less toxic product because practically doesn't contain sulfur. [6]

Beside carbon emissions reduction bioethanol as a component of motor fuel increases octane number and detonation firmness of fuel. In fact autoignition temperature of gasoline is 290°C. The fuels mixed with alcohol increase antiknock quality to 425°C.

In spite of beneficial indicators, there are a few shortcomings. Firstly, for instance, bioethanol calorific effect is reduced by 30% in comparison with fossil fuels. It lead to decreased release of energy and engine power loss causing higher fuel consumption.

Secondly, availability of water and fluctuations of temperature creates opportunity for stratification of fuel mix. The third in case of water containing bioethanol causes corrosion of metals which lead to engine parts wear. Finally, threat of depressurization of pipes and biofuel capacities and increases percentage a water containment. [7]

The world's most effective way to stimulate the development of bioenergy, which allows you to move from single projects to their mass replication, is the tariff regulation. Tariff subsidies from biofuel generation on the starting phase is a credit to stabilize and even decrease, rates in the future.

After the completion of the payback period on investment costs the cost of energy from bioenergy is defined only by the operating costs, which is proportionally less than the cost of the fuel component. Accordingly, a real factor that plays against rising tariffs appears when a significant proportion of biofuels in energy.

367

Nowadays, in Russia there is the same excise levied bioethanol as alcohol. Tax breaks that exist in the United States and some other countries, we have not even considered. According to market participants, the biofuel in Russia has unreal excise rate-up to 90% of the cost of its production. Excises increase bioethanol cost by alcohol and alcohol-containing production several times and do its production unprofitable. It is known that the excise on alcohol in the Russian Federation makes 23 rubles per liter, on alcohol-containing production – 162 rubles per liter. This makes it impossible to spread. [4]

Summing it up, the renewable energy sources (RES) use in Russia can be a key factor that will lead the country out of the prolonged socio-economic crisis on the path of sustainable development.

It should be stated that the problem of alternative fuel usage has not been adequately assessed yet in Russia. High oil prices do not stimulate a natural monopoly to invest ahead of the curve. Enterprises also do not take a direct interest in fuels from renewable materials.

References

1. Shinnosuke Onuki: Bioethanol : Industrial production process and recent studies, 2008

2. Crop Energies, the article: "Production processes", [URL]-http://www.cropenergies.com/en/Bioethanol/

3. Kataliticheskie prevrashhenija biojetanola» / V.F. Tret'jakov, Ju.I. Makarfi, P.M. Talyshinskij, N.A. Francuzova, K.V. Tret'jakov // Vestnik MITHT.- 2010.- №4.- С. 5-22.

4. «Perspektivy razvitija proizvodstva biotopliva v Rossii. Soobshhenie 2: Biojetanol» / R.G. Vasilov T.3 №2, str 54-55, 2007P.W. Madson and D.A. Monceaux - "Fuel ethanol production", 2003

5. «Energoresursosberegayuschaja tehnologiya polucheniya bioetanola iz zelenoy massy rasteniy roda heracleum» / S.S. Dorzhiev, I.B. Pateeva // 2011

6. «Tehnologija polucheniya bioetanola iz sel'skohozjajstvennoj produkcii» / Suhih R.A., Matveenko A.S. // 2011

7. Poluchenie vodorodsoderzhashhego gaza parovoj konversii jetanola / M.S. Jakimova, V.F. Tret'jakov, N.A. Francuzova, L.O. Jarygina // Vestnik MITHT.- 2010

368

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ELECTRIC CARS: SOLUTION OR POSTPONING

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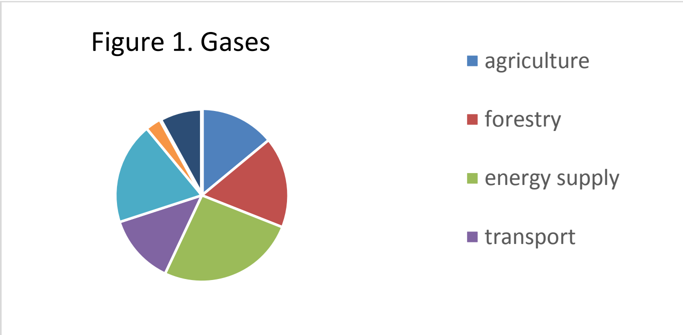
Abstract: Greenhouse gas emission is one of the most acute issues today. One possible solution is to use electric cars instead of internal combustion engines. However, can this solve the problem? Data from different sources is combined and analyzed in this article to find out the answer to this question.

Key words: electric cars, greenhouse gases, GHG emissions, internal combustion engines.

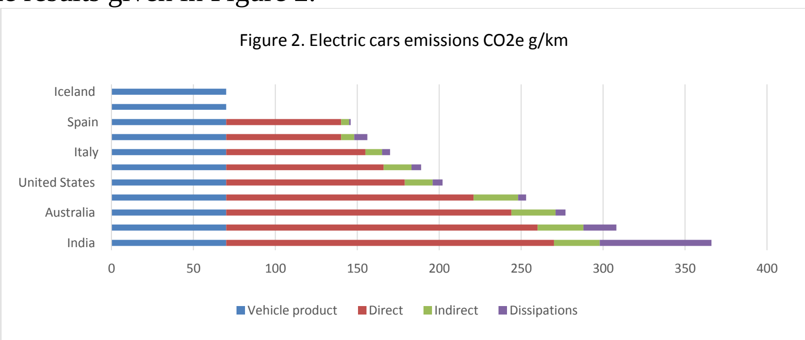
The key assumptions used in this article are that an electric vehicle has manufacturing emissions of 70 g CO2e/km over its lifetime, and that its wall-to-wheels energy use is 211 Wh/km, similar to a Nissan Leaf. Data for international electricity emissions factors is sourced from DEFRA in the UK. Nowadays the world faces an essential problem called global warming. This process occurs due to absorbing solar radiation by some atmospheric gases, named greenhouse gases. They transfer this energy to other components of the atmosphere, and it is re-radiated in all directions, including back down towards the surface.

Greenhouse gases usually consist of water vapor, carbon dioxide, methane, nitrous oxide, ozone, and chlorofluorocarbons. According to the EPA agency research there were 6,673 million metric tons of CO2 emitted by the USA cars in the 2013. Only internal combustion cars were considered in this research [1]. Many popular magazines are promoting the idea that electric cars can totally reduce the emissions because of their green engines working on electricity accumulated in batteries. Unfortunately, this fact is largely fiction. According to IPPC, the whole effect of transport on the environment is 13 %. It is not significant even if we could eliminate all emissions. It is clearly shown in Figure 1.

369



Here you can see that transport emissions account for a considerably small proportion. It is only bigger than waste water and commercial building emissions [1]. So the next question is ‘do electric cars reduce emissions in general’? The answer is ‘yes’. However, it actually depends on where the car was charged. In order to evaluate the impact of grid electricity consumption we count the emissions that appears from fuel combustion at power plants, upstream fuel production, and the share of electricity lost in transmission and distribution [2].Considering electric car emissions, it is more properly to call it grid emissions because it does not occure by driving electric cars.Summing up all the points of electric cars grid emissions we obtain the results given in Figure 2.



Illustrated by the Figure 2, electricity in India and Australia is coal based, the United States electricity is rather fossil heavy, Paraguay and Island are low carbon, and the other countries presented there are fossil light. Carbon emissions of grid powered electric vehicles are four times greater in countries with coal-dominated power generation than in those with low-carbon electricity [3]. Given that there is no difference

370

in the production of electric cars by different countries, we have three types of emissions called direct, indirect and dissipations. Let us consider each of them:

Direct - these emissions are commonly known as Scope 2 emissions. Scope 2 emissions physically come from a plant or a mill where electricity is generated. Scope 2 accounts for greenhouse gas emissions from the generation of purchased electricity consumed by a company. Particularly this type of emissions arises from fuel combustion at power plants.

Indirect - these emissions are commonly known as Scope 3 emissions. This type of emissions is an unnecessary reporting category that allows for the treatment of all other indirect emissions. It considers all company activities but occurs from non-company sources. In particular, it occurs from sources not controlled by the company.

They include CO2, N2O and CH4 emissions from fuel extraction, transportation, processing, distribution, and storage.

Dissipations – these emissions come by producing electricity that is lost in transportation and distribution. Therefore, these type emissions strongly depend on the quality of grid energy transmission to consumers [4]. As above, manufacturing emissions are 70 g CO2/km in every country without exception. It means that the difference between Iceland (70g) and India (370g) is a result of using various sources of energy.

Another drawback is that electric cars have reduced lifetime mileage in comparison with conventional cars. It means that their emissions per kilometer are higher.Now let us contemplate the comparison of different types of cars engines in different countries.

In analysis electric vehicle emissions are equal to a gasoline fuel economy of 40 MPGUS (9 L/100 km), or similar to a modern petrol hybrid. But this evaluation of electricity emissions assumes typical petrol production emissions.

Using an emissions factor specific to US petrol production raises the estimate to 43 MPGUS. Considering the fact of continuing shift from coal to gas, electric vehicle emissions seem to outperform top hybrid in the short term. Moreover, it has already been done in many lower carbon grid regions. [4; 5; 6; 7].

It is clear from these observations that electric vehicle emissions range from similar to average petrol cars to less than half of the best

371

hybrids depending on power source. Analyzing this data, we can conclude that driving an electric car reduces emissions in particular, but not a huge part of them in general.

This article prompts that electric cars cannot help solve the problem of global warming. It is only a way to reduce emissions. Unfortunately, this technology is not standalone and highly depends on the sources of energy used to charge electric cars.

In countries with coal dominated power generation, electric vehicles do little to reduce carbon emissions when compared to petrol vehicles. In countries with a broad fuel mix they are equivalent to the best petrol hybrids or efficient diesels. In places with low carbon power, they are more than twice as good as the best combustion engines.

Therefore, if we could use electric car along with alternative sources of energy it would help address the global problem of GHG emissions.

References

1. Sources of Greenhouse Gas Emissions [EPA official website]. URL:http://www3.epa.gov/climatechange/ghgemissions/sources/transportation.html (date of access 25.09.15).

2. James Larminie, John Lowry, 2003. Electric Vehicle Technology 3. Greenhouse gas protocol [official websire]. URL: http://www.ghgprotocol.org/ (date of access 25.09.15).

4. Don Anair, Amine Mahmassani, 2012. State of Charge. Electric Vehicles' Global Warming Emissions and Fuel-Cost Savings across the United States", Union of Concerned Scientists, 150.

5. Michalek, J., Hendrickson, C., 2015. Regional Variability and Uncertainty of Electric Vehicle Life Cycle CO 2 Emissions across the United States. Environmental Science & Technology, 49, 8844-8855.

6. Notter, D. A., M. Gauch, 2010. Contribution of Li-ion batteries to the environmental impact of electric vehicles. Environmental Science 44, 6550–6556.

7. India greenhouse gas program [official website]. URL: http://indiaghgp.org/ (date of access 27.09.15).

372

GREEN BUILDING

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EL ANÁLISIS DE FUNCIONALIDAD DE SOFTWARE EN LA SIMULACIÓN AMBIENTAL

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Resumen: El análisis de funcionalidad de software en la simulación ambiental como una parte importante de la recepción y la transmisión de experiencias a los equipos en los proyectos de construcción

Palabras clave: software, simulación ambiental, diseño, funcionalidad, sostenibilidad ambiental.

Abstract: The analysis of functional features of software in the field of ecological modeling as an important part of obtaining and transfer of experience of environmental teams for construction projects.

Key words: software, environmental simulation, design, functionality, environmental sustainability.

La simulación ambiental es una de las herramientas más prometedoras en la construcción del diseño ambiental, que permite evaluar características operacionales, identificar y medir el consumo de los recursos naturales, el agua y la energía, también optimizar el beneficio financiero del uso de las estrategias diferentes en la fase inicial del diseño. La simulación ambiental también permite evaluar los parámetros de la eficacia ambiental y económica, los factores de impacto negativo en el hábitat y promover la implementación de las tecnologías innovadoras de diseño de edificios y complejos residenciales.

El propósito de la investigación es la determinación y la comparación de la funcionalidad de software en el simulación ambiental. Las tareas principales son: la comparación de los softwares,

373

la elaboración de las recomendaciones para la selección de los softwares y la detección de las prácticas.

Los criterios ambientales de la funcionalidad de los softwares son el tema de la investigación, mientras que el objeto de la investigación son los softwares GaBi 5, SimaPro 7, Umberto NXT LCA, IES. La utilización de los esquemas lógica-gráfica y los principios metodológicos es la base del análisis. La metodología de la investigación consiste en el análisis paralelo comparativo y en la evaluación de la funcionalidad de los softwares. El esquema lógico-gráfico se ha compilado en función de la disponibilidad de las diferentes funciones en los softwares. (Figure 1).

Los criterios principales elegidos para realizar la comparación fueron: 1. La creación del diseño sostenible del producto; 2. La creación el plan del consumo efectivo de recursos; 3. El uso internacional del software; 4. La integración los resultados de la simulación en el sistema de la certificación ecológica de los edificios; 5. La identificación de los materiales y procesos para la reducción de los riesgos; 6. El análisis y la evaluación de las medidas de optimización de procesos; 7. La creación de la estrategia de la sostenibilidad del producto.

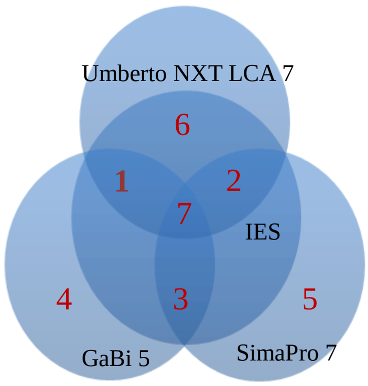

Fig.1. El esquema lógico de comparación de la funcionalidad de los softwares en la simulación ambiental, su intercambiabilidad y complementariedad: 1,2,3 – la sucesión de las funciones IES en GaBi 5, SimaPro 7, Umberto NXT LCA y entre sí, 4,5,6 - la sucesión de las

374

funciones IES individualmente en cada software, 7 - la intersección de todos los softwares por la presencia de las funciones totales.

El análisis lógico-gráfico de los softwares en la simulación ambiental (Fig.1.) permitió identificar las similitudes y diferencias en las funciones determinadas de cuatro softwares. Este análisis demostró que IES tiene todas las funciones [4]. Sin embargo, mediante el análisis hemos podido identificar que otros softwares no tienen todas las funciones. Por ejemplo, GaBi 5 no tiene la posibilidad de la creación del plan del consumo efectivo de recursos, el análisis y la evaluación de las medidas de optimización de procesos, y la identificación de los materiales y procesos para la reducción de los riesgos (2,5,6) [1]. SimaPro 7 no tiene las funciones 1,4,6; Umberto NXT LCA no tiene las funciones 3,4,5 [2,3]. Por otra parte, todos los softwares tienen la posibilidad de la creación la estrategia de la sostenibilidad del producto. También, mediante el análisis, hemos podido identificar que sólo IES y GaBi 5 tienen la posibilidad de la integración de los resultados de la simulación en el sistema de la certificación ecológica de los edificios, lo que determina directamente su ámbito de aplicación en la construcción «verde».

Las representaciones sobre la funcionalidad de varios softwares en la simulación ambiental son la competencia más importante en la actividad de los equipos y en los proyectos de construcción, También ayudan a formar la base propia lógica para la planificación del proyecto. La posibilidad de comparación y la selección del software más adecuado determina el desarrollo clave del proyecto en todas sus etapas, y contribuye al crecimiento de la calidad del trabajo realizado.

El esquema lógico de comparación de la funcionalidad de los softwares en la simulación ambiental resultante de la investigación, así como su intercambiabilidad y complementariedad, puede ser la base para la selección de software para los equipos cuando se utiliza el método de simulación ambiental en el diseño construccional.

Referencias

1. Duinen M.V., Deisl N. / Handbook to Explain LCA Using the GaBi EDU Software Package / 2009, August

2. Gelder C., Oele M., Cleij V., Moore M., Durksz S., Haringsma A. / SimaPro installation manual / 2012, February

375

3. Ifu Hamburg GmbH. / Umberto® NXT LCA (v7.1) User Manual / 2015, July
4. IES Virtual Environment / LifeCycle Analysis (LCA) User Guide / 2014

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ECO-CITIES: REALITY OR UTOPIA

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Abstract: The article is devoted to green building based on conception of sustainable development. What are eco-cities and their criteria? What kind of city of the world can be called an eco-city and why do we need them?

Key words: eco-cities, environmental education, non-waste production, landscaping, alternative energy sources, green transport, green building, waste recycling, conception of sustainable development

Over the past century agricultural industry, manufacturing industry have highly increased, medicine quality has improved. As a result death rate has decreased; life expectancy has risen, consequently, population of the Earth has increased. Nowadays, world population is more than 7 billion. Overpopulation and anthropocentric view lead to intensive consumption of natural resources. Unreasonable use of resources and human's pursuit to comfort achieve gigantic influence on the nature and the urbanization growth.

Nowadays popularity of the conception of sustainable development is rapidly increasing. It is based on three interrelated components such as economic, social and ecological elements. These three elements are equal and inseparable parts of a whole. According to conception, the present generation is using nature benefits, developing without causing harm to the environment. Rather future generation will have opportunity to use natural resources.

The modern city is a powerful engineering and technical infrastructure. Implemented in cities, it is the fundamental part of all

376

extract resources. We must reconstruct the cities to improve global environmental situation.

Eco-cities are in balance with nature. They are procuring their own products, goods and energy resources. Also they have environmental education system, provide high quality of people's life without oppressing nature. This definition sounds like a utopia, something unreal. Eco-city is determined by the following criteria: • closed cycle at the plants (non-waste production); • using renewable inexhaustible sources of energy (solar energy, wind energy, tidal energy end etc.); • using energy-efficient technology; • using ecologically clean transport (green cars, bicycles and etc.); • recycling consumer waste; • low-stored houses construction; • using underground area for garages, warehouses and etc.; • widespread planting of greenery (parks, gardens, squares), verdurization building surfaces (vertical and horizontal); • own food and energy; • involving people in the Eco-house building and interior finishing; • presence of center for environmental education of residents; [1, 2, 3]. Nowadays there are several Eco-cities. Almost all of them are located in Europe.

Despite the Vancouver is the third largest city in Canada, it has the cleanest air of a city in North America status. Vancouver's electricity, near 90%, consists of renewable energy sources. The town is famous for wide gardens and parks which are more than 200 and longest coastal zone for 30km. Moreover, in another Canada's city – Calgary - a highly efficient water filtration system is operated. [4, 5]

Eco-city Curitiba is situated in Brazilia. It has exceptional model system of public transport. Residents prefer to use public transport and only quarter exploit their own cars. There is original way of planting, beside that there are special public transport express routes. When mayor of the city was Jaime Lerner, had been entered the program called "garbage that is not garbage". The program aim was involving residents in the sorting of waste and maintenance cleanliness. People received travel card for sorted rubbish bag or package of fresh fruit and vegetable for biowaste. There was entered «solcriado» system which finances restoration of historic buildings, landscaping and etc. Moreover, city's treasury fund is almost not affected. There are 16 parks, botanical garden built on the place of city dump. The city is attractive that per inhabitant is more than 50 m^2 green area, while according to the norms of the UN perfect – 48 m^2. Curitiba recognized

377

as a model eco-city. [4] Masdar - city of the future - is on the stage of construction. It is sited close to capital of the UAE. The Sun is the main energy source of the city. Solar panels are located on the roofs and on the ground around the buildings. Also, rainwater harvesting and using is planned. Sewage plant will purify waste water and use it for irrigation. Waste recycling and sorting factory is the part of the city. The initial stage of waste sorting will begin with the residents. [1, 6]

List of the cities that are trying to reduce harmful effects on the environment is not limited to the above cities. A lot of cities are operating and switching to alternative energy sources, expending green areas, trying to decrease carbon emission to the atmosphere, using green transport (for example, St. David's, Freiburg, Songdo). [1, 5]

The first Russian eco-city with low storey houses and developed infrastructure as far as 70 km from the capital. It is New Stupino. Satellite city is a landmark project of the program of the Regional Development Ministry - "long-term strategy of mass housing construction for all walks of life of Russian Federation". New city will consist of an industrial park with environmentally friendly companies, high quality of life, comfortable labour conditions and leisure facilities. [7]

In conclusion, one of the issues is connected with financial capabilities. Eco-cities construction is long-term project which pass through a several economic cycles. Unfortunately, they often have a financial collapse. But despite this we should learn how to receive energy and materials without harmful influence to nature. We should develop nanotechnologies in order to save nature for future generation. Eco-cities are the best way. [3]

References

1. Eco Cities: what they are and where in the world to find them Available at: http://hubpages.com/hub/Ecocities-What-They-Are-And-Where-To-Find-Them (accessed 17 October 2015)

2. Ponyatie, tipy i printsipy funktsionirovaniya ekogoroda. zarubezhnyi i rossiiskii opyt [definition, types and principles of operation of the eco-city. foreign and Russian experience] Available at: https://phamanhphuong.wordpress.com/2012/05/03/ (accessed 17 October 2015)

378

3. Novoe Stupino: maloetazhnyi gorod-sputnik [New Stupino is low-rise satellite city] Available at: http://www.novoestupino.ru/ (accessed 17 October 2015)
4. Living in: the world's most eco-friendly cities Available at: http://www.bbc.com/travel/story/20141215-living-in-the-worlds-most-eco-friendly-cities (accessed 17 October 2015)
5. Ekogoroda stran mira - budushchee planety [eco-cities of the world is the future of the planet] Available at: http://xn----8sbiecm6bhdx8i.xn--p1ai/%D1%8D%D0%BA%D0%BE%D0%B3%D0%BE%D1%80%D0%BE%D0%B4.html (accessed 17 October 2015)
6. Ekogoroda [eco-cities] Available at: http://sector83.net/ecogoroda (accessed 17 October 2015)
7. World problems Available at: http://www.youcansavetheworldrightnow.com/eco-cities-world-energy-problems/ (accessed 17 October 2015).

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ENERGIEQUELLE SONNE

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Annotation: Die Energie unserer Sonne ist die einzige unerschoepfliche Energiequelle der Menschheit. Sie ist absolut kostenlos, sicher, umweltfreundlich und ist immer da, wenn die Sonne scheint. Die Aufgabe der modernen Forscher ist die Feststellung der Möglichkeiten der Energiegewinnung aus Sonnenlicht.

Stichwörter: Sonne, grüne Energie, Photovoltaik, erneuerbaren Energien, Solarmodule, Solarzelle, Energiequelle erneuerbare Energieträger, Weltraum.

Abstract: The energy of the sun is the only never-ending source of energy of mankind. It is absolutely free, safe, and environmental and is always available when the sun is shining. The aim of modern researchers is to determine the possibilities of producing energy from sunlight.

379

Key words: sun, green energy, photovoltaics, renewable energy, solar panels, solar cell, energy source, renewable energy sources, Space.

Russland ist der Pioniere der Entwicklung von Weltraum mit dem Ziel der Stromgenerierung. In Russland hat man entwickelt und die großen, mehrstöckigen Solarzellen montiert, die die Raumstation mit dem Strom versorgt. Raum-Kraftwerk besteht aus einzelnen Zellen und hat die Fähigkeit, im Raum (d. h. auf der Sonne orientieren) zu drehen und die Strahlen der Sonne zu fangen. Der im Raum erzeugte Strom wird auf künstliche Elektrolyse Systemarbeit verbraucht, d.h. die Zersetzung auf Wasserstoff und Sauerstoff an der Station und verdampft in einem speziellen Wassertank. So können die Astronauten den benötigten für Atmen Sauerstoff bekommen.

