



**Principal Directions**  
**of State Policy of Ukraine in Environmental Protection, Use of Natural**  
**Resources, and**  
**Ensuring Environmental Safety**  
**A main element of Ukraine's**  
**National Environmental Action Plan**  
**Kyiv - 1998**

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PRINCIPAL DIRECTIONS OF STATE POLICY OF UKRAINE  
IN ENVIRONMENTAL PROTECTION, USE OF NATURAL RESOURCES,  
AND ENSURING ENVIRONMENTAL SAFETY

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**PRINCIPAL DIRECTIONS OF STATE POLICY OF UKRAINE  
IN ENVIRONMENTAL PROTECTION, USE OF NATURAL RESOURCES,  
AND ENSURING ENVIRONMENTAL SAFETY**

**The Principal Directions of State Policy of Ukraine in Environmental Protection, Use of Natural Resources, and Ensuring Environmental Safety (hereafter, the "Principal Directions") were developed in accordance with Article 16 of the Constitution of Ukraine, which states environmental safety and maintaining the ecological balance within the territory of Ukraine, dealing with the impact of the Chornobyl catastrophe (a global disaster), and maintaining the genetic pool of the Ukrainian people, are mandatory for the state.**

**I. STATE OF THE ENVIRONMENT**

**The present environmental situation in Ukraine may be characterized as being in a crisis that has arisen over a long period as a result of the objective laws of development and the re-habilitation of a natural resource complex in Ukraine being ignored. Structural deformations of the national economy placed emphasis on the mining and metallurgical industry, the most ecologically dangerous of industries.**

**The economy of Ukraine is characterized by a large share of resource- and energy-consuming technologies, the introduction and development of which were carried out in the**

**"cheapest" way possible - without relevant pollution reduction and treatment facilities. This was possible because of a lack of efficiently functioning legal, administrative, and economic mechanisms for environmental management, and without taking into account environmental protection requirements.**

**These and other reasons, including the low-level of public environmental awareness, have led to a significant degradation in the environment of Ukraine, excessive pollution of surface and underground water, air, and land, and the accumulation in great quantities of harmful wastes. Such processes have been going on for decades and have led to a sharp deterioration in human health, decline in human births and rise in mortality, threatening depopulation and the biological and genetic degradation of the people of Ukraine itself.**

**An exclusive feature of the condition of Ukraine's environment is that ecologically detrimental local situations are aggravated by the dreadful regional crises. The disaster at the Chernobyl nuclear power plant (NPP), with its long-term medical and biological, economic and social consequences, has led to a situation in Ukraine that is close to a level of global environmental catastrophe.**

### **1. Industry**

**The main reasons for the dangerous state of Ukraine's environment are as follows:**

- obsolete technology for production and equipment, with energy consumption and material intensity that exceeded by 2-3 times the amounts used in developed countries;**
- high level of industrial concentration;**
- unfavorable structure of industrial production, with a high concentration of enterprises that are ecologically dangerous;**
- lack of corresponding environmental management systems (waste treatment facilities, reclaimed water supply systems etc.), low level of operation of existing environmental management systems;**
- lack of necessary economic and legislative mechanisms to encourage the development of ecologically safe technologies and nature-protection facilities;**
- lack of appropriate control over environmental protection.**

**The metallurgy industry, which includes ferrous and non-ferrous metallurgical complexes, coke production, rolling production and related auxiliary systems and processes, is one of the most polluting sectors of industry. In Ukraine it discharges up to 38% of the overall volume of pollutants from stationary pollution sources.**

**The petrochemical industry is characterized by releases into the environment of hydrocarbons, sulfuric acid, and carbon disulfide, mercury, fluoride, and other compounds. In several regions of Ukraine a high concentration of chemical and petrochemical production facilities has led to excessively high levels of water pollution. Chemical enterprises discharge into open water bodies around 70 million cubic meters of untreated or insufficiently treated wastewaters. The chemical industry is one of the main producers of large amounts of wastes, a large quantity of which are toxic.**

**Enterprises of the oil and gas complex are considered to be objects of increased environmental risk. They are potential sources of environmental pollution that can occur in the event of abnormal equipment operation or emergency situations. Some facilities cause pollution even under normal conditions of operation, provoked by existing technological processes.**

### **2. Energy and Enterprises of the Nuclear Sector**

**Thermal electric power stations are some of the largest polluters of the atmosphere (around 30% of all stationary harmful emissions into the atmosphere).**

**Two most important environmental problems that dominate the thermal energy industry are air pollution, and soil pollution through accumulation of great quantities of solid wastes (ash, slag, dust).**

**Nuclear energy in Ukraine is used by all sectors of the economy - industry, medicine, agriculture, scientific research, as well as for domestic purposes.**

**In 1996, 43.9% of the country's electricity was produced at nuclear power plants. At the five nuclear power plants, there were 15 reactor units with a total capacity of 13,618,000 MW, which produced 79.6 billion kWh of power. Ukraine is eighth in the world and fifth in Europe in terms of the number of reactors and their capacity.**

**Four power units with VVER-1000 type reactors are in the process of being built at the Rivne and Khmelnytsky NPPs and are at various stages of completion. The second unit of the Chornobyl NPP is sealed, and the first unit of this station was completely closed down in November 1996. Kyiv and Sevastopol have nuclear research reactors which were not operating in 1996, but their operations are planned to continue in coming years.**

**Radioactive wastes are accumulated mainly at NPPs, where they undergo primary refining and temporary storage. NPPs do not have a complete cycle of primary refining of wastes according to the norms, regulations and standards of nuclear and radiation safety, which leads to ineffective use of underground storages and increases the risk of radiation accidents. In the 30 km exclusion zone around the Chornobyl NPP, a large volume of radioactive wastes, including wastes from nuclear power plant operations, are kept in temporary unsuitable storage. The main source of the danger in the 30 km exclusion zone is the shelter "Ukryttia", where dangerous radioactive substances and nuclear materials are concentrated, with a radioactive level that is almost 20 million curies.**

**The government enterprise UkrDO "Radon", which was established to process and store radioactive wastes from all branches of the economy, operates sites in six oblasts of Ukraine. However, these enterprises do not have capability for the primary processing of such wastes.**

**Enterprises for the mining and refining of uranium ore are located in the Dnipropetrovsk, Mykolaiv and Kirovohrad oblasts. A characteristic feature of uranium processing is the fact that almost all of its wastes are sources of radiation pollution of the environment. These wastes contain natural uranium, thorium-232, by-products of the breakdown of uranium and thorium, including the radioactive gas radon. The chief environmental danger from the uranium industry comes from the large volume of mining and processing residues and the radioactive materials located in them.**

**Ukraine belongs to the group of countries with intensive use of sources of ionizing radiation (hereinafter, "SIR") in many sectors of the economy and scientific activity. At the present moment, there are almost 8,000 enterprises and organizations (in Kyiv city alone there are almost 400) which use over 100,000 SIR.**

**Due to the existence of a large amount of artificial and natural sources of ionizing radiation, and, as a result of the Chornobyl catastrophe, a very difficult radio-ecological situation has arisen in Ukraine which requires the creation of a complex system of measures for radiation protection of the population and environment.**

**These measures should include nuclear legislation, state regulation of nuclear and radiation safety, state programs for Chornobyl catastrophe consequence minimization, norms for radioactive waste handling and increasing nuclear power plant safety, and social protection of the population.**

### **3. Agriculture**

**Agriculture in Ukraine is the most nature-intensive branch of the economy. It includes 41.84 million ha of agricultural lands (69.3% of the territory of Ukraine), including 33.19 million ha of arable land (55%), and 7.63 million ha of natural fodder lands - hayfields and pastures (12.6%). Agriculture consumes annually over 10.9 billion cubic meters of water, being 36.4% of total water consumption. There are 0.82 ha of agricultural land per one inhabitant, including 0.65 ha of arable land, while in Europe these indicators are 0.44 and 0.25 ha. On average, some 72% of agricultural land is ploughed, and in some regions it**

exceeds 88%. Low-productivity lands, including river shore meadows and pastures, and hilly lands, have been placed under cultivation. While Ukraine occupies 5.7% of the territory of Europe, its agricultural lands occupies 18.9% and arable lands - 26.9%. The efficiency of land usage in Ukraine is much lower than the European average.

The main reasons for the low yield from the agricultural resource potential of Ukraine are poor land management, prolonged absence of a real owner, erroneous strategy for the maximum utilization of land under cultivation, inefficient techniques and technology of land cultivation and agricultural production, unbalanced pricing policy, and non-observance of scientifically proven cultivation management systems, e.g. overall absence of crop rotation; insufficient application of organic fertilizer; low scientific and technological level of design, construction and operation of irrigation systems; an inefficient system of mineral fertilizer usage and application; and non-observance of nature conservation, integrated drainage, anti-erosion, and other measures.

