



**Eastern European  
Association of the Greens**

**The main environmental problems of Eastern Europe**

**Brussels, 2017**

<b>Contents</b>	<b>Pages</b>
<b>Introduction to Analytics</b>	<b>3</b>
<b>Climate Change</b>	<b>4</b>
<b>Stratospheric ozone depletion</b>	<b>6</b>
<b>The loss of biodiversity</b>	<b>9</b>
<b>Major accidents</b>	<b>12</b>
<b>Resource problem</b>	<b>14</b>
<b>Acidification</b>	<b>16</b>
<b>Tropospheric ozone and other photochemical oxidants</b>	<b>18</b>
<b>The management of freshwater resources</b>	<b>22</b>
<b>Forest degradation</b>	<b>23</b>
<b>Waste production and management</b>	<b>25</b>
<b>Urban stress</b>	<b>28</b>
<b>Chemical risk</b>	<b>29</b>
<b>Conclusion</b>	<b>30</b>

## Introduction to Analytics

The Eastern Europe region geographically includes the following countries: Belarus, Bulgaria, Hungary, Moldova, Poland, Romania, Russia, Ukraine, Czech Republic, Slovakia. But if we consider wider the list of countries related to this region may be bigger.

Analytical work is a generalized conclusion based on the study of media monitoring, reports and studies of the European Environment Agency (EEA), as well as environmentalist's expert opinions.

This analytical work highlights 13 issues of particular interest to Eastern Europe, paying special attention to the reasons for their emergence, as well as the goals and strategies that are being needed to solve these problems.

The Eastern Europe region includes the following countries: Belarus, Bulgaria, Hungary, Moldova, Poland, Romania, Russia, Ukraine, Czech Republic, Slovakia. The structure of these countries, their economic development etc. are different. Some of them are the members of the EU, and other not. That is why countries of Eastern Europe are not sufficiently represented in joint research programs of EU, in international discussions on climate change and in regional initiatives.

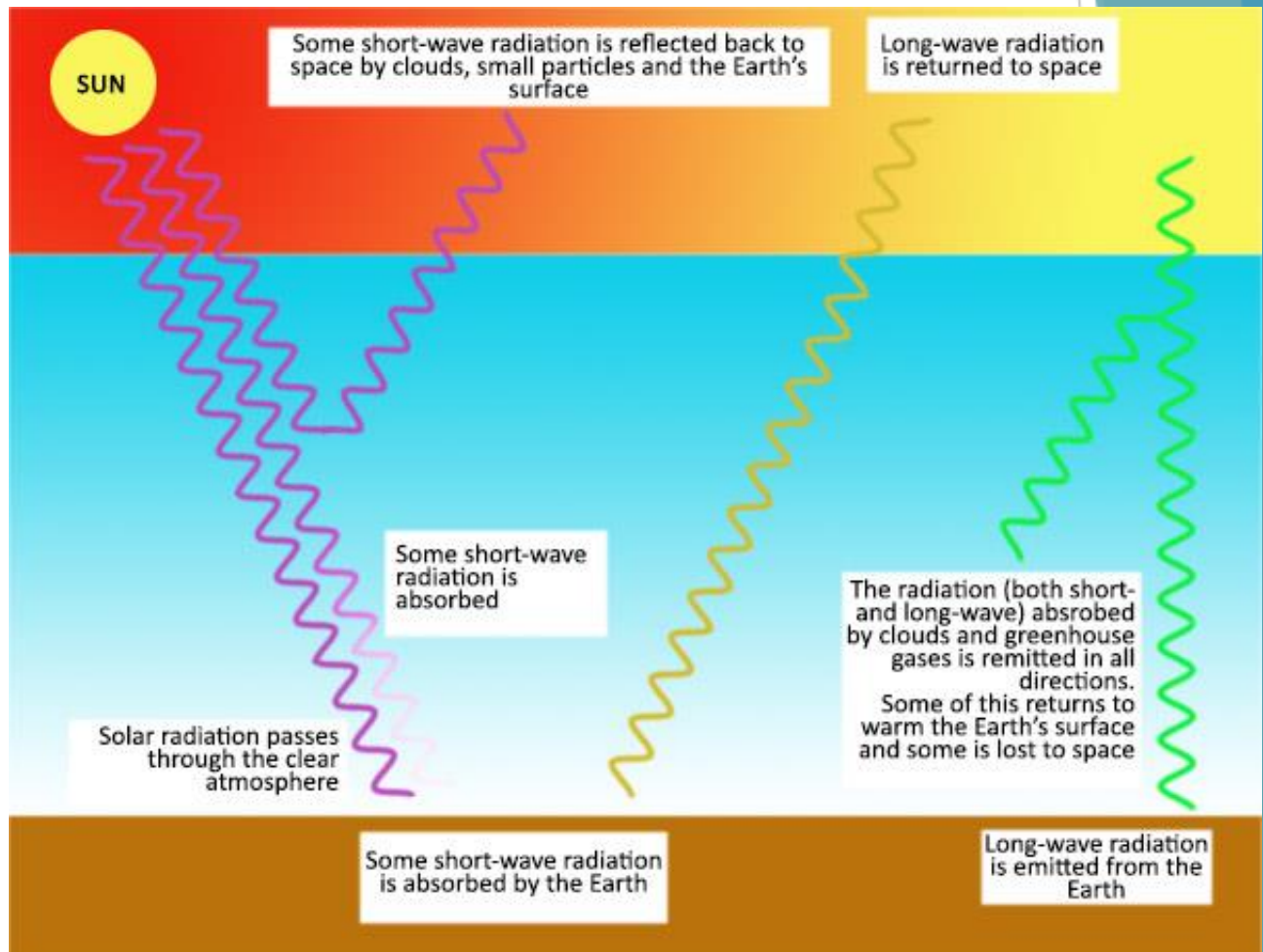
The main studies on climate change only cover a limited range of regions in Eastern Europe. The "green legislation" of the European Union focuses primarily on the problems facing the West European countries, and little attention is paid to the environmental situation of the countries of Eastern Europe. Therefore, to solve many issues related to sustainable environmental development, having a common past and future, the countries of Eastern Europe should consolidate to work together to develop a unified development strategy towards improving the ecology of their region.

Ecosystems and protected areas in Eastern Europe are in danger because of climate change and other stress factors. The consequences of climate change pose a threat to biodiversity on land and in large and small water objects - lakes, rivers and seas. Many species of animals and plants experience changes in their life cycles and migrate to the north and to the heights, while various invasive species have established or expanded their range of habitats and influences on the ecosystem. These changes affect various ecosystem and economic sectors, such as agriculture, forestry and fisheries.

Eastern Europe is also affected by the effects of climate change occurring outside Europe, due to the globalization of all processes: trade, infrastructure, geopolitical threats and threats to security and migration.

## Climate Change

The problem of the potential impact of the enhanced greenhouse effect in Europe is associated with an increase in the level of carbon dioxide in the atmosphere, which is already 50% higher than in the preindustrial period. International strategies and international experience should be applied to limit the temperature increase, taking into account changing climatic conditions, sea level rise, effects on hydrology, threats to ecosystems and land degradation.



Current forecasts refer to increase the concentration of carbon dioxide in the atmosphere by about two times by 2030. That will lead to a possible temperature increase by 1.5-4.5 °C.

Under the most optimistic forecasts, there will be an increase in temperature in winter by 2 °C, and in the summer by 2-3 °C in Eastern Europe.

Warm and wet winters will lead to floods increase.

Today's international strategies still do not consider the possible long-term aim to limit the temperature increase maximum by 0.1 °C per decade.

European Environment Agency (EEA) in its report researched the climate change negative consequences problem. Thus, the report says that the Southern and Western European regions

will suffer more from those changes, and heat and drought will be more extensive there.

It is the south and southeast that will face the greatest number of negative consequences. Those regions already experience considerable (even extreme) temperature increase and the decrease in the number of weather elements.

The report underlines that the climate change may be very harmful to the economy. Thus, in 1980 the loss resulted in by extreme natural disasters amounted to 40 billion Euro. And that is only for 33 EEA countries.