Probleme und Perspektiven der Herstellung von Solarraumkraftwerke (SRKw)

SRKw werden die größte Energieobjekte repräsentieren, vergleichbar mit den auf der Erde hergestellten Kraftwerken, z. B. das Krasnojarskaya oder Sayano-Shushenskaya Wasserkraftwerk. Deren Bau im Weltraum ist ein äußerst komplexes Problem, von der erfolgreichen Lösung von denen die Möglichkeit und die Zweckmäßigkeit der Schöpfung des SRKw abhängt. Und dies hängt in erster Linie von der Notwendigkeit, Transport und Unterkunft in hocherden Umlaufbahnen von Hunderten Millionen Tonnen verschiedenen Strukturelemente des SRKws und Einheiten für ihre Montage und Installation ab. Bei solchen Maßstäben der Transportoperationen entstehen nicht nur technische, sondern ernsthafte ökologische Probleme, die infolge der Freisetzung in die Atmosphäre der enormen Massen auf eine hohe Temperatur erhitzte Gas erfolgt.

Die Zweckmäßigkeit der Schöpfung des SRKw hängt letztlich von ihrer Rentabilität ab. Wege zur Reduzierung der Kosten des Projekts der Station bestimmen die wichtigsten technischen Lösungen in diesem Bereich. Daraushin werden die sozio-politische und rechtlichen Aspekte der Umsetzung der Projekte der Stationen von großer Bedeutung.

Entwicklungsperspektiven des SRKw hängen von den Fähigkeiten der effektiven integrierten Lösung allen diesen Probleme ab.[2].

380

Ökologische, soziale und wirtschaftliche Probleme

Die Entwicklung der weltweiten Energie mit zunehmendem Tempo schafft eine Gefahr für die Biosphäre der Erde. Eine Verschmutzung der Atmosphäre mit den Produkten der Verbrennung von Bio-Kraftstoffen und Hydrosphäre mit der Ableitung von Energieunternehmen, Überschwemmungen und Verschmutzung von großen Gebiete im Zusammenhang mit der Schaffung von Stauseen für Wasserkraftwerke, die Lagerung der radioaktiven Abfälle der Kernkraftwerke und schließlich die thermische Verschmutzung der Biosphäre allen thermischen Energiestationen, einschließlich der künftigen thermonukleare, – das sind die wichtigsten Faktoren, die können zu einer gefährlichen Störung des ökologischen Gleichgewichts auf unserem Planeten bei der weiteren Entwicklung der Energiewirtschaft führen. Deshalb kann die Zukunft der Energie heute nur unter Berücksichtigung Ihrer Wechselwirkungen mit der Umwelt behandelt werden.

Eine der wichtigsten Ziele der Schaffung der großen SRKw für die Energieversorgung der Erde auf der letzten Phase der Industrialisierung des Weltraums wird eine Entlastung der Biosphäre von gefährlichen Folgen der Energieentwicklung der Erde. Hier möchte ich noch einmal betonen, dass dies wird wahrscheinlich sinnvoller Grund sein, der teilweisen Entfernung der Energieproduktion in den Weltraum, als der Mangel an Energieressourcen auf der Erde. Aber dann, natürlich, erschien noch eine Frage über die ökologischen Aspekte der Bau und Ausbeutung von SRKw, denn nur, wenn es ökologisch positive Wirkung Ihrer Entwicklung deutlich größer als der negative wird, wird es sinnvoll, ein solches Kraftwerk zu entwickeln. Darum ist es wichtig in den Programmen der Forschung und Entwicklung SRKw Konzeptes ökologische Probleme zu berücksichtigen.

Bei der Erstellung und Ausbeutung des SRKws können drei Gruppen der Faktoren auf die Umwelt und die Gesundheit der Menschen wirken, die mit dem Bau des SRKws zusammenhängen, einschließlich der Herstellung von notwendigen Materialien und Details auf der Erde und alle technologischen Arbeiten im Weltraum, Transportierung von Gütern auf die Umlaufbahn und die Übertragung von Mikrowellen-Strahlung von SKRw auf die Erde.

381

Dabei wird der Einfluss aller Faktoren auf die Vorgänge auf der Erde und in der unteren Atmosphäre (Troposphäre), in den oberen Schichten der Atmosphäre, in der Ionosphäre und Magnetosphäre separat betrachtet werden.

Untersuchungen der ökologischen Probleme des SRKws haben gezeigt, dass die Schaffung von Stationen eine begrenzte Auswirkungen auf die Umwelt und die Gesundheit der Menschen haben wird, deren Auswirkungen mit der Annahme der notwendigen Maßnahmen minimisiert werden kann. In der gleichen Zeit, benötigen einige Prozesse eine zusätzliche detaillierte Studie. [1, s. 56] Dazu gehören:

- längere Exposition der Mikrowellen-Strahlung auf die Biosphäre;
- Auswirkungen der kosmischen Strahlung auf die Gesundheit der Menschen, die die Bauarbeiten im Weltraum durchführen;
- die Auswirkungen der Verbrennungsprodukte von Treibmittel und leistungsstarke Mikrowellen-Strahlung auf die obere Atmosphäre usw.

Umweltprobleme sind mit den sozio-politischen Aspekten des Konzepts des SRKws eng verbunden.[3]. Wenn Sie das erforderliche ökologische "Reinheit" des SRKws erreichen könnten, kann es positive Auswirkungen auf die Lebensbedingungen der Menschen auf der Erde sein. SRKw würde nicht nur die Belastung der Biosphäre reduzieren, sondern auch einen Beitrag zu einer effizienteren und zügige Verteilung der Energie, weitere Erforschung des Weltraums als Sphäre der multilateralen Aktivitäten des Menschen leisten.

Abschließend stelle ich fest, dass in dem betrachteten System kosmisch-irdischen Energie eine entscheidende Rolle zu den Geräten gehört, in denen die Prozesse der Erzeugung, Umwandlung und Übertragung der Ströme unterschiedlicher Solar -, Mikrowellen-und Laserstrahlung durchgeführt werden . Bei diesen Geräten gibt es grundlegende Unterschiede, aber es gibt sehr viel Ähnliches.

Literaturverzeichnis

1. [1] Grilikhes V.A.; Solar Raum Kraftwerke; Wissenschaft, 1986. 182 s.
2. [2] Zitationen von Internet-Quellen, Online im Internet/URL:http://www.solarbat.info/drugoe/solnechnie-elektrostancii-v-kosmose Zugriffsdatum:31.10.

382

3. [3] Sysoev V.K., Pichkhadze K.M., Barabanov A.A. Zitationen von Internet-Quellen, Online im Internet/URL:http://reenfor.org/upload/files/(1)sysoev.ppt.pdf Zugriffsdatum: 30.10.2015.

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LCA IN GREEN BUILDING

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Abstract: Climate modification stems and its effects will have severe consequences for our community. Lowering energy consumption in buildings is one of the most fundamental tasks.
Life cycle assessment (LCA) is an important tool for the sustainable design and green building.

Key words: green building, LCA, sustainable design, climate change.

Life cycle assessment (LCA) is an important tool for the sustainable design and green building. It is a resource for designers, any desire to look after the development of action that connects the system and the whole life-cycle thinking. Construction and operation of buildings consumes more thirds of the world energy consumption and 40% of all lacked resources. Rushing to make the structure more stable, while keeping operational and maintenance costs and improve the health and welfare of passengers allowed and convenient not only, it must be the target building industry. This purpose requests the awareness of the dilemma and skills to design, orient, build and retrieve the structure in a style that is often very different from the current conventional approaches.

If we take the definition of building science as "the science and art of creation and running of buildings", then there is obviously an extremely huge overlap between the skills and interests of greenish developer / designer and those buildings scientist. Consequently, "green" buildings are an excellent structure in most ways. They are:

- Energy efficient – in operation and in construction

383

- Resource efficient – in operation and in construction
- Non-polluting – in operation and production
- Durable – so that they can be used for a long time
- Adaptable for many uses – so they can be re-used easily
- Healthy – few chemicals given off, no mould, fresh air
- Beautiful and comfortable – so that people will want to use and re-use them.

LCA is a method of quantifying the environmental impact of a certain product or service, such as greenhouse gas emissions, water pollution, land use, toxins, and much more. These effects can be measured for any or all stages of the product life cycle, including production, distribution, use and disposal. The complexity of some materials and their life cycle is so high that this is often reason enough to avoid them.

LCA can be used for many purposes, from help inform the early stages of the design process for the provision of detailed data for environmental reporting. The depth and breadth of analysis may vary considerably. A rough estimate can take less than an hour; while a full assessment is carried out according to international standards can take weeks.

What to include in your assessment? There are direct effects, such as usage and waste in the manufacturing process. But there are also many indirect factors, such as emissions from power plants that generated electricity for the plant; the consequences of the mining and processing of raw materials; transport; energy use during the life of the product; and end of product life. The more factors you include, the more complete your assessment and analysis will be, but the more time and money it would require. In addition, when you turn on the factors that are outside of your direct control, such as supplier and user behavior, your results will be less confident and accurate.

Composition of the LCA.

Functional units.

Most LCAs do not simply list the environmental impacts of a product; instead, they list impacts per unit of service.

Materials and Processing.

To determine the impact of a product, you should know all the components of your product and how they were handled.

384

Transport.

Transportation Planning is an important part. Designing buildings that minimize the need for transportation and encourage the use of less polluting transportation modes (walking, biking, public transit, rail or ship vs. truck, etc. can have a large environmental impact. The most important intervention in this aspect is better planning–higher density towns and cities are critical to a sustainable future.

Energy and Resource Use During Life.

Energy use during the life cycle of the product should be evaluated, as well as other resources (water, paper, or other materials). You can do this by assessing the profile of use and product life, and multiplying them.

End of life and recycling.

Recycled non-renewable materials, while often an excellent means of reducing resource use, may in some cases use more energy than a different non-recycled virgin material. The obvious example is steel, which is both plentiful and easily recyclable, but consumes so much energy in production and recycling that it is difficult to justify the claims that it is a "green" material.

Over the last 10 years building simulation has had a profound impact on not only the UK building industry but also worldwide. 3D building models offer the potential for continuously optimising building performance.In addition, the increased awareness of climate change added considerable momentum to the wider application of building simulation. Hence building simulation use will evolve as a key component in both the design and operation of extremely low-energy buildings, and ultimately of our smarter buildings, and, more importantly, our smarter cities.

References

1. Jigar V. Shah Energy Efficiency Must Be Central to the World's Urbanization and Industrialization - Retrieved from -
URL http://www.greentechmedia.com/articles/read/green-industry-forges-greener-cities

2. About Green Building - Retrieved from -
URL https://www.gbcsa.org.za/about/about-green-building/

385

3. Frank Redavide Advantages and Disadvantages of Green Building - Retrieved from -
URL http://www.castaliahomes.com/blog/advantages-disadvantages-green-building/.

Soloviev A.N., [1] ***Zhuravlev S.D.*** [2]

HEALTHY BUILDINGS AND PEOPLE'S HEALTH

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Abstract: Research worldwide shows that environmentally-friendly buildings are much better for the health of the people who live and work in them, as well as for the Earth.

Key words: healthy buildings, environmentally-friendly buildings, green building, people's health, healthier effects

Green buildings are designed for using water, energy, fuel and other resources effectively; reduced environmental degradation and waste pollution; improving employee productivity and protection occupant health.

The green building movement began about twenty years ago. It has drawn considerable attention over the past several years, as a result of all the above possibilities[1].

In 150 countries, studies into more than 50 thousands homes, offices and factories − show that there are fewer illnesses among workers and residents, who report that they are feeling more happier and comfortable.

Because of the unceasing work of governments, businesses and non-governmental organizations everywhere, the green building marketplace has accelerated quickly, mainly because green building is seen as a business opportunity. As well workers stay longer in their workplaces and recruitment is easier, and have fewer absences because new co-workers are involved to environmentally-friendly buildings.[2]

The green building movement began twenty years ago with a simple mission: contribute stability in construction industries and in the

386

building. There are now 0.325 metres of certified green building space available around the world, and explorers in many different countries have been measuring the actions to see if these buildings as "healthy" buildings.

Residents of green buildings are more satisfied with their workspace, the indoor air quality, building cleanliness and maintenance.

The research measured light, internal air quality, the presence of chemicals and noise that might disadvantageously affect health, as well as asking the people who live and work in them about their experience.

The information is serious for future building design because these days peoples spend 92 percent of their time indoors. To evaluate the effect on well-being and health, the scientists looked at many research that had taken into account factors that affect health − including chemical, radiological, physical and biological aspects of environmental hazards.[3]

They looked at ventilation, air quality, filtration, acoustics and lighting, and studied the quality of the canteens, the architecture, the building's surroundings and access to natural light.

Across all green buildings there are fewer cases of sick building syndrome symptoms, with better mental and physical health all round. [4] There is one incontestable fact that rings constantly in our faces: buildings have a lot to do with our internal and external environment, and have a significant impact on both our health and the health of future generations.

References

1. Myerson, D. (2007). Environmentally Sustainable Affordable Housing. ULI.

2. Mahesh Ramanujam., Healthy buildings and healthy people: The next generation of green building. Retrieved on April, 2014. URL: http://www.usgbc.org/articles/healthy-buildings-and-healthy-people-next-generation-green-building

3. Sard, B., Waller, M. (2002). Housing Strategies to Strengthen Welfare Policy and Support Working Families. The Brooking Institution, Center on Budget and Policy Priorities. pp. 1-11.

4. Navas-Acien, A., Weisskopf, M. (2015). Current Environmental Health Reports. Journal no. 40572.

387

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AIR POLLUTION AND URBAN STRUCTURE LINKAGES

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Abstract: Urban air pollution is a major environmental problem in the developing countries of the world. A study of that issue shows that ambient air pollution concentrations are at critical level where serious health effects are reported. This paper investigates the relationship between local air pollution and urban structure with an emphasis on urban fragmentation.

Key words: urban structure, air pollution, fragmentation

Introduction. Adverse effects of air pollution have been extensively documented. Annually, approximately 3.7 million people die prematurely due to outdoor air pollution worldwide [1]. This incidence on health induces considerable economic impacts, manifested through increases in medical costs, number of deaths as well as the reduction of productivity through lost working days.

Moreover, air pollution damages materials and buildings, but more importantly it has a clear environmental impact, e.g. Nitrogen Oxides, Sulfur Dioxide and Ammonia contribute to the acidification of soil, lakes and rivers, causing the loss of animal and plant life and crop yields [2].

Therefore, understanding the factors influencing pollution concentration is essential. Air pollution is released from various processes (e.g. industrial production and road transportation) which are driven by different socio-economic phenomena.

In this context, the structure of urban areas can have strong influence on pollution emissions, this is particularly evident for transport-related pollutants. For instance, fragmented development may translate into car-dependent urban areas, and thus, worsen air quality. Better knowledge of the relationship between urban characteristics and air pollution may help to improve air quality through better spatial planning and transport policies.

388

Using a sample of European Large Urban Zones (LUZ), this paper explores the relationship between urban indicators and the concentration of three air pollutants: Nitrogen Dioxide (NO2), Sulfur Dioxide (SO2) and Particulate Matter (PM10). [3]

Methodology.

First, the analysis is conducted at the LUZ-level. This unit is larger than the administrative definition of a city (i.e. the core city) and enables accounting for urban sprawl observed beyond these boundaries. A priori, there are no clear reasons to believe that concentrations of NO_2, PM_{10} and SO_2 would have the same determinants.

Thus, a model selection method would allow for specification uncertainty and possible differences across pollutants. In this regard, Fig. 2 highlights the share of emission discharged by five different economic sectors for the three pollutants.

Important differences can be noticed: for example, while the majority of NO_2 emissions come from transportation and storage sectors (42%), half of SO_2 is produced by energy generating processes.

Regarding PM_{10} emissions, they originate from various important sources: transportation and storage (30%), agriculture, forestry and fishing (25%), and manufacturing (25%).

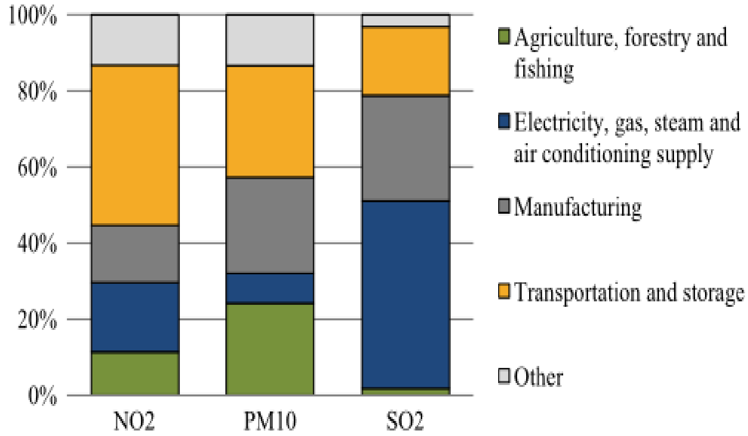

Fig. 2. Air pollution emissions by economic sector.

Thus, the model of interest should take into account the sources of each pollutant and other factors which may impact the level of concentration.

389

Air pollution data.

In the estimation sample, LUZs have an average of 3.62 monitoring stations, 49.4% of such stations are defined as background stations, 42.4% as traffic stations, 7.5% are industrial measuring stations and the remaining 0.7% of stations have an unknown classification.

The average of concentrations registered by all monitoring stations is computed within a predefined LUZ. We observe the opposite phenomenon for a number of Polish LUZs. Yet, Madrid experiences high levels of concentration for each type of pollutant as opposed to Estonia which records a low level of pollution.

Regarding atmospheric environmental standards, the World Health Organization has established global guidance for air pollution. [3]

Nitrogen Dioxide

Number of fragments is highly significant and positively correlated to the level of NO_2, indicating that urban fragmentation is associated with higher NO_2 concentration. A positive relationship between share of artificial area and NO_2 is also found. Temperature is also significantly positively correlated with NO_2 concentration. Interestingly, the relationship between the share of agriculture in the LUZ's economy and NO_2 concentration is negative.

Particulate matter.

First, results show a positive and significant correlation between the LUZ fragmentation and PM_{10} concentration. Similarly to the results above, this finding is consistent with the fact that PM_{10} is produced largely by road transportation. Share of artificial area is found to be positively correlated with the concentration of PM_{10}. Share of industry in the added value is positively correlated with PM_{10} concentration. Results show a positive and significant relationship between Temperature and PM_{10} concentration.

Sulfur dioxide.

Population density and Share of agriculture are significant and positively correlated with SO_2 concentration. In contrast to other pollutants, the degree of fragmentation of a city does not appear to affect SO_2 concentration. [3]

Conclusion. Urban fragmentation plays an important role in explaining the concentration of transportation-related pollutants. In

390

particular, this paper presents evidence that urban fragmentation is correlated with higher concentration of NO_2 and PM_{10}, when controlling for socio-economic factors and climate conditions.

Moreover, the results suggest that cities with larger artificial areas may experience higher NO_2 and PM_{10} concentration, whereas densely populated cities are associated with higher SO_2 concentrations.

This analysis also highlights the fact that NO_2, SO_2 and PM_{10} are affected differently by urban characteristics due to differences in emission sources.

High-income urban areas experience lower concentrations of PM_{10} and SO_2. This may result from tighter environmental regulations or higher public expenditure to improve air quality in high-income areas.

More generally, empirical analyses of the relationship between urban form and environmental quality are still scarce and deserve more attention.

References

1. World Health Organization. Ambient (outdoor) air quality and health. WHO Media Centre, Fact sheet 313. 2014.

2. Freedman. B. Environmental ecology: the ecological effects of pollution, disturbance, and other stresses. Academic Press; 1995.

3. Miguel Cárdenas Rodríguezn, Laura Dupont-Courtade, Walid Oueslati. Air pollution and urban structure linkages: Evidence from European cities, OECD, Environment Directorate, Paris, 2015. p. 5-8.

4. Determination of "LUZ". Available at: https://en.wikipedia.org/wiki/Larger_urban_zone (accessed 20 October 2015).

5. CORINE Land Cover data and Airbase monitoring data, average 2006, NO_2 concentration for 236 cities, PM_{10} concentration for 238 cities, SO_2 concentration for 219 cities – Retrieved from: http://www.eea.europa.eu/data-and-maps/data/interpolated-air-quality-data-2#tab-gis-data

391

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CLASSIFICATION OF KAZAKHSTAN'S CITIES ACCORDING TO THE GREEN INFRASTRUCTURE STATE

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Abstract: The issues raised in the article, green infrastructure in urban areas of different types located in different geographical conditions, are particularly relevant at the time of global environmental changes.

Key words: green building, ecology, cities, parks, complex, citizens, economical benefits.

A modern city is a complicated anthropogenically transformed system affected by many different factors and in turn it affects population and environment.

One of the most effective methods of ecological stability maintaining in cities is formation and development of green infrastructure therein. Green infrastructure is a complex of natural and technical assets which provide many functions and services for people, economy and environment [1].

Different approaches to creating a network of green spaces in urban areas depend on differences in natural conditions, the value of industrial specialization, an individual approach and certainly on the functional structure reflected in the planning, as well as the whole urbanized area.

Thus, there are nuances in the definition of green areas acceptable in this study, and indirectly in quantitative calculations. In addition, it is expedient to frame the review of landscaping at the macro- and micro- levels.

For investigation and comparison of green infrastructure in different cities of the Kazakhstan Republic the database containing different indexes directly or indirectly affecting infrastructure or depending on it was compiled.

Only major cities with a population of more than 50 000 were considered. Moreover, in the process of the research we used

392

cartographic materials which became the base for visual analysis and measurement. Thereby, the major cities of Kazakhstan were divided into 5 types according to the current state of green infrastructure.

The first type is characterized by the best condition of green infrastructure and natural uniform landscaping of the city.

The best state of the infrastructure of this type is not connected with the work of city services aimed to create a network of green areas but is likely to be caused by location of towns in the steppe zone.

Consequently, cities of this type do not require the application of special measures to improve already existing and operating infrastructure. This group includes the cities of Ridder and Petropavlovsk.

The second type includes the cities of the steppe zone with a high level of greenery, which is caused by a combination of secondary development of natural landscaping and artificial elements of green infrastructure.

The second type is represented by nine cities, namely: Astana, Kokshetau, Kostanai, Pavlodar, Rudnyi, Semey, Temirtau, Uralsk, Ust-Kamenogorsk.

The high level of created green infrastructure is all along determined by socio-economic and political factors.

Due to active urban water pollution by sulfur compounds, carbon and metals that fall into water with precipitation, not only directly, but also flow from the surface of urban spaces and sanitation, we should establish and improve an element of green infrastructure, such as storm water management technology.

The third type is represented by the towns of the steppe zone with low level gardening in spite of the natural conditions for its successful development. Cities of this type are Aktobe, Ekibastuz, Karaganda.

The factor hindering the development of well-functioning green infrastructure in the cities of the third type is their multi-beam and multi-core layout which suggests the presence of several urban centers or generally separated areas and creates natural barriers to achieving the relationship between green spaces, recreational areas of the city [2].

It will be expedient to improve and develop the linear elements of green infrastructure that will help to refine the connection of elements and take on some of the pollution from vehicles.

393

The fourth type of cities according to the green city infrastructure state is represented by semi-desert and desert areas with a high level of landscaping due to created green spaces. Cities of this group are Aktau, Almaty, Kaskelen, Shymkent and Zhezkazgan.

Their benefit is the high level of irrigated agriculture development.

Vast areas reserved for plantations and fields in the suburbs and within the city on private lands are agricultural lands that serve as elements of green infrastructure as well as parks and avenues. The status of green infrastructure in the cities of the fourth type is risky because natural conditions and natural factors will always complicate its existence and functioning.

It will be more appropriate to create a green belt that will gradually increase "the effect of the city" and to systematically plant marginal parts of the city rather than to concentrate green areas within the city.

The last type is represented by five cities of the desert zone with low landscaping, both of natural character and that organized by people. This type includes the following cities: Atyrau, Balkhash, Zhanaozen, Kentau, Kulsary, Kyzylorda, Satpayev, Taldykorgan, Taraz, Turkestan. It is important to keep any activity of planting space there and it is appropriate to use new forms of landscaping that do not require the conversion of large urban space areas, for example, the method of "green roofs" and vertical gardening.