The condition of land resources is constantly deteriorating. In some areas there is an uncontrolled depletion of ground waters, depletion of organic mass, and in irrigated areas - flooding and salinization of soil and degradation of black soil, that has led to negative ecological consequences in the regions of Polissia and in southern Ukraine. Now, 14.8% of the total area of irrigated land is eroded, 1.5% is overwatered, and over 4% are alkaline or saline. The increased mineralization of ground water threatens the secondary salinization of land. A decrease in the content of humus is observed on practically all lands. In 20 years from 1961 to 1981, the average content of humus in the soils of Ukraine fell from 3.5% to 3.2%.

The development of various forms of ownership, and management of land without strict and reliable State ecological and customs control over the import of dangerous wastes, and without a corresponding legislative base, leads to a negative consumer attitude towards land. Wide-spread application of mineral fertilizer, pesticides, and other chemicals together with industrial and radiation pollution can complicate the ecological situation in Ukraine still further, reduce reproductive capability of the biosphere, and environmental resistance of agricultural landscapes.

#### **4. Transportation**

A significant contribution to environmental pollution is made by transportation, particularly vehicles (cars and trucks, diesel locomotives, sea and river ships) which use as fuel various types of petroleum products, and stationary logistical support facilities (fuel and lubricant storages, filling stations, service stations, workshops, etc.) as well. Considerable damage is done by automobile exhaust gases, fuel and lubricants, wastewater from carwashes and their compounds, gases of various harmful substances, acids, and materials used in automotive repair operations.

Taking into account the large volumes of fuel used, automobile transportation pollutes the environment with toxic components at a level of 25% by lead salts and 50% by carbon oxides. In 24 large cities of Ukraine, e.g. Kyiv, Kharkiv, Sevastopol, and Odesa, transportation contributes over 50% of harmful emissions into the atmosphere.

The railroad transportation of Ukraine consumes around 170 million cubic meters of water annually. Around 50% of water is used for household needs, unreclaimable losses of water constitute over 40%. Every year, railroads dump over 20,000 tons of pollutants into sewage systems, and natural water bodies, of which almost 50% are untreated. The main pollutants are exhaust gases of diesel locomotives, oil products, phenols, aerosols, and litter. Over half of the total amount of river transport contribution to air pollution is composed of engine exhaust gases from vessels and motor transportation - around 500 tons annually for every large river port or transport junction.

Sea transportation pollutes the sea with food refuse, garbage, oil and petroleum products that considerably deteriorates the state of sea, especially in port areas.

## **5. Housing and Communal Sector**

The process of urbanization is intensifying in Ukraine. It has the following negative environmental consequences:

**(i) concentration of industrial facilities in a limited territory, which results in a high level of environmental pollution;**

**(ii) unfavorable urban planning structure caused by subordination to development of industrial potential. As a consequence, housing areas are frequently adjacent to industrial enterprises, and all transit transportation passes through cities, thereby considerably increasing the gas content;**

**(iii) second-rate attitude towards urban construction problems in comparison with industrial development priorities, that led to neglect of important aspects of city life such as water supply and sewage system networks, the technical state of which directly influences urban ecology and potable water quality;**

**(iv) destruction of the natural environment of large cities. A high level of environmental pollution, with industrial discharges and wastes, including household ones, an unsatisfactory state of life support systems, rapid growth of the city population based on extensive industrial development, and the need to expand their territories led to a reduction of green zones, increased pollution, and rendering useless of water bodies, etc.**

Presently, all cities, 821 small towns, and also 5,760 rural settlements (in total, over 70% of the population of Ukraine) have a centralized water supply.

The output capacity of all centralized water supply systems is 29.5 million cubic meters per day, including communal water utilities - 17.2 million cubic meters per day, of which those in cities and towns supply 17.1 million cubic meters per day, in villages - 0.1 million cubic meters. Around 40% of the overall volume, used for water supply of the population, is underground water.

The system of water supply and sewage facilities is now facing a critical ecological state for the following reasons:

- **water supply networks do not have an internal anti-rust coating;**
- **over 17% of water to be used does not meet standards set for several physical and chemical parameters;**
- **a significant reduction in investments into the communal sector has forced a significant increase in the rate of breakdowns of water supply facilities (in city systems alone, 16,600 km of water pipes and 6,400 km of sewage network are unsafe);**
- **water leaks and unaccounted water losses constitute over 15%, there is no proper water metering available in the housing sector (the average daily water consumption per urban resident in Ukraine is 325 liters, compared to 100-200 liters per person in large cities of Europe);**
- **27 cities and 392 towns do not have centralized sewage systems, and in 187 towns of Ukraine sewage treatment facilities are functioning inefficiently (over 10,600 cubic meters of untreated or insufficiently treated wastewater are discharged daily into receiving water bodies);**
- **an ineffective comprehensive program of the ecologisation of technology in industry, energy, construction, agriculture and transport, and inefficiency of communal treatment facilities, carrying the primary burden of industrial and city wastewater treatment, has led to the accumulation of large quantities of sediments and sludge (annually over 40 million tons), which poses a real threat of secondary environmental pollution;**
- **industrial enterprises lacking efficient production wastewater treatment and sediment utilization technologies discharge into water reservoirs through centralized sewage highly concentrated wastewaters, whose harmful substances ruin**

sewage networks, impair technological regimes of urban wastewater treatment and are not separated during the process of biological purification, which prevent the usage of treated urban wastewaters and their sediments in agriculture.

The primary sources of atmospheric air pollution within the housing and communal sector of Ukraine are road construction material plants, heating boilers, communal engineering enterprises, and motor transportation. They emit into the atmosphere a considerable amount of ash, carbon oxides, sulphur, and nitrogen, and discharge into sewage chemical compounds that have appeared as a result of reagent water treatment for heat supply systems.

Around 40 million cubic meters of garbage are accumulated in cities and towns, disposed of at 771 urban dumps, of which almost 80% operate without maintaining preventative measures against pollution of underground water and air basins, and 4 garbage incineration plants, whose technological equipment does not meet modern ecological requirements.

Traditional technology of urban garbage disposal at dumps is not viable or suitable for village populations.

## **6. Industrial Waste**

The long-term specialization in energy and raw materials, as well as the low technological level industry, has placed Ukraine among countries with the largest absolute volumes of waste production and accumulation. The volume of wastes produced in 1996 was 700-720 million tons.

A reduction in waste volumes, as has been observed in most branches of the economy during 1991-1996, was not reflected significantly on the overall situation regarding the creation of wastes.

As of 1996 the total mass of accumulated wastes on the territory of Ukraine at surface dumps was more than 25 billion tons, which constitutes almost 40,000 tons per square kilometer.

Wastes are piled-up in the form of slag dumps, mine pit heaps, and spoil heaps and other types of dumps. The total area covered by them constitutes around 160,000 ha.

Given the over-development of the mining industry in Ukraine, there is a "predominant" presence of wastes created from developing deposits (up to 75% of the total volume) and mineral concentration (accordingly 13 and 14%). A sizable part is made up of wastes from the chemical-metallurgical processing of raw materials.

Taking into account the current technological level of waste-processing in Ukraine, of the total amount of wastes accumulated annually, 410-430 million tons have real value. Only a third of the overall volume of wastes is utilized. It testifies to significant resource reserves.

However, between 1992-1996 a stable tendency for a drop in the use of wastes can be observed (each year an average of 20% less compared to the previous year), which took place at a higher rate than the reduction in the total volume of industrial production.

The existing level of secondary raw material utilization does not provide a tangible effect on the improvement of the environment. This is linked to the fact that processing involves primarily large-tonnage mining and other wastes: low-toxic and neutral (inert wastes). For these reasons, the ecological effect of waste processing is insignificant. Only 1-2 % of total industrial wastes are included in the highly toxic category, but their influence on the environment continues to grow. Until now, not a single specified plant for toxic industrial waste treatment has been built, a suitably organized system of collection and storage of toxic wastes is lacking; and there is no equipment for treatment of construction and public utility wastes.

Insufficient norms exist for administrative and criminal responsibility for violating regulations on the collection, storage, transportation and use of industrial and other wastes.

The one-sided environmental policy is evident also in the insufficient ecological control over mass usage of certain wastes (phosphoric gypsum and sulphur slime, etc.). This is an additional source of environmental pollution.

#### **7. Military Activity and Military-Industrial Complex (MIC) Conversion**

The geopolitical location of Ukraine in the European continent historically determined the role and place of its territory, as well as the military and economic potential in projects and programs of implementing military doctrines of various civilian political systems and military political alliances. Thus, in East and Central Europe for decades a large number of military and naval fleet forces, a variety of military equipment and weapons, including nuclear missiles, were stockpiled. A developed network of strong enterprises, institutions and organizations for military purposes were established.

The daily activity of the military, as a rule, has a huge negative impact on the environment. As a result of decades of breaches in environmental legislation, e.g., management and exploitation of aviation and military sea bases, training grounds, tank fields, training centers, fuel and lubricant bases and stores, maintenance workshops and construction facilities, lots for battle and tractor equipment, military forestries and subsidiary facilities, heat-, water- and power supply facilities, drainage and treatment facilities, sites for the collection and utilization of wastes, as well as resulting from non-compliance with the requirements of environmental safety during military and operational training, the military and naval forces have already polluted and continue to pollute the main components of the environment: soil, surface and underground water, and the air. Environmental conditions may deteriorate even further during the course of further large scale military reform, defense industry conversion, elimination of nuclear missiles and chemical weapons remaining from WWII, continued use (destruction) of obsolete forms of military products and ammunition, military production waste, if the military continue to disregard ecological requirements.