Scientists believe that the periods of anomalous heat, which have increased in recent years, are associated with a global increase in temperature, rising sea level and the melting of sea ice in the Arctic. In addition, the more and more often and intensive floods, hurricanes, and droughts occur. That all is resulted in by global climate change.

## Stratospheric ozone depletion

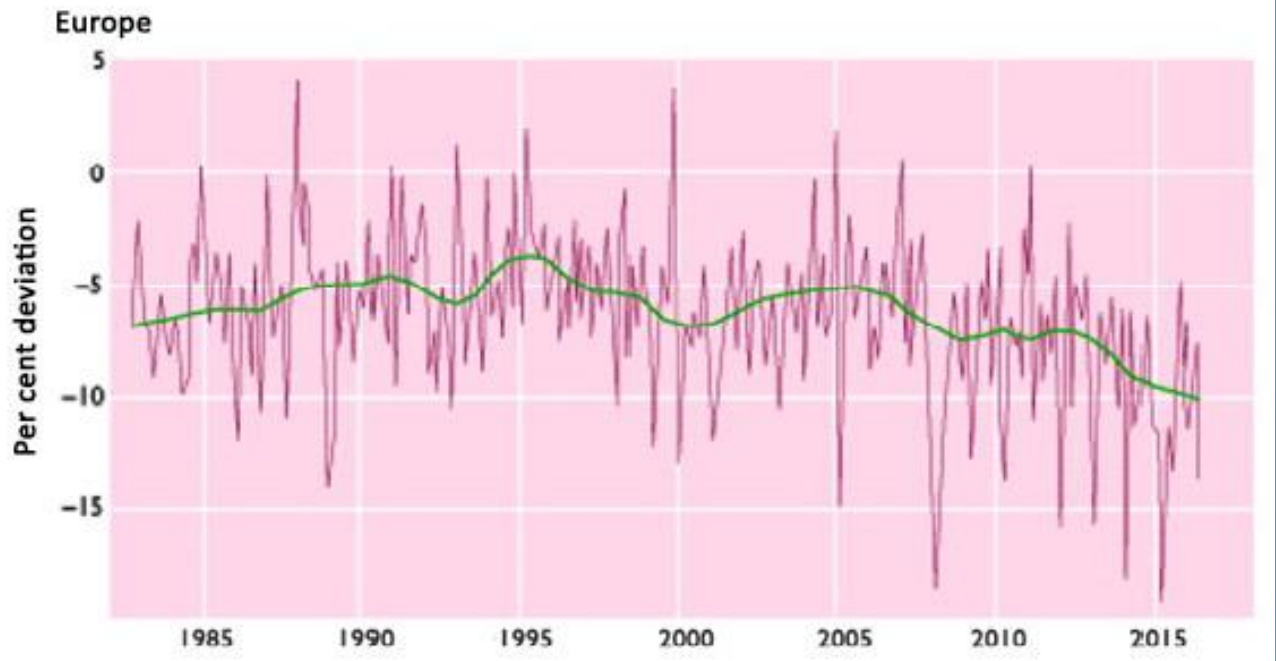
Stratospheric ozone depletion problem is still actual for Eastern Europe countries. Globalization processes make that problem common for the whole planet.

Stratospheric ozone depletion is caused by the release of the chemicals known as chloro- and bromofluorocarbons, used as refrigerants, industrial cleaners, foaming agents and fire extinguishers. The scientists analyzing that problem admit that the negative consequences are inevitable and include possible changes in atmospheric circulation and increased UV-B radiation on the Earth's surface. That may lead to increased levels of skin cancer, eye cataracts and effects on ecosystems and materials. The urgent measures are necessary to address that problem, and scientists are currently looking for options that may help to minimize ozone depletion.

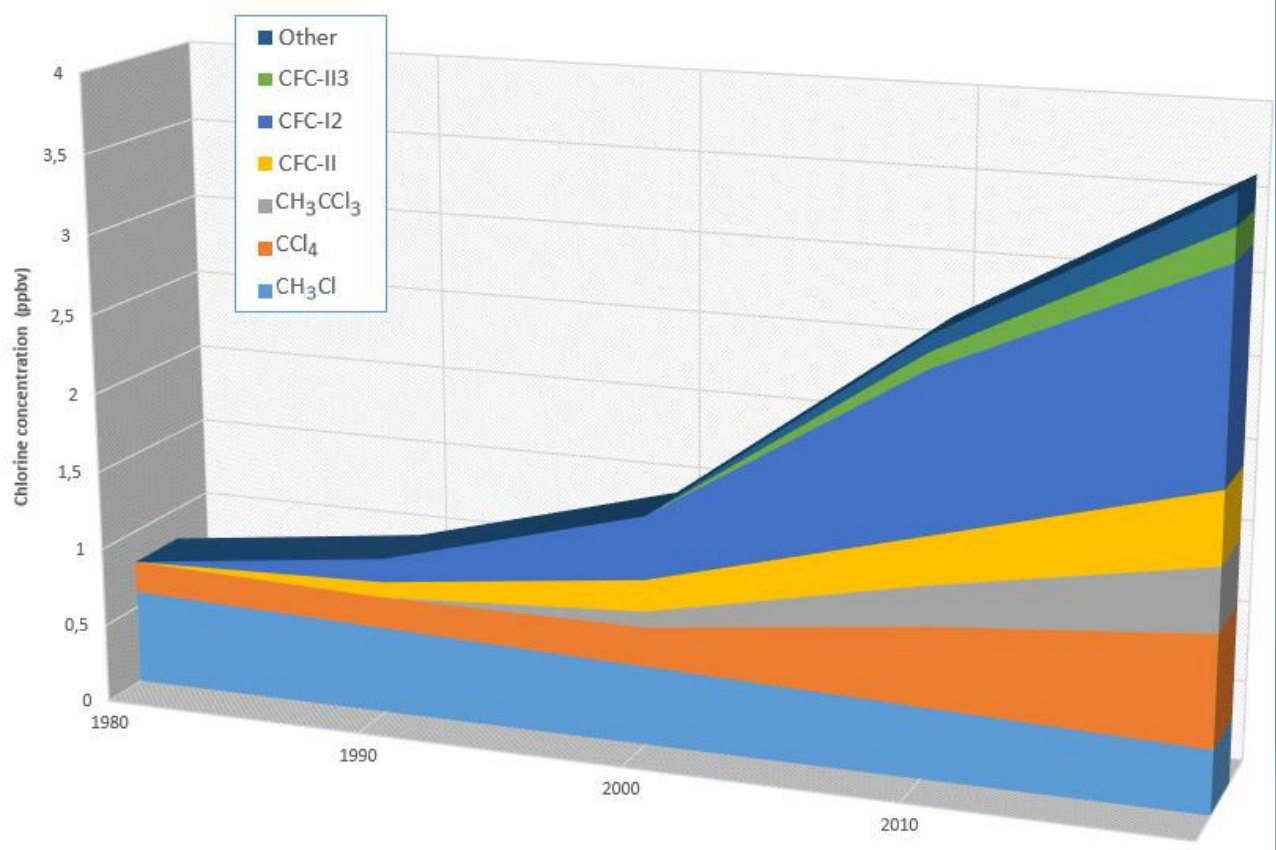
One more problem ecologists and climatologists are worried about is CO<sub>2</sub> (carbon acid) content in the atmosphere. Now, it amounts to about 336 shares/million. However, it was about 310-315 shares/million something 25 years ago. Anthropogenic emission of carbon dioxide into the atmosphere and the burning of mineral fuels lead to significant increase in CO<sub>2</sub> concentration.

UV radiation influence to living organisms.