References

1. Biryukov L.E. Basics of Planning and Improvement of Residential and Industrial areas: Studies. The Manual for Schools. Moscow: Higher School, 1978, 232 p.
2. Luntz L.B. Urban Green Building. Moscow.
3. Rubtsov L.I. Designing of Gardens and Parks. Moscow, 1972.

394

LEGAL AND ECONOMIC FRAMEWORK FOR ENVIRONMENTAL MANAGEMENT

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ECONOMY VS ECOLOGY: WHAT IS MORE IMPORTANT?

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Abstract: In this article we consider the principles of the authorities faced by the population as a result of the pollution from emissions now (i.e. oil spill) and volunteer organizations that seek to improve the current ecological situation. The essential questions are who will support the government and who the culprit of the accident is.

Key words: the technological impact on the environment, environmental organization, financial investments, foreign organizations, economic resources, environmental problems.

In recent years, there has been an increase in the issues related to the environment. On March 31, 2015 there was an oil spill into the rivers of Sakhalin. It was estimated that the amount of the spilled oil varied around several tons. Sakhalin Environment Watch, Russian environmental and volunteer organization, tried to draw public attention to the pollution and posted the images of oil spills on the Internet in order to raise funds for the solution of this problem.

This situation provoked a strong reaction of the local authorities who added this public organization in the list of foreign agents [1]. The Federation Council included Sakhalin Environmental Watch on the list of undesirable organizations [2].

After the story was published the fund accepted financial investments from foreign organizations. In particular, the fund Leonardo DiCaprio donated 159 thousand dollars to the organisation.

The fund Leonardo DiCaprio supports projects of saving the last undisturbed natural ecosystems areas around the world. "Sakhalin

395

Environmental Watch" was the first Russian organization that received its support.

However, nowadays the organization is in the list of foreign agents because if an organization has a foreign investment it automatically has this label [2].

The members of Sakhalin Environmental Watch decided to return back all the financial aid which had been offered and refused any further financial support. All the donated money was returned. However, there is still need for financial resources for ecosystem conservation, ecological raids and expeditions, communications, updating of the legal system and etc.

Sakhalin Environment Watch work is carried out solely in the interests of the inhabitants of the Sakhalin region.

Therefore, it is logical to obtain local support rather than receive the financial aids from other countries [3].

This example clearly shows the priority of economic resources to natural ones.

References

1. Information Registry of NGOs that perform functions of a foreign agent / The information portal of the Ministry of Justice of the Russian Federation [Electron. resource]. - Mode of access: http://unro.minjust.ru/NKOForeignAgent.aspx

2. Organization "Sakhalin Environment Watch" included in the list of foreign agents / Kommersant. Ru [Electron. resource]. - Mode of access: http://www.kommersant.ru/doc/2814157

3. "Sakhalin Environmental Watch" has refused of foreign financing and asked for help to Sakhaliners / Ecological Network "EKODELO" [Electron. resource]. - Mode of access: http://ecodelo.org/rossiyskaya_federaciya/dalnevostochnyy_fo/sahalinskaya_oblast/37964-ekologicheskaya_vahta_sahalina_o

396

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THE CONCEPT OF TRANSITION TO RATIONING OF NEGATIVE IMPACT ON THE ENVIRONMENT ON THE BASIS OF THE BEST AVAILABLE TECHNOLOGIES

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Abstract: Introduction of the BAT will improve the state of environment, promote emergence of new high-performance workplaces, creation of the domestic equipment and the accelerated growth of various industries.

Key words: BAT (best available technology), sustainable development, reference book.

Systematic increase in the level of negative impact on the environment from the enterprises working at ecologically inefficient equipment and also global greening of the international relations and many aspects of interstate life in the developed countries demand special attention to a control system of environmental protection in the Russian Federation. [1]

On January 1, 2015 the Federal law of July 27, 2014 No. 219-FL "On modification of the Federal law "On environmental protection" and separate acts of the Russian Federation", providing introduction of the best available technologies came into force.

The considerable amount of works which should be executed for introduction of the principles of BAT is directed first of all at the creation of simpler and effective control system of the environmental protection meeting the principles of sustainable development. [2]

The system of the nature protection legislation accepted by the European Community is conventional and the most perfect. This legal system is the legislation of direct action and unlike frame laws of Russia, doesn't need additional interpretation by acts of any authorities. Besides, the system covers practically all main problems of environmental protection and environmental management. And the

397

most important – norms of the EU is the result of compromise equal dialogue between society, the state and business. [1]

In the European Union BAT are presented in the form of help recommendatory documents for separate industries (oil processing, metallurgy, food, large-capacity production of organic chemicals, industrial cooling systems, cleaning of industrial drains and flue gases; installations for burning of waste, etc.), the technological processes considering everything and their hardware equipment taking into account ecological influences and economic expenses. [3]

33 reference books on BAT are now developed and applied by the European Bureau IPPC (Integrated pollution prevention and control). [4]

The processes preceding primary activity as, for example, the handling of raw materials, transportation of the used materials, and operations upon termination of production process, as a rule, are not included in reference books on BAT. If in some special cases there is a reason for inclusion of the operation preceding primary activity or finishing it, it is specified in a document scope. [1]

The reference book on BAT "lives" 5-7 years, its processing requires about 2 years. Work on reference books is financed by the European Commission, the overall cost of development (processing) of one document makes about 3 million euros. On reference books on BAT copyright doesn't extend, they can be translated freely into other languages and to extend applications of the document. [2]

For prevention of negative impact on environment of economic and other activity within the Russian legislation requirements for development of standards of admissible emissions of substances and microorganisms in environment, standards of admissible physical impacts (amount of heat, noise levels, vibrations and so forth) on environment, standards of formation of production wastes and consumption which have to provide observance of standards of quality of environment are established.

However, despite existence in the legislation of the fundamental provisions concerning rationing on the basis of indicators of BAT, application of this approach is complicated because of lack of the mechanisms of realization of the established norms. Lack of the corresponding standard legal support of the considered problem

398

increases the risk of unreasonable rise of ecological payments for emissions and placement of production wastes and consumption.

In view of the situation in the sphere of the nature protection relations in the Russian Federation, and also existence of positive western experience, desire and readiness of business to introduce BAT, can be concluded that there are all main prerequisites for introduction in Russia of the system of rationing founded on BAT.

Thus, for universal improvement of an ecological situation in the Russian Federation it is expedient to adapt positive experience of the European states taking into account territorial, economic and social specifics of the Russian Federation and to eliminate contradictions between provisions of the current legislation and practice of regulation regarding rationing of admissible impact on the environment.

Within implementation of actions for improvement of system of rationing it is necessary to tie standards of admissible impact on the environment to the existing technologies and to provide gradual decrease in emissions after improvement of standards of production. In these coordinates the parameters of perspective programs for production modernization will be set. It is also important to note that toughening of administrative responsibility of legal entities, as well as increase of payment for impact on environment, are inefficient without use of economic levers for providing rational and ecologically responsible organization of production. Only such approach will allow to take place in the period of financial and economic crisis with the smallest losses and to increase quality of industrial development. [1]

According to the Minister of Natural Resources and Environmental Protection of the Russian Federation Sergey Efimovich Donskoy, all enterprises of the country will be divided into 4 groups, depending on extent of impact on environment.

The first is the "dirtiest". Here it is planned to define about 300 enterprises of different branches for all country. This group will have to head by 2018 for introduction of BAT.

Dirty productions also belong to the second group, but they have smaller impact on environment.

The remained 2 groups, S.E. Donskoy commented so: "Respectively, there are 2 more groups, with the minimum influence and practically with lack of impact on environment. Measures of moderate administrative control will be applied to them. For example,

399

in group which doesn't make impact on environment, we carry kindergartens, schools, it is clear because it is not production."

Important element of introduction of BAT have to become reference books of BAT which will not only be based on modern achievements of science and technology, but also contain technologies, economically and technically available to application at the domestic enterprises that will demand close interaction of authorities and representatives of business community

Emergence of new high-performance workplaces, improvement of an ecological situation, creation of the domestic equipment and the accelerated growth of various industries will become the result of introduction. [2]

References

1. Rebrik I.I, Kocheshkov A, Yu. Borisovskaia I.A. Kontseptsia perekhoda k formirovaniyu... – Retrieved from: //www.ineca.ru/?dr=bulletin/arhiv/0134&pg=010
2. Sostoialos sovmestnoie zasedanie... – Retrieved from: http://mnr.gov.ru/news/detail.php?ID=136550&sphrase_id=646122
3. Razrabotka otraslevykh spravochnikov NDT – Retrieved from: http://mnr.gov.ru/activities/list.php?part=1768&sphrase_id=646122
4. Reference documents under the IPPC Directive and the IED – Retrieved from: http://eippcb.jrc.ec.europa.eu/reference/

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REDUCTION OF GREENHOUSE GASES EMISSIONS TO THE ATMOSPHERE

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Abstract: Nowadays greenhouse effect is an important world problem. Humanity needs measures to protect the Earth and leave a healthy environment for future generations.

Key words: greenhouse effect, emissions, energy efficiency, photosynthesis, renewable sources of energy.

400

Greenhouse gases are the gases which cause the greenhouse effect. The main greenhouse gases are carbon dioxide, water vapor, nitrogen and sulfur oxides, chlorofluorocarbons (CFC) or Freon. Greenhouse gases differ in "power" of their greenhouse effect and long-term presence in the atmosphere. Anthropogenic activity affects concentrations of methane and carbon dioxide. Since the beginning of the industrial era greenhouse gases have begun to emit into the atmosphere by burning fossil fuels (carbon dioxide), rice cultivation and production (methane), due to the leakage of refrigerants and the use of aerosols (fluorocarbons), missile launches (oxides of nitrogen), the car motors (ozone). In addition, human industrial activity has led to the reduction of forest areas - the main natural carbon dioxide absorber.

Global anthropogenic greenhouse gas emissions, unfortunately, are growing rapidly. A numerical estimate of the total amount is not easy - the CO2 emissions from fossil fuel combustion produce about 65% of the total greenhouse emissions. It is also well known for CO2 emissions from various industrial chemical processes: the production of cement, metallurgy and others. But they provide only about 3% of total greenhouse gas emissions [1].

Certainly, carbon dioxide (CO2) is the main anthropogenic greenhouse gas, but the role of methane is also quite high. In addition, the types of sources of methane (CH4) are distributed in a much more complicated manner than carbon dioxide (CO2). The main source of anthropogenic methane is ruminants, especially high-yielding dairy cattle (beef cattle, particularly young bulls, is not a major source). Sometimes this situation is interpreted as eating meat harms the climate. Domestic animals produce only about 5% of global greenhouse gas emissions, but farming provides 29%. The second source, which is important in Russia, is the oil and gas sector. Furthermore, landfills and waste water, cultivation of rice and other agricultural sources emit this harmful gas [2].

In 1990 developing countries produced 1/3 of greenhouse gas emissions, and developed ones - 2/3, now the opposite is true. There is the strongest growth in emissions in China and also in India, Brazil, South Africa and Indonesia. In developed countries emissions are stable or slightly go down. It means that the introduction of new energy-efficient technologies and products is faster than the expansion of production and consumption. Note that in developed countries

401

population growth is low too. Russia has seen slow growth in CO_2 emissions – the country energy efficiency grows, but still this process is slower than the increase of production and consumption. Probably, if Russia becomes more developed, the CO_2 emissions will come to a stable level and then gradually go down [3]. Specialists have developed methods to reduce greenhouse gas emissions.

The first measure is energy efficient buildings. According to the International Energy Agency, buildings account for approximately 40% of energy consumption in most countries [4]. In Russia, the task of improving the energy efficiency of residential, public and industrial buildings is particularly relevant to the severe climate and their extremely low energy efficiency. A number of small-scale low-cost solutions can provide a reduction of heat loss in buildings. These include sealing windows and doors, baseboards and other sealing leaks, insulation of attics, floors of the first floor and wall cavities. Main attention could be given to the mass use of LED light sources. Complete replacement of incandescent lamps with more modern ones includes the transition to compact fluorescent lamps and LED lamps. Purchasing energy-efficient public consumer electronics (computers, televisions, video recorders, DVD-players, chargers) instead of those used earlier may give the effect, estimated at 4 million tons of CO_2-eq. Furthermore, it would be better to install meters and regulators of heat in residential buildings [4].

The second measure is changes in the energy sector. It includes upgrading energy management, including heating systems and power lines; termination of burning of associated gas flaring; the cardinal reduction of methane emissions in the gas transportation system and an accelerated development of renewable sources of energy [4].

Also humanity needs measures in the transport sector. Transport is one of the main consumers of energy and one of the main sources of greenhouse gas emissions. The reason for this is huge amounts of fossil fuels combustion (mainly oil products such as gasoline, kerosene and diesel fuel) in internal combustion engines of land, air and water vehicles. According to the International Energy Agency, about 60% of the world's oil is consumed by the transport sector. Transportation consumes more than 17% of the final energy in Russia, and this proportion is growing [1]. Because of it people need a rising efficiency of the transport system and use the car with the lowest CO_2 emissions.

402

The process of transition to more fuel-efficient passenger car models is dictated by fuel prices. In addition, the prices dictate a more economical use of private vehicles. If they pay the appropriate tax and follow regulatory measures, more than a half of the cars with an internal combustion engine will meet a certain level of technical improvements in 20 years.

The next measures are those related to the waste management sector. The main purpose is to organize proper waste disposal and to take measures restricting the accelerated increase in the amount of waste. This is especially true for the municipal solid waste. Government needs organization of separated waste collection and, most of all, its further utilization. The problem of waste, of course, must be addressed beyond climate issues, but it is important to note that the use of recycled materials gives a lot to save energy and reduce greenhouse gas emissions [4].

And the last measures are those related to forests. Forests effectively clean the air of dust and pollutants, they are considered as the "lungs" of the city also affecting their microclimate. Of course, forests absorb CO2 during photosynthesis, but also release it during respiration and decomposition of organic matter. A young, fast-growing forest is a net absorber, and an old one is a net source of CO2. The forests will inevitably grow old, and calculations show that in 2040 net absorption may be zero. To regulate this process is impossible, but it can be influenced by two other factors: fires and chopping [4].

In conclusion, effective payments for greenhouse gas emissions should be mentioned. Payments for emissions of greenhouse gases already exist in many countries. Experience shows that it is an effective means of introducing new technologies with low emissions. To talk about the effect of the introduction of payments is difficult. Calculations which were carried out at the Institute for Economic Policy by E.T. Gaidar showed that the introduction of charges (in particular, growing 50-80 dollars per 1 ton of CO2 from 2020 to 2050) in the whole country reduces emissions by 10-20% from the level of 1990. Payments should be differentiated - to promote new technologies with funds which are collected from companies that continue to use the old technologies. It is hardly possible to speak about payments from the population, in practice it will be tariff increasing [2].

403

In coming years, global greenhouse gas emissions will continue to grow, especially in China, India and other major developing countries. According to sources, the largest increase in carbon dioxide (CO2) emissions is expected from the burning gas and coal in the energy sector. Methane emissions will continue to grow in the oil and gas industry due to population growth. In the future, probably in 2020-2030, global emissions should reach a constant level and then begin to decline [5].

References

1. Mezhdunarodnoe Energeticheskoe Agentstvo, Politika energoeffektivnosti. Rekomendatsii [The International Energy Agency, Energy Efficiency Policies. Recommendations], 2009. Available at: http://energosber.info/upload/EE_recommendations_russian.pdf (accessed 27 September 2015).
2. Energoeffektivnaya Rossiya. Puti snizheniya energoemkosti vybrosov parnikovykh gazov [Energy-Efficient Russia. Ways to Reduce the Energy Intensity of Greenhouse Gas Emissions]. McKinsey & Company, 2009. Available at: http://energosber.info/upload/pdf/CO2_Russia_RUS_final.pdf (accessed 27 September 2015).
3. Energy Revolution. Perspectives for Establishment of Energy System Security of Russia. Russia Energy Revolution. Greenpeace International, EREC, 2009, 44 rr. Available at: http://www.energyblueprint.info/822.0.html (accessed 25 September 2015).
4. 25 rekomendatsii v oblasti energoeffektivnosti [25 Recommendations in the Field of Energy Efficiency], Mezhdunarodnoe Energeticheskoe Agentstvo [the International Energy Agency], 2011. Available at: http://www.iea.org/publications/freepublications/publication/25recom_2011.pdf (accessed 27 September 2015).
5. Energetika Rossii i izmenenie klimata [Russian Energy and Climate Change]. Obshchestvennyi doklad [The Public Report], Moscow: RSoES, 2012. Available at: http://rusecounion.ru/doc_rseu_20912 (accessed 25 September 2015).

404

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REMOTE SENSING SYSTEMS AND FORECASTING OF ENVIRONMENTAL SITUATIONS AFTER FOREST FIRES IN THE EUROPEAN PART OF RUSSIA

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Abstract: The biomass of forest vegetation in the Central Russia reflects positive dynamics of the recovery of ecological potential. Remote sensing in real time monitoring of forest fires-2010 has been analyzed. Space monitoring allows forecasting, finding and controlling fires on the large territory.

Key words: space imagery maps, forest fires monitoring, Central Russia

There are three types of forest fires monitoring systems: land, air and space [1]. Each system has its own methods of monitoring and each method has its advantages and disadvantages. It is important that the most reliable results could be obtained by using all systems in complex.

The aim of the work is to examine the possibility of the remote sensing systems separately using for forest fires monitoring and assess the dynamics of the biomass recovery on the territory as a result of forest fires impact. This type of forest fire monitoring is the most preferable method for Russia because of the area of the country [2]. But remote sensing requires often good meteorological conditions and land support for errors avoidance [3]. Our country has six exploited satellites suitable for forest fire monitoring.

To conduct the research and determine the amount of recovered biomass on the territory the Normalized Difference Vegetation Index was used. Its values are in the interval from -1 to +1 degrees Celsius and have the type of the object [3]. The most important types are the first three objects: dense, sparse vegetation and open soil.

The examined area is situated on the territory of Bor and Lyskovsky district of Nizhny Novgorod region of Volga-Vyatka economic region in the central part of Russia that is characterized by

405

the zone of coniferous-deciduous forests. The initial data of the work were satellite images made by «Meteor-M» №1 and Landsat-5 dating back to the warmest month from 2010 till 2013.

By using the images the NDVI histograms were constructed and analyzed. They show the amount of plants biomass attributable to the examined area each year from 2009 to 2013: *1) NDVI map and Histogram №1. Landsat-5 (10 August 2009); 2) NDVI map and Histogram №2. « Meteor -M» №1 (15 August 2011); 3) NDVI map and Histogram №3. « Meteor -M» №1 (17 September 2012); 4) NDVI map and Histogram №4. «Meteor-M» №1 (14 July 2013 year)*

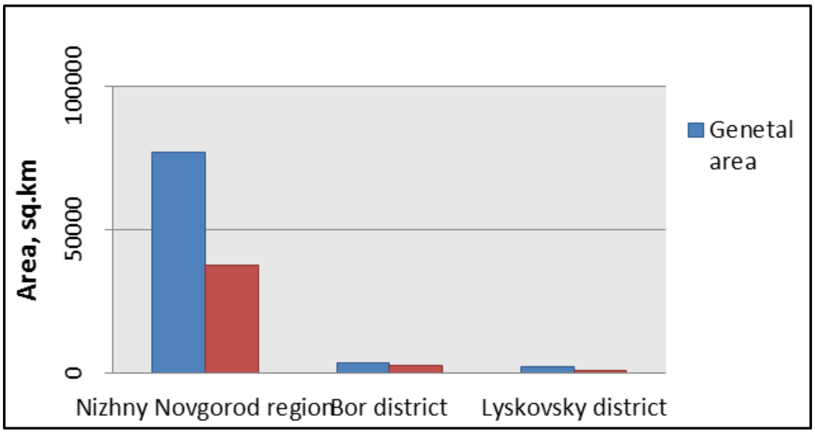
The next step was to calculate the recovering vegetation from 2011 till 2013 by using land data and satellite images in complex. Here you can see the sequence of calculations: 1.Find the area of the region; 2. Find the forest area of the region; 3.Find the area of the examined and damaged territory; 4. Calculate the amount of biomass for the undamaged territory of this type using NDVI histograms for three regions: 1. NN - Nizhny Novgorod region; 2. BD -Bor district; 3) LD - Lyskovsky district. We presented data in the Table 1.

Table 1. Area and the amount of biomass of the territories [4].

	Area of the territory, km^2	**Area of the forest territory, km^2**	**Biomass of the territory, t**
1.NG	76 900	37 580	418 220 000
2. BD	3584	2509	19 491 553,71
3. LD	2134	960	11 605 740,96
Total	**5 718**	**3 469**	**31 097 294,67**

Then we calculated the amount of recovering biomass from 2011 till 2013 using biomass gradation depend on NDVI value. As a result of the analysis the following conclusion could be made: The biomass of forest vegetation in the examined area increased, reflecting the positive dynamics of the recovery of ecological potential.

406



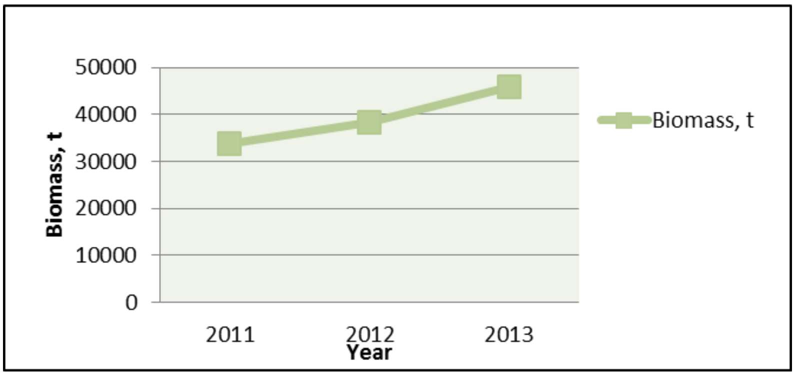
Picture 1. General area and area of Nizhny Novgorod region forests, Bor district forests and Lyskovsky district forests.

Table 2. Area and the amount of biomass of the territories [4].

Year	Biomass, t
2011	33 760
2012	38 372
2013	45 900

Biomass gradation depend on NDVI value:

- 0,1-0,3 – <100t/3600m^2
- 0,3-0,4 – 1500t/3600m^2
- 0,5-1 – 2500-3574,4 t/3600m^2



Picture 2. Graph of biomass variation from 2011 till 2013.

Besides the opportunities of remote sensing in real time monitoring on an example of fires in 2010 were analyzed. Space

407

monitoring allows forecasting, finding and controlling fires on the large territory.

We made four images: 1) Undamaged territory (23.07.2010); 2) First emerged fires (24.07.2010); The process of forest fires spreading (31.07.2010); The damping fire (01.09.2010).

As a result it was found the following:

- the data of remote sensing, can be successfully used to assess the amount of lost biomass and the rate of recovery of vegetation on the basis of the space imagery maps of vegetation index NDVI;
- the integrated use of remote sensing data and ground-based reference information about biomass of forest areas can give the most accurate assessment of the state of vegetation cover of the territory;
- the remote sensing data contribute to monitor the spread of fire at real time and to determine the speed, direction and the overall dynamics of the fire, and can be successfully used in Russia as the main method for monitoring forest fires.

References

1. *Brown, James K.; Smith, Jane Kapler,* eds. 2000. Wildland fire in ecosystems: effects of fire on flora. Gen. Tech. Rep. RMRS-GTR-42-vol. 2. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 257 p.
2. *Savin I., Negre N.* Agro-meteorological Monitoring in Russia and Central Asian Countries/ Institute for the Protection and Security of the Citizen – European Commission, Luxembourg, 2006. – p. 214
3. *Jensen, John R.* Remote Sensing of the Environment: An Earth Resource Perspective. Upper Saddle River, N.J.: Prentice Hall, 2000
4. IIASA's Global Forest Database (GFD) Retrieved from: http://www.iiasa.ac.at/web/home/research/modelsData/GlobalForestDB.en.html

408

Kan V.S.