#### **8. Water Resources and Ecosystems**

The main sources of fresh water on the territory of Ukraine are the Dnipro, Dnister, Southern Buh, Siversky Donets, and Danube rivers, with their tributaries and the small rivers of the northern shores of the Black and Azov Seas. The violation of water quality norms have reached a level that leads to a degradation of the water ecosystems, and reduced productivity of water bodies. A significant part of the population of Ukraine uses poor quality water for its daily needs, which threatens the health of the nation.

The total volume of Ukrainian river flows, excluding the Danube, in an average water year is 87.1 billion cubic meters, dropping in low-water years to 55.9 billion cubic meters.

Sourced directly in the state territory are, on average, 52.4 billion cubic meters per year, dropping to 29.7 billion cubic meters during drought conditions. Danube water resources on average are 123 billion cubic meters annually.

The projected resources of underground water of potable quality are distributed over Ukrainian territory extremely unevenly, and constitute 22.5 billion cubic meters per year (61.7 million cubic meters daily), of which 8.9 billion cubic meters (24.4 million cubic meters daily) hydraulically are not connected with surface flow, and form an additional component to surface flow. Water intake of underground water as a part of projected resources is 21%, which testifies to the fact of the possibility for their more extensive use in many regions.

In order to provide the population and the national economy with sufficient quantities of water, 1,087 water storage reservoirs have been built in Ukraine with a total volume of over 55 billion cubic meters; 7 large canals of 2,000 km length with a 1,000 cubic meters per second water supply, and 10 large-diameter water mains through which water is supplied to water-deficit regions of Ukraine.

Fresh water demand per unit of manufactured product significantly surpasses such indicators in developed countries of Europe, e.g., France - by 2.5 times, Germany - 4.3, and Great Britain and Sweden - 4.2.

The full provision of water supply services to the population of Ukraine is complicated by the unsatisfactory quality of water in natural water bodies. In most of them, the quality according to chemical and bacterial pollution is classified as polluted and dirty (4th-5th class). The most acute ecological condition can be seen in the basins of the Dnipro, Siversky Donets, Azov shore rivers, individual tributaries of the Dnipro, and the Western Buh, where the water quality is classified as very dirty (6th class). The elements of ecological and metabolic regress are characteristic of the majority of Ukrainian water bodies.

Petroleum products, phenols, ammonium and nitrite nitrogen, and heavy metals are among the primary pollutants.

Discharge of pollutants by the majority of industrial and communal enterprises substantially exceeds the established admissible levels (AL). That leads to pollution of water systems and violation of water quality standards.

The main reasons for surface water pollution in Ukraine are the following:

- discharge of untreated or insufficiently treated communal-domestic and industrial wastewater into water bodies directly or through municipal sewage systems;
- introduction of pollutants into water bodies due to surface run-offs from build-up territories and agricultural lands;
- erosion of soil in water intake areas.

As a result of economic activities, the quality of underground water is also constantly deteriorating. This is connected with the existence in Ukraine of almost 3,000 filtering accumulators of wastewater (i.e. unlined wastewater ponds), as well as widespread usage of mineral fertilizers and pesticides. The most unsatisfactory state of underground water is in the Donbas and Kryvbas regions. Significant danger is posed by the presence of phenols (up to 5-10 times admissible concentration levels, hereinafter ACL ) in operational wells in Western Ukraine, the increase of mineralization, and the increase in heavy metal content in underground waters in Crimea.

The issue of the ecological state of water bodies is important for all water basins of Ukraine. Regarding the Dnipro river, which comprises almost 80% of Ukraine's water resources and provides water to 32 million people and to two-thirds of the economic potential of the country, it is one of the most important tasks for economic and social development and environmental protection policy of the state. This is due to the complex ecological situation on the territory of the basin, since 60% is cultivated land, 35% of the land is seriously eroded, and 80% is transformed from its primary natural landscape. Water reservoirs on the Dnipro have turned into pollutant accumulators. Significant damage has occurred in the northern part of the basin as a result of the Chornobyl NPP catastrophe and small rivers of the basin are in critical shape, a significant part of them have lost their natural ability for water self-treatment. Rivers of the lower Dnipro are in a catastrophic state where each month the sanitary and epidemiological situation grows worse, the number of fish is declining, and biological diversity is deteriorating.

Significant damage to the Dnipro ecosystem, along with annual pollution of the basin with organic elements (40,000 tons), petroleum products (745 tons), chlorides, sulfates (400,000 tons each), salt from heavy metals (65-70 tons), is caused by pollutants from biogenic elements as a result of the use of out-dated technologies, agricultural production, and low efficiency of communal treatment facilities.

The ecological improvement of the Dnipro basin is one of the most important priorities of state policy in the field of water resources protection and renewal. On 27 February 1997, the Verkhovna Rada of Ukraine ratified a National Program for Ecological Improvement of the Dnipro River Basin and Improvement of Drinking Water Quality. The main goal of

**the National Program is the renewal and provision of the stable functioning of the Dnipro ecosystem, safe water supply, ecologically safe conditions for vital activities of the population and economic activities, and the protection of water resources from pollution and depletion.**

**The other river basins of Ukraine (Siversky Donets, Dnister, Western Buh, Southern Buh, rivers of the Azov Sea and Black Sea basins) are not in any better condition, and sometimes are even worse. Thus, the goal and strategic directions defined in the National Program for the Dnipro are the same for other water basins of Ukraine.**

**A systemic analysis of the modern ecological state of the river basins of Ukraine, as well as of the organization of the management of the water resources protection and usage, allowed for the identification of the most important problems which need to be solved, in particular:**

- excessive anthropogenic load on water bodies, as a result of extensive water utilization practices, has led to a critical reduction in the self-regenerating abilities of the rivers and the depletion of water resource potential;**
- steady increase of significant pollution of water bodies as a result of unregulated drainage of wastewaters from populated areas, economic facilities, and agricultural lands;**
- wide-scale radiation pollution of many river basins as a result of the Chernobyl NPP catastrophe;**
- deterioration of potable water quality as a result of the unsatisfactory ecological state of sources for drinking water supply;**
- imperfect economic mechanisms of water use and implementation of water protection measures;**
- insufficient efficiency of existing management systems for water resources protection and use as a result of the imperfect normative legal base and organizational structure of management;**
- lack of automated, permanent monitoring of the ecological condition of the water basins of the Black Sea and Azov Sea aquatoriums, and potable water and wastewater systems of populated areas and economic facilities.**

## **9. Land Resources**

**Current land resource usage in Ukraine does not meet the requirements of efficient nature management. The ecologically admissible ratio of arable land, natural fodder lands, and forested areas is unbalanced, which negatively impacts on the stability of the agricultural landscape. The ploughing of land is the highest in the world and has reached 56% of the country's territory and 80% of its agricultural land. Intensive agricultural usage of land has led to a decrease in soil fertility due to its over-consolidation (especially of chernozem) to the loss of lumpy-granular structure, water permeability, and aeration capabilities, all with negative environmental implications.**

**Every year 11.0 million tons of humus, 0.5 million tons of azote, 0.4 million tons of phosphorus, and 7.0 million tons of potassium are washed away with soil. Annual ecological and economic losses from soil erosion are equal to 9.1 billion hryvnia.**

**Substantial ecological damage to land resources is inflicted by pollution from industrial effluents (heavy metals, acid rain, etc.), as well as use of chemicals in the agricultural sector. Over 40% of all organic substances produced at large cattle breeding complexes and poultry farms is turned from potential organic fertilizer into environmental pollution sources.**

**Land pollution has been aggravated by the Chernobyl NPP catastrophe. Radionuclides have polluted over 4.6 million ha of land in 74 regions of 11 oblasts, including 3.1 million ha of arable land. No longer in use are 119,000 ha of agricultural lands, including 65,000 ha of arable land.**

## **10. Mineral Resources**

The mineral raw material base is the main production basis for over 90% of heavy industry products. The share of mineral raw materials comprises a third of production assets, around 40% of capital investments, and nearly a fifth of labor resources. The approximate value of extractable deposits of basic minerals is equal to 14.8 trillion hryvnia. Ukraine surpasses such developed countries as the USA, Canada, Britain, France, China, and others in the variety and wealth of mineral raw material resources. Ukraine produces around 5% of the world's raw mineral resources. Annually, the mining industry of Ukraine produces US\$25-28 billion worth of products (at world prices).

Around 8,000 deposits of 90 different minerals are prospected in Ukraine, out of which 20 have primary economic importance. These include oil, gas, iron, manganese, titanium, uranium ores, coal, sulphur, kaolin, graphite, refractory clays, construction minerals, and potable and mineral waters.

Between 40-75% of explored deposits of minerals are utilized for industrial purposes.