1. Irradiation of DNA and cell membranes of microorganisms leads to a loss of orientation ability, which ultimately contributes to their death. It ultimately causes food chains destruction which is a serious environmental hazard to the organic world.
2. UVB-radiation negatively influences the growth of plants on land, their number and size, and photosynthetic reactions are suppressed. Therefore, even a slight decrease in ozone concentrations in the atmosphere leads to a sharp reduction in yield and population of the flora.
3. Most UVB irradiation is absorbed by water, but this process is limited. Photosynthesis is suppressed in phytoplankton and its productivity decreases. And in zooplankton, young organisms are particularly sensitive to radiation, in which pathological changes appear. Cases of mass death of individual communities and entire populations are not rare.
4. In large mammals, including humans, UVB radiation primarily affects the eyes, skin and immune system. In humans, that leads to such diseases and problems as conjunctivitis, cataracts, intense skin wrinkling (photoelastosis), skin burns (erythema), and the likelihood of skin cancer increases. That probability grows at 1-2% ozone level decrease. Thus, the death rate from skin cancer has already increased by 0.8-1.5%.



*Changes in average ozone concentrations in Europe*



*Estimated chlorine concentration in the atmosphere*

For example, the figures from the recent EEA report show that the annual damage to public health and the environment resulting from air pollution by European industrial enterprises exceeds 100 billion Euros (EEA, 2014t). That information is given for the whole Europe but we think that Eastern Europe is way more polluted. The damage caused by pollution is harmful not only

economically, but also in reducing the expected human lifetime expectancy. In many cities, large industrial enterprises are located in the urban zone. Poland is the largest European coal manufacturer. Every year, the country produces 75 million tons of coal, which means that carbon dioxide emissions into the atmosphere are colossal. More than a half of 50 poor ecology European cities are in Poland.

Over the past decade, the ozone concentration in the middle latitudes over Eastern Europe has decreased by 6-7%.

The whole of Europe throws out about a third of the substances destroying the ozone layer a year. And that is one third of total world amount.

It is assumed that by 2030, the mortality from skin cancer as a result of an increase in the level of exposure to UVB radiation will reach two cases per one million inhabitants.

Even if all the requirements of the London Amendment to the Montreal Protocol to the Vienna Convention are complied with, that will take at least 70 years before the depletion of the ozone layer stops.



## The loss of biodiversity

Reviews the extent of biological diversity in Eastern Europe, and the reasons for its decline on a continent where human influence is particularly pervasive.

There are many reasons for decreasing the diversity of animals and plants, and all of them are directly or indirectly caused by people:

- deforestation;
- expansion of settlements;
- regular emissions of harmful elements to the atmosphere;
- the transformation of natural landscapes into agricultural facilities;
- using chemicals in farming;
- water and soil pollution;
- road and communications construction;
- planet population growth which requires more food and habitation area;
- poaching;
- plant and animal species crossing experiments;
- ecosystems destruction;
- ecological disasters caused by people.

Today's rates of extinction are 100-1000 times higher than those of previous eras. Even if these rates remain at the same level and will not grow, then in 50-100 years the planet will lose from 25 to 50% of the current species diversity. Scientists call that the sixth extinction. It is characterized by an unprecedented and irreversible loss of species, mainly caused by human activities.

The destruction of the ozone layer and other negative changes in the atmosphere, as well as global climate change, only deepen the problem. The ozone layer, which, as the result of all those processes, becomes thin, more vulnerable and allows biologically active ultraviolet radiation to penetrate to the surface of the Earth. Thus, the ozone layer depletion leads to a more extensive damage to the living layer of the planet.

Scientists have already assessed the negative impact of global warming on the change of places of residence and the changing migration patterns of species. Ecologists underline that a large number of species of flora and fauna will be on the brink of extinction if the average world temperature rises by at least one degree. Also, our food production systems can be seriously affected.

Representation of natural European ecosystem groups: total area, and area where problems of management and stress pose a potential threat to biological diversity.

It should be remembered that in almost every European country has endemic species (which nowhere else are found). Now Europe is at the center of interstate efforts aimed to conserve biological diversity.

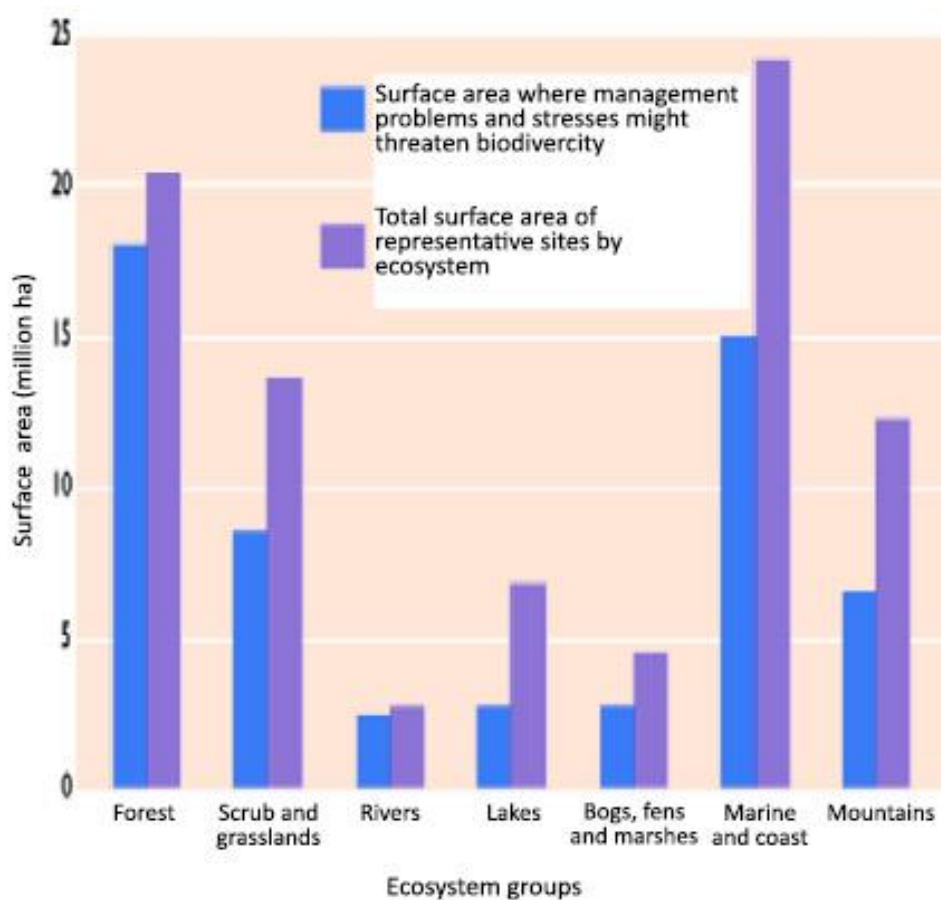
Due to the creation of a network of protected areas, a corresponding knowledge base is constantly being replenished for the conservation and monitoring of biological diversity.

However, we can not ignore the challenges that ecologists and climatologists are facing now.

Degradation of landscape, ecosystem and habitat in the region obviously leads to the fact that the general state of habitats and species does not show any improvement.

Protected areas can help to "slow down" the climate change processes. They prevent the transfer of natural habitats to other categories of land use - thus there is the possibility to avoid exceeding the carbon dioxide emissions standards. According to experts, about 15% of the world's carbon stocks of the earth's crust are in the world network of protected areas.

Statistics are disappointing: 52% of Europe's biological species currently have an unfavorable nature status (unsatisfactory or poor), 31% are not known, and only 17% of species have favorable status.



To improve that situation, European countries supported a number of internationally agreed commitments on biological diversity. For example, there is a Strategic Plan for Biodiversity for 2011-20 under the Convention on Biological Diversity. In addition, the European Union has developed a Biodiversity Strategy to 2020, which includes the following commitments:

- to stop the reduction of biological diversity in Europe by 2020;
- to protect, evaluate and restore services for the conservation of biological diversity and ecosystems in the EU by 2050;

It should be noted that in order to conserve biodiversity in Eastern Europe, it is necessary to support agro-ecological measures to preserve agricultural lands of high natural value, as well as support and development of protected areas. This can be done, for example, within the

framework of the European Union's "Natura 2000" program and programs implemented by non-EU countries (the "Natura 2000" program has been constantly developing over the past 15 years and currently covers more than 26,000 objects occupying 18% of the territory and water area of the European Union).