COMPARATIVE ANALYSIS OF THE WASTE MANAGEMENT PROBLEMS IN MEGACITIES

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Abstract: The purpose of this article is to present the challenges of waste management in megacities and to outline the major issues that have to be further elaborated in order to create sustainable patterns in waste management.

Key words: sustainable waste management, solid waste management, cities, comparative analysis, governance, technologies, emerging changes, stakeholders.

The 21st century is already much more a century of radical changes. Economic power and global production centers are already moving to Asia. Population is expected to grow more or less by 50% until 2050 [1]. This increase is mainly expected to be in the current developing countries.

Megacities are a product of the continuous urbanization process. A megacity is usually defined as a metropolitan area with a total population in excess of 10 million people. Megacities can be distinguished from global cities by their rapid growth, new forms of spatial population density, and both formal and informal economy, as well as poverty, crime, and high levels of social fragmentation.

Megacities face tremendous environmental challenges and threats to human health. In this framework the role of waste management is becoming more and more crucial both for the daily life as well as for the long to medium term sustainability of megacities. The challenge of successful waste management in megacities is one of the most demanding for human societies and especially for the waste management industry. To respond to such a challenge it is important, first of all, to have a better understanding of megacities and emphasize their particularities that really affect waste management.

409

For the comparative analysis and discussion, we have chosen to follow common practice and to classify countries according to income per capita (gross national income or GNI/cap), using the World Bank's grouping into low, lower middle, upper middle and high income countries [2].

Metropolitan governance has become increasingly complex as cities have morphed into agglomerations combining multiple administrative organizations and jurisdictions. This has led to calls for a complete reassessment of urban governance but still there is a considerable debate about the best practices and the solutions required for the unique circumstances and needs of each city.

Controlled disposal indicates a disposal site with a minimum degree of management, consisting of gate control, fencing and waste placement, which reduces the potential of water, soil and air pollution, and is widely advocated as a significant first step as a system modernises towards sound environmental control [3].

The data collected from each city in terms of inclusivity is focused first on identifying the stakeholders. Far from being trivial, this research step helps to avoid one of the most common failures in attempts to introduce sustainable changes and modernise waste management systems: failing to understand how the system is already working. The data collection then focused on issues of equity between the system users in receiving a fair and adequate service and having a say in its planning and evaluation; and equity among service providers – large and small, formal and informal ones – in terms of a fair share of economic opportunities for providing the service or valorising materials.

Conventional technological approaches to waste management are not working in emerging and transitional megacities because they involve imported solutions that are centralized, bureaucratic and suitable for different socio-economic conditions and so the possibility of decentralized models must be examined [4].

It is very difficult to find out conclusions of general importance from the different technological systems applied in different megacities. But it is substantially easier to outline conclusions from the negative experiences that exist and provide a "Failure Receipt" that has to be avoided.

410

On the other hand, there are certain issues that can really be suggested in order to create a framework for a successful waste management approach in megacities. But those issues are just some generic components that also do not guarantee successful waste management solutions but they can increase the possibilities for that [5].

Megacities should develop an overall Strategic Urban Waste Management Plan that prioritizes areas of the city that are most vulnerable and require ongoing monitoring and proactive intervention. These priorities should be decided locally through an environmental planning and management process to ensure that the issues are pertinent to specific parts of the city rather than to simply apply generic, city wide issues [6].

Megacities are too complex systems and their waste management cannot be easy and simple. In fact, waste management solutions will be always late comparing to the fast population and economic growth of emerging and transitional megacities. Since this growth cannot be modeled, any waste management plan will be temporary and static. So it is really important to develop certain patterns that will reflect the rapid changes of the city and support the decision makers to adapt waste management to the emerging changes.

A reliable approach is to be critical and creative; to start from the existing strengths of the city and to build upon them; and to involve all the stakeholders to design local models. Learning from each other in a global community of practice provides an opportunity to 'pick and mix', adopt and adapt the solutions that work in a particular local situation.

References

1. UN, 2007, World Urbanization Prospects: the 2007 Revision Population Database, Department of Economic and Social Affairs: Population Division, New York.

2. World Bank. How We Classify Countries. Available at: http://data.worldbank.org/about/country-classifications (accessed 03 October 2015).

3. Wilson, D.C., Rodic, L., Scheinberg, A., Alabaster, G. (2010). Comparative Analysis of Solid Waste Management in Cities Around the World. In: Proceedings Waste 2010: Waste and Resource

411

Management – Putting Strategy into Practice. Stratford-upon-Avon, Warwickshire, England, 28-29 September 2010.
5. Frauke, Kraas (2003). Megacities as Global Risk Areas, Petermanns Geographische Mitteilungen, 2003-2004.
6. Wilson, D.C., Velis, C., Cheeseman, C. (2006). The Role of Informal Sector Recycling in Waste Management in Developing Countries.
6. Wilson, D.C., Velis, C., Cheeseman, C. (2006). The Role of Informal Sector Recycling in Waste Management in Developing Countries.

Котько М.С.

БЕЗДОМНЫЕ СОБАКИ КАК ЧАСТЬ ГОРОДСКОЙ ЭКОСИСТЕМЫ

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Аннотация: Статья посвящена бездомным собакам как части городской экосистемы. В ней дается детальный анализ широкого спектра городских проблем, связанных с бездомными животными. Внимание обращается на факторы, влияющие на популяцию бездомных собак. На примере разных стран приводятся данные о решениях проблем бездомных собак. Делаются выводы о необходимости использования гуманных методов для регулирования численности бездомных животных.

Ключевые слова: бездомные собака, городская экосистема, приют для животных, приюты неограниченного приема, отлов, усыпление, экологическая культура.

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STRAY DOGS AS PART OF THE URBAN ECOSYSTEM

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Abstract: The article is devoted to the stray dogs as a part of the urban ecosystem. It gives a detailed analysis of wide range of urban problems associated with stray dogs. Special attention is drawn to the factors influencing the population of stray dogs. Data from different countries on solutions of stray dogs' problems are given. Conclusions about the necessity to use humane methods for controlling the number of stray animals are provided.

Key words: stray dogs, urban ecosystem, animal shelter, open-admission shelters, catching, euthanasia, ecological culture.

В городах живет сейчас не менее трети всего человечества. Город есть подлинная экосистема не только со своей «каменной» литогенной основой и специфической растительностью, но и особым животным миром.

Бездомные бродячие собаки имеют определенное значение для городских экосистем [1]. Бездомная собака – это собака, которая в данный момент не находится под контролем или ее перемещение ничем не ограничено. Большинство зоологов, упоминая о бездомных собаках, отмечают их роль в основном как регуляторов численности синантропных грызунов и/или указывают на них в качестве пищевых конкурентов бродячим кошкам, крысам и серым воронам. В действительности проблемы бездомных собак в городе намного шире и масштабнее. Во-первых, бродячая собака зачастую рассматривается как опасный передатчик эпидемиологических, эпизоотологических и зоонозных заболеваний. Во-вторых, обращают внимание на агрессию собак по отношению к людям и домашним животным. Причиной нападения может стать территориальная, пищевая, оборонительная, межвидовая (например, защита щенков) и охотничья агрессия. В-третьих, возникают психологические проблемы (дискомфорт от присутствия бездомных собак, жалость или жестокость, проявляемая людьми в отношении бездомных животных и ее последствия). В-четвертых, бездомные собаки часто служат источником дорожно-транспортных происшествий.

Количество бездомных собак оценивается в 500 миллионов особей. Чтобы популяция стабильно существовала, необходимы

413

определенные факторы, способствующие этому: география, климат, доступность пищи и укрытия [2, с. 3].

К положительным факторам относятся обильное количество кормовых ресурсов, а также наличие укрытий. Непреднамеренное влияние человека по увеличению популяции бездомных собак заключается в пополнении популяции за счет выброшенных на улицу владельческих собак или их невостребованного потомства [3, с. 9]. Выброшенные и потерявшиеся животные с трудом приживаются на улицах. Собака может оказаться на улице из-за смерти хозяина, давления соседей, лишения жилища и т.д. В последние годы этот процесс становится массовым из-за уплотнительной застройки, выселений и ликвидации «частного сектора». Эти же явления происходят во многих городах из-за строительного бума.

Наряду с положительными факторами, существуют и отрицательные факторы, препятствующие обитанию бездомных собак, а также повышению их численности: болезни собак, нападение хищников, отлов различными службами, а также смерть из-за активной хозяйственной или иной деятельности человека в городе, под колесами автотранспорта, либо преднамеренно от ядовитых приманок..

Собаки, как и другие животные, привержены к большому числу различных инфекций и болезней, которые могут передаваться другим животным, а некоторые и человеку [2, с. 14]. Для бездомных животных постоянно существует угроза заражения бешенством, которое практически всегда фатально для животного [2, с. 16]. В Беларуси в 2013 и 2014 гг. было зарегистрировано 8 и 6 случаев бешенства соответственно среди бездомных собак.

Научные данные показывают, что «*собаки могут передавать человеку около 45 болезней. Кроме того, повсеместно в городах отмечается значительная зараженность собак и кошек кровососущими паразитами (до 60–70 %), которые также могут быть носителями опасных инфекций*» [4, с. 136].

Основной формой работы с безнадзорными владельческими и бездомными животными в западных странах является «*безвозвратный отлов и помещение животных в приюты. Приюты также действуют как центры сбора «лишних» животных у владельцев, и как центры передачи животных новым*

414

владельцам. После обязательного срока передержки, в течение которого собаки и кошки возвращаются владельцам, животные могут быть переданы новым владельцам или общественным приютам для дальнейшего содержания» [5, с. 13].

Отлов бесхозных животных в городе с последующей их ликвидацией позволяет прервать на определенном уровне передачу заразного начала из природного очага инфекции или инвазии к домашним животным и человеку, гарантирует безопасность людей от нападения агрессивных бродячих собак [4, с. 136].

В 2012 году работники белорусского государственного предприятия (ГП) «Фауна города» отловили 1663 собаки. В 2014 году бригады по отлову доставили в ГП «Фауна города» 2005 собак. Еще 594 собак привезли горожане [6]. Более 11 тысяч безнадзорных животных отловлено в Могилеве [7]. По правилам, животные содержатся в пункте приема 5 суток без права передачи новым хозяевам, чтобы у прежних владельцев было время их забрать [8]. В ГП «Фауна города» за 9 месяцев 2014 года прежние хозяева забрали 71 собаку.

Во многих зарубежных странах (Австралия, Великобритания, Германия) строгие правила содержания собак, позволяющие местным органам, фермерам или охотникам помещать в приюты либо убивать собак, которые находятся в ненадлежащем месте или без контроля человека [2, с. 4]. Так, в период между 1 апреля 2014 и 31 марта 2015 г. в Великобритании 50 % бездомных собак (общее количество бездомных собак – сто две тысячи) были возвращены своим владельцам, 22 % были переданы в благотворительные организации или питомники для поиска нового хозяина. В дальнейшем 9 % были пристроены с помощью местных органов [9].

Невостребованные животные усыпляются. Усыпление (эвтаназия) рассматривается как неизбежная мера, так как приюты, выполняющие муниципальные программы – так называемые «приюты неограниченного приема» (open-admission shelters) – должны обеспечивать достаточную пропускную способность и быть всегда готовыми к поступлению новых животных [5, с. 13].

В Италии убийство бездомных собак не разрешено и они должны быть отловлены и помещены в общественные питомники.

415

В Гонконге в среднем двадцать тысяч собак изымаются и уничтожаются каждый год. Численность уничтоженных собак лишь компенсирует смертность, которая может наступить из-за болезней, голода и смерти в результате несчастного случая. Это говорит о том, что в Гонконге очень большая численность бездомных собак и происходит очень быстрое возрождение популяции [2, с. 4].

Россия приняла общие положения ассоциации An international coalition to regulate the number of animals – human companions [10], благодаря чему разработан протокол мер по передаче животных новым хозяевам из приютов и центров. Также приняты положения по проведению эвтаназии неизлечимо больных животных, а также смертельно раненных и имеющих поведенческие проблемы.

Программа регулирования популяции по правилам этой коалиции должна следить за тем, чтобы применение эвтаназии было исключительным, а всем здоровым животным был найден новый дом.

Численность бездомных собак в городских условиях зависит от многих факторов, но такие факторы, как кормовая база, влияние хищников и конкуренция с другими видами не стоят в этом ряду: бездомные собак находят кормовые ресурсы, и они распределены в городе относительно равномерно, порой в избытке. В городе нет и более сильных хищников. Крысы и бездомные кошки, врановые и чайки бездомными собаками не конкуренты.

Реальными факторами, ограничивающими количество единиц популяции бездомных собак являются следующие: 1) топография города: особенности городской застройки, недостаточное и нерациональное функционирование городских служб (результат чего, помойки и свалки доступны бездомным собакам), потенциальные убежища; 2) климат; 3) человеческий фактор.

Влияние человека подразделяется на прямое и косвенное. Прямое влияние заключается в регулярном тотальном отлове всех бездомных собак. Косвенное влияние человека проявляется в гибели бездомных собак.

«Низкий уровень экологической культуры населения в части обращения с отходами, которые являются первым звеном

416

коротких трофических цепей» [11, с. 10]. В результате в городской экосистеме плотность обитания и численность бездомных собак, главным образом, определяются отношением местных органов власти, работой служб отлова, а также отношением населения к обитающим на улицах собакам [3].

В заключение можно отметить, что любое бездомное животное – это часть экосистемы, в которой должен соблюдаться баланс. В цивилизованном правовом обществе любое вмешательство в этот процесс должно быть продиктовано целесообразностью и гуманностью методов и принимаемых мер, определяемых уровнем экологической культуры народа при развитом правовом контроле со стороны государства.

Библиография

1. Золина Н.Ф. Особенности экологии популяций бездомных собак в городе Пензе // Известия ПГПУ им. В.Г. Белинского. – 2011. – № 25. [Электронный ресурс]. – URL: http://cyberleninka.ru/article/n/osobennosti-ekologii-populyatsiy-bezdomnyh-sobak-v-gorode-penze (дата обращения 30.10.2015).
2. Brickner, I. The impact of domestic dogs (*Canis familiaris*) on wildlife welfare and conservation: a literature review. With a situation summary from Israel / I. Brickner. Zimbabwe, 2002. P. 31
3. Ильинский, Е.А. Комплексная оценка эффективности применения различных стратегий регулирования численности бездомных животных в городских экосистемах / Е.А. Ильинский. М.: РУДН, 2011. 72 с.
4. Рахманов, А.И. Проблема бродячих собак в городах / А.И. Рахманов // Ветеринарная патология. 2002. № 1. С. 136–140.
5. Рыбалко В.А. Обзор мирового опыта решения проблемы бездомных животных // Ветеринарная патология. – 2006. –№ 2. С. 12–19. [Электронный ресурс]. – URL: http://www.animalsprotectiontribune.ru/Kommentmir.html (дата обращения 30.10.2015).
6. Филиппович А. С начала года в Минске отловлено более 4 тыс. безнадзорных животных // Агентство Минск–Новости. – 2012. [Электронный ресурс]. – URL: http://minsknews.by/blog/2012/05/26/48769/ (дата обращения: 30.04.2015).

417

7. Более 11 тысяч безнадзорных животных отловлено в Могилеве в 2014 году // Могилевский портал. – 2015. [Электронный ресурс]. URL: http://www.mogilev.by/mogilev/121840-bolee-11-tysyach-beznadzornyh-zhivotnyh-otlovleno-v-mogileve-v-2014-godu.html (дата обращения: 30.04.2015).
8. Яцук У.К. Болезни собак и кошек. Заболевания, передающиеся человеку // Зоовет. – 2008. [Электронный ресурс]. – URL: http://www.zoovet.ru/text.php?newsid=282 (дата обращения: 20.04.2015).
9. Stray dogs survey 2015. Dogs Trust Stray Dogs Survey 2015 Draft Report September 2015. Retrieved from https://www.dogstrust.org.uk/whats-happening/news/stray%20dogs%202015%20summary%20report%20-%20final.pdf
10. Руководство по гуманному регулированию численности собак // Международная коалиция по регулированию численности животных – компаньонов человека. Лондон, 2007. [Электронный ресурс]. – URL: http://www.icam-coalition.org/downloads/ICAM_russian.pdf (дата обращения 25.03.2015).
11. Седова, Н.А. Экологический мониторинг группировок бездомных собак / Н.А. Седова // Экология. 2008. № 2. С. 1–10.

418

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THE PROJECT OF ECOLOGICAL PATH IN THE KATUNSKIY BIOSPHERE RESERVE

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Abstract: The project of ecological path could affect the nature and control the amount of tourists of the national reserve. That is why it is very important nowadays.

Key words: ecological path, information stands, marking of a route

The purpose of the work was the project of an ecological path in the Katunsky reserve, which is located in the Altai Republic. The main objectives set in the work (design of a track) are the equipment, its mapping, edition of the booklet and description of excursion.

The extention of the ecological path is 20 km. It connects one of the most beautiful places of the reserve – lake Multinskoye's Srednee, Poperechnoe and Verchnee Multinsky lake. [1, p.29]

To make an ecological path, we should mark the track for the tourists on route. Observation decks should be constructed to take pleasure observing the most beautiful places. The path should be equipped with rubbish bins, benches and information stands.

Well designed ecological track can promote:

• reduction of the tourists' influence;

• preservation of soils and vegetation of the area;

• ecological culture of purity of the nature;

• regulation of a tourist stream [2, p.76].

During field researches it was found that the larch, the cedar, the fir-tree can be met throughout the track of the reserve. The average height of trees is 8-10 meters. The willow prevails in the subgrowth, and the honeysuckle – in the underbrush. Motley grass and sedge prevail in herbage cover.[3, p.74]

419

In the studied area at the beginning of the ecological path it is supposed to make the stand at which the general information on the ecological track will be displayed: its scheme, extent, etc.

It is very important to specify the rules of conduct on the territory of the reserve at the beginning of the path. In the territory of the Katunsky reserve in which the ecological track is located, the following actions are forbidden: the actions changing the hydrological mode of lands; prospecting works and development of minerals, violation of a soil cover, exits of minerals, exposure of rocks; cabins of the main use, preparation of crude turpentine, wood juice, herbs and technical raw materials, and also other types of forest exploitation; mowing, pasturage of cattle, placement of beehives and apiaries, collecting and preparation of wild-growing fruits, berries, mushrooms, nuts, seeds, flowers and other types of use of flora; construction and placement of the industrial and agricultural enterprises and their offices, construction of buildings, roads and overpasses, power lines and other communications, except for reserves, necessary for ensuring activity; trade, sports and amateur hunting, other types of use of fauna; use of mineral fertilizers and chemical means of protection of plants; timber-rafting; transit run of pets.

The tourists should be provided with the information about plants species included in the Red Book of the Russian Federation. There are 17 species of the higher vascular plants, 27 bird species and 2 species of mammals which are under protection [4, p.88]

There are dangerous species of animals on the territory the ecological path: brown bear, snakes (medyanka, viper).

Two tourists stop zones were organized throughout the ecological path: on the cordon with which the ecological track begins, and also on the crossroad where one of the roads leaves to Poperechnoe lake, and the second to Verchnee Multinsky lake. Floorings, ladders are made in the most humidified sites of the track. However all these mesures don't exclude further improvement of the track.

Thus, for the ecological track the following parameters will be specified: JPS of the initial point of the track and its height; JPS of the final coordinate point of the track and its height; track extent; physiographic description of the track; necessary tools and technology to design the track.

420

In total it is planned to make 47 information boards, 4 observation decks in the territory of the path. Besides that, it is recommended to improve designs of bridges, to equip the territory of the track (to put shops, rubbish bins for garbage, etc. [5, p. 45]

References

1) A.F. Mandych, T.V. Yashina Biodiversity Conservation in the Russian Porton of the Altai-Sayan Ecoregion Under Climate Change. Adaptation Strategy. – Krasnoyarsk, 2012. – 62 pp.

2) A.N. Kupriyanov Biological Dixersity of the Altai-Sayan Ecoregion. – Kemerovo, 2003. – 156 pp.

3) Ivanov V.A. Methodological Basis for the Classification of Central Siberian Forests by Storm Related Fire Hazard Level. Ph.D. in agricultural science thesis. – Krasnoyarsk, 2006. – 42pp.

4) Pyak A.J. et al. Endemic Plants of the Altai Mountain Country. – Hampshire, UK : Wild Guides Ltd., 2008. – 368 p.

5) Ovchinnikova N.F., Ermolenko P.M. Long-term forest vegetation inventories in the West Sayan Mountains. World Resourse Review. 2004

421

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EXPERIENCE IN COMBATING DESERTIFICATION OF ARID TERRITORIES

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Abstract: To survive in hard arid conditions under a pressure of different social-economics issues, human learned how to make an analysis of periodical crisis and catastrophic situations and make adequate protective measures, studying their own mistakes and improving the land management.

Key words: agro-culture, arid territories, land management, livestock, pasture rotation, grazing animals.

The danger of wiping down of the productive agro-cultures territories has caused an emergence of many administrative and executive orders of the government. The aim is to find reasons and develop measures for future generations to protect them from the negative effects of droughts. The range of the offered measures has included the development of the conforming classification of the land management (adduction of agriculture and cattle breeding practices in the conforming with prevailed soil and climatic conditions), the improvement of the soil processing, the creation of the windproof forest belts and the usage of the alley cropping method to deal with the soil erosion and the soil drying, caused by hot dry winds [1]. The situation has been normalized.

In fact, actions connected with the cultivation foodstuffs cultures in plowed virgin and fallow lands of West Siberia and Kazakhstan were analyzed. The agriculture systems of soil protection were developed by the scientists, who applied the agro-techniques from North America [2]. The main peculiarities of this system are moldboardless lane processing of soil (lanes are put perpendicular to the dominated winds), the mulching steppe (conservation stubble and straw on the surface of soil), crop rotations, including soil-conservation with striped planting of perennial grasses, interlaced by annuals cultures. The implementation

422

of this technology on the area of more than 20 million ha proved its efficiency, allowed to normalize ecological situation in the region and to recommend its using in arid districts of the former USSR.

It was written in the proceedings of the Conference of the United Nations Organization that a vast experience of combating with the desertification in arid regions in different countries was obtained in Nairobi [3]. The attention was drawn to those failures in the system of livelihood maintenance on the arid lands of last years that had happened because of the impossibility to use gained knowledge practically, but not due to the misunderstanding of these processes. The special attention was paid to the development of national and transnational projects of the combating with the desertification. Also it was stressed, that actions of the combating might give a result only if a government would look at it as a compound of developed plans in social-economic fields and also as a part of collective efforts on accomplishing demands of new international economic order.

The plan of actions was accepted by General Assemble of the UN, which put its implementation in the program of environmental protection. In 1984 the first evaluation of the plan of actions was taken into practice. The effort to estimate the success that had been reached in a decade was made in 1987 [4]. This evaluation confirmed that desertification processes had been taking place in all continents, and as it was mentioned before, the most suffering countries were those, which were situated in arid, sub-arid, drying sub-humid zones in Asia and Africa.

Unfortunately, it is stated now that the world's society is not ready yet for accepting these conceptions, but those discussions in the UN are going on.

Considering that arid territories are mostly used as pastures, supplying forage for livestock, it is advisable to revise the main actions in the field of management optimization. The schemes of pasture rotations are different, because there are various conditions of pastures: rank of degradation, range of growing plants and its consuming.

In 80-90th some pasture rotations' models were used in the Middle Asia and Kazakhstan. A lot of money was spent. The slow recoupment of these resources is a powerful breakthrough. In the Republic of Kalmykiya several schemes of implementation were

423

offered. Ecological and economical benefit of this appliance was cogently shown in different articles and recommendations [5].