The future development of raw mineral resources of Ukraine requires an urgent solution at the state level of problems which slow-down substantially the expansion of raw mineral resources complex, its environmental rehabilitation, and efficient use.

At present, there is no clear mechanism for the management and relevant state supervision over resource usage and protection, which leads to a thriftless attitude of mining enterprises to mineral resource base and increased unjustifiable losses.

Due to inefficient technologies for mineral resources mining and processing, and unsatisfactory solution of problems of integrated exploration of deposits, the following amounts of minerals remain in the earth depths or get wasted:

- 70% of prospected oil resources
- 50% of salts
- 28% of coal
- 25% of metals.

Still unsolved is the problem of geological exploration and usage of technogenic deposits of minerals contained in mining waste heaps as well as wastes from mineral raw materials concentration and processing, that contain valuable minerals and are of industrial value. Right now, the volume of these wastes in Ukraine surpasses 25 billion tons, covering an area of 150,000 ha. Their amount is growing every year. Thus, hundreds of large, medium, and small technogenic deposits of usable minerals that can be industrially explored have appeared in Ukraine. According to preliminary calculations the potential value of technogenic deposits is estimated at dozens of billions of US dollars. This mass of secondary products calculated per one square kilometer of Ukrainian territory surpasses similar indicators in the USA by 6 times and in EU countries by 3 times.

## **11. Atmospheric Resources**

The strained environmental situation in many regions and cities of the country testifies to the fact that, despite the increase in attention lately to these issues and considerable expenditures, the applied measures are not adequate, and do not entail changes in the tendency for the environment to deteriorate. The structure of industrial production that has been built in Ukraine is linked to the development of energy, mining and metallurgy, coal mining, chemical, and engineering industries, and is characterized by intensive consumption of energy, raw materials, water and land resources, as well as by an increased burden on the environment. In 1996 around 6.34 million tons of pollutants were emitted to the atmosphere in Ukraine, including 4.76 million tons from stationary sources, and 1.58 million tons from mobile sources. Between 1992-1996, the total volume of pollution emissions into atmosphere decreased from stationary sources by 45%, and from mobile sources by 12%. The latter emit 85% of the lead, 49% of carbon oxides, and 31% of hydrocarbons.

From the industrial branches, the biggest air polluters are energy (32%), metallurgy (27%), coal industry (23%).

Ukraine is eighth in the world among emitters of carbon dioxide from the energy sector, which makes up 2.35% of the world emissions of these elements in energy sector.

## 12. Flora and Forest Resources

The flora of the lowest and highest plant species in Ukraine number over 25,000. According to the spectrum of the main life forms, all species of vascular plants can be divided into trees, bushes, shrubs, perennial grasses, biennials, and annuals. Ukraine has over 5,000 species of vascular plants, of which almost 250 species are officially recognized medicines in Ukraine, although almost 1,100 species of flora have biologically active elements which have medicinal effects, and their raw material is used for the preparation of medicine in world practice.

However, the continuous uncontrolled use of natural resources of many valuable medicinal plants, the intensification of economic use of territories which have medicinal plants, and the unfavorable ecological situation in zones with high resource potential after the accident at the Chornobyl NPP, caused a critical situation with the resources of most wild medicinal plants.

Today, the medicinal plants grow in areas which make up less than 10% of the territory of Ukraine. Generally, in Ukraine almost 85% of medicinal plant raw materials are collected in natural growth areas of medicinal plant species. Each year, the area under cultivation and the variety of cultivated medicinal plants increases, however, their number, as a rule, does not exceed 15 species. Many medicinal plants cannot be cultivated because of the complicated field management and several other reasons.

Over the past 10-15 years, the number species of medicinal plants have practically not changed, while their overall collection rate, as well as for individual species, decreases significantly every 3-5 years, since the natural reserve of these plants decreases as a result of the intensive usage of the land on which they grow, and the harvesting of their raw materials is carried out without following the norms and rules of gathering which, in turn, lead to the depletion of medicinal plant resources. At the same time, the demand by the pharmaceutical industry of Ukraine for raw materials of wild medicinal plants remains great.

The overall volume of forest usage is 14.4 million cubic meters, of which the primary usage is 6.7 million cubic meters, that meets the demands of the national economy only by 25-27%. Due to the deficit of timber, the annual need for its import exceeds 30 million cubic meters.

Erroneous practices of extensive forest management planning led to considerable depletion of forests, decline in overall productivity of forest cenoses, and deterioration of the timber structure of cutting area reserves. Thus, in the post-war years, it was allowed to exceed the rated cutting area 1.5-2.0 times, which caused changes in the age structure of forests, a rise in third-class quality plantings (up to 13%), and less productive timber. Today the greatest area is covered with young (45.4%) and medium (37.7%) plantings, while maturing and mature trees cover only 10.1% and 6.8%, respectively, which is 1.5-2.0 times less than optimum. The intensification of intermediate usage led in recent years to the situation when virtual reserves of maturing and mature timber are over half of that potentially possible, and the share of plantings with low fullness (0.6-0.3) reaches 24%. Due to this, while cutting for primary usage, 5 million cubic meters are missing annually.

The current ecological state of forests is conditioned by the level and intensity of anthropogenic influence as well as by the growing technogenic load which impair the natural stability and environment formative functions of forest ecosystems. In the last decade alone, 2,500 ha of forests perished due to industrial discharges; radiation pollution from the Chornobyl NPP catastrophe affected 3.5 million ha of forests; that requires

restrictions in forest usage, and improvements in forest fire prevention systems. On average, 3,500 forest fires erupt annually covering a territory of 4,000 ha.

The damage to the natural stability of forests leads to the increased vulnerability of plantations. By the end of 1996, the total area of forests infected by pests and forest diseases was 396,100 ha.

### **13. Nature Reserves, Biodiversity Conservation**

Extensive nature usage, neglect of environmental justification in the process of developing the agro-industrial complex, redirection of river courses, reclamation of marshlands, unregulated development of collective gardening, and other unregulated activities, have led to the destruction of nearly 70% of the valuable natural complexes and landscapes of Ukraine.

The area of nature reserves in Ukraine grows rather slowly, and today covers only 2 million ha, or 3.4% of the country's territory, which is not a sufficient guarantee for conservation and reproduction of the gene pool of flora and fauna, as well as the variety of natural ecosystems; especially on the left bank of the Dnipro's wooded steppe zone, the Dnipro region, and the steppes of Crimea, where only 0.2-0.7% of the territory is set-aside for nature reserves.

The existing botanical gardens and dendrological and zoological parks, because of lack of funding and poor logistical and laboratory bases, presently cannot carry-out their functions of conservation and reproduction of rare and typical species of flora and fauna. Under conditions of economic and ecological crisis during the transition to market-type relations and various forms of ownership, the degradation of the gene pool of flora and fauna will become irreversible without efficient state-implemented measures.

### **14. Fauna, Hunting, and Fish Resources**

There are 45,000 species of animals in Ukraine, among them over 700 species of vertebrates, the remainder are invertebrates. The main problems in the protection and regulation of the usage of the animal world is that this world has not been studied sufficiently, the lack of reliable information on reserves of industrial species and volumes of their extraction, worsening of the natural conditions of the existence of wild animals through the growing anthropogenic influence, and weakening of their protection from illegal use and destruction. Today, some 382 rare species and those under threat of extinction have been entered into the *Red Book of Ukraine*.

Hunting has expanded in geographic area because of a decrease in the availability of artificially bred game fauna, reduction in the use of biotechnical measures, and weakening of the protection of hunting areas. Too little attention has been given to optimizing the gender-age structure of the total population of cloven-hoofed game animals and improving their gene pool.

An important component of the country's bioresources are the reserves of fish and other water fauna. In recent years, the majority of water bodies have shown a visible tendency of decreased fish catches. The main factors restraining the fishery sector development, and negatively impacting the process of fish reserves and other water species recreation, especially those of valuable species, are: pollution of water bodies, unjustified water usage, violation of hydrological regimes, absence of effective devices to protect fish and fish ways at hydrotechnical facilities, and weakening of state control over the catch and realization of water living resources.

### **15. Economic Mechanisms of Natural Resources Usage**

The economic system of the country determines the general system of use of natural resources with all its attributes (volumes of mining, processing and consumption of resources, efficiency, types of relationships, responsibility to future generations), as well as financial and economic mechanisms of environmental protection.

For a long time the economy of Ukraine was formed in a centralized way with great structural disproportions. The inefficient economic system with its collective ownership; administrative redistribution of funds and resources from profitable to unprofitable enterprises, low prices for energy, water and raw materials, and lack of metering at enterprises, have facilitated the uneconomic use of resources and inefficient energy consumption in the sphere of monopolized production. The share of heavy industry with its resource-intensive technologies in the economy of Ukraine constituted 61% of the GDP, in comparison with 34% in EU countries. The energy consumption capacity of the GNP in Ukraine is the largest among countries of the former Soviet Union. It is 9 times higher than the OECD countries and almost 4 times higher than in the countries with per capita income being higher than average.

It is the liquidation of the structurally deformed production sector, with its excessive energy and resource consumption capacity, which is the key to identifying ways and means of economic reform that should provide for efficient use of natural resources and ensure environmental safety.