Moreover, in every country in Eastern Europe, the conservation of biological diversity is determined at the law-making level. Now, the figures in some Eastern European countries look different.

Russia is the richest country in terms of biodiversity. We must also mention its regions which do not belong to Eastern Europe. Siberia and Tundra are unique regions where, due to severe climatic conditions and anthropogenic activity, many species of fauna are at risk of extinction. For example, polar bears, which are rare animals on a global scale.

Bordering with Europe, the Pskov region is characterized by a variety of habitat conditions: coniferous and mixed forests, marshes, numerous lakes and rivers, floodplain and dry meadows - have determined the diversity of the animal world. There are 372 species of vertebrates in the region, of which 334 are terrestrial and 42 are aquatic animals. In general, the Red Lists of almost all regions of Russia list dozens of plant and animal species.

Ukrainian fauna, according to zoologists, has 44,800 species, of which 98.5% are invertebrates, including 20,000 species of mollusks. 800 species of vertebrates of which 108 species of mammals, 367 are birds, 21 are reptiles, 17 amphibians, 250 fish, and 12 other species. Ukrainian Red List contains 511 species of plants and 382 species of animals.

At the same time, Moldova, for example, ranks 55th out of 180 countries included in the Efficiency Index published by the Yale Center for Environmental Law & Policy. The environmental performance study measures the country's achievements in terms of the environmental conditions and the management of natural resources based on 22 indicators in 10 categories. Those categories reflect various aspects of the environment condition and the viability of its ecological systems, the preservation of biological diversity, the counteraction to climate change, the health status of the population, the practices of economic activity and the degree of its environmental burden, and the effectiveness of state environmental policy.

A number of objectives and strategies should ensure the conservation of biological diversity in the sustainable use of biological resources, including the implementation of the Cartagena Protocol on Biosafety to the Convention on Biological Diversity adopted in 2000 as part of the implementation of the provisions of the Convention on Biological Diversity. Since the ecological role of many species is in most cases is unknown, the most correct and wise decision is to observe the precautionary principle in order to avoid any actions that could lead to an unnecessary decrease in biological diversity.

## Major accidents

Technical accidents in Europe continue to occur, but in the last decade, the number of accidents with a large number of deaths has decreased. For example, if the situation has been greatly aggravated by disasters in the mines of Ukraine until the recent years, then the situation with the beginning of the conflict in the East of Ukraine changed dramatically.

Nevertheless, accidents at fields, large industrial enterprises, pipelines still occur. For example, a fire at the wells of the Alabushin oil and gas field in the Usinsk region of the Komi Republic in April 2017. According to the environmental organizations, 8,800 cubic meters of hydrogen sulfide are emitted daily from 8 April from two neighboring villages - Shchelyabozh and Kushor - since April 10th. Which, of course, poses a threat to people's lives.

In May 2017, a chemical leak occurred in the Brest Chemicals Plant in Belarus.

In August 2017, Mariupol was covered with a huge cloud of brown smoke. The release was caused by an accident on the converter of the Illich metallurgical plant. The law enforcement agencies are seriously concerned with the situation with violations of environmental legislation by metallurgical plants. While solving problems with the accident at the metallurgical giant, hundreds of kilograms of metal and coal dust were thrown into the air every day. Full replacement of filters at the metallurgical plant will be completed only in 2020.

Accidents on pipelines, that is, the leakage of liquid hydrocarbons into surface waters or their penetration into groundwater, as well as the gas release into the atmosphere, usually affect only the environment. Another major source of danger is oil spills in the water area. In such accidents, the impact is known to be of an ecological nature. Explosions on oil platforms have recently become more frequent and they occur annually. The result is dozens, or even hundreds, of deaths (as a rule, one or more people work at the plants at the same time), and the leakage of oil into the reservoir and the soil.

For example, in January 2017, an oil spill occurred in the water area of the Vladivostok seaport in Zolotoy Rog Bay. As a result of the operation to eliminate pollution, the water area of 800 square meters was cleaned, and about 100 liters of the oil-water mixture was collected.

In January, the devices of the Norwegian station Svanhovd, and then in Finnish in Rovaniemi recorded a slight increase in the level of the radioactive isotope iodine-131. Later, traces of iodine-131 were recorded in Poland, the Czech Republic, Germany, France and Spain. The causes of iodine-131 emission into the atmosphere in Europe have not been accurately determined.

In the EU countries, industrial accidents involving human factors or wear and tear of equipment happen more rarely because of a higher economic and social level of development. Nevertheless, extraordinary situations happen. The emergency occurred in one of the production facilities of Polické strojirny a.s. n, located in the town of Polička in the east of the Czech Republic. One of the tanks with a combustible substance exploded. Several dozen people were injured. The

situation was assessed as extremely serious. And in the Gulf of Riga in May of this year, there was a fire on Zircon tanker. Timely detection of accidents and rapid response can help to avoid human losses and prevent possible consequences for the environment.

Accidents at nuclear power plants are one more concern. After the Chernobyl accident in 1986, there were no such disasters in the territory of Eastern Europe. But its consequences are still felt by people of Ukraine, Belarus, and adjacent territories.

Nuclear safety is one of the priorities of the policy of states using that type of fuel. Certain problems of nuclear safety in Eastern Europe are solved within the framework of the assistance strategy from 24 countries.

Since the end of the last century, the number of nuclear installations in Europe has increased, and now in many countries, there are nuclear reactors that have expired or expire. Even though in recent years some Central European countries have declined to use atomic energy, its role in the energy supply system has not diminished. It should be noted that in recent years the safety of Soviet-designed reactors has improved. This can be explained, first, by the development of a culture of maintaining security, which was facilitated by the strengthened cooperation with Western European countries and significant investments in the development of reactors.

We should mention the problem of public trust in the nuclear industry due to a number of accidents at nuclear facilities and their consequences. The issue of using nuclear energy and responsible treatment with it, as a key to increasing public confidence and clean ecology, should be considered in more detail.

## Resource problem

In order to take climate change seriously and to stop oil production, it is necessary to promote more efficient use of energy, and to use renewable energy sources - wind and sun, introduce an environmentally friendly lifestyle. But that will not be enough to slow down the accumulation of carbon dioxide in the atmosphere and to meet the needs of modern industrial civilization, as well as the aspirations of developing countries. Nuclear energy needs to be developed quickly, so that it can replace coal, oil and gas in developed countries, and ultimately in developing countries.

The only feasible way for the future is to effectively combine energy conservation and renewable energy sources for low intensity use at the local level and use nuclear energy for electricity generation.

In the near future, nuclear power plants can provide electric power to electric vehicles, thereby reducing the negative impact on the environment. The use of new high-temperature reactors will allow the extraction of fresh water from the sea and ensure the hydrogen production.

It is important to understand that unwillingness of some organizations to protect the environment to the peaceful use of nuclear energy can become one mistake of our times.

Energy is required for the normal development and operation of industrial civilization, and 85% of the energy used in the world is provided by such fossil fuels as coal, oil, and gas. Coal began to be widely used after the forests could no longer meet the energy needs of the developing industry. Coal can be found in almost any region of the planet, and its reserves will be sufficient for several more centuries.

Oil began to be widely used at the end of the 19th century when it replaced whale oil, and since then its consumption has increased significantly. The discovery of new deposits does not completely compensate for the ever increasing volumes of oil consumption, so oil production will soon reach its peak. At the current rate of consumption, the available oil reserves should be sufficient for several decades, but only if the demand for this fuel does not increase even more. Nowadays, more than half of the world's oil production is concentrated in the fragile and politically unstable zone of the Persian Gulf.

As for gas, initially it was a by-product of oil production and it was simply let out or burned. With the further development of technologies, gas has become the main source of energy. Gas reserves are also limited and are designed for several decades.

The formation of fossil fuels occurred during long geological periods, but they will be completely depleted for several centuries (approximately from 1850 to 2100).