The tendency of the beginning of the decade dedicated to the deserts and to the combating with desertification was announced by the UN in Brazil on the 16th of August in 2010. The measures of providing the society with the information about the necessity to protect the lands from degradation and to improve the quality of arid territories, where a third part of worlds' population lives, were supposed to be taken into action in the period from 2010 to 2020. However, an amount of lands suitable for agriculture still continue decreasing. This situation can cause danger to foodstuff safety and provoke economic crises. "Continuation of degradation – whether it is because of climate change, inappropriate agriculture management or bad management of water resources – is still harmful for foodstuff safety. It leads to starvation and loss of the fertile lands", - said Ban Ki-moon, the Secretary-General of the United Nations Organization [6]. Nowadays about 2,1 billion people or approximately 40 % of world population are living in arid regions, 110 countries are being affected by desertification. Every year we lose 12 million ha of land, it is a territory that is equal to Bulgaria in size. The 17th of June was declared to be The World Day to Combat with Desertification and Droughts.

Land degradation as a result of the expansion of agriculture and livestock occurred throughout the history of mankind. According to the scientists, as a result of unsustainable use of land during the Neolithic revolution humanity has already lost 2 billion hectares of productive land, which is significantly more than all modern arable land. Nowadays the issue of desertification is still extremely very important. But this problem can be tackled only with combination of economic efforts and intergovernmental interaction, considering the current political and economic situations.

References

1. Gljanc Majkl G. Zasuha. opustynivanie i proizvodstvo prodovol'stvija. Vsled za plugom - zasuha: ispol'zovanie marginal'nyh zemel' [After plow – drought: using of marginal territories], M, 1996, pp.9-33.

424

2. Zonn I., Gljanc M.G., Rubinstajn Je. Osvoenie celinnyh zemel' v byvshem Sovetskom Sojuze, Vsled za plugom - zasuha: ispol'zovanie marginal'nyh zemel', M, 1996, pp. 135-150.
3. Gerasimov I.P., Osnovnye itogi Konferencii OON po problemam opustynivanija. Problemy osvoenija pustyn', 1978, pp. 24-33.
4. Maukonjan T. Sostojanie opustynivanija i osushhestvlenie Plana dejstvij OON pop bor'be s opustynivaniem.. Problemy osvoenija pustyn', 1992, pp. 16-22.
5. Zungruev S.S. Vnedrenie pastbishheoborota na Chernozemel'skih pastbishhah, Elista, 1989, p. 23.
6. UNDDD 2010-2020. Availble at http://www.unepcom.ru/home/env-problems/desert.html (assesed by August 16, 2010)

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ECONOMIC AND ECOLOGICAL ROLE OF URBAN AGGLOMERATIONS

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Abstract: The concept of solid waste management in urban areas, the impact of urbanization on the amount of waste produced, waste recycling are considered in the article.

Keywords: urbanization, agglomeration, municipal solid waste.

The speed of urbanization that is observed in the world indicates not only an increase in population, number and size of cities, it is also a process of creating a special environment – territorial units called urban agglomerations. Urban agglomerations are the main places of using and transforming natural resources. Material flow is a physical base of economy without which there cannot be any production [1]. It turns out that the cities produce waste and product flows (which, in fact are left-off wastes) continuously in different phase states, as a result, a special geochemical background arises and pollution of the environment takes place. It is important to distinguish biodegradable and non-biodegradable substances most of which being super toxicants moving

425

through the food chains, accumulating in human body, and globally, in biota. The main problem is that the removal of such substances is very expensive, whereas the prohibition of their discharge is impossible.

The biodegradable substances recycling main aim is that the speed of appearance of such pollutants must not exceed the speed of their decomposition. As a result, we can say that the urban environment is special and different from natural ecosystems [2]. The urban environment as man-made technological systems includes parts of natural ecosystems being under powerful pressure of the man-caused environment. This problem has to be solved at all levels, regional and national. In turn, control solutions which can provide economic and social development and a favorable environment for life, have to be made at the level of urban agglomerations. Ultimately, the ideal solution to the problem of solid municipal waste for a large agglomeration would simultaneously and continuously solve ecological (neutralizing the wastes) and economic (using products of recycling) problems. In addition, it is necessary to apply the principle of separation of waste hazard classes. Such approach would reduce the waste flows to the filled landfills and expenditures connected with it as well as reduce the need for thermal equipment for waste incineration.

The successful solution of the problem will help to create a market of waste, a secondary raw materials market and new products from waste. This requires the support of urban systems: industrial, construction, social and administrative ones.

References

1. Bringezn S. Accounting for the Physical Basis of National Economies Material Flow Indicators. Sustainability indicators. Chichester etc.: Iohn Wiley and Sons, 1997, pp. 170 – 180.

2. Rozenberg G.S., Chernikova S.A., Krasnoshchekov G.P., Krylov YU.M., Gelashvili D.B. Myths and Reality "Sustainable Development". Problems of Forecasting, 2009, no. 2, pp. 130-154.

426

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ANALYSIS OF ACCOUNTING AND CONTROL OF OZONE-DEPLETING SUBSTANCES IN THE RUSSIAN FEDERATION
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Abstract: The ozone layer is destroyed by the ozone-depleting substances therefore a great number of international and local documents have been worked out and adopted to regulate and control the production of these substances. In the article there is the analysis of modern Russian and international documents.

Key words: ODSs, depletion, Montreal protocol, ozone layer, chlorofluorocarbons, resolution

Ozone depleting substances (ODSs) are all substances that deplete the ozone layer. These chemical compounds consist of chlorinated, brominated or fluorinated hydrocarbons, capable of reacting with the ozone molecules in the stratosphere. The ability of agents to destroy the ozone layer is called the ozone-depleting potential (ODP). [1, p. 6]

Chlorofluorocarbons (CFCs), carbon tetrachloride, hydrochlorofluorocarbons (HCFCs) and methyl chloroform are the main human-produced ODSs which are used in refrigerators and air conditioners (CFCs and HCFCs are used as refrigerants in cooling systems). [2] Also ODSs can be used as blowing agents in the production of foams, as cleaning solvents in the electronics industry and in chemical cleaning, as sprays in aerosol and medical dispensing aerosol inhalers (MDI) employed to treat pulmonary diseases, as a sterilant in hospitals, as a means of fire extinguishing, as fumigants for the control of pests, and as a feedstock in the chemical industry. Furthermore, ODSs can be used as laboratory or analytical reagents.

427

There is a global consensus that the chlorine in artificial substances, including CFCs and HCFCs refrigerants released into the atmosphere, are the main cause of ozone depletion. Ozone depletion is associated with an increase in the ultraviolet (UV) radiation at the ground surface. UV radiation causes skin cancer, damages plant and aquatic life. The stable structure of these chemicals contributes to the destruction of the ozone layer. Substances rise into the stratosphere intact. There they break down under the influence of intense ultraviolet radiation (UV), releasing chlorine, which selects an atom of the ozone molecule transforming it into ordinary oxygen. Chlorine acts as a catalyst, contributing to the destructionof the ozon layer. And there is no sustainable change in chlorine molecules, which allows them to repeat this process again and again. [2]. The most dangerous are long-lasting chemicals. On average the term of CFC-11 existence in the atmosphere is 50 years, CFC-12 - 102 years, and CFC-113 - 85 years. Therefore, even after the consumption of these chemicals, the depletion of the ozone layer will continue for a long time. The most important international document that includes the list of numerous ODSs is the Montreal Protocol on Substances that Deplete the Ozone Layer (a protocol to the Vienna Convention for the Protection of the Ozone Layer). It was signed on September 16, 1987, and entered into force on January 1, 1989. The USSR was one of the first countries to sign this Protocol. The Montreal Protocol requires the phase-out of CFCs by December 31, 1995 in developed countries and provides a grace period of 10 years for developing countries. The protocol envisages achieving 65 percent of reduction in HCFCs production by the beginning of 2004, and completing withdrawal of these chemicals from production by 2030. The theory of global warming may affect the success of the introduction of various alternative refrigerants or new technologies that can replace systems using CFCs and HCFCs. [2]

Nowadays in Russia there are a number of resolutions that regulate the problem of ODSs. And one of the latest is The Resolution of the Government of March 24, 2014, No. 224 «On the measures of state regulation of circulation and consumption of substances that deplete the ozone layer». According to this document the consumption of substances that deplete the ozone layer is determined by the international treaties signed by the Russian Federation. They mainly used CTC and R-22. [3]. Also, according to Paragraph 6 of this

428

Resolution, all entities and individual entrepreneurs engaged in the manufacture, use, storage, recovery, recuperation, recycling, and the destruction of ODSs in the Russian Federation must keep records of these ODSs. And each year they are to report to the Ministry of Natural Recourses and Ecology of the Russian Federation about ODSs that they use, storage and etc. [3]

As a result of the systematization of the reports on ODSs manufacturing and other documents several conclusions have been made:

1. It was found that the majority of entrepreneurs use ODSs: R-22, HCFC-22, R-410A, R-12, R-404, R-134, and HCFC-21 for domestic purposes. These ODS are mainly present in refrigerators and air conditioners in enterprises and offices and are used in small amounts; 2. There is no data about the recovery of ODSs; 3. There have been no entities and individual entrepreneurs that recycle and recuperate ODSs; 4. Some companies have used ODSs for analytical purposes.

References

1. Environmental Guideline for Ozone Depleting Substances (ODS's) and Halocarbon Alternatives, 2011 Available at: http://www.enr.gov.nt.ca/sites/default/files/guidelines/guideline_for_ozone_depleting_substances_and_halocarbon_alternatives.pdf (accessed 2 October 2015).

2. Montreal Protocol on Substances that Deplete the Ozone Layer, 1987 Available at: http://ozone.unep.org/en/handbook-montreal-protocol-substances-deplete-ozone-layer/5 (accessed 2 October 2015).

3. Postanovlenie Pravitel'stva RF ot 24.03.2014 N 228 "O merakh gosudarstvennogo regulirovaniya potrebleniya i obrashcheniya veshchestv, razrushayushchikh ozonovyi sloi" [Resolution of the Government of Russian Federation dated 24 November 2014 No. 224 «On measures of state regulation of circulation and consumption of substances that deplete the ozone layer»] Available at: http://www.consultant.ru/document/cons_doc_LAW_160753/ (accessed 2 October 2014)

429

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СОВРЕМЕННОЕ ЗАКОНОДАТЕЛЬСТВО В СФЕРЕ ОБРАЩЕНИЯ С ОТХОДАМИ И ОХРАНЫ ОКРУЖАЮЩЕЙ СРЕДЫ

Пленарный доклад

Член Совета при Председателе Совета Федерации по вопросам агропромышленного комплекса и природопользования, член Общественного Совета Министерства природных ресурсов и экологии РФ, член Президиума Экспертного Совета Комитета Совета Федерации по аграрно-продовольственной политике и природопользованию, Заместитель Председателя Комитета Торгово-Промышленной Палаты РФ по природопользованию и экологии, Председатель Комитета координационного Совета по развитию отрасли обращения с отходами при полномочном представителе Президента по ЦФО по созданию современной нормативно-правовой базы, член Экспертного Совета Федерального агентства по строительству и жилищно-коммунальному хозяйству по развитию рынка и модернизации инженерной инфраструктуры обращения с отходами, исполнительный директор НП «Национальный Центр Эколого-Эпидемиологической Безопасности»

Член Совета при Председателе Совета Федерации по вопросам агропромышленного комплекса и природопользования, исполнительный директор НП «Национальный Центр Эколого-Эпидемиологической Безопасности»

Аннотация: Обсуждаются принципы правового регулирования в области управления отходами, современное понимание термина «отходы», а так же источники и механизмы финансирования всей системы обращения с отходами. Особо рассматривается принцип ответственности производителей и импортеров товарной продукции, в результате потребления которой образуются отходы.

430

Ключевые слова: правовое регулирование, отходы, механизмы финансирования и управления отходами

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CURRENT WASTE MANAGEMENT AND ENVIRONMENTAL PROTECTION LEGISLATION AND LAWS

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Abstract: The principles of legal regulation of waste management, modern understanding of the term "waste", as well as the sources and mechanisms for financing the entire system of waste management are represented in the article. Special attention is given to the problem of waste generation and the responsibility of producers and importers of products.

Keywords: legal regulation, waste, funding mechanisms, waste management

Экологическая безопасность гражданина Российской Федерации следует из его прав на охрану здоровья и на благоприятную окружающую среду (статьи 41, 42 Конституции Российской Федерации) и обеспечить безопасность людей это важнейшая наша задача коллеги.

Система обращения с отходами затрагивает все отрасли экономики и все сферы жизни, ведь отходы возникают как на производстве, так и в торговле, транспорте и при непосредственном потреблении товаров и услуг.

Лично Президент неоднократно говорил о создании современной системы утилизации и переработки промышленных и бытовых отходов, отмечая что при всей кажущейся прозаичности эта проблема имеет огромное экономическое и социальное значение.

431

С 2008 года в Российской Федерации идет реформа отрасли обращения с отходами, заданная решениями Совета Безопасности.

На заседании Совета Безопасности по вопросу обеспечения экологической безопасности 30 января 2008 года было определено, что: «Сложившаяся в Российской Федерации обстановка в сфере обращения с отходами производства и потребления представляет прямую угрозу национальной безопасности страны».

Поручениями Президента Российской Федерации от 29.03.2011г. №Пр-781, от 10.08.2012 года № Пр-2138, от 21.09.2012 года № Пр-2516, Решением заседания Совета Безопасности РФ, посвящённому обеспечению национальной безопасности в сфере охраны окружающей среды и природопользования от 20.11.2013г.,

Решением выездного заседания Секретаря Совета безопасности РФ ЦФО в Белгородскую область от 26.03.2013г. была предусмотрена необходимость решения субъектами РФ проблем в сфере обращения с отходами. Неразвитость системы переработки отходов жизнедеятельности названо одной из основных внутренних угроз развития Центрального федерального округа (п. 3 Стратегии социально-экономического развития Центрального федерального округа до 2020 года. Системной проблемой продолжает оставаться отсутствие должного учета в сфере обращения с отходами. Так, по данным Росприроднадзора, в Российской Федерации действует 1 092 полигона для захоронения ТБО, в Роспотребнадзоре таких объектов учтено 4 617, а органами исполнительной власти субъектов Российской Федерации - 3 919. Данные о ежегодном образовании ТКО колеблются в диапазоне 30-67 млн. тонн. Отсутствует достоверная информация о количестве и классах опасности захороненных отходов, этим создаются условия для финансовых злоупотреблений. По данным Росприроднадзора за 2014 год в ЦФО собрано 2 млр рублей от платы за размещение , а должны были собрать как минимум 20 миллиардов рублей.

На территории субъекта находятся 1120 объектов размещения отходов, на учет Росприроднадзор смог поставить из них всего 360 объектов, остальные не могут вести хозяйственную деятельность и станут собственностью субъектов. Многие из этих свалок и хранилищ можно из-за собранных там отходов назвать с

432

технической точки зрения «реакторными» и являющимися таким образом скрытым бременем прошлого для будущих поколений, так как тело свалки или хранилища сохраняет свои реактивные способности на протяжении столетий.

По экспертным данным, в России на свалки выбрасывается около 9 млн. тонн макулатуры. По г.Москве потери вторичного сырья оцениваются в 5,9 млрд. рублей, в то время как сумма субсидий городского бюджета на утилизацию ТКО составляет 3,4 млрд. рублей в год, из которых 2,3 млрд. рублей - на термическую утилизацию. При этом отходы сжигаются несортированными. А построенные мощности по переработке вторсырья стоят недозагруженными.

Инженерная инфраструктура, обеспечивающая безопасную переработку и захоронение отходов, исчерпала проектные мощности и не справляется с возросшим объемом отходов. Индустриальной переработки мусора почти нет.

Рынок вторичного сырья слабо развит. С 2016 года структура полномочий в области обращения с отходами будет изменена. Основные полномочия закрепляются за регионом. Вводится институт региональных операторов. Региональная политика строится на двух документах - региональной программе и территориальной схеме обращения с отходами. Назрела необходимость создавать отрасль в соответствии с принятым Федеральным законом от 31.12.2014 N 488-ФЗ "О промышленной политике в Российской Федерации». 1 января 2015 года вступил в силу Федеральный закон № 458-ФЗ «О внесении изменений в федеральный закон «Об отходах производства и потребления», отдельные законодательные акты Российской Федерации и признании утратившими силу отдельных законодательных актов (положений законодательных актов) Российской Федерации.

Закон внес многочисленные изменения в ФЗ № 89 «Об отходах производства и потребления», а так же в ряд иных законодательных актов, в том числе, к отходам отношения не имеющим.

В отношении отходов изменено как само определение отхода, так и принципы правового регулирования, а так же источники и механизмы финансирования всей системы обращения с отходами. Основополагающим принципом закона стало введение

433

ответственности производителей и импортеров товарной продукции в результате потребления (использования) которой образуются отходы.

Данный принцип будет реализован путем получения экологического сбора с производителей и импортеров товаров потребления в федеральный бюджет РФ. Закон предусматривает возможность создания производителями (импортерами) индивидуальной системы по обращению с собственными отходами, в этом случае экологический сбор государством не взимается. В законе дано новое определение отхода: «отходы производства и потребления (далее – отходы) – вещества или предметы, которые образованны в процессе производства, выполнения работ, оказания услуг или в процессе потребления, которые удаляются, предназначены для удаления или подлежат удалению в соответствии с настоящим Федеральным законом».

Теперь вместо термина «использования» в соответствии с законом будет использоваться два термина «обработка» и «утилизация». Когда отход используется, он сначала обрабатывается, потом утилизируется. Вместо ТБО теперь ТКО (твердые коммунальные отходы). Срок накопления отходов (не требующий дополнительных разрешений) увеличен с 6-ти месяцев до 11. Закон направлен на стимулирование сокращения площадей, занятых полигонами. Установлены в порядке приоритетности направления государственной политики в области с отходами:
1. Максимальное использование исходных сырья и материалов;
2. Предотвращение образования отходов;
3. Сокращение образования отходов и снижение класса опасности отходов в источниках их образования;
4. Обработка отходов;
5. Утилизация отходов;
6. Обезвреживание отходов.

Законом № 458 предусматривается конкретизация вопроса обучения лиц, допущенных к деятельности по обращению с отходами I-IV класса опасности, что является актуальным в связи с отсутствием на сегодняшний день чётких требований, предъявляемые к порядку и периодичности обучения.

С 01 июля 2016 года ст. 15 Закона № 89-ФЗ будет предусматривать наличие профессиональной подготовки,

434

подтвержденной свидетельствами (сертификатами) у лиц непосредственно допущенных к деятельности по сбору, транспортированию, обработке, утилизации, обезвреживанию, размещению отходов I - IV классов опасности.

С 1 июля 2015 года в соответствии с законом лицензия будет требоваться на сбор, транспортирование, обработку, утилизацию, обезвреживание, размещение отходов 1-4 классов опасности. Причем к утилизации относится использование отходов для производства товаров (продукции), выполнения работ, оказания услуг, включая повторное применение отходов по прямому назначению (рециклинг), их возврат в производственный цикл после соответствующей подготовке (регенирация), а также извлечение полезных компонентов для их повторного применения (рекуперация). Соответственно, возврат собственных отходов в собственное производство так же, при желании правоприменителя, может быть оценен как деятельность, подлежащая лицензированию. С 1 января 2017 года запрещается захоронение отходов, в состав которых входят полезные компоненты, подлежащие утилизации. Перечень этих видов отходов устанавливается Правительством РФ. Основные подзаконные акты планируется подготовить уже в 2015 году.

Средства, поступившие в счет уплаты экологического сбора, будут расходоваться через механизм государственных программ в виде субсидий субъектам Российской Федерации. Законом определены и виды целевого использования средств экологического сбора – это софинансирование региональных программ в области обращения с отходами и территориальных схем обращения с отходами, на покрытие расходов на сбор, транспортирование, обработку, утилизацию отходов от использования товаров, на покрытие дефицита средств, поступающих в счет оплаты населением услуги по обращению с ТКО, на выполнение инженерных изысканий, подготовку проектной документации для строительства объектов, используемых для обработки, утилизации, обезвреживания отходов, на строительство и оснащение таких объектов.

С 2017 года предусматривается наложение запрета на захоронение полезных компонентов, которые могут быть вовлечены в хозяйственный оборот. Кроме того, Законом № 458

435

предусмотрено создание единой государственной информационной системы учета отходов от использования товаров. Однако, в создавшихся внешнеполитических условиях (санкции, ограничение импорта и как следствие снижение общей мотивации иностранных инвесторов), а также учитывая сроки принятия разъясняющих подзаконных актов, достижение инвестиционной привлекательности данной сфере хозяйственной деятельности решительно ставится под сомнение. В таких условиях представляется возможным решить проблему с помощью средств финансовой поддержки государственных объединений потенциалов субъектов для создания межрегиональных объектов обращения с отходами.

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НЕКОТОРЫЕ ВОПРОСЫ ПЕРЕВОДА ЛЕСНОГО КОДЕКСА ТУРКМЕНИСТАНА НА РУССКИЙ ЯЗЫК

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Аннотация: На примере Лесного Кодекса Туркменистана в статье анализируются вопросы перевода нормативных правовых актов Туркменистана на русский язык. Рассматриваются случаи расхождения понятий в оригинальном и переводном тексте. Делаются выводы о необходимости единообразного подхода при подготовке правовой базы.

Ключевые слова: Лесной Кодекс Туркменистана, кустарник, дерево, лесные правоотношения, лесовладение, генерация, вырубка, лесовосстановление, облесение.

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SOME ISSUES OF TRANSLATING THE FOREST CODE OF TURKMENISTAN INTO RUSSIAN

436

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Abstract: Using the Forest Code of Turkmenistan the article gives the analysis of the issues of translation of regulatory legal acts of Turkmenistan into the Russian language. Cases with difference of definitions of original and translated texts are considered. Conclusions about the need for a unified approach to the preparation of the legal base are provided.

Key words: Forest Code of Turkmenistan, shrub, tree, forest relationship, forest tenure, generation, deforestation, reforestation, afforestation.

В соответствии со статьей 14 Конституции Туркменистана государственным языком Туркменистана является туркменский язык [1]. На этом языке принимаются и публикуются нормативные правовые акты, которые в последующем подвергаются переводу на русский язык, поскольку помимо туркменского языка в Туркменистане широко используется русский язык – великая ценность, перешедшая от советского периода туркменскому народу. При переводе нормативные правовые акты подвергаются существенной переработке, что приводит к определенным погрешностям в сравнении с оригинальным текстом.

Примеры таких ошибок при переводе содержатся в Лесном Кодексе Туркменистана (далее – Кодекс) [2]. Так, в пункте 7 статьи 1 Кодекса установлено, что под кустарником следует понимать многолетнее растение с древесными стеблями без ясно выраженного главного ствола, ветвящееся от поверхности почвы и отличающееся от дерева низкорослостью. Под деревом, как указано в пункте 6 статьи 1 Кодекса, следует понимать древесное растение, имеющее один ствол, или поросль с несколькими стволами, имеющую крону, высота которой составляет не менее двух метров. Из анализа этих пунктов следует, что законодатель

437

при составлении определений понятий «дерева» и «кустарник» придерживался визуальных критериев сопоставления понятий и главную черту их различия находит в высоте.

Из этого следует, что деревом должно признаваться всё, что выше двух метров, а кустарник определяется низкорослостью, то есть его высота не должна превышать эту величину. Однако верным было бы придерживаться критерия наличия или отсутствия главного ствола. Так, в Толковом словаре Ожегова [3] слово кустарник (куст) означает растение с древовидными ветвями, не имеющее главного ствола, при этом не упоминается критерий высоты. В биологическом энциклопедическом словаре под кустарником понимается многолетнее древесное растение, высота которого может достигать от 0,8 до 6 метров [4].