#### **16. Regional Environmental Policy**

Territorial organization of Ukraine is aimed at unification of all-state, regional, and local interests.

Territorial distribution of social interests in nature protection is defined by the territory size of natural geo-ecosystems and divides into:

- all-state, spread over the entire territory of Ukraine;
- regional, that is spread over the territory of two or more oblasts and the Autonomous Republic of Crimea or extend over the territory of neighboring countries and the aquatorium of a marine economic zone;
- local, that extend within the Autonomous Republic of Crimea, an oblast or region.

This objective nature of spatial extension of natural systems has created territorial mismatching between administrative units and natural systems as subjects of management. Therefore, the need for regionally oriented environmental protection measures arises.

The state's current environmental protection management system is overly centralized and has some elements of departmental division. It leads to a low level of management efficiency at the regional level, particularly regarding the directions of planning and use of environmental protection investments, and makes it impossible to take into account territorial interests in creating ecologically safe environment.

## **II. MAIN PRIORITIES IN ENVIRONMENTAL PROTECTION AND EFFICIENT USE OF NATURAL RESOURCES**

Implementation of environmental management programs requires significant funds.

During the next 5-10 years, though, the country will be restricted in funds necessary for improving the environment and ensuring efficient use of natural resources. All this requires clear determination of priority directions and issues, in order to work on realistic, efficient and economically effective decisions. With this purpose and given the existing environmental condition of the territory of Ukraine, the following criteria and indicators have to be taken into account:

- deterioration of human health due to high levels of environmental pollution;
- decrease in national economy productivity caused by losses and ruin of physical assets and natural resources;
- deterioration of conditions or threat of irreparable damage to biological and landscape diversity, especially to meadows, pastures, lakes, water bodies, rivers, lands, forests, coastal and sea ecosystems, and mountain regions;
- ecological and economic effectiveness of nature protection measures.

Among the key priorities of environmental protection and efficient natural resource usage are:

- **guarantee of ecological safety of nuclear facilities and radiation protection of the population and environment, and minimization of the detrimental effects of the Chernobyl NPP catastrophe;**
- **improvement of the ecological state of river basins of Ukraine and potable water quality;**
- **stabilization and improvement of ecological conditions in cities and industrial centers of the Donetsk-Dnipro region;**
- **construction of new and renovation of existing capacities of communal wastewater treatment facilities;**
- **prevention of pollution of the Black and Azov seas and improvement of their ecological condition;**
- **formation of a balanced system of use of natural resources and suitable restructuring of production potential of the economy, and the "greening" of technologies in industry, power generation, construction, agriculture, and transportation;**
- **maintenance of biological and landscape diversity, and of natural preserves.**

**In order to achieve this, the following tasks are to be completed:**

- **minimization of radioactive contamination;**
- **protection of air basins from pollution, especially in large cities and industrial centers;**
- **protection and conservation of land resources from pollution, depletion, and inefficient usage;**
- **conservation and expansion of territories with natural landscapes; revitalization of nature protection activities in nature reserves and recreational zones; increasing the stability and ecological functions of forests;**
- **rendering harmless, utilization, and disposal of industrial and domestic wastes;**
- **prevention of sea and inland water pollution; reduction and discontinuance of polluted wastewater discharge into water bodies; protection of underground water from pollution;**
- **conservation and rebirth of small rivers, water resource management based on the watershed principle;**
- **final creation of a state environmental monitoring system;**
- **creation of a system of forecasting, prevention and quick response in case of emergency situations of natural or natural-technogenic character;**
- **incorporation of environmental protection measures in the conversion of the military industrial complex;**
- **taking measures of ecological supervision over Armed Forces of Ukraine activities;**
- **development of implementation mechanisms for use of natural resources schemes;**
- **introduction of active economic components to influence use of natural resources systems;**
- **creation of a system of environmental education, fostering and informing.**

**The state policy in environmental protection, use of natural resources, and ensuring environmental safety, is to be implemented through individual interstate, state, sectoral, regional and local programs, aimed at achieving the identified priorities.**

### **III. STRATEGY AND TACTICS FOR HARMONIOUS DEVELOPMENT OF PRODUCTION AND NATURAL RESOURCE POTENTIAL**

#### **17. Industry**

**The main tasks for the near future are to prevent an increase of pollution levels and depletion of natural systems.**

**The solution of technogenic and ecological safety issues requires:**

- reconstruction of the technogenic environment and technical re-equipment of the production industry, based on the introduction of innovative scientific achievements, energy- and resource-saving technologies, waste-free and ecologically clean technological processes, utilization of renewable energy resources, and the solution to problems of safe disposal and usage of various types of wastes;
- introduction of effective environmental controls in the scientific research, design, construction, and functioning of artificially created sites, in order to manage the technogenic loads and efficiently use natural resources and allocate productive forces;
- classification of Ukraine into regions according to their technogenic and ecological loads, and creation of technogenic and ecological load maps;
- development of methodologies to define the level of environmental risk caused by technogenic facilities;
- research on developing appropriate environmental monitoring models for industrial, power generation, construction, transportation, and agricultural facilities.

**A program of actions envisages developing and implementing measures to counteract against two types of harmful influences of the technogenic environment:**

- in the normal functioning mode, entailed by imperfect equipment and technology of production and waste treatment;
- in emergency mode, as a result of the non-observance of usually admissible operational conditions of activity that causes, or can cause, an adverse impact on humans or natural systems.

#### **(i) The Metallurgy Industry**

**Taking into consideration world experience and a systematic analysis of environmental problems in the metallurgical complex, strategic directions of activities in this sector are:**

- comprehensive restructuring of the industry;
- increase of efficiency of resource- and energy-consumption to world levels;
- decrease of the share of products manufactured using open-hearth technology, and expansion of converter production technology;
- transition to environmentally clean technologies by key components of the metallurgical industry.

**The program to solve environmental problems in the metallurgical industry should foresee the following:**

- conducting comprehensive environmental audits at all metallurgical complexes of Ukraine;
- development of environmentally oriented criteria for restructuring of Ukraine's metallurgical industry, based on results of the audits;
- development of measures that the metallurgy industry should urgently undertake to reduce particulate emissions into the air, and to improve the environment;
- improvement of standard and methodological tools for regulating pollutant releases by the metallurgy industry;
- development and implementation of a mechanism to adjust admissible discharge levels with the rate of modernization of technologies and restructuring of the metallurgy industry;
- fulfillment of a set of programs for treatment and utilization of solid wastes.

#### **(ii) The Chemical and Petro-chemical Industry**

**Considering basic directions of industry development, i.e.:**

- improvement of industry structure, and identification of priority directions of its development;
- development of the national mineral raw material base;
- establishment of basic products manufacturing;
- introduction of scientifically capacious technologies aimed at the integrated use of raw materials, energy resources, and end-products;

the strategic tasks of the program are:

- development and introduction of advanced low-waste and waste-free resource-saving technologies;
- integrated purification of gas emissions and wastewater discharges simultaneously with the utilization of by-products and their further processing;
- conducting research and development works aimed at minimizing or preventing reducing the number of emergency situations at facilities of this industry;
- development and implementation of programs to create highly efficient treatment systems for gaseous and liquid releases to the environment;
- fulfillment of a program of integrated waste processing;
- fulfillment of programs to discontinue operation of facilities with ecologically imperfect technologies throughout the entire chemical and petro-chemical technological cycle.

### **(iii) The Oil and Gas, and Oil Refining Industry**

Environmental problems in the oil and gas industry have both internal and external influences.

The internal level is connected with technological and operational problems of functioning oil and gas facilities, and concern first and foremost issues of environmental safety.

In order to address the issues of this level, it is necessary:

- to carry out a comprehensive certification of oil and gas facilities;
- to develop measures concerning the improvement of environmental safety of technological processes at these facilities;
- to introduce changes and amendments to the current standards of technical design and operation of oil and gas facilities regarding the requirements of environmental protection;
- to develop and introduce technological programs of waste and used oil product processing;
- to develop environmentally efficient hydrocarbon extraction technologies from subterranean reservoirs;
- to introduce production technologies aimed at reducing emissions of volatile organic compounds;
- to develop comprehensive technologies of water and soil purification from pollution caused by hydrocarbons;
- to develop and introduce systems for evaluation of underground water pollution expansion caused by oil and oil products;
- to develop regulations concerning the determination and calculation of harmful discharges from oil refineries.

The problems of external influence concerns usage of refined oil and gas products (petrol, diesel, heavy fuel oil, gas) in other sectors of economy, and are related primarily to the poor quality of produced fuel.

To solve these problems, it is necessary to:

- halt the output of petroleum products containing lead compounds;
- increase oil refining degree by constructing catalytic reforming plants at main oil refineries;

- introduce hydraulic purification processes for diesel and aviation fuel with simultaneous sulfur production at oil refineries;
- develop technologies for motor fuel production from alternative raw materials;
- develop and introduce methods and technologies of gas and alternative fuel for transportation.