### **Ecological consequences:**

When burning fossil fuels, 23 billion tons of carbon dioxide are emitted into the atmosphere

every year - 730 tons per second. Half of this amount of gas is absorbed by the seas and vegetation, and half remains in the atmosphere. Because of that, the composition of the atmosphere changes significantly, which seriously affects the climate of our planet.

If we want our planet to continue to be suitable for life, to ensure modern comfortable conditions for humanity, and to develop an industrial civilization, we need to urgently change our way of life and find other sources of energy.

### **Mineral resources.**

By estimations of experts, by 2100 oil and natural gas reserves will be exhausted. What remains is coal and nuclear energy.

From the ecological point of view, the idea of increasing the volume of coal mining, the most polluting energy source on the planet that most contribute to global warming, is simply not acceptable. The process of capturing or isolating millions and billions of tons of carbon dioxide at this stage is only a pleasant dream, it is still not proven, and is unlikely to be widely used. The progressive European countries have already refused or are on the path of refusal or a significant reduction in the use of coal-fired power plants. France is one of such countries.

At the UN Climate Conference (COP23) in Bonn (Germany) in November 2017, the issue of non-use of coal was one of the main issues. At least 15 states expressed their readiness to join the international alliance Powering Past Coal, which calls for a gradual refusal to use coal in electricity generation by 2030. Among them are Great Britain, Canada, Denmark, Finland, Italy, France, Netherlands, Portugal, Belgium, Switzerland, New Zealand, Ethiopia, Chile, Mexico and the Republic of the Marshall Islands. The alliance was created by the United Kingdom, Canada and the Republic of the Marshall Islands, they aim to increase the number of participants to 50 by the next UN climate conference in 2018, which will be held in the Polish Katowice. The Eastern Europe countries should follow the same example.

## Acidification

Combustion of fossil fuels emits sulphur and nitrogen dioxides into the atmosphere where the gases are converted into acids which, after deposition, lead to a series of undesired changes in terrestrial and aquatic ecosystems. Thus, it causes the adverse chemical and biological effects found in lakes, soils and forests as a result of deposition of acidifying substances in amounts exceeding critical loads.

Acidification is one of the most wide-spread types of soil pollution in the Eastern Europe, where vast territories are contaminated, especially in Poland (10 million ha, taking into account natural acidification) and in Ukraine (about 11 million ha of agricultural land).

Nitrogen is a hazardous pollutant. It enters the environment out of three sources: as a result of laying manure (organic) into the arable land and pastures; using synthetic fertilizers in agriculture; and fallout of NO<sub>x</sub> and NH<sub>y</sub> of anthropogenic origin from the atmosphere.

Decomposition of organic matter and combustion of fossil fuels causes emissions of carbon monoxide, nitrogen and sulphur oxides are emitted in the atmosphere. As a result, pH of rain water can decrease down to 3.0-4.5. If soil buffer capacity is low, the rain water acidifies streams and lakes, which is often accompanied by the increased solubility of aluminium and heavy metals. Since 1800, the pH values have decreased by 0.5-1.5 in many parts of Europe. By 2100, pH will probably have decreased by one more unit. In the cases of drainage and cultivation of soils and sedimentary rocks, rich in sulphides (e.g. at conversion of mangrove brushwoods into fish ponds or at urbanization), the sulphuric acid, contained in the sulphides, causes pH decreasing down to 2.5, which leads to activation of aluminium, heavy metals and arsenic that are leached into the aquatic environment, causing significant reduction of biodiversity.

In Europe, 70-75% of nitrogen enters with synthetic nitrogen fertilizers, whereas in the world it is about 50%. However, only about a half of it is assimilated, while the other part is leached into surface and ground water or dissipated in the atmosphere. The nitrogen loss from manure accounts for 30-40%, whereas a half of this amount volatilizes in the form of ammonia. The yearly nitrogen emission in the atmosphere, caused by combustion of fossil fuels, accounts for 25 million tonnes.

In the forests and undisturbed ecosystems, atmospheric nitrogen is exclusively of anthropogenic origin. It can become a serious threat, notably for oligotrophic ecosystems.

The leached nitrogen researches show that contamination of ground water with nitrates occurs in many countries of the Eastern Europe as a result of using modern agricultural technologies.

Coniferous forests are being damaged in the Czech Republic, Poland and the Slovak Republic probably as a result of acidification and high concentrations of ozone and sulphur dioxide in the air. In Estonia, the air is severely polluted with sulphur dioxide from power plants in the North-East, working on shale tar. In Latvia, water and air pollution is caused by the lack of treatment facilities.



Acid deposition is expected to decrease in the Eastern Europe following emission reductions but in more than half the area, critical loads will still be exceeded.

- In Lithuania and Estonia, in the area of military bases the soils and ground water are contaminated with oil products and other chemicals.
- In Moldova, intensive use of agricultural chemicals is identified, including banned pesticides, such as DDT, which have contaminated the soils and ground water.

## Tropospheric ozone and other photochemical oxidants

Air pollution is a transfrontier environmental problem related to many pollutants of different impacts. Complex reactions that occur in the lower atmosphere producing oxidants such as ozone from the main precursors - nitrogen oxides, volatile organic compounds, methane and carbon monoxide. Levels of these oxidants are increasing, and are having adverse effects on human health. In the northern hemisphere ozone concentrations are expected to keep rising at 1% a year. No limiting goals have yet been set and the actions already undertaken are not thought to be sufficient in Europe.

WHO Air Quality Guidelines for ozone are frequently exceeded in most parts of Europe. In many cities, large industrial enterprises are located within city boundaries. In the bottom layer of the atmosphere, the main ozone source is photochemical reactions, which nitrogen oxides, volatile hydrocarbons (exhaust from motor vehicles and industrial emissions) and a row of other substances are taking part in. These components are called ozone precursors. Carried by the wind, they can spread hundreds of kilometers away.

There is no chemical in the atmosphere where the difference between actual and toxic levels is as marginal as that for ozone. At ground level, photochemical oxidants including ozone, can cause premature ageing of the lungs, eye, nose and throat irritation, chest discomfort, coughs and headaches.

For most cities, the air pollution still remains a severe problem. A significant part of urban population is affected by the concentration, exceeding the maximum permissible limits. The long-term average ozone concentration in the bottom layer of the atmosphere keeps rising, despite the fact that the short-term peak concentrations are decreasing. The impact of solid particles can constitute the greatest potential hazard for health in large cities, which is related to air pollution. In the countries of the Eastern Europe, air pollution still remains a serious problem and requires implementing more advanced methods, monitoring and assessment. Thus, in Moscow, about 95% of atmospheric air pollution with ozone precursors is caused by emissions from motor vehicles. This is the case in all large cities of the countries of the Eastern Europe. Greater than twofold content of hydrogen sulphide in the air is detected in Moscow regularly. The main air pollution sources in Moscow are motor vehicles and over 30 industrial enterprises, working with hazardous gases, including ammonia and chlorine. In Belarus, the city government is planning to have moved 19 enterprises out of the city boundaries by 2020, among them the Minsk Aircraft Repair Plant, Minsk-1 Airport and the yeast integrated works. At present, most of the industrial giants are still located along the banks of the Svislach river.

Despite the fact that for the past few years emissions in the countries of the Eastern Europe have been reduced significantly, mainly due to restructuring of the economy, conversion from coal to gas and more efficient desulphurization of emissions from power plants, the problem still remains actual for the inhabitants of the large cities. Gradual restructuring of the economy and conversion to cleaner fuels can enable the countries of the Eastern Europe to fulfill their

commitments concerning the maximum permissible limits of emissions. Implementation of EU legislation in the Eastern Europe will make it possible for the countries of this region to comply with all the maximum permissible limits of emission of all air pollutants, except ammonia.

Pursuant to the latest WHO report on atmospheric air pollution, the first place in the world, according to relative mortality caused by diseases related to air pollution, is occupied by Ukraine (120 deaths per 100,000 people), the second place - by Bulgaria (118 deaths per 100,000 people), while Belarus is on the third place and Russia - on the fourth one.