Таким образом, при определении понятий присутствуют несоответствия, и, следовательно, при составлении нормативных правовых актов целесообразнее было бы использовать уже сложившиеся дефиниции. Также в пункте 2 статьи 1 Кодекса дается определение понятия «лесные правоотношения», под которыми следует понимать отношения в области охраны, защиты, пользования и воспроизводства лесов, участков (земель) лесного фонда. Здесь можно отметить, что данное определение является неполным, так как не включает отношения, связанные с лесовладением. В пункте 23 и пункте 28 статьи 1 Кодекса даются определения понятий «гарь» и «вырубка». Так, под гарью следует понимать лесную площадь, на которой насаждения уничтожены пожаром, а новое поколение леса еще не образовалось. Под вырубкой понимают лесную площадь, на которой насаждение вырублено, а новое поколение леса еще не образовалось. В обоих пунктах при переводе используется слово «поколение», однако представляется правильным использовать в данных случаях термин «генерация» [5]. При исследовании пункта 38 статьи 1 Кодекса, в котором дается определение понятия «лесные репродуктивные материалы» как «семена, части растений и растения, предназначенные для лесовосстановления и облесения», является очевидным, что законодатель некорректно использовал слова «лесовосстановление» и «облесение», поскольку лесовосстановление уже есть элемент облесения. Согласно пункту 37 статьи 1 Кодекса облесение – это искусственное

438

восстановление или естественное возобновление лесов на территориях, не покрытых лесом. В данном случае просматривается тавтология.

В заключение следует отметить, что любой перевод текста, особенно имеющий отношение к юриспруденции, должен предполагать согласованную работу высококвалифицированных специалистов (юристов, лингвистов, специалистов иной профессиональной сферы, как в обозначенных случаях, биологов) и должен выполняться в соответствии с правилами юридической техники. Однако довольно часто не только в туркменской, но и в зарубежной практике встречаются переводы, приводящие к неточности, двойственности понятий. Чтобы избежать правовых казусов, законодательную базу необходимо совершенствовать путем соблюдения единообразия при определении понятий.

Бибилиография

1. Конституция Туркменистана // Новости Туркменистана. – 2015. [Электронный ресурс]. – URL: http://infoabad.com/zakonodatelstvo-turkmenistana/konstitucija-turkmenistana.html (дата обращения: 28.10.2015).
2. Лесной Кодекс Туркменистана от 25 марта 2011 года № 166-IV (с изменениями и дополнениями по состоянию на 28.02.2015 г.) [Электронный ресурс]. – URL: http://online.zakon.kz/Document/?doc_id=31342518 (дата обращения: 29.10.2015).
3. Толковый словарь Ожегова // Словари и энциклопедии на академике. 2004–2014. [Электронный ресурс]. – URL: http://dic.academic.ru/dic.nsf/ogegova/95318 (дата обращения: 29.10.2015).
4. Биологический энциклопедический словарь // Энциклопедии&словари. – 2009–2015. [Электронный ресурс]. – URL: http://enc-dic.com/biology/Kustarnik-2848.html (дата обращения: 30.10.2015).
5. Толковый словарь Ушакова // Словари и энциклопедии на академике. 2004–2014. [Электронный ресурс]. – URL: http://dic.academic.ru/dic.nsf/ushakov/778582 (дата обращения: 29.10.2015)

439

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THE INFLUENCE OF ZOOLOGICAL PARKS ON BIODIVERSITY CONSERVATION AND THE NUMBER OF RARE AND ENDANGERED SPECIES OF WILD ANIMALS

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Abstract: This work aims to identify violations of or adherence to norms and standards of keeping wild animals (including rare and endangered species) in captivity, as well as to detect various projects to restore their numbers in Zoological parks. We have evaluated the work of four Zoological parks. On the basis of personal observations and questionnaires we have created a rating scale for Zoological parks and characterized each of them.

Key words: biodiversity conservation, rare and endangered species, Zoological parks

All zoos fall into two categories - zoos and menageries. The first group performs a variety of scientific and educational work. The second group is made for profit and entertainment of visitors.

The proliferation of zoos has led to the establishment of such global organizations as The World Association of Zoos and Aquariums (WAZA), The European Association of Zoos and Aquariums (EAZA), Eurasian Regional Association of Zoos and Aquariums (EARAZA). In general, they are united by one idea: "*Unity for the sake of species conservation*". The World Zoo and Aquarium Conservation Strategy (WZACS) was developed and adopted to implement this idea. It describes the functions of zoos, the standards of animal welfare, and the main issues to be addressed. [1]

440

1. Comparative characteristics of zoological parks in Russia and Germany. The objects of research are Moscow, Berlin, Gelendzhik and Chita Zoos. The aim of visiting them was to give a comparative characteristic. The evaluation was conducted on a five-point scale according to the following criteria:

- The physical condition of the animals (trauma, general condition, activity);
- Satisfaction of the basic needs (availability of food and water);
- Satisfaction of the secondary needs (Entertainment instruments, objects of natural environment);
- The condition of the aviary (space);
- The condition of the aviary (safety);
- Veterinary care;
- Procreation as a method of species conservation;
- Scientific activity;
- Educational work among children and youth;
- The availability of entertainment centers for visitors;
- The external condition of the zoo;

Visiting these four Zoos we tried to evaluate each of them using our own scale and gave the following characteristics.

Being a member of EARAZA, the Moscow Zoo implements all the points of the "Conservation Strategy". There are ongoing projects for procreation and conservation of species. Animals have the minimum necessary conditions in their aviaries. However, in my point of view, the welfare leaves much to be desired there. There remains a lot of work to be done. [2]

Apart from representative functions the Berlin Zoo is an active participant of different programs for procreation of rare species, it carries out serious scientific and selection work, cooperates closely with many research institutions and other zoos all over the world. It rightly takes pride of the seventh place on the list of the best zoos in the world.

The Gelendzhik Safari Park specializes in the protection of rare animals affected by humans: poachers, circus actors, photographers, etc. The Park has veterinary, rehabilitation programs, but does not pay much attention to the conservation and development of genetic

441

material. The main rule there is that animals must be kept in most natural conditions. However, Gelendzhik Park lacks scientific base.

Chita Zoo cannot be called a zoo yet, but a menagerie. We revealed unacceptable violations (dirt, rotten remains of food, lack of water, space, natural objects; animals are sluggish, apathetic, motionless for a long time). No research work is conducted there. [3]

Experimental research. The results of the analysis. Our experimental study was conducted by the method of questioning employees of zoos, zoo visitors (adults), pupils of the 11-th and the 7-th grades. According to the survey, the majority of population in Russia objectively assesses the state of zoological parks and their influence on environment and considers that it is necessary to develop them. However, some of the respondents know only menageries; therefore they believe that animals must only live in natural conditions. Besides, almost half of the respondents noted inadequate conditions of animal welfare. 20% have witnessed cases of cruelty to animals. More than 90% admit that humanity is to blame for the extinction of species.

According to the employees, every zoo has some rare species of animals and conducts regular veterinary inspection, but only few of them have projects to conserve rare species population.

Conclution

Zoos play an important role in restoring the populations of rare and endangered species. Humans continue to destroy the wild life. Fortunately, thanks to the work of the world organizations mentioned above many species have been recovered. They are no longer endangered and can exist in the wild. The result of this research was a model of an ideal zoo of the future, that would meet all the requirements of “The Environmental strategy" and international organizations (including welfare, nutrition, space, aviaries, natural objects, veterinary care, and scientific work). The ideal zoo works in the field of media and scientific research. There must be playgrounds and pavilions of creativity for children, and a club of young biologists there.

References

1. The World Zoo and Aquarium Conservation Strategy, 2005. The World Association of Zoos and Aquariums. Editor: Peter J. S. Olney. WAZA, Berne. P – 70. Available at:

442

http://www.waza.org/files/webcontent/1.public_site/5.conservation/conservation_strategies/building_a_future_for_wildlife/wzacs-en.pdf.
2. Moscow Zoo. About the zoo nursery. Available at: http://www.moscowzoo.ru/about-zoo/zoo-nursery/
3. Chita Zoo park. About the zoo park. Available at: http://zoopark.restchita.ru/stati/52-o-zooparke.

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THE CONCEPT OF SUSTAINABLE DEVELOPMENT

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Abstract: Many environmental problems are generated by lagging economic thought. Until the middle of the twentieth century, cientists did not pay attention to ecological limitations in economic development. In pursuit of quantitative indicators, the economy did not consider the future problems and the interests of future generations. Therefore, it is the expected reaction to move to the new strategy, called a model of sustainable development.

Key words: sustainable development, noosphere, economic component, social component, ecological component, future generation, human thought.

Introduction. Today, many scientists characterize the modern relationship between man and nature as an anthropogenic ecocide. Destruction of natural ecosystems goes together with strong industrial pollution as well as rapid depletion of unrecoverable natural resources (minerals) and use of reproducible resources (soil, forests, etc.). To produce 1 kg of some kind of a final product one has to make 25 kg of waste [1]. It means the destruction of a habitat, including the conditions of people's own existence. Therefore, all of these environmental problems are generated by lagging economic thought. It is the expected reaction to move to the new strategy, called a sustainable development model.

443

The achievement of sustainable development is not an easy process, sometimes it is very painful, but it can be real. Movement in this direction should be gradual, careful and calculated. Nowadays it is being done a lot in this regard: the development and introduction of resource-saving technologies and recycling, development of alternative energy sources, attempts of the more equitable distribution of resources and benefits.

The quality of life for hundreds millions of people is a fight against a shortage of safe drinking water, malnutrition and diseases.

History.

In the 20-30 years of the twentieth century Russian academician V.I. Vernadsky came to the idea that the human mind was the main force changing the planet life, the noosphere. As a result, people took responsibility for the future development of nature [3, p. 120].

In 1972 the United Nations Environment Programme (UNEP) was created in Stockholm. For the first time at such a high level, it was suggested that the environment and the development of civilization could not be considered separately, they were inseparable from each other. So now the problems of civilization are directly related to ecological troubles.

In 1984 on the UN General Secretary's initiative the International commission on environment and development headed by Norwegian Prime Minister Gru Harlem Brundtland was created.

The Commission included such an important task as creating of long-term strategies, consideration of ways and facilities by which the international community would be able to deal effectively with environmental problems. An important point in the development of the concept of sustainable development was the publication of the report "Our Common Future", submitted by the Commission in 1987. Only in the body of this report the term "sustainable development" appeared.

The present day situation.

Actually the concept of sustainable development was adopted at the UN conference on environment and development that was held in June 1992 in Rio de Janeiro. It was at the level of heads of countries and governments. Today, this concept has become the most well-known and even fashionable global model for the future of the world civilization.

444

Sustainable development (according to the UN) is the development of a society that allows to meet the needs of current generations without damage to future generations letting them meet their own needs [2].

The sustainable development implies:

- responsible production (recycling, re-manufacture);
- social responsibility (a useful product for society);
- systematic approach;
- using of local resources and technologies;
- refusal of rare, hard-to-reach technologies and resources.

The concept of sustainable development is the result of combination of the three main points of view: economic, social and environmental ones.

The economic component.

The economic approach to the concept of sustainable development is based on the theory of maximum flow of aggregate income, which can be made subject to save the aggregate capital, which produces this income. This concept implies the optimal using of limited resources and use of eco- friendly, nature-, energy- and material-saving technologies, including the extraction and processing of raw materials, the creation of eco-friendly products, minimization, recycling and utilization of waste products.

There are two types of stability. The first one is the weak stability. It implies not decreasing in time natural and industrial capitals. And the second one is the strong stability. It implies not decreasing natural capital. The part of the profits from the sale of non-renewable resources should be directed at increasing the value of renewable natural capital [3].

The social component.

The social component of sustainable development focuses on humans and aims at preservation of the stability of social and cultural systems, including the reduction in destructive conflicts between people. An important aspect of this approach is the equitable sharing of benefits. It is also important to preserve the cultural capital and diversity globally, and to better use sustainable development in the less dominant culture.

To achieve sustainable development the modern society will have to create a more effective decision-making system that takes into

445

consideration historical experience and encourages pluralism. In the concept of human development a man is not an object and subject of development. Based on the extension of variants of human choices as the main value, the concept of the sustainable development implies that a man should participate in the processes that shape the scope of his activities, promote the making and realization of decisions, and control their execution.

The ecological component.

From the point of view of ecology, sustainable development must provide the integrity of the biological and physical natural systems. The vitality of ecosystems that influence global stability of the biosphere is particularly important. Moreover, the term "natural" systems and habitats can be interpreted widely, including the environment that is built by man, such as a city. The focus is on keeping the ability to heal itself and dynamically adapt to changes in systems. Degradation of natural resources, pollution and loss of biological variety reduce the ability of ecosystems to regenerate.

The concept of sustainable development implies the world as a system that connects space and a system that combines the time.

If we are talking about the world as a space, it should be understood that air pollution, for example in North America, affects the air quality in Asia, and that pesticides sprayed in Argentina can harm fish near the coast of Australia.

If we are talking about the world as a system over time, it should be noted that the decisions taken by our ancestors about the way of farming the land affect the modern agriculture industry. Therefore, the decisions we take today will affect the lives of future generations [5].

Subtleties of translation.

Different authors have repeatedly pointed out the inaccuracy of the Russian translation of a foreign term «sustainable development». Actually, the definition of "sustainable development" means a steady, permanent increase.

"Sustainability" involves balance and "development" is possible only if the system is off balance.

The term "sustainable development" was introduced to extensive use by the International Commission on Environment and Development (The Brundtland Commission) in 1987. "Sustainable development" is the development that meets the needs of the present generation, but

446

does not rock the boat for the future generations to meet their own needs. It includes two key concepts:

- the concept of needs, in particular the needs necessary for the subsistence of the poorest sections of the population, which should be a subject for urgent solution;

- the concept of limitations due to the state of technology and organization of society, that influence the ability of the environment to meet the present and future needs.

According to the arguments of academician N.N. Moiseyev, the meaning of the idea is expressed by the term "co-evolution of man and biosphere", which is almost synonymous with "noosphere" of V.I. Vernadsky. From that point of view, a more accurate translation of "sustainable development" can be "co-development" [4].

Criticism.

It should be noted that sustainable development is a very difficult subject, its interpretation in some cases is toughly criticized by some experts. First of all, there is the fact that at this stage humanity can not be without the non-renewable natural resources, such as oil, gas, coal, metals. Even to use alternative energy sources, it needs to use these resources.

Secondly, the concept of sustainable development comes into conflict with the pursuit of people to increase consumption and material well-being, coupled with a steep economic inequality between people and countries.

Thirdly, attitude to growth of Earth's population and demographic policy is very painful. Undoubtedly, growth of population does not contribute to preservation of the natural environment and resources, but an attempt to control its number contradicts traditional norms of morality, humanism, human rights and freedoms.

According to UNESCO, in the historical period humanity has already lost about 2 billion hectares of fertile soil, turning them into barren lands – and this is more than the area used for agricultural purposes in the world today.

Pollution of the oceans has become catastrophic. Greenhouse gas emissions are gradually changing the climate. Reducing the area of tropical forests and the northern taiga is an anxious fact too.

But perhaps the most important point for achievement of sustainable development is the change of value orientations, both at

447

personal and public levels. Provision of sustainable development requires not only new technologies and investments, but also the social innovations, changing priorities and objectives of the development of civilization, ready to give up short-term profits for the sake of future generations [1].

References

1. Basic Features of the Russian Strategy of Sustainable Development (ed. A.M. Sholokhova). Moscow, 2002, 161 p.
2. The Definition of "Sustainable Development". Available at: dic.academic.ru.
3. A Few Words About the Noosphere. Successes in Modern Biology (ed. V.I. Vernadsky), no. 18, edition 2, 1944, p. 120.
4. Co-Evolution of Man and Biosphere. Ecology and Life (ed. N.N. Moiseyev), 1997.
5. What is Sustainable Development? International Institute for Sustainable Development. Available at: www.iisd.org.

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DER WALD MUSS GERETTET WERDEN

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Annotation: Der Wald ist ein wichtiges Erholungsgebiet und gewährleistet frische Luft. Trotzdem werden täglich unvorstellbar große Waldflächen abgeholzt. Illegale Entwaldung ist eine der die Hauptursache der Abholzung. Einige Beispiele dafür sind der Wedauer Wald und der Khimki-Wald. Die illegale Entwaldung und der Handel mit gestohlenem Nutzholz sind Umweltkriminalität, die von internationalen Gremien anerkannt werden.

Die Waldungen formen immer von den Leutehände um, während andere Reliefformen bleiben gleich. Das bestehende Wald-Ökosystem wird dabei durch ein anderes Ökosystem ersetzt. Das ist ein riesiges Umweltproblem.

Die Stichwörter: die Umwelt, die Entwaldung, der Wald, der Umweltschützer, das Holz

448

Abstract: Forest is considered to be an important leisure area and it guarantees the purest air. However, huge forest areas are cut down every day. Illegal logging is the main cause of deforestation, for example, in Wedauer and Himkinsky forests. Illegal logging and trade of stolen timber are internationally declared to be environmental crimes.Forest areas are always under some kind of transformation made by people while other land forms stay the same. That's why contemporary ecosystem is slowly changing. This is a big ecological problem.

Key Words: environment, deforestation, forest, environmentalists, wood

Wälder speichern Kohlenstoff, regulieren das Klima, filtern Wasser, mindern die Gefahr von Überschwemmungen und liefern dem Menschen wichtige Rohstoffe. Der ökologische Wert besteht im Schutz der Artenvielfalt und der Stabilisierung des Klimas. Bäume nehmen das Treibhausgas CO_2 auf und speichern den Kohlenstoff im Holz. Gleichzeitig setzen sie Sauerstofffrei. Jedes Jahr gehen rund um den Globus jedoch 13 Millionen Hektar verloren - pro Minute 40 Fußballfelder [1]. Wälder bedeckten etwa 60 Prozent der Landfläche der Erde. Heute sind es nur noch etwa 30 Prozent, rund vier Milliarden Hektar.

Ein Beispiel dafür ist der Wedauer Wald in Duisburg. Hier gab es bis vor kurzer Zeit noch zahlreiche Vogelarten und sogar seltene Fledermäuse. Aber vor einigen Monaten wurden sie vertrieben. Die Stadt baut einen neuen Kanal mit einer Strecke für Ruderboote, einem beleuchteten Weg für Spaziergänger und einem Spielplatz.

Das Projekt wird zu einem Drittel von der Europäischen Union finanziert. Matthias Schneider vom BUND kann das nicht verstehen: "Die Projekte, die mit EU-Geldern finanziert werden, sollten eigentlich umweltschonend durchgeführt werden. "[2].

Ein anderes Beispiel wäre ein Fall von den Jahren 2007-2012. Das war Streit um den Khimki Wald. Der Bau einer Autobahn von Moskau nach St. Petersburg wurde durch eine Verordnung des Verkehrsministeriums der Russischen Föderation vom 31. Juli 2006 vorgesehen [3].

Mit solider politischer Unterstützung, welche zu Korruptions-Vorwürfen geführt hat, wollte der französisches Baugigant Vinci eine Mautstraße direkt durch Moskaus jahrhundertealten Khimki Wald bauen – obwohl der Wald gesetzlich geschützt war. Monatelang haben

449

die Menschen gegen den geplanten Bau einer Autobahn zwischen Moskau und St. Petersburg gekämpft, weil dafür der Khimki-Wald abgeholzt werden soll, der zum Grünen Gürtel von Moskau gehört. Die Aktivisten haben vorübergehend einen Erfolg erreicht [4].

Im Dezember 2010 hat die Regierungskommission für Verkehr und Kommunikation entschieden, dass der Bau durch den Khimki-Wald weitergehen kann. Die Experten hatten elf alternative Autobahnrouten vorgeschlagen und von denen einige billiger und kürzer waren, trotzdem wurden sie ignoriert.

Dann wurde es zu einem internationalen Thema gemacht. Heute unterstützen die Russen im ganzen Land die ökologischen Projekte, und bitten auch die Leute sie zu unterstützen.

Wegen der Größe Russlands können in einem Land gleichzeitig verschiedene lokale Situationen entstehen: Während in einen Gebieten man große Zuwächse verzeichnen kann, kommt es in infrastrukturell günstiger gelegenen Gebieten zu massiven, oft gesetzwüdrigen Übernutzungen.

Die effiziente Bewirtschaftung von Wäldern ist nur in dem Fall möglich, wenn die Eigentumsrechte am Wald vollständig geklärt, exklusiv, gesichert und übertragbar sind, sonst können Konflikte um Grenzen, Zutritt und Nutzen entstehen, und die Ressourcenallokation ineffizient gestaltet wird.

Eine Eigenschaft vieler Güter und Dienstleistungen von Wäldern ist, dass sie keine Märkte haben, die den Erhalt von Wäldern rentabel machen. Das ist großes Versäumnis für die Umweltschützer und die vorrangige Aufgabe des Waldschutzes.

Literaturverzeichnis

1. V Moskve. [Elektronnyi resurs]. – URL: http://www.newsmsk.com/ Zugrifsdatum 20. Oktober 2015.
2. Deutsche Welle. [Elektronnyi resurs]. – URL: http://www.dw.com/ru/ (Data obrashcheniya 23. Oktober 2015).
3. Ria Novosti. [Elektronnyi resurs]. – URL: http://ria.ru/ Zugrifsdatum 20. Oktober 2015.
4. Moskauer Komsomolec. [Elektronnyi resurs]. – URL: http://www.mk.ru/ Zugrifsdatum 20. Oktober 2015.

450

5. Greenpeace Suisse. [Elektronnyi resurs]. – URL: http://www.greenpeace.org/switzerland/fr/ Zugrifsdatum 23. Oktober 2015.

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THE ENVIRONMENTAL IMPACT OF FOOTBALL

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Abstract: Football is the most popular team sport. It is played by 250 million players in 150 countries. However, nobody thought about its' environmental disadvantages until nowadays.
Key words:football, stadiums, water waste, huge amounts of electricity, garbage

Football is certainly the most popular team sport. It is played by 250 million players in 150 countries. People can play football everywhere, but the professionals do it at special stadiums with different capacities (up to 150.000 in Rungrado 1st of May Stadium, Pyongyang, North Korea). However, it was not thought about an environmental impact of a football match and everything that is related to a football club until today.

Football stadiums have a huge environmental impact. Just keeping a pitch in top condition requires regular watering, under-pitch heating to prevent freezing in the winter, and even the use of high-power lighting rigs to promote grass growth. It has been revealed that it takes 20,000 liters of water per day to maintain a football pitch in the English Premier League, and at Camp Nou, home of Champions League winners Barcelona, up to 54,000 liters of water are needed to irrigate the pitch on a hot day.

Floodlights, scoreboards and video screens have large electricity demands, while thousands of fans who travel to matches generate huge amounts of waste and carbon emissions travelling to and sustaining their big day out. There are also environmental impacts associated with the supply chains of football clubs' catering and merchandising outlets. Measuring the ecological footprint of FA cup final football game held at

451

Cardiff's Millennium Stadium in 2006 showed that a total of 59 tonnes of waste was generated by supporters and food and drink businesses in Cardiff.

It could have been worse with ecological situation in football world, if not the teams who think and somehow deal with this adverse side of football. There are many examples of how can a football club ease the ecological impact of the game

A 2008 survey by "Ethical Consumer" looked at the eco-credentials of clubs in the English Premier League and found that Manchester City was the greenest. Among its achievements, the team says it has reduced landfill by 85%, moved to electric vehicles at the ground, and used eco-friendly paper for match-day programs.

A simpler way for football teams to reduce greenhouse gas emissions is simply to cut down on waste. Last year, Norway's most successful team, Rosenborg BK, invested around $40,000 in energy-saving measures. It is not a huge investment, but it is enough to make a difference, and the club say the scheme will pay for itself by reducing energy expenditure

German club Nuremberg has a cistern that can hold 1,000 cubic meters of water at its home ground. The cistern stores rainwater that can be used to irrigate the pitch, but compared to most clubs' water consumption, it is just a drop in the ocean.

Dartford's Princes Park stadium, opened in 2006, has a capacity of just over 4,000, but it manages to incorporate some neat features. The stadium is covered with a "living roof" of plants that provide a natural air filtration system, gray water is supplied from two huge ponds near the stadium and solar panels are used to heat water for the toilets.