**(iv) The Engineering Industry**

The basis for environmental protection programs in this sector should be the following:

- significant reduction of pollutant releases from the engineering industry;
- introduction of environmentally cleaner technologies in all aspects of engineering production activities, in particular, solving the issues of utilization and safe disposal of toxic wastes from galvanic production.

**(v) The Mining Industry**

In order to solve environmental problems in mining industry, it is necessary:

- to modernize and technically refurbish enterprises of the industry;
- to develop and introduce effective environmental monitoring systems at facilities with enhanced ecological risk;
- to increase extraction of coal for power generation as a result of reducing coking coal extraction;
- to improve the technological process of coal washing in order to increase sulphur extraction from coal that is to be burned at power plants;
- to develop and introduce technological processes and equipment for exploiting the energy potential of coal mine methane;
- to develop and implement techniques for the purification and use of mineralized mine water;
- to develop and implement technologies and equipment for utilize waste rock as raw materials for the construction industry;
- to provide separate storage arrangements for overburden in order to use it efficiently in the future for construction and other materials and products;
- to provide in the coming years for waste dump quenching, as well as promoting the back-filling of mines with waste rocks;
- to develop and implement environmentally safe methods of mine closure.

**(vi) The Construction Industry**

The goal of environmental protection activities in construction is to normalize conditions of public life and improve the state of natural territorial complexes of Ukraine which are in critical environmental condition.

To form a task list for specific programs, it is necessary:

- to carry out environmental audits of critical territories of Ukraine;
- to determine a set of environmental quality criteria for urban development.

In order to complete these tasks, it is necessary to:

(a) to conduct environmental audits of critical territories of Ukraine -- the audits should include identification of control levels of pollution in order to develop norms for the next 1-3 years, and their practical feasibility; urgently audit highly urbanized regions and cities;

(b) to prepare urban development regulations that, when implemented, would result in territories overcoming critical environmental conditions:

- conduct audits, considering changes in land use structure and increase the area allocated for nature parks and recreational zones;
- define a set of urban development measures to achieve improved environmental quality;

(c) to take measures concerning resource-saving:

- restrict use of mineral resources, the demand for which can be met by using secondary and recovered resources;
  - develop and introduce programs for the creation and production of new resource-saving construction materials and structures;
- (d) to take measures that prevent pollutant releases:
- develop comprehensive programs to introduce waste-free and ecologically safe technologies;
  - develop and introduce mobile, light, ecologically safe and low energy-consuming construction machinery and power tools;
- (e) to develop and implement architectural and planning measures, and measures to protect specific sites, as well as measures for reorienting territorial infrastructures:
- solve the issue of urgent deconcentration of decision-making concerning environmental, economic, and planning aspects;
- (f) to develop measures preventing the consequences of accidents in densely populated areas.

The most environmentally dangerous branch of construction material production is the cement industry, whose enterprises pollute the environment most of all. Thus, it is necessary to create a special program that would significantly reduce the impact of cement enterprises on the environment.

**(vii) Mechanism for Achieving Goals in Industry**

Saving the industrial complex from environmental crises should be carried out in three directions:

- (a) carry out a set of organizational and technical measures aimed at providing for the efficient operation of environmental protection entities in modes that are conditioned by established designs and norms. In such a way, the full usage of available technical environmental protection potential and improvement of the system of charges for pollutant discharges will be achieved;
- (b) realize in 2-3 years a set of urgent technical measures to bring into operation environmental protection facilities that are under construction or design in the communal sector and industry. Establishing economic and legal base for environmental management regulation in the market economy;
- (c) realize a program of industrial sector structural and technological changes over 5-15 years, first and foremost in the fuel and energy complex, ferrous metallurgy, and chemical industry, and a program that introduces efficient wastewater treatment, use of recycled or recovered materials, air emission control technologies, and to solve the problem of industrial waste processing.

**18. Environmental Safety in Energy and the Nuclear Industry**

***Thermal Energy Industry***

According to a long-term concept for the wide-scale development of thermal power generation based on solid fuels, in order to fundamentally improve environmental conditions, it is proposed:

- to introduce new technologies of low-quality coal burning in boiler units with circulating fluidized bed and coal intercycle cycle gasification, and use of producer gas in steam-gas plants;
- to use high-efficiency steam-gas plants that burn natural gas at modernized existing gas/oil-fired thermal power plants (TPP), and at new TPPs;
- to introduce efficient coal-desulfurization units while building new generating units and reconstructing existing TPPs;
- to install modern efficient particulate removal facilities at operating TPPs and at newly built units;

- to improve the quality of solid fuel, by reducing ash content to 10% and sulphur to 1-1.5%;
- to develop and introduce control systems that minimize atmospheric emissions of dust, sulphur, nitrogen, and carbon compounds, etc.;
- to undertake programs that utilize solid wastes (ash, slime and dust) in the construction industry;
- to increase water recirculating to 75-80% of its total volume;
- to create closed water use and treatment systems for wetter scrubbers and slime dumps;
- to introduce efficient means of using sludges from water treatment systems;
- to review environmental standards and requirements in keeping with their economic viability and environmental condition.

#### *Basic Principles and Tasks for Environmental Safety of Nuclear Facilities*

The environmental safety of nuclear industry enterprises must be evaluated at all stages of design, construction, operation, and shutdown. The environmental impact of such enterprises should be determined for their life cycle, taking into account all types of dangerous emissions (radioactive, chemical, and thermal), as well as synergetic effects. It is also necessary to take into consideration the environmental impact of the Chernobyl NPP catastrophe.

The basic principles of environmental safety are as follows:

- selection of sites for nuclear industry enterprises taking into consideration geological, hydrological, landscape and meteorological characteristics of sites, biogeocenosis, population density;
- scientifically justified selection of nuclear technologies, installations, and equipment;
- reduction of the impact of natural ionizing radiation sources on public health;
- consideration, during design of nuclear facilities, of means of reducing the impact on public health and the environment;
- taking into account the composite effect on human health and the environment of enterprises of nuclear and other industries when deciding on their location.

In order to limit the impact of various pollutants on the environment, it is necessary to work-out a system of environmental norms, that should take into account relevant natural and geographic features of a region, and measures aimed at reducing the content of artificial radionuclides in the biosphere.

In order to create and introduce a system of environmental norms, it is necessary to achieve the following tasks:

- to develop unified environmental norms for various indicators of negative environmental impacts, in particular admissible release levels for radioactive substances;
- to organize different levels of environmental monitoring (local, regional, national) in order to study and typify the environmental state of Ukraine and to create a database which will allow analyses and forecast of environmental conditions.

#### *Radioactive Wastes*

The creation and provision for conditions of safe handling of radioactive wastes (RAW) necessitates:

- further development or partial revision of regulations and legal foundation regarding ensuring environmental safety;
- scientific and technical justification for RAW handling from the time of RAW generation to its burial, in compliance with environmental norms;
- development of a scientifically based selection of alternatives to burial of RAW.

Ensuring environmental safety of RAW handling should include:

- **planning (scientific justification for environmental safety of RAW handling methods, adoption of legal acts and standards, development of national programs);**
- **providing environmental safety at all RAW handling stages until burial (collection, classification and processing of RAW, conditioning and packing, intermediate storage, transportation), and evaluation and prevention of adverse environmental effects from RAW handling facilities;**
- **development of scientifically grounded approaches to environmentally safe near-surface and deep-geological burial of RAW (selection of sites and archiving input data, predicting of radionuclide migration in the geosphere and biosphere, environmental impact assessment, developing of monitoring systems);**
- **safe mining and concentration of uranium ore (selection of sites, conservation of dumps and tailings, environmental impact assessment, development of monitoring systems);**
- **shutdown of nuclear facilities and environment rehabilitation (power and research reactors, nuclear fuel cycle enterprises, etc., environmental impact assessment, rehabilitation).**

#### ***Radiation Safety Priority Tasks***

The radiation safety priority tasks are:

**(a) development of measures on the provision of radiation protection of the population of Ukraine, which should provide for:**

- **establishment of a dosage level of interference aimed at prevention of the appearance of determined effects by limitation of the exposure levels to much lower than threshold of their occurrence (rating annual dosage), and the use of necessary measures to reduce the possibility of remote random medical effects taking into consideration economic and social factors;**
- **conducting emergency evaluation of the radiation situation of the territory of Ukraine, in particular aimed at minimizing the overall impact to public health of ionizing radiation and ecological, social-psychological, and economic consequences of implementing measures concerning resettlement, limitation of consumption of locally produced food products, changes to traditional lifestyles etc.;**
- **optimization of comprehensive measures of radioactive protection of the population;**
- **provision of social security of the population which resides on the territory polluted by radiation and its related harmful factors.**

**(b) development of measures on ensuring radiation protection of the population of Ukraine in connection with the Chornobyl NPP catastrophe.**

The impact of the Chornobyl NPP catastrophe on public health today is still one of the most important problems in Ukraine in relation to significant changes to the social and psychological conditions of the public residing in polluted territories or those resettled from the zone of radioactive contamination, and a worsening of their health, especially in children.