The British power company The Eco Experts has published a rating of toxic countries. The research covered 135 states. The goal of the research was to show it, how the toxicity level of a certain country affects the environment all over the world. The research utilized data of the World Health Organization and the International Energy Agency.

The toxicity of the countries was estimated according to five criteria:

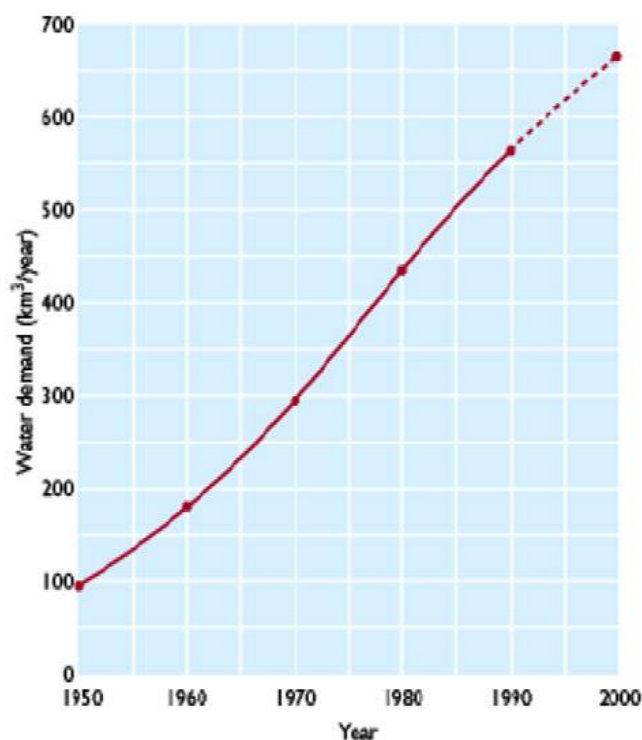
- energy consumption per head;
- emissions of carbon dioxide caused by fuel combustion;
- air pollution;
- number of deaths related to air pollution (per 100 people);
- utilization of renewable energy.

According to the research, the Republic of Moldova appeared to be less “toxic” than Russia and Ukraine, but a more polluted country than Romania, for instance.

At the same time, the Czech Republic lags behind its neighbours in EU according to the air purity parameter. Pursuant to the report of the European Environment Agency (EEA), the air in the territory of the Czech Republic keeps being one of the most polluted among the EU countries and constitutes serious hazard for health. In order to reduce the exhaust emissions, the government is planning to appropriate a budget for conversion to electric vehicles.

All over the world, about 3 million deaths a year are related to air pollution. 94% of such deaths are caused by noninfectious diseases, such as the stroke, the lung cancer, and the cardio-vascular diseases. The air pollution also increases the risk of acute respiratory infections.

## The management of freshwater resources



Water pollution and deterioration of aquatic habitats are severely hampering the use of water for human consumption and wildlife. This figure may reach 50 %.

Regarding water as an economic good could benefit water management through appropriate pricing.

Throughout the territory of the Eastern Europe, the quality of potable water keeps being a matter of concern, whereas significant microbiological contamination of potable water sources is still the case. More than 15% of population of the countries in the European Union are exposed to the potential risk of impact from microbiological and other contaminants, exceeding the maximum permissible concentrations. As a rule, the most difficult problems arise nearby “hot spots” of contamination of the environment, which are the result of a whole range of industrial and other activities.

The environmental stress is caused by the economic growth and revival of economy in some countries of the Eastern Europe.

The tension is generated by the needs of agriculture, notably irrigation, growing urbanization, continuous failure of the waste water to comply with the requirements and growth of recreation activity. Moreover, contamination with oil products appears to be the most significant in the Black Sea and the Sea of Azov.

For the past 30 to 40 years, high rates of direct water intake from the rivers and rapid growth of ground water extraction have been supporting the development of agriculture and the

socioeconomic sector, but not everywhere. This is only possible in those regions, where the alternative surface water resources are insufficient, unstable or too expensive.

However, in some countries of the Eastern Europe, the water resources have been renewed after their excessive usage was stopped.

For instance, since the middle 1980-s the intensive use of ground water resources in Hungary has lowered by one third. Thus, the ground water level in the countries of the Danube river basin, where it had lowered by 30 m, was eventually renewed. It happened due to the end of cavern ground water usage at mining operations in the early 90-s of the 20th century.

Whereas in Latvia, the intensive and imbalanced use of ground water resources led to depression - there appeared vast zones of lowered ground water levels in the catchment basin of the Liepāja (1000 km<sup>2</sup>) and the Riga (7000 km<sup>2</sup>). However, in the 90-s as well, after the water consumption had been reduced, the level of water rose back gradually. This was achieved due to taking measures of keeping record over water consumption and applying economic instruments.

The quality of potable water is still a matter of concern throughout the Eastern Europe. In most of the countries in this region, there are serious problems of microbiological contamination of the potable water supply systems. The percentage of samples that showed exceeding of microbiological standards varies from 5% to 30%. This factor is higher in the non-central potable water supply sources, especially in rural areas. It is supposed that at least a half of the population in the Russian Federation is exposed to the risk of contaminated water consumption as a result of obsolete infrastructures and high prices for disinfectants. In the aforementioned countries, there are also problems of contamination with poisonous chemicals and toxic metals along with reports of nitrate contamination.

There is a significant lack of comparable data about the quality of ground water in a range of countries. However, some information has been extracted from national environmental reports of the countries. Belarus states that, in general, its ground water resources are characterized by good quality. Furthermore, the general quality has increased for the past few years. At the same time, smaller (shallow) wells in rural areas of Belarus are seriously affected by nitrates.

About 75% of deep seated water-bearing beds in the Republic of Moldova show a high extent of natural salinity; therefore the water is subjected to pretreatment. Whereas 61% of small (shallow) wells in rural areas are exposed to severe nitrate contamination.

In the Russian Federation, nitrates are one of the main contaminants of ground water. In Ukraine, there is severe contamination caused by industry, mining operations and agriculture.

The regional distribution of problems concerning European water resource - such as the imbalance of water availability and demand, the destruction of aquatic habitats, and water pollution - is highlighted and discussed in relation to the pressures arising from human activities in the catchment areas. A series of sustainable goals for water resource management has been

proposed, along with the means of reaching them. Particular attention is devoted to the necessity of international cooperation for management of transboundary rivers.

## Forest degradation

The chapter focuses on two most important causes of forest degradation across Europe and, as a result, air pollution that seriously threatens the sustainability of forest resources in the Eastern Europe. The condition of forests is estimated on a yearly basis in 37 countries of Europe, taking part in the International Cooperative Programme on Assessment and Monitoring of Air Pollution Effects on Forests, established in 1985 by the United Nations Economic Commission for Europe (UNECE) within the Convention on Long-Range Transboundary Air Pollution (CLRTAP). The analysis of the damage is derived from large-scale spatial observations of European-wide surveys.

In the range of countries, such as the Republic of Moldova, Ukraine, Belarus and Russia, broad-leaved forests are dominating. The widest territories, occupied by the forests, are undoubtedly located in Russia. In the European region, the issue of deforestation is not of such a disastrous character as it is all over the world. However, it does not mean that this issue must be left aside.

The previously caused damage to the wildlife is hard to be recovered. Reduction of hunt areas and natural habitats has led to the threat of extinction for many types of animals, such as the Siberian tiger, the Amur leopard, the Pallas's cat etc.

A 2016 survey of 113 tree species in 34 European countries showed that 24% of trees were damaged in that defoliation exceeded 25%; 10% of trees were suffering from discoloration.

As much as 54% of the forests of the Czech Republic may have suffered irreversible damage.