Home of BSC Young Boys football team, the Stade de Suisse won the 2005 European Solar Prize for its use of photovoltaic panels installed in its roof. The stadium roof now has more than 10,000 solar panels. Under peak sunlight conditions the panels can produce 1 million kWh of energy a year, saving 630 tons of carbon dioxide emissions each year.

To draw the conclusion, one can say that football will probably have to wait until the next generation of stadiums are built for features like solar panels, wind turbines and rainwater cisterns to become

452

commonplace. Nevertheless, for the past decade much has been done to reduce the ecological footprint of football culture.

References

1. Heledd Jenkins. The Environmental Impacts of Sport –The Case of Football (2012). Available at:http://www.cardiff.ac.uk/cplan/sites/default/files/CCS-EnvImpactsSport-Football.pdf (accessed 25 October, 2015)

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EL EFECTO DE LA MÚSICA PARA LA SALUD HUMANA

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Resumen: La música es una parte integral de muchas personas. La evidencia científica demuestra que no todo tipo de música tiene efectos beneficiosos en el cuerpo humano

Palabras clave: música, salud mental, método de la evaluación experta.

Abstract: Influence of music on people`s health is studied. Also the scientists approved that every style of music affects us differently.

Key words: music, mental health, method of expert evaluation.

Inroducción. La música es una parte integral de la vida de muchas personas. Alguien escucha música para pasar el tiempo, alguien - para relajarse, mientras que otros - para mejorar su estado de ánimo. En cualquier caso, escuchamos música porque nos trae emociones positivas.

Pero aquí surge una pregunta importante ¿ afectan igualmente a una persona todos los géneros de la música?

Se ha demostrado el impacto positivo de la música en el ser humano [1 p.2]. La música clásica es la más valiosa. El mayor sanador entre todos los compositores es Wolfgang Amadeus Mozart. Sus obras musicales tienen un enorme poder no sólo en la persona, sino también

453

en todos los seres vivos. Con su música las flores florecen más rápidamente [2 p.1].

Métodos y materiales. Pero no todo tipo de música tiene efectos beneficiosos en el cuerpo humano. Para estudiar los efectos de la música a la salud yo impleé el método de la evaluación experta. Me interesaban los encuestados de edad entre 18-21 anos, estudiantes de la univesidad, o sea, la gente jóven culta. Realicé comparación de 3 tipos de los encuestados. Para ello elaboré una lista que contenía 13 preguntas. Entrevisté a 30 personas de diferentes edades (Im.1).

Resultados

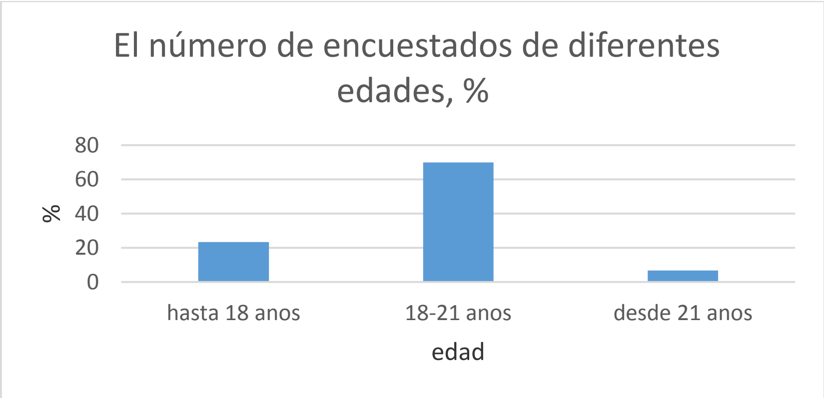

Figure 1. El número de personas entrevistadas de varias edades, %.

Las preferencias musicales de los encuestados están mostrados en la Im.2

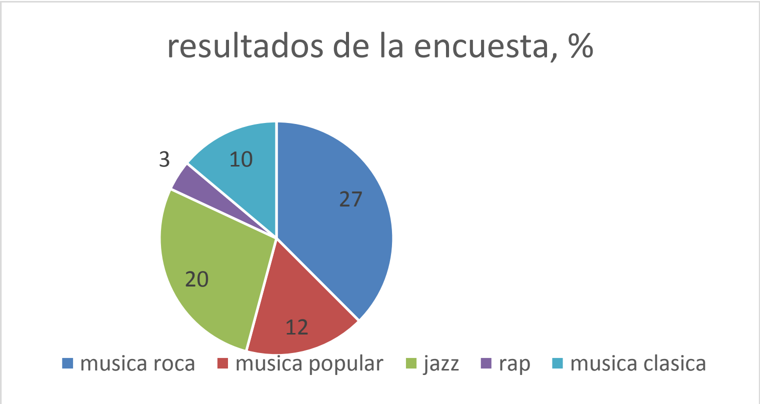

Figura 2. Resultados de la encuesta, %.

454

Así, entre 100% de los encuestados, la mayoría escucha rock, seguido de pop y jazz clásicos. Una minoría prefiere rap. Después de recibir los datos, consulté las preferenciaso reales de la gente encuestada.

Conclusión

Los resultados mostraron que la mayoría de ellos son verdaderos, lo cual es importante para una encuesta social. Como podemos ver, la música rock es mucho más popular entre los jóvenes en comparación con otros géneros de música.

La segunda etapa consistirá en determinar el estado mental de los encuestados.

La tercera etapa del experimento investigará los efectos que tiene música al cuerpo y el estado mental (salud psicológica de la persona) de los mismos encuestados.

Referencias

1. Zakharova N.N., Avdeev V.M. *Funktsional'nye izmeneniya tsentral'noi nervnoi sistemy pri vospriyatii muzyki* [Los cambios funcionales en el sistema nervioso central en la percepción de la música] //Zhurn. vyssh. nerv. deyat.–1982.–T. 32. Vyp. 5. – S. 915–929.
2. Ovchinnikova T. *Muzyka dlya zdorov'ya* [La música para salud]. SPb.: *Soyuz khudozhnikov* [Unión de Artistas]. 2004.

455

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PROBLEMATICA DE LA EVALUACIÓN DEL DESARROLLO SUSTENTABLE

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Resumen: Hoy en día se han observado varios intentos de construir indicadores como herramienta de comunicación para informar sobre el estado del medio ambiente en distintos países. Sin embargo, la dificultad para la aplicación de éstos ha sido un tema importante dentro de diferentes índices, como es el Índice de Rendimiento Ambiental (EPI).

Palabras clave: EPI Índice de Rendimiento Ambiental, analisis, indicadores, ecosistemas, salud ambiental, medio ambiente.

Abstract: Today we can see several attempts at building indicators as a communication tool to report on the state of the environment in different countries. However, the difficulty of implementing these has been an important theme in different indices, such as the Environmental Performance Index (EPI).

Key words: EPI Environmental Performance Index, analysis, indicators, ecosystems, environmental health, environment.

A pesar de más de 20 años de experiencia en la identificación de indicadores de desarrollo sostenible, hasta ahora no se ha desarrollado un sistema de puntuación estandarizado que se pueda caracterizar sobre la base de una sola tendencia de desarrollo sostenible del mundo y contribuir a la sostenibilidad global de políticas (regional y local).

El actual sistema de indicadores de desarrollo sostenible incluye cerca de 140 indicadores privados, cuyo cálculo se basa en un extenso material. Estos indicadores son en general suficientemente representativos y objetivos, pero su cálculo es posible sólo para un número limitado de países con sistema bien organizado de recopilación y mantenimiento de datos estadísticos sobre diversos aspectos de la vida (económico, social, ambiental). Para llevar a cabo un sistema con un modelo de medición de la sostenibilidad ambiental que sea perfecto,

456

es necesaria una muy detallada información. Es por eso que en los resultados se ha manifiestado la falta de comparabilidad de las calificaciones, la inexactitud de aproximación, la incapacidad de análisar los países e identificar sus tendencias de desarrollo.

En general, los requisitos de rendimiento y sistemas tradicionales se realizan en base a grandes volúmenes de información de gran dificultad. Por lo tanto, la complejidad hace que sea necesario operar con una serie de distintos indicadores. Lo que provoca distintos errores en la interpretación de los mismos.

Durante décadas, el Centro de Política y Ley Ambiental de la Universidad de Yale (Yale Center for Environmental Law and Policy), en conjunto con la Red de Información del Centro Internacional de Ciencias de la Tierra de la Universidad de Columbia, han elaborado indices internacionales de desarrollo de rendimiento ambiental. Sin embargo, evaluar el grado de sustentabilidad del medio ambiente sin indicadores cuantitativos es prácticamente imposible. En este caso se observan demasiados indicadores, algunos de los cuales son difíciles de formalizar o no pueden ser evaluados para cada país. El Índice de Rendimiento Ambiental (EPI - *Environmental Performance Index*) es un método de cuantificación y evaluación comparativa de los estados de política ambiental de distintos países del mundo.

Por política de medio ambiente se entiende una muy amplia gama de problemas que hay que resolver. EPI clasifica a los países en base al rendimiento en varias categorías, que se combinan en dos grupos: vitalidad de los ecosistemas y salud ambiental.

En la evaluación de estos grupos se tienen en cuenta los siguientes indicadores:

6. Efecto del ambiente en la salud
7. Agua potable y saneamiento
8. Calidad del aire en la salud
9. Contaminación del aire en ecosistemas
10. Recursos hídricos
11. Biodiversidad y hábitat
12. Cambio Climático (Gases efecto invernadero)
13. Recursos forestales
14. Recursos pesqueros
15. Recursos agrícolas

457

Todos los criterios de evaluación se pueden observar en el siguiente esquema. Entre paréntesis se menciona el valor porcentual relativo de cada indicador en cada categoría:

Según nuestra opinión, la distribución de los valores porcentuales esta incorrectemente definida, ya que no refleja el valor completo de cada categoría.

Dependiendo de cada indicador, el país recibe un puntaje. La cantidad de puntos depende de la posición dentro del rango - el puntaje minimo se expresa con la cifra 0 (en relación con la escala de 100 puntos como máximo) y el objetivo deseado (el equivalente a cien puntos). El objetivo deseado se puede establecer sobre la base de los acuerdos internacionales; normas de ciertas organizaciones internacionales; juicio profesional, lo que refleja el consenso científico, o de otras fuentes.

Sin embargo, a pesar del hecho de que el índice abarca muchos aspectos del desarrollo y recibe una extensa propagación a nivel mundial, hay varios problemas con su uso e interpretación de los resultados.

1. *Calidad de la información utilizada.* El índice está formado por dos grupos de parámetros, que a su vez se calculan con ayuda de la información primaria. Su calidad determina la objetividad de la evaluación y, de igual manera, la de las decisiones administrativas (políticas). Los conjuntos de datos utilizados para el cálculo EPI se basan en un número limitado de indicadores parciales, la selección de los que, a nuestro juicio, están débilmente fundamentados y no reflejan plenamente el estado del problema.

En dicho índice el aire se evalúa sólo a través de la presencia de indicadores de partículas PM 2,5, del número de la población, que se encuentra en constante contacto con el aire contaminado, y de la calidad del aire de los espacios interiores. Sin embargo, no tienen en cuenta los parámetros de contaminación del aire por otras sustancias peligrosas (como los contaminantes orgánicos definidos (COPs) en el marco del Convenio de Estocolmo).

El mismo método se aplica a la calidad de los recursos hídricos, donde se evalua sólo el acceso al agua potable, sin evaluar la calidad y el potencial de las reservas disponibles (de seguridad).

El cálculo de EPI incluye la evaluación de la explotación de los recursos pesqueros y la carga de la pesca en el área de las aguas

458

costeras (total de puntajes de la categoría "Pesca" - hasta un 10%), aunque, obviamente, dicho indicador no es relevante para todos los países.

Al mismo tiempo, en el índice la categoría de "Agricultura" es valorada hasta un 5%, a pesar de que la agricultura en los países proporciona la seguridad alimentaria, y para algunos de ellos es la base de la existencia. Cabe señalar que en la evaluación del desarrollo sostenible se da poca utilidad a las recomendaciones actuales de las organizaciones de las Naciones Unidas - UNESCO, la ONUDI y otros.

Los indicadores adicionales, en nuestra opinión, deben caracterizar el desarrollo sostenible del país, y de tal manera es necesario incluir evaluaciones integrales de la contaminación ambiental - aire, agua, suelo.

También, un problema importante es la falta de información y características del sistema educativo de los países. Este es el indicador más importante para comprender la dimensión social del desarrollo sostenible, sin el cual la evaluación es claramente incompleta.

Otro aspecto que merece consideración es la descripción de normalización del sistema nacional en el ámbito de la protección del medio ambiente.

El análisis de los problemas ambientales en los países en desarrollo sugiere problemas significativos en la regulación de normativas en la gestión ambiental. La investigación debe incluír problemas ambientales, el daño socioeconómico y el uso ineficiente de los recursos.

El desarrollo sostenible se considera desde el punto de vista de la estrategia «E4» [2] – *Economy, Environment, Energy, Education*. Sin embargo, en los indicadores incluidos para las evaluaciones en el índice EPI, no se observan las características del sector económico y el sector educativo. EPI proporciona una estimación de sólo una parte de la imagen necesaria (el estado ecológico de los territorios y la salud de la población).

De tal manera, la investigación muestra los efectos de las prácticas de gestión ambiental existentes en cada país y la práctica de las decisiones políticas, sin considerar las razones de estas (es decir, las características del desarrollo económico y de la educación como una condición de la gestión y conciencia ambiental).

459

Es necesario la extensión de los datos del índice EPI para desarrollar de mejor manera las características de los aspectos económicos de la gestión del medio ambiente y la educación en los países. Lo que es muy importante, ya que el desarrollo sostenible en cada país se forma con ayuda no sólo de los especialistas, sino que también de un nivel suficientemente alto de educación de la población (y por lo tanto la comprensión de los problemas ambientales).

2. *Métodos para el análisis cuantitativo de los datos originales.* Actualmente, en la unidad de investigación ecológica y económica se recomienda la utilización de estadística multivariante, la cual permite trabajar con información con un conjunto de datos multivariantes.[3-6]

En nuestra investigación se han realizado cálculos de control, que confirmaron los problemas anteriores: muchos de los indicadores muestran información no profundizada sobre la dinámica de los procesos que ocurren en los ecosistemas y en la esfera social. Por lo tanto, la evaluación [7] necesita una representación más objetiva a través del análisis de series de tiempo para cada país. También, es importante identificar indicadores cíclicos específicos y evaluaciones integradas. De tal manera es posible no sólo evaluar la contribución de los resultados primarios, sino también identificar vulnerabilidades en las evaluaciones ecológicas y sociales. Así los cálculos indican una clasificación más objetiva del ranking en comparación con EPI. Bajo los calculos del índice EPI no se observa la evaluación de informatividad de las caractertísticas utilizadas y de la identificación de parámetros duplicados e independientes. Los indicadores son condicional y práticamente iguales, que en teoría no es correto.

En nuestra investigación se han realizado una serie de técnicas de instrucción para evaluar el contenido de la información de las características y el desarrollo de sus correlaciones. En nuestra opinión, este es un punto fundamental para todos los tipos de investigación cuantitativa, sobre todo con la participación de la información sobre economía. La contabilización de las correlaciones permitirá de manera efectiva aplicar los criterios de desarrollo sostenible en la práctica. [8]

3. *Criterios para grupos de países en base a las caraterísticas con tendencia al desarrollo sostenible.* El análisis multivariado de los datos permitió producir una agrupación "natural" de los países en base a una serie de datos en bruto con el análisis de su contenido de información. De todas maneras, los grupos seleccionados se

460

modificarán en el proceso de rastreo de identificación de datos, lo que permitirá un enfoque más objetivo para establecer tendencias en el desarrollo sostenible y la estabilidad política de los países y sus regiones.

4. *La falta de ideas sobre el "estándar" de la sostenibilidad.* La selección de grupos de países que participan en el análisis está realizada sobre la base de un complejo de indicadores parciales utilizando métodos estadísticos multivariados. Para cada uno de estos grupos es posible la formación de un modelo "estándar", es decir la de un país caracterizado por valores de indicadores típicos (promedios). Los datos cuantitativos del "estándar" se requieren para el análisis comparativo. Así, en base a las características del grupo de países ecológicamente más exitosos (estables) se formará el "estándar" de un país - "un modelo a seguir".

Como resultado de esta investigación se podrán revelar los problemas de diferentes naturalezas, específicos para cada grupo de países.

5. *La aplicación práctica de los resultados.* EPI se calcula sobre la base de una cantidad significativa de datos de entrada y combina muchos aspectos del estado de cada país. Sin embargo, hasta hoy en día, el índice presenta sólo una función informativa, creando una imagén general de la situación en diferentes países de todo el mundo.

Aun así, sería razonable ampliar el uso del índice bajo los auspicios de las Naciones Unidas, utilizandolo en la base para desarrollar planes de trabajo para el mejoramiento de la situación en los respectivos países. Los grupos de países que se forman teniendo en cuenta los indicadores parciales de EPI, requieren enfoques específicos para mejorar la situación y la aplicación de los principios del desarrollo sostenible.

La experiencia de trabajo con diversa y compleja información utilizando diferentes métodos para el desarollo de esta, indica que antes de la aplicación del análisis estadístico es muy útil disponer de un análisis visual de las relaciones entre los parámetros de distribución de las características más esenciales de los objetos con el análisis de las relaciones dentro de cada grupo.

Todos los parametros han sido clasificados de acuerdo con el valor estimado del producto nacional bruto (PNB) per cápita. Esta

461

clasificación se basa en los criterios del Banco Mundial presentados en Internet[12]:

• Países con bajos ingresos: $ 1035 USD (o menos) por persona en un año

• Países con ingresos por debajo de la media: 1036 - 4085 USD.;

• Países con ingresos por encima de la media: 4086 - 12615 USD.;

• Países con altos ingresos: 12 616 USD (o más).

En base a esta clasificación fueron seleccionados los indicadores más informativos según nuestra opinión. Resultó que la clasificación del PNB del Banco Mundial claramente refleja tanto el indicador de "salud ecológica", como "la vitalidad de los ecosistemas", entre otros, como por ejemplo el nivel de educación.

Así, se confirmó el argumento expresado anteriormente sobre que la economía determina el desarrollo sostenible y el ingreso per cápita debería ser una prioridad en el desarrollo de evaluaciones del índice EPI.

También, se establecieron indicadores específicos para identificar los cambios dentro de los grupos seleccionadas de países. Se evaluaron las emisiones de CO_2 por KWH, de CO_2 per cápita, PIB (nominal) (lista de la ONU, mil millones. $.), densidad de la población (personas por km^2).

El índice de CO_2 per cápita. [9]

De acuerdo con este indicador, Chile ocupa el primer lugar (4,6) entre los estados con altos ingresos. Según el índice EPI ese país recibe 70 puntos, lo que indica una situación sostenible del medio ambiente. En este caso el valor del indicador de CO_2 per cápita y el índice EPI son similares. Según los resultado del indicador de emisiones de CO_2 per cápita Luxemburgo está en último lugar (20,9), lo que indica una emisión suficientemente alta de dióxido de carbono, a pesar de que el país prácticamente no tiene emisiones nocivas a la atmósfera. En este país las población es muy pequeña, por lo tanto las emisiones son producidas por los vehículos de motor y los servicios públicos. Según el índice EPI, este país ocupa el segundo lugar de cada cien que indica una falta de correspondencia entre el índice EPI y el indicador de emisiones de CO_2.

En el grupo de países con ingresos por encima del promedio Bolivia ocupa el primer lugar (1,6). Sin embargo, en el índice EPI, el

462

país latinoamericano recibió 50 puntos por las condiciones ambientales inestables. En este caso, hay una diferencia significativa entre el indicador y el índice EPI. En el mismo grupo Kazajstán ocupa el último lugar (15), lo que indica las altas emisiones de CO_2. Y en el índice EPI ese país tiene 51 puntos por la situación del medio ambiente en general. Al evaluar los resultados de los indicadores de emociones de CO_2 per cápita entre Bolivia y Kazajistán, se observa que las diferencias entre las puntuaciones con el índice EPI son muy significativas, ya que en Bolivia hay menos emisiones de CO_2 que en Kazajstán, pero Bolivia tuvó puntuaciones más bajas en el índice EPI que Kazajstán.

En cuanto al grupo de países con ingresos por debajo del promedio, Guatemala ocupa el primer lugar (0,7) en términos del indicador de CO_2 per cápita. Sin embargo, el país recibió 48 puntos en el índice EPI, lo que indica la discrepancia entre este índice y el indicador. Ucrania también pertenece al mismo grupo, en donde ocupa el décimo puesto (6,3). Pero en el índice EPI Ucrania recibió 49 puntos, aunque el valor del índice de CO2 per cápita es más alto que el de Guatemala.

En el grupo de bajos ingresos Nepal, Etiopía y Mozambique ocupan el primer lugar, ya que presentan emisiones insignificativas de CO_2 (0,2). En el índice EPI Nepal obtuvo 37 puntos, Etiopía - 39, Mozambique - 30. Si se comparan estos resultados con los valores de los países en términos del indicador de emisiones de CO_2 per cápita, entonces es posible notar diferencias entre los países respectivos. Marruecos es también miembro de este grupo y ocupa el décimo lugar (1,7). Pero en comparación con otros países del grupo el indicador de CO_2 de Marruecos ligeramente se diferencia de los otros valores. A este país en el índice EPI se le dio la calificación más alta entre los países que también pertenecen a este grupo (52 puntos), pero en términos de CO_2 per cápita en el país se observa la peor cantidad de emisiones de dióxido de carbono.

La densidad de población (habitantes por km2).[10]

En el grupo de países de ingresos altos, Australia está en el primer lugar con una densidad poblacional de 3 personas/km^2. Según el índice EPI Australia obtuvó 82 puntos. Aquí, el valor de este indicador y el índice EPI son bastante similares. El último lugar en el grupo de países de altos ingresos lo ocupa Japón (351 pers./km^2), lo que indica una alta sobrepoblación en el país. Este estado recibió 72 puntos en el

463

índice EPI. Por lo tanto, se puede decir que el valor del indicador de densidad coincide con la estimación obtenida de Japón. En cuanto a la densidad de la población de Alemania, Luxemburgo y Suiza no coinciden con sus puntuaciones del índice EPI, ya que en este consiguen un resultado positivo, pero en términos de densidad de población, estos países presentan exceso de población en los territorios. También, podemos decir que Australia según la densidad poblacional tiene el puntaje más alto (3 pers. / km^2), aún así obtuvó peor evaluación en el índice EPI que Suiza (200 pers. / km^2). Lo que expresa la diferencia entre este indicador y el índice EPI.

El primer lugar en el grupo de países con ingresos por encima del promedio lo obtuvó Kazajstán (6 pers. / km^2). Este país ocupa el lugar 84º en el índice EPI. Considerando la situación socio-económica del país, podemos decir que en este caso el valor del indicador de densidad poblacional coincide con la estimación del índice EPI (51) .En este mismo grupo de países se muestra la densidad de la población de China que es 143 pers. / km^2. Según el índice EPI, China recibió más puntos que Kazajstán. Lo que da a conocer la discrepancia entre los datos del indicador y el índice EPI.

Mongolia pertenece al grupo de países con ingresos por debajo de la media, y ocupa el primer lugar en términos de densidad de población (2 pers. / km^2). El país presenta la densidad de población más baja entre los países de los otros grupos. El país recibió 45 puntos en el índice EPI, lo que indica la falta de sostenibilidad de la situación ecológica en el país. De hecho, Mongolia es uno de los países más "limpios" y el índice más bien refleja la dimensión social de la viabilidad del sistema y en una pequeña parte la del medio ambiente. India obtuvo 30 puntos en el índice EPI, y su densidad de población es de 420 pers./km^2. Esto habla de una falta de distinción entre el indicador y el índice EPI.

Uno de los países de más bajos ingresos es Bangladesh. Este país es el que tiene la mayor densidad de población. Esto indica la inestabilidad de la situación social y ambiental en el país. El estado actual del país también se refleja en el índice EPI (26 puntos).