The results of scientific research on the overall set of problems which arose as a result of the accident at the Chornobyl NPP, experience gained in recent years in eliminating its effects, the change in priority directions in resolving this problem as well as the need to improve legislation regarding protection of the rights of Ukrainian citizens, who suffered as a result of the Chornobyl catastrophe, and future generations, require the development of a new *Concept* of protecting the population of Ukraine in connection with the Chornobyl catastrophe.

The goal of the Concept is to determine new, scientifically grounded, principles and ways of practically implementing activities directed towards:

- **minimisation of the radiation load and radiation injury;**
- **ecological, medical and social protection;**

- rehabilitation of the population of Ukraine that is victim of the Chornobyl catastrophe;
- development of industrial, agricultural economies and forestry, and improvement of the social infrastructure on territories with increased levels of radioactive contamination and in densely settled locations of relocated citizens;
- improvement of laws and other regulations adopted in relation to the Chornobyl catastrophe.

decrease the radiation load on the population of Ukraine from natural sources of ionizing radiation.

In post-Chornobyl conditions, it is crucial to determine the total dose of the radiation load on the population of Ukraine. As the years pass, the size of the additional radiation load related to Chornobyl decreases, and the relative proportion of the effects from natural radiation factors, especially radon, increases.

Especially critical are the regions of Ukraine where radioactive contamination has a high technogenic component (i.e., a high level of radioactive pollution due to the activity of enterprises) in combination with a natural radon component.

The program of reducing the total impact dose for the population of different regions and of Ukraine as a whole stipulates that the following tasks be completed:

- regional division of the Ukrainian territory in accordance with radon source locations;
- determination of the radon content in underground mine air in order to reduce radiation burden on miners;
- reduction of radiation burden on the population by using construction materials with a limited quantity of natural radionuclides, and adjusting architectural decisions and principles of building locating in relation to enhanced natural background radiation levels, etc.

(d) creation of a system of radiation monitoring.

Radiation conditions in Ukraine are formed under the influence of nuclear fuel cycle facilities (uranium mining and processing industry and NPPs), the enterprise "Ukryttia", facilities designated for radioactive waste management, enterprises of the oil-, gas- and coal mining industries, and the impact of the accident at the Chornobyl NPP.

From the standpoint of radiation safety, the regions of enhanced control should be regions of NPP location and other radiation-risky facilities.

To collect and process information regarding the radiation situation in the territory of Ukraine, a step-by-step creation of a system of early-warning radiation monitoring should be carried out. Its creation will provide for the automated control over radiation emergency situations and immediate supply of information on radiation conditions necessary for early warning about a radiation accident with the goal of the development and effective use of measures on protecting the population and environment.

## 19. Agriculture

Under existing conditions in Ukraine, the strategy for an agricultural environmental management system should foresee:

- formation of highly productive and ecologically stable agricultural landscapes;
- harmonious unification of the action mechanisms of economic and environmental laws within the territories, taking into account limiting indicators of the load on agricultural land, biological resources, and landscapes;
- introduction of environmental safety requirements into the system of agricultural environmental management;
- provision of broad revitalization of soil fertility by developing and implementing a system of soil conservation measures;
- provision of an ecological basis for agri-chemicals handling and application;

- formation of mechanisms of economic, administrative and criminal responsibility of agricultural land users for violation of environmental requirements;
- development of natural protection measures based on international legislation requirements, and enhancement of its role in agricultural natural resources use practices;
- creation of a system of economic incentives for ecologically safe agricultural produce on the basis of organic land cultivation;
- maintenance of environmentally favorable infrastructure and conditions for work, recreation, and physical development of the rural population;
- removal from usage of unproductive agricultural lands, primarily in regions with high land cultivation.

In order to accomplish these tasks, it is necessary:

- to carry out comprehensive ecological and economic evaluation (regional division) of the territory of Ukraine and identify within it nature-protection complexes, including sites and facilities of natural reserve fund, lands for highly intensive agricultural production and industrial construction, as well as polluted regions for implementing target environmental protection measures;
- to ensure implementation of a National Program of land protection to the year 2010;
- to prepare and introduce sectoral schemes for the preservation and renewal of land, water, biological - particularly fish and forest, raw material and mineral, and other natural resources;
- to implement land redistribution, taking into account the environmental situation that resulted; withdrawing radioactively contaminated and industrially polluted, very eroded, secondary waterlogged, salinated, flooded, and environmentally vulnerable lands from use;
- to create a complete system of field protection and water protection forest shelter belts, to plant forests in ravines, gulches, slopes, sands and other unusable lands, in order to provide for the optimum anti-erosion forestation of land;
- to create water protection zones along river banks, water storage reservoirs, lakes and ponds, to remove silt, and to form highly effective hydrological systems;
- to ensure active transition to organic methods of agriculture and production of ecologically safe products;
- to improve the distribution of agricultural production in order to efficiently use local natural conditions and resources.

## **20. Transportation**

### **(i) Motor Transportation**

In order to improve air quality, and prevent and decrease the effect of pollutants, it is necessary to implement measures concerning the reduction by 2005-2010 of total emissions from motor transportation by more than 40% (in comparison with 1995), prevent emissions of lead, and undertake these foremost in recreational zones and the capital of Ukraine, Kyiv.

The following measures are planned for this purpose:

- to improve provisions of the legislative system, encouraging the introduction of environmental protection measures;
- to equip new automobiles with efficient emission-reduction systems (catalytic convertor, automatic starter and warm-up, fuel steam recovery system);
- to enlarge the fleet of automobiles and buses using gas fuels;
- to discontinue by 2005-2010 the production and use of leaded petrol;
- to produce fuel and lubricants that reduce the adverse effect of internal combustion engines on the environment;

- to develop and introduce new types of internal combustion engines with increased economical features;
- to develop diagnostic sets to determine technical conditions of engines and the pollutant content in automobile exhaust gases;
- to develop new, environmentally cleaner, types of motor transportation using alternative energy sources;
- to develop regulations for the construction and operation of motorways aimed at reducing harmful emissions from motor transportation;
- to expand the motorway network, with improved paving.

To solve the environmental problems of motor transportation, it is necessary:

- to ensure priority development of electrically powered public transportation, with concurrent reduction of fossil-fueled public transportation, in large cities of Ukraine;
- to apply stricter environmental regulations for new automobile and engine designs;
- to develop and introduce automobile and engine certification systems, with regard to their environmental safety, and control their compliance with the certificates;
- to create a system of certification of road vehicles and provide necessary testing equipment and devices;
- to develop a set of model progressive technologies and designs for the construction and reconstruction of wastewater treatment systems at auto service facilities;
- to develop a set of technologies, methods, and technical means for the evaluation of environmental safety of automobiles during operation;
- to develop a set of technologies and technical means for the evaluation and reduction of pollution from automobile-manufacturing enterprises.

#### **(ii) Railroad Transportation**

In order to resolve environmental problems of railroad transportation, it is necessary to develop:

- regulation requirements for rolling stock, regarding environmental norms;
- methods of estimating environmental damage that may be inflicted by railroad transportation facilities;
- technologies of utilization and safe disposal of oil product residues and other wastes;
- methods of reducing atmospheric emissions of granular cargo during transportation;
- technologies for wastewater treatment after engine and locomotive washes.

#### **(iii) Air Transportation**

The adverse effect of aviation on the environment has both a global and local nature. The aviation impact on the ozone layer of the atmosphere and its related consequences fall into the global category; the problems of aviation noise and pollutant releases into the atmospheric, underground water, and soil at the airport sites, fall mainly into the local category.

In order to comprehensively solve environmental problems of civil aviation, it is necessary to develop first and foremost:

- principles and methods of pollution reduction from aircraft engines;
- principles and methods of protection from electromagnetic fields of airport radio frequencies;
- technology for soil and water protection from airport effluents;
- optimization of a scheme of air traffic control en route and in airport zones, taking into account environmental considerations;
- methods of quantitative integrated evaluation of environmental conditions at aviation enterprises.

#### **(iv) River Transportation**

Resolution of environmental problems of river transportation envisages the development of:

- regulatory requirements for vessels regarding compliance with environmental norms;
- programs for developing a logistical base of river transportation, with the introduction of a set of progressive environmentally safe technologies and means in the various branches of river transportation (fleet, reloading units, waterways, hydro technical facilities);
- modern systems of remote diagnosis instruments, and contact signalling systems and control and measuring equipment at river transportation facilities;
- informational data systems of hardware and software support of automated control of environmental protection.

#### **(v) Sea Transportation**

The solution of environmental problems of sea transportation requires the development of:

- methodologies for the estimation of damage that may be inflicted on the environment by sea transportation enterprises;
- technologies for the protection from air pollution at and surrounding sea ports and ship-repair docks;
- technologies for protecting aquatic environments at ports from pollution;
- technologies of effective management of wastes from sea transportation enterprises.