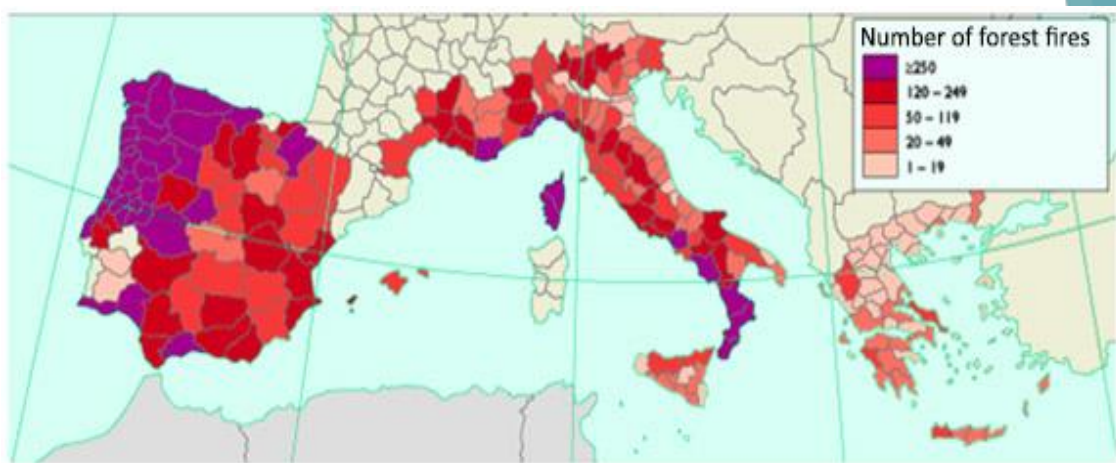
There are also fires among the causes of destruction of forest resources. For fires, causes are often related to socioeconomic factors which render the control of the causes complex since they often indicate conflicts and tensions in the overall system of land management.

An average of 700,000 ha of wooded land are burnt each year by a total of 60,000 fires in Europe.

74% of European forests have been destroyed as a result of the human activities. The Russian Federation excluded, only 5% of forests in Europe appear to be of natural origin, and 8% belong to plantations.

For the last year, deforestations in Poland and Romania have been a matter of great concern. Just in June 2016, the European Commission started a legal process against Poland in relation to felling trees in the Belovezhskaya Pushcha because of the damage, caused by the bark beetle. The Belovezhskaya Pushcha, divided by the border between Belarus and Poland, is the greatest preserve of the primeval forest in Europe.

In the Polish territory, there is Belovezhskaya Pushcha National Park, included into the UNESCO List of World Heritage Sites.



The massive drying of pine trees caused by the bark beetle is detected in the southern regions as well - in the territories of Brest and Gomel regions along with partial drying in Minsk and Mogilev regions of Belarus. The total area of the wooded land of Belarus, damaged by the bark beetle, accounts for 12.4 thousand hectares. Unofficially, the specialists compare the measures taken to “martial law” in the forests.

In Romania, deforestation practices or any other actions, “threatening the aquatic, forest or land resources”, are legally given the same status as the threat to national safety. This measure was preceded by the loss of wood that had been lasting for many years. Thus, for the past 20 years due to illegal deforestation Romania has lost about 80 million cubic meters of wood at a cost of around EUR 5 billion.

All the countries of the Eastern Europe, more or less, have to face similar problems. The illegal deforestation, carried out for the interest of business, the forest fires, the parasites (to a lesser extent), and the inefficiency of the state policy for protection of forest resources lead to gradual permanent degradation of the forest resources and, as a result, to the change of the whole ecosystem.



## Waste production and management

The increasingly severe problem is the one of waste disposal and processing caused by steady increases in both the quantity of wastes and in their toxic component. Despite increased emphasis on waste prevention and recycling, most European waste is disposed of by landfill and incineration. Waste control options are discussed, pointing out that in spite of progress achieved most waste still escapes control or avoids strict regulations by transfrontier movement across European countries or to developing ones. Strategies to minimize waste generation and ensure safe management are seen as crucial to move towards sustainable patterns of production and consumption.

Every year, Europe produces over 3000 million tonnes of waste. According to ecologists' calculations, it is about 6.3 tonnes per head in the countries of the Eastern Europe. In the Eastern Europe the situation is more diverse: In some countries (the Czech Republic, Hungary and Poland) the quantity of wastes has increased, although it has decreased in other countries (Estonia and the Slovak Republic). However, the limited data set prevents conducting accurate and correct assessment.

In the urban landfills, even medium-size cities accumulate hundreds of thousands tonnes of municipal waste annually. While decomposing, it poisons the air, the soil and the ground water and thereby turns into a serious hazard for the environment and the human beings. Process industry, construction and housebreaking, mining operations in mines and open pits along with agriculture are the main sources of waste.

Among the other wastes, causing as many problems, there are municipal wastes, wastes from out-of-use mechanized transport, waste water sediments, wastes from packaging and the waste, formed at power production.

The definitions of waste in different countries make it extremely difficult to compare total amounts of rubbish of any type. When the definitions of waste are changed in some countries, it is hard to conduct an analysis according to time series, except the cases when detailed information is available.

In the Eastern Europe, the indices of collected municipal waste are lower than in the Western Europe due to the difference in the level of economic resources and the nature of consumption. Moreover, the waste removal system can also vary from city to city.

A lot of parts of the Eastern Europe, mostly the rural areas, are not provided with the services of urban waste collection systems. On an average, this is leading to increase of the amount of municipal waste in these countries, despite the fact that it is currently lower than in the other parts of Europe.

The wastes from process industry include food waste, chemical, nonmetallic mineral materials, base metals, wood, paper etc.

The difference in waste composition from process industry is most likely influenced by a large share of paper industry in some of the countries.

The countries of the Eastern Europe are accumulating a greater quantity of wastes from chemical and steel industry. In 1980, the main waste source in five countries of the Eastern Europe was base metal production (the share of these wastes was 50%).

The process industry is able to play the main role in the process of waste reduction, as long as the following practice is implemented:

- implementation of a service life analysis into designing and manufacturing products and providing services;
- support of non-pernicious use of materials and energy;
- complete banning or reducing the use of substances and materials that are hazardous to human health and the environment.

At the same time, it is worth mentioning that the rubbish, produced by the mining industry in mines and open pits, constitutes a great part of all waste in Europe - over 20%.

The amount of this waste has reduced in Poland and Romania. Supposedly, this process was caused in these countries by the reduction of mine workings in mines and open pits.

The traditional way of waste disposal in the post-Soviet territory is burial in landfills, simply speaking - in dumps. It must be taken into account that burial is at the lowest stage of environmental ranking of waste disposal methods. However, this method is still predominating in Europe, and in a number of countries of the Eastern Europe the burial sites have insufficient capacity. Therefore, wastes, including the hazardous ones, are being stored and waiting to be recycled or disposed some other way. Thus, nowadays the landfill occupancy in Russia is at the level of about 70 to 90%. This is a disaster not only from the environmental point of view, but also from the economical one.

Hazardous waste is frequently stored in inappropriate conditions, which leads to an increased risk of affecting human health and contaminating the environment, as well as the risk of industrial emergencies. Though, two countries - Estonia and Latvia - are showing some success in solving this issue. These states have ensured safe storage of large amounts of obsolete pesticides, although the question of their further disposal is still open.

However, there is one more problem that is going to arise in the future. This problem means organization of standards for waste burial sites and closure of the sites that will fail to comply with these standards.

Since 2010, the conversion to a new form of statistical recording in Ukraine has made it possible to make significant, though not fully unambiguous, changes in the assessment of the waste situation. According to the aforementioned records, the annual amount of waste generation has

made 419.2 million tonnes, whereas the accumulated amount in the “specially designed sites or facilities” is 13.27 billion tonnes, which is much less than in the previous reports.

Nevertheless, a new paradox has arisen in the new version of the statistics. All the generated wastes are given a “hazardous” status, and according to their amount Ukraine has left behind the whole Europe and Russia altogether. Such a situation has occurred as a result of the Soviet legacy of waste gradation into four classes of hazard.

The further analysis shows that all the countries of Europe that have high absolute indices of waste generation “owe” this to mineral resource industry in the first place, i.e. mineral wastes.

In Bulgaria, it is caused by massive mining for lignites, in Estonia - for pyroshale etc.

Europe produces more than 250 million tonnes of municipal waste and more than 850 million tonnes of industrial waste annually.