Indicador PIB (nominal).[11]

Según los términos del PIB (nominal) Estados Unidos ocupa el primer lugar, lo que indica un alto nivel de desarrollo económico del estado. Sin embargo, en el índice EPI a este país le dan sólo 68 puntos

464

por su actual estado de la situación del medio ambiente. Por lo tanto, existen diferencias significativas entre el valor del PIB y el índice EPI. En el mismo grupo de países Luxemburgo está en último lugar del indicador PIB (60,1 millardos de dólares). Pero el desempeño ambiental es óptimo según el índice EPI (83 puntos). Estos valores coinciden entre sí.

México ocupa el primer lugar en el grupo de países con ingresos por encima de la media (1259 millardos dólares). Pero en el índice EPI ocupa un lugar con 55 puntos. En este caso, las diferencias entre los valores del PIB y el índice EPI no son similiares. Bolivia en este grupo es el país con el valor de PIB más bajo (30,6 millardos de dólares. Dólares). Su estado nacional en términos socioecologicos y de la economía también se refleja en el índice EPI (50 puntos). A pesar del hecho de que India ocupa uno de los últimos lugares en el índice EPI, el país tiene el valor más alto del PIB (1938 millardos dólares) en el grupo de países con ingresos por debajo de la media. Los países de este grupo presentan los resultados promedio del índice EPI, lo que indica la falta de desarrollo del rendimiento ambiental en estos. Esta situación también se observa con la ayuda dei indicador PIB.

En el índice EPI Haití obtiene el puesto número 176 de 178, y en el indicador PIB ocupa el último lugar. Esto muestra la situación crítica del rendimiento medioambiental en el país. También, podemos decir que entre el PIB y el índice EPI hay una coincidencia notable de los resultados en relación con Haití. Nigeria, así como Haití se encuentra en el grupo de países de bajos ingresos. Este país ocupa el pirmer puesto según el indicador PIB. Nigeria, en comparación con el resto de los países del grupo, también tiene un buen lugar en el índice EPI ganando 39 puntos. Sin embargo, la relación entre el PIB y el índice EPI en este grupo destaca diferencias. El valor del PIB de Bangladesh deja al país en el segundo lugar (154 millardos de dólares. Dólares), pero en el índice EPI este ocupa el penúltimo lugar (26 puntos).

El análisis relizado muestra claramente la necesidad de una investigación entre las relaciones de los indicadores de la selección general de los países y la selección grupal de estos. El análisis nos permite formular propuestas para la optimización del sistema de evaluación:

465

1. La expansión de áreas evaluativas: la inclusión de las características de los aspectos económicos de la gestión del medio ambiente y la educación en los países.

2. La ampliación de los indicadores en la evaluación de los grupos existentes incluyendo indicadores de componentes contaminadores del medio ambiente.

3. El uso del análisis estadístico multivariado para el procesamiento de datos y la selección de los grupos de países, así como para la formación de los modelos de "países estándares" y las listas de problemas comunes para los grupos de países.

4. La formación de los mapas de carreteras basado en los problemas asignados y específicos para cada grupo de países.

Referencias

1. Environmental Performance Index - [Documento electrónico]. – http://epi.yale.edu/. – Revisado 16.01.15
2. Zidanšek A. Sustainable development and happiness in nations //Energy. – 2007. – Т. 32. – №. 6. – С. 891-897.
3. Thinh N. X. et al. Evaluation of urban land-use structures with a view to sustainable development //Environmental Impact Assessment Review. – 2002. – Т. 22. – №. 5. – С. 475-492
4. Roelandt T. J. A., Den Hertog P. Cluster analysis and cluster-based policy making in OECD countries: an introduction to the theme //Boosting innovation: The cluster approach. – 1999. – С. 9-23.
5. Redina M.M. *Ekologo-ekonomicheskaya diagnostika ustoichivosti predpriyatii neftegazovogo kompleksa* [Ecological and economic stability of the enterprises Diagnostics of oil and gas complex] – M.: RUDN, 2011. – 168 s.
6. Khaustov A. P., Redina M. M. *Ekologicheskaya otsenka effektivnosti proizvodstva (informatsionnoe obespechenie ekologo-ekonomicheskogo analiza)* [Environmental assessment of production efficiency (information support of ecological and economic analysis)] //*Ekonomika prirodopol'zovaniya* [Environmental economics]. – 1999. – №. 3. – S. 2-24.
7. Summary for policymakers – http://epi.yale.edu/files/2014_summary_for_policymakers_fordownload.pdf. - Checked 16.01.15

466

8. Prigozhin I., Stengers I. *Poryadok iz khaosa: Novyi dialog cheloveka s prirodoi. Per. s angl.*[Order out of Chaos: Man's New Dialogue with Nature.] //M.: KomKniga. – 2005.
9. Índice de CO_2 per cápita. http://datos.bancomundial.org/indicador/EN.ATM.CO2E.PC
10. Densidad de población (habitantes por km2).http://data.worldbank.org/indicator/EN.POP.DNST
11. Indicador PIB (nominal). https://ru.wikipedia.org/wiki/
12. Producto nacional bruto (PNB) per cápita. Banco Mundial http://data.worldbank.org/about/country-and-lending-groups

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"NORD STREAM" - A RELIABLE AND EFFICIENT SUPPLY ROUTE FOR RUSSIAN GAS TO EUROPE

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Abstract: Nord Stream is the gas pipeline with theannual capacity of 55 billion cubic meters of gas, transporting the natural gas from Russia to Europe through the Baltic Sea.

Key words: gas pipeline, environmentally sound channels, eco-friendly supply route, environmental monitoring, multi-national.

Gazprom has been constructing a gas pipeline in unison with the European consumers to provide Europe with Russian gas. It is noted that Nord Stream line has served as a safe, reliable and environmentally sound transport route for the first supplies of Russian gas to the EU with the annual capacity of 27.5 billion cubic meters that was launched in 2011.

Nord Stream is the gas pipeline running from Russia to Europe and bypassing transit countries and therefore, being one of the most reliable and effective channels of the Russian gas supply to the European consumers [1].

467

Figure 1. European Gas Pipeline System

The Baltic Sea is inhabited by unique types of flora and fauna. The numerous assessments of the potential impact of human activity on the surroundings were made, including studies of the seabed, flora, fauna, salinity of water and others. All the data was carefully studied and all countries reported finding potentially dangerous objects, which could cause difficulties bypassing transit. The findings were summarized in the materials assessing the environmental impacts and the most eco-friendly route. Optimal design and effective measures to mitigate the impact on the environment were selected by experts. Eventually, five transit countries – Russia, Finland, Sweden, Denmark and Germany gave the license for construction of the pipeline [2]. More than 6,000 kilometres of large-diameter gas pipelines were laid in the North Sea alone. Some of them have been in use since 1970. They show that offshore pipelines like Nord Stream are a proven technology.

The construction of the pipeline went strictly in accordance with international and national standards of safety construction of pipeline systems and was certified as a safe route of gas supply by the certification body Det Norway Norske Veritas (DNV). According to experts, all partners in the project had the necessary experience and a great track record in similar projects [3].

The program of environmental monitoring was developed for each of the 5 countries located on the shores of the Baltic Sea for a precise assessment of impact of the construction of the pipeline on the environment. The program of monitoring included all possible

468

ecological factors, such as research of ocean water and water in the coastal areas, lower streams, water resources, flora and fauna of coastal zones and restitution of a seabed. This monitoring also included the social and economic aspects of potential impact on the cultural heritage. All the reports were submitted by the federal government annually [4].

Summing up the results, it is told that direct routes of gas transportation, in particular Nord Stream, play a key role in strengthening the reliability of export supply of natural gas for the country. Also the construction of the gas pipeline Nord Stream II has a strategic importance for this export route, and for the improvement of the reliability of gas supply to Europe. At the present moment, the current project is capable of transportation of 100 billion cubic meters of Russian natural gas to the European Union [2].

Today, Russia faces serious international problems between transiting countries. According to the latest reports, Gazprom also wants to leave Ukraine as a transit state by 2019. Most of Gazprom's long-term contracts with specific delivery points (such as the Ukrainian-Slovak border) will require adjustments if Russia withdraws from the TRANS-Ukrainian export routes. On the one hand, the transit of Russian gas to Europe is possible through the 'Urengoy-Pomary-Uzhgorod' pipeline system, which can carry more than 100 billion cubic meters of natural gas. On the other hand, construction of TurkStream and Nord Stream II at the same time would eliminate the need for transit of natural gas through Ukraine completely [5].

According to the German vice-chancellor Sigmer Gabriel, the political situation should not affect the construction of Nord Stream II. Anyway, the project is facing obstacles, as the EU declared, that the existing gas pipelines from Russia are more than enough. The commission also expressed support of Ukraine as the reliable transit country [6].

According to Vladimir Putin: *"German authorities should have the final say in all legal issues. If we succeed, any external influence will be ruled out," said Gabriel, adding that political influence on gas projects was the biggest concern In order to limit political interference in these questions, it is necessary to settle the role of Ukraine as a transit country...This has technical reasons, and you know that the gas transportation system in Ukraine is not in a very good condition," he added* [6]. This Russian-German project has already turned into a

469

multi-national European project which is aimed at solving urgent energy problems in Europe. He is firmly convinced this project will contribute to the development of both Russian and European economies [5].

References

1. Direct Gas Transmission Routes Add to Reliability of Supplies (2015). Available at: http://www.gazprom.com/press/news/2015/april/article225752/ (accessed 31 October 2015).
2. Nord Stream – Reliable and Efficient Route of Russian Natural Gas Supplies to Europe (2015). Available at: http://www.gazprom.com/press/news/2015/april/article223865/ (accessed 31 October 2015).
3. Nord Stream 2 to Increase Reliability of Gas Supply to Europe (2015). Available at: http://www.gazprom.com/press/news/2015/october/article249853/ (accessed 31 October 2015).
4. Vital Ecological Data (2015). Available at: http://www.nord-stream.com/environment/environmental-monitoring/ (accessed 31 October 2015).
5. http://sputniknews.com/business/20151013/1028449828/Putin-Nord-Stream.html
6. Germany Says Ditch Politics over Nord Stream-2 (2015). Available at: https://www.rt.com/business/320029-germany-nord-stream-gas-russia/ (accessed 31 October 2015).

470

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ECOLOGICAL PROBLEMS OF RUSSIA

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Abstract: Four analyzed text-books show that air and water pollution, soil contamination and municipal waste disposal are urgent for the theoretical ecology in Russia today and are taught in the ecological schools. Possible outcomes are discussed.
Key words: environmental issues of Russia, text-books on theoretical ecology.

Four currently used text-books are the subject of the present analysis [1; 2; 3; 4].

Economic issues. Despite the decline in economy and implementation of a number of conservation measures at both the federal and regional levels, the environmental situation in the most populated and industrialized areas of the country remains declined, and pollution of the environment is high. In recent years little attention has been paid to environmental problems by the government: reduced government support for conservation, permanent reorganization (accompanied by reduction in the status and the reduction in the number of staff and volume of budgeting) have set the national system of nature protection in critical situation. Existing economic mechanisms of nature protection are ineffective primarily because they do not create incentives for efficient use of resources and energy saving technologies, and do not provide sufficient funds from payments for emissions and discharges, waste disposal and use of natural resources to finance conservation activities on the required scale.

Air. The most numerous group of population (15 million people) are exposed to suspended solids, the second place is taken by benzopyrene with 14 million people being exposed to it. More than 5 mln. people live in the areas with the high concentration of nitrogen dioxide in the air as well as hydrogen fluoride, carbon disulfide, more than 4 million people – formaldehyde and carbon monoxide, more than 3 million men – ammonia, styrene. A significant part of the population

471

(over 1 million people) is exposed to elevated concentrations of benzene, nitrous oxide, hydrogen sulfide, methyl mercaptan.

Water resources. Virtually all surface water sources in recent years have been exposed to contamination. In some regions the anthropogenic load has been exceeding the established standards for a long time, and the situation is critical. Among the major rivers of Russia the Volga, the Don, the Kuban, the Ob and the Yenisei have the greatest environmental problems. They are ranked as "contaminated".

Soils and land use. A part of Russian farmland is erosion-hazardous and subject to water and wind erosion of soil. They cover more than 125 million ha, including eroded ones - 54.1 million ha. Every third of a hectare of arable land and pastures is eroded and in need of implementation of measures of protection from degradation. Pollution and littering of the land are marked in 54% of the country. Cities change the environmental situation not only within their own borders. Over 90% of oil spills cause severe and largely irreversible damage to natural systems.

Flora and fauna. In regard to the level of 2006 the total volume of reforestation in Russia decreased by 344 thousand ha. It does not solve the problem of preservation of tundra vegetation, which occupies about a third of the territory of the Russian Federation. In the cities, the level of provision of green spaces per capita does not meet accepted standards. In 2007, the number of animals listed in Red Book of the Russian Federation increased by 1.6 times.

The use of mineral resources. In the mining sector, environmental protection measures are almost not funded. In the oil fields in 2007 there were more than 35 thousand accidents involving tightness of pipeline systems.

Environmental protection. In Russia there are many protected areas, such as nature reserves, national parks and reserves, which are designed to protect wildlife. At the moment, there are 101 Reserves in Russia with a total area of 33.5 million hectares or 335 thousand sq. km. But in Russia, there is a problem of poaching. Such animals as the polar bear, Amur tiger, Caucasian leopard, snow leopard and some others are almost extinct. Their destruction is largely due to illegal imports of animals killed abroad for their further implementation in the form of medicines, jewelry or clothing. Often poachers are people who have lost their jobs and can not be legally engaged in hunting or

472

fishing. But, anyway, to some extent the state is concerned about the state of affairs and takes measures for the conservation of biodiversity in Russia. In 2010, in St. Petersburg the Tiger Summit was held to discuss the problem of the dying tiger population in the Far East which is threatened by the intensive poaching and deforestation.

Russian Energy and Ecology. Inefficient and sometimes wasteful consumption and use of electric power in Russia in conjunction with the use of fuel minerals for its production also leads to numerous environmental problems. 68% of Russia's electricity is produced by burning fossil fuels. The Fuel Resources Ministry of Russia recognizes that the updated fuel and energy complex of the country would reduce carbon dioxide emissions by 25% if the economy is about $ 1 billion annually.

Municipal waste. According to the survey conducted by VTsIOM in November 2013, Russian citizens believe that waste is the major environmental problem in the country. Every year, Russia produced tens of millions of tons of household waste. In 2011 it formed 52.9 million tons, representing approximately 400 kg per person. The methods of waste management, currently used in Russia are ineffective and have a negative impact on the environment. In the EU, an average is of up to 60% recycled waste, while in Russia – 2-3% only.

Air and water pollution, soil contamination and municipal waste disposal in Russia today are discussed in the four text-books as well as possible outcomes are outlined.

References

1. Akimova T.A., Haskin V.V. Ecology – Man – Economy – Biota – Wednesday. Moscow: Unity Dan, 2001, 105 p.
2. Glukhov A.S. Ecological Bases of Ecology. St. Petersburg, 2002, 99 p.
3. Danilov–Danil'yan V.I., Zalikhanov M.Ch., Losev K.S. Environmental Safety. General Principles and the Russian Aspect. Moscow: MPPA BIMPA, 2007, 288 p.
4. Galperin M.V. Ecological Bases of Nature. 2003, 272 p.
5. Ilinykh I.A. Human Ecology. Gorno-Altaisk: RIO GAGU Publ., 2005, 136 p.

473

Quliyeva I.F.

THE MODERN CONDITION FOR USING NATURAL LANDSCAPES OF THE TALYSH MOUNTAINS FOR RECREATION PURPOSES

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Abstract: In the article, the complex factors of recreational resources are taken into consideration. The opportunities of appropriation of the area for recreation purposes are estimated. The modern situation of the use of recreation potential in the area has been investigated.

Keywords: recreational resources, assessment of recreational potential of the landscape, ecotourism, adventure tourism

The recreation economy is developing quickly in modern times as a sphere that arises from people`s physical, economic, social and psychological needs. The development of the recreation economy contributes to the improvement of the social condition of population, the improvement of health, increase of labour capacity and the growth of economy.

The recreation tourism concerning the scientific-technical progress that occurred from 50s of XX century was of special importance. This caused the expansion of the international relations, the development of the relaxation convenience in regions. Today, recreation-tourism service is one of the main spheres that expands the employment rate of the population and profits of the country.

Several researches were carried on in the sphere of the estimation and optimization of recreation resources of landscapes

474

in separate regions of Azerbaijan. The recreation resources of the north-eastern slope of the Minor Caucasus were studied by Y.A.Garibov, the shores of the Caspian sea were surveyed by V.Dargahov, etc. The recreation resources and landscape ecological potential of the Talysh mountains were not sufficiently investigated. Whereas,the Talysh mountains are one of the regions with the main recreation and ecotourism resources of our republic. The area has quite favourible conditions for tourism. The realization of large-scaled international projects and businessmen`s investing helps the growth of resort tourism.

The Talysh mountains are a separate physical-geographical region of Lankaran and differs from other regions for its geological and geomorphological structure. The Talysh mountains consist of three main mountain ranges and their parts being parallel to each other, stretching from the North-West to the South-East. Its relief rises from the absolute height of 200m to 2500m. Talysh range is the highest among the mountain ranges and the highest peaks Gomurgoy (2494m) and Gizyurdu (2435) are situated in this range. The relief is gradually lowering from the Talysh mountains towards the North-East and is replaced by Peshtasar and Burovar ranges. The Talysh mountains are one of the regions with many tourism-recreation opportunities. But in spite of this the low level of organization management and infrastructure make difficulties for the growth of tourism. At present situation it is necessary to choose areas with the suitable natural-geographical and historical cultural objects and to prepare the working plan by getting through the ecological and economical expertise for the development of resort-tourism in the region [1, p. 12].

Lankaran has a favourible condition for the development of tourism. Lankaran area with subtropical climate is one of the nicest parts of Azerbaijan,too. It is possible to watch birds of different species in Gizilagac sanctuary. So, there are more than 129 species of birds in this sanctuary with the area of 93 hectares. 12km apart from the city there is Istisu with importance of

475

treatment. Every year hundreds of people suffering from stomach and bowels diseases, joint aches come here. But it is a pity, a tourism centre having international standards wasn`t created in such an important place.

There are a lot of castles and temples reflecting the ancient history of Azerbaijan in Lankaran. Among them Ballabur castle is the most important. This ancient castle was built 7km apart from Lankaran, at the bottom of the Talysh mountains, on the left bank of the Lankaran river. It is possible to see all around looking from the castle built at the height of 1300-1400 metres from the sea level. The castle seems to have been used as an observation station in ancient times. Ballabur castle is supposed to be built in the 4th century of our era. Azeri archaeologists made excavations around this castle and attained important materials for our history. Several buildings dating to the middle ages in Ashagi Nuvedi, Sutamurdov, Shaglakuca, Kargalan, Separadi villages and other places in Lankaran keep their scientific-cultural significance. Generally, there are conditions for all types of the organization of tourism in Lankaran and Lerik. These places with the sea at one side, mountains, Talysh forests and green tea plantations at the other side can go ahead of the modern tourism contest. All these are typical for Lerik region with splendid nature and people living a long life. The health-resorts "Tabassum", "Xayal", "Meshabayi" and "Relax" in this region are very significant for the tourists to spend their leisure hours. The mountains full of snow, flowered plains, cool springs, religious places (Babagil, Cobir, Siyo-Tog) rocks attract tourists` attention. Thousands of people visit Lerik`s Babagil, Cobir, Siyo-Tog and other religious places from different parts of our republic. This plays important role in formation of our spiritual and moral values. At present Relax is considered to be the most magnificent resort of the republic. The activity of Relax is being made relevant to the world standards level. All conveniences were made for the rest of tourists. To increase tourists` information balance is very actual because the tourists wishing to see places of interest and

476

historical places dream of staying at the hotels with modern conveniences.

The natural landscapes of the Talysh mountains are suitable for the recreation, adventure tourism, ecotourism, rural-tourism and own rich recreation potential. It is possible to form vast tourism economy in this area by using these potential opportunities efficiently.

References

1. Aliev A.A., Gasanov G.K. "Landshafty Talysha". Baku. Nauka 1972.
2. Vugar Dergahov "Turisticheskie recrecionnie resursy poberejia Kaspiskogo morya". Baku 2003
3. Yagub Geribov "Optymyzacia estestvennih landshaftov Azerbaijanskoy Respubliky". Baku 2012

477

CONTENTS

478

ECOLOGY AND BIOSYSTEMS

479

ESSENTIAL ENVIRONMENTAL PROBLEMS OF REGIONS

480

WATER RESOURCES AND ECOLOGY:
MONITORING, POLLUTION AND RESTORATION

481

SOIL CONTAMINATION AND LANDSCAPE RESEARCH

482

ENERGY-SAVING, ENVIRONMENTALLY FRIENDLY CHEMICAL AND TECHNOLOGICAL PROCESSES

483

484

GREEN BUILDING

LEGAL AND ECONOMIC FRAMEWORK FOR ENVIRONMENTAL MANAGEMENT

485

ECOLOGY, POLITICS AND SOCIETY

486

ECOLOGICAL EDUCATION AND TRAINING IN ACTION

487

INDEX

1 = HUMAN ECOLOGY
2 = ECOLOGY AND BIOSYSTEMS
3 = ESSENTIAL ENVIRONMENTAL PROBLEMS OF REGIONS
4 = WATER RESOURCES AND ECOLOGY: MONITORING, POLLUTION AND RESTORATION
5 = SOIL CONTAMINATION AND LANDSCAPE RESEARCH
6 = ENERGY-SAVING, ENVIRONMENTALLY FRIENDLY CHEMICAL AND TECHNOLOGICAL PROCESSES
7 = GREEN BUILDING
8 = LEGAL AND ECONOMIC FRAMEWORK FOR ENVIRONMENTAL MANAGEMENT
9 = ECOLOGY, POLITICS AND SOCIETY
10 = ECOLOGICAL EDUCATION AND TRAINING IN ACTION
11 = ECOLINGUISTICS AND ENVIRONMENTAL DISCOURSE

488

489

490

491

492

493

494

495

Лукашова Кира Сергеевна т. 2-6
Лукина Юлия Сергеевна т. 2-3
Лунев Дмитрий Владимирович т. 1-1
Люк Мария Владимировна т. 2-1
Лямина Дарья Сергеевна т. 2-1
Ляшенко Елена Антоновна т. 2-3
Мазыгула Елена Дмитриевна т. 2-3
Макарова Марина Геннадиевна т. 2-3
Максимова Ольга Александровна т. 2-6
Мамаджанов Роман Хасанович т. 2-2
Маргарян Гагик Арменович т. 1-7
Маркелов Константин Алексеевич т. 2-6
Мартьянова Виталия Юрьевна т. 2-9
Масленникова Ольга Владимировна т. 1-1
Масса Джулия. т. 1-4
Махрова Ксения Сергеевна т. 2-3
Машкова Ирина Вячеславовна т. 2-2
Мейкшане Александра т. 1-8
Мейрамкулова Куляш Садыковна т 1-3
Мелешко Анна Александровна т.1-3
Меркушина Наталья Васильевна т 1-11
Мессай Абдельджалил т 1-6
Минакова Елена Анатольевна т 1-4
Михайличенко Ксения Юрьевна т 1-4
Михайлова Варвара Александровна т 2-2
Мишланова Юлия Леонидовна т 2- 2
Мойя Виктория Гальярдо т. 2-9
Мокроносова Марина Адольфовна т. 2-1
Мотакова Дарья Дмитриевна т. 2-4
Муканова Мадина Жумабеккызы т. 1-2
Мустафа Джавара т. 1-4 Mustafa Jawhara
Мухортова Оксана Владимировна т. 1-2
Мырзыгалиева Жанар Жумагуловна т. 1-3
Нарышкина Мария т. 1-3
Наянова Елизавета Александровна т. 1-3
Нгуен Ву Хоанг Фыонг т 1-1
Недялкова Кристина Юрьевна т. 2-6
Некрасова Марина Александровна т. 2-7

497

498

499

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