In the OECD countries of Europe there are 10,000 annual transfrontier movements, totaling 2 million tonnes, of hazardous waste.

More than 55,000 contaminated sites have been registered in just six European countries, and the total contaminated area in Europe is estimated to be between 47,000 and 95,000 km<sup>2</sup> including 1000-3000 km<sup>2</sup> of contamination from landfill.

Prevention of waste generation can be defined as a necessary measure for designing materials, goods and services in such a way that, when they are being produced, used, recycled, reprocessed and disposed of upon expiry of their service life, there should remain the least possible amount of waste. This measure is a problem that is hard to solve, especially for the countries with developing economies.

Unfortunately, nowadays most of the countries of the Eastern Europe, particularly the ones in the post-Soviet territory, do not have a legal basis and experience in applying laws of this kind in order to stimulate the population to perform separate collection of waste, while insufficient capacity for waste recycling leads to sky-rocketing pollution of the environment. The solution to this problem lies in using efficient, waste-free and environmentally friendly technologies of waste recycling. Among them, it is worth mentioning waste incineration plants, capable of neutralization and disposal of municipal waste and, at the same time, generation of thermal and electric energy, thereby compensating significant costs of recycling itself.

## Urban stress

Urban areas in the Eastern Europe show increasing signs of environmental stress, notably in the form of poor air quality, excessive noise and traffic congestion. On the other hand, cities absorb increasing amounts of resources and produce increasing amounts of emissions and waste. Thus, the so-called urban stress occurs. There are massive urbanization processes, “death” of rural regions along with rapid growth and overpopulation of large cities going on. The last two points are about the countries of the post-Soviet territory. The rapid changes in the urban lifestyle and patterns of urban development, which have occurred in the last few decades, are showing the necessity of solving the problem of densely populated cities: improved urban planning; integrated transport management; efficient use of water, energy and materials; the setting of new standards and improvement of information.

Urban traffic is an increasingly important source of air pollution causing most of the summer smog in European cities. Whereas the WHO Air Quality Guidelines for ozone, nitrogen oxides and carbon monoxide are breached.

Urban transport accounts for about 30% of total energy use in most cities. A shift has occurred towards the use of the car which fulfils more than 80% of total mechanized transport.

## Chemical risk

Some environmental problems in Europe can be traced back to some form of excessive chemical loading. The goal is to reduce levels of chemicals in the environment to a target, low-risk level where only negligible harmful effects occur to both the population and the environment.

Prevention, recycling and processing of municipal waste are among the most regulated types of activity in Europe. Nevertheless, the amounts of wastes keep rising, despite the EU aiming to reduce them.

Compared with other regions of Europe, the eastern part of it suffers this problem most of all, whereby it exposes the surrounding regions to the same hazard. The industrial waste, which has been left since the times of socialism, is still causing environmental problems, such as contamination of ground water.

The absence of data on the existing chemicals and rapid technological changes, leading to appearance of new chemicals at the market, have been hampering assessment of the current situation and trends in Europe in the area of chemicals and wastes.

In the European countries, only 38 % of total amounts of wastes are being recycled or processed.

The average amount of waste per one inhabitant of the Eastern Europe is about 6 tonnes a year.

For the period from 1995 to 2017, the amount of processed municipal waste has increased more than twice, having risen from 17 % to 42 %.

By 2035, the estimated total amount of generated waste in the EU member countries will have increased by 60 to 84%, compared with the levels of 2003, though this forecast may be reviewed in relation to the current economic crisis.

In Russia, the mineral resource industry accounts for 90% of waste. About 26 % of total amount of waste in Russia are being processed.

The amount of obsolete pesticides in the countries of the former Soviet Union, the Southern Balkans and new member countries of the European Union, the Russian Federation and the Central Asia altogether may reach 256,000 – 263,000 tonnes, whereas the costs of their disposal may constitute USD 768 to 790.5 million.

Management of chemicals is the subject of 17 different multilateral agreements. Moreover, the Strategic Approach to International Chemicals Management (SAICM) was established in 2006. This political framework unites various interested parties and includes the objective to have achieved the safe management of chemicals all over the world by 2020.

In order to reduce chemical wastes and their impact on the environment, it is necessary to emphasize waste prevention along with recycling and processing.

## Conclusion

The region of Eastern Europe has its own peculiarities associated with a certain economic structure, the pace of development, and common past, but at the same time it is an integral part of the whole Europe. If we are talking about environmental problems, then we can say for sure that they are common for the whole world. It is possible to single out the main problematic issues pertaining to the environment that affect every resident of Eastern Europe:

- Air, water and soil pollution
- Depletion of biological diversity
- Changing of the climate
- Technogenic accidents and diversification of energy sources

Modern human activities lead to an inevitable climate change. Emissions of carbon dioxide from coal combustion, exhaust gases, overpopulation of urban areas, industrial deforestation, pesticides and chemical fertilizers, accidents occurring in factories and reservoirs, undervaluation of nuclear energy are all links of the same chain that together cause irreversible damage to our countries and to the whole Planet.

Climate change. Many studies of the European Environment Agency (EEA) and not only, say that it is Eastern European regions that will suffer more from global warming than the rest of Europe. Studies prove that the temperature in Eastern Europe will rise by an average of 2-3 ° C. And this increase already has a noticeable effect on the environment, the vital activity of flora, fauna and human health. These changes for human health are associated with extreme weather events, changes in the distribution of climate-sensitive diseases and changes in environmental and social conditions. As, for example, coastal floods and drainage of water bodies have affected millions of people in Eastern Europe over the past decade ( Romania, Hungary and others). The consequences for health were injuries, infections, exposure to chemical hazards and changes in mental health.

Gas, oil, coal have already caused and continue to cause damage to the environment. That is why practically "boycott" of nuclear energy will also have its consequences. And there is another problem following gas, oil and coal extraction. Accidents happening while the extraction of these fuels that often turn into catastrophes at the national level, whose victims, in addition to nature, are people. In the EU countries, similar accidents have decreased in recent years, but this is due to a higher level of economic development and renovation of plants and factories.

Industrial deforestation in Eastern Europe has reached a catastrophic scale and, unfortunately, not all countries have banned this activity. Dozens of kilometers of forests in Ukraine, Russia, Latvia and Belarus are devastated. In consequence of such actions, a great harm is inflicted on the flora and fauna - some species die out completely, the amount of carbon dioxide begins to increase in the atmosphere, soil erosion happens that leads to the formation of deserts. Places with a high level of groundwater become bogging.

These changes we have to face and get used to. According to the forecasts of environmentalists, this trend will grow and intensify if appropriate measures are not taken. Today, it is impossible to discuss and solve the environmental problems of one country in isolation from other countries. Silencing, or

not paying attention to one region, we smoothly damage the other. Harm to nature, inflicted in Ukraine or Hungary, for example, will necessarily feel the countries of Central and Western Europe.

That is why only a well-coordinated joint work on a cardinally new approach to human life, openness, adoption of effective measures and laws, participation in pan-European programs and policies, will be able to improve the ecology of the region in the long term and make the future of the countries of Eastern Europe safe.

**Authors:**

Alexander Kamenets, President of the Eastern European Association of the Greens (Ukraine)

Algirdas Ūrgelevicius, Vice-President of the Eastern European Association of the Greens (Lithuania)

Alexandra Batiy, Vice-President of the Eastern European Association of the Greens (Ukraine)

Imrus Kovacs, environmental expert (Hungary)



Together with analysts of KAMALEX LP (Scotland)

**When prepared the following expert opinions were used:**

Dmitry Arion, Chairman of the Environmental Association (Moldova)

Suzanne Jakab, WHO Regional Director for Europe (Czech Republic)

Jos Dings, Director of the research organization Transport & Environment (Poland)

Valentin Voloshin, Chairman of the Public Council at the State Inspectorate in the Transcarpathian Region (Ukraine)

Vladimir Usenya, Deputy Director of the Forest Institute (Belarus)

Alexander Kovalevich, Director of the Forest Institute of the National Academy of Sciences of Belarus (Belarus)