### **21. Housing and Communal Sector**

#### **(i) Water Supply and Sewerage Facilities**

The goal of the State policy in this sector is:

- elimination of the disparity between capacities of urban water supply and sewage treatment systems;
- provision of sewage treatment in accordance with environmental laws and regulatory requirements; discontinuance as soon as possible of discharging untreated or partially treated sewage into water bodies;
- ensuring that the quality of water supply sources is in accordance with the standard on Sources of Centralized Water Supply for Housing and Drinking Purposes;
- appropriate utilization of sludge from treated sewage.

Implementation of these tasks envisages:

- creation of an up-to-date structure of public water supply;
- implementing measures to bring water quality in centralized water supply systems in compliance with requirements of the current sanitary norms;
- construction of enterprises for bottling of quality drinking water;
- introduction of efficient technologies and equipment for the treatment of waste- and storm-waters from populated areas;
- taking measures to ensure that communal sewers only carry to receiving water bodies adequately treated wastewaters;
- development of programs that appropriately utilize sludge from water supply and wastewater treatment plants -- the measures include new efficient coagulants, flocculants, small-scale treatment facilities -- and production of alternative energy sources (e.g. biogas) from wastewater treatment plants.

#### **(ii) Communal Thermal Energy Generation, and Road Facilities**

The main objective of environmental protection measures in this sector is the achievement of minimum admissible emissions of fuel combustion by-products into the atmosphere and discharges of chemical water treatment products into sewage.

Realization of these environmental protection measures foresees completion of the following tasks:

- development and introduction at enterprises of this sector qualitatively new technologies (such as efficient thermal energy generators and heat-recovery units for boiler combustion products, equipment of boilers and boiler rooms with modern fuel-burning regulating automated facilities, research and development of measures on increasing rust-resisting capabilities of dust catchers at asphalt-concrete plants, etc.) that eliminate or drastically reduce the emissions of harmful substances into the atmosphere;
- use of alternative and renewable thermal sources to reduce the total volume of fuel consumption;
- introduction of reagent-free methods of water treatment and circulating water supply systems.

### **(iii) Municipal Solid Wastes**

The aim of solving the municipal solid waste problem is the creation of a set of activities in order to collect, transport, and neutralize waste by industrial techniques, and to utilize valuable components in compliance with environmental protection requirements.

The main tasks necessary for solving the problems are:

- introduction of new technologies for municipal garbage collection and selective extraction of valuable components, and introduction of industrial technologies for utilization of the latter on domestically produced equipment;
- development of design programs for industrial non-hazardous solid waste processing plant facilities.

### **(iv) General Action Program for Communal-housing Sector**

In order to resolve ecological problems of the communal-housing sector of Ukraine, it is first necessary to:

- introduce a set of economic, scientific, technical, and legal measures for the protection and improvement of water basin conditions;
- develop and introduce legal and economic tools for the regulation of efficient water supply using modern water consumption metering systems;
- optimize use and artificial replenishment of underground waters for potable water supply;
- develop and organize production at military-industrial conversion enterprises of technological and pumping equipment and fixtures for water supply and sewerage systems;
- develop prospective heat supply schemes for small towns of Ukraine with the aim of identifying efficient sources of heating for customers;
- conduct research on defining and optimizing the characteristics of particulate-control equipment, and to develop specific recommendations concerning air quality protection at the locations of asphalt-concrete plants;
- provide enterprises with a modern regulatory and logistical basis for implementing a set of activities dealing with the collection, transportation, and neutralization of municipal solid waste.

## **22. Industrial Wastes**

One of the priority directions for minimizing the accumulation of industrial wastes is the extraction of economic components in such wastes and use them as secondary resources. To reduce Ukraine's dependence on import supplies of non-ferrous and rare metals that are a deficit in the country, extraction of these metals from wastes of mining, metallurgical, and other industries should hold future prospects.

Potential sources of industrial wastes are from:

- steel industry - zinc, copper, lead;
- mineral fertilizer production - strontium, lime, sulphur, rare earth elements;
- titanium and magnesium production - vanadium, nickel;
- alumina slime - iron, non-ferrous metals;
- coal-fired power plant slag-ash - aluminum, vanadium, nickel, ferrosilicium;
- galvanic production - non-ferrous metals;
- iron and manganese ore mining - gold, silver, germanium, manganese, iron, etc.;
- coke production - mercury, rare metals, and certain organic compounds.

In fuel energy, the greatest potential are coal processing wastes, which have accumulated to 1 billion tons.

The gap between the volume of accumulated wastes and the volumes of their utilization and neutralization aggravates the environmental crisis. At the same time, expenditures for primary raw materials extraction for industrial purposes is constantly growing. Lately, the problem of resource-dependence of Ukraine on external sources for many types of resources has been added to those factors. All this shows the importance of secondary resource usage.

Thus, the issue of wastes should be viewed within the framework of a unified approach to socioeconomic and resource-technology aspects, as a combination of three components (problem aspects):

- resource-related (development of secondary resource usage);
- environmental (achievement of environmental safety);
- methodological and organizational (scientific and methodological, informational and analytical, organizational, and legal support of decision-making and regulation).

The resource and environmental aspects of the waste issue have both independent and common, integrated goals. A separate task is the development of measures and techniques to solve the above-mentioned problem. As potential raw materials, wastes can substantially replace primary resource sources, thus lowering total resource consumption. Today, the majority of wastes either remain unused or are utilized in the simplest technological schemes that do not ensure the full realization of their resource potential.

Thus, the set of goals for the resource-related aspect foresees:

- identification of the economic value of wastes, and technological capability of their integrated processing;
- identification of the ability to replace primary raw materials with secondary, and recycling;
- economic justification of ways and means of waste utilization;
- creating a scheme of resource utilization that has a system of closed-cycle territorial production links on the basis of intersectoral cooperation and cascading production design.

Industrial wastes are one of the most significant factors of environmental pollution. The dumping of wastes requires setting-aside considerable areas of land, as well as transportation and storage, involving huge expenses by enterprises. The most toxic wastes require special measures for rendering them harmless and burying them. Therefore, the reduction of waste volumes, especially of toxic waste, would facilitate their neutralization and reduce their adverse environmental effect.

Taking this into account, the set of goals for the environmental management foresees the development of measures concerning:

- minimization of waste volumes caused by technical and technological reconstruction of production, and fuller and more comprehensive usage of raw material;

- reduction of the toxicity of residual wastes and their negative impact on the environment by means of treatment, rendering harmless, or reliable isolation;
- environmental and technological justification of ways and means of the most efficient neutralization of hazardous wastes;
- rehabilitation, particularly recultivation, of territories covered and/or polluted by wastes.

Irrespective of the independence of the goals of resource utilization and environmental management, their general aim is common. It is the creation of environmentally safe, resource-saving, low-waste or waste-free production facilities, and territorial production complexes at various levels (industrial unit, city, district, etc.), where the wastes of one enterprise become fully or partially the raw material for another, i.e. a cascading production scheme.

The solution of the waste issue should be viewed from the standpoint of so-called "industrial metabolism." According to this, the economy, production, and consumption structure, together with the quality of life, are a united system and correspondingly a unified socioeconomic issue.

Since a wide range of socioeconomic entities (enterprises-waste producers, developers of waste utilization technologies, local executive authorities, and local environmental protection facilities where wastes are produced and/or stored) are involved in the waste problem, it is evident that accomplishment of the tasks of various entities requires a unified scientific, methodological, legislative, organizational, and regulatory base.

Thus, the goal of the methodological and organizational aspect is:

- development of a conceptual targeted program to address the problem of wastes;
- creation of scientific and methodological support for environmental and economic evaluations of secondary resource usage, economic incentive mechanisms, and normative bases;
- development of information and analytical services to support resource-related and environmental tasks;
- creation of a set of administrative, legal, organizational, and environmental measures to encourage the utilization and neutralization of wastes.

Achievement of the goals of the resource-related aspect foresees:

- determination of volumes, rates of production, and relocation of wastes;
- determination of the composition and properties of wastes;
- analysis of the conditions and regulations for primary and secondary raw material use; the state of the raw materials market, and economic evaluation of waste utilization feasibility;
- justification of the concept of the priority directions and scales of development of secondary resource usage and target programs;
- classification of wastes according to their problems and goals by resource indicators;
- development of new and improvement of existing technologies and production schemes for waste utilization;
- provision for selective storage of wastes according to their properties, and conservation of resource-valuable wastes (creation of technogenic deposits);
- development of specific recommendations and justifications for waste utilization and for the design of technological links for integrated raw material processing.

In order to achieve the goals of the environmental aspect, the following tasks should be completed:

- estimate the toxicity of wastes and to research the mechanism and effects of their impact on ecosystems;

- **classify wastes according to their ecological hazard;**
- **develop requirements for waste conservation and storage according to their toxicity categories;**
- **provide justification of economic measures for the safe waste disposal, and reduction of toxic content and overall volume of wastes;**
- **work out technologies of rendering toxic waste harmless;**
- **create regional dump grounds in which toxic wastes are to be rendered harmless.**

The following tasks are shared by both the resource-related and environmental aspects:

- **registration (inventory) of wastes and technologies, compilation of registries, etc.;**
- **comprehensive environmental and economic evaluation of the efficiency and prioritization of measures for waste utilization and neutralization.**

The above-mentioned tasks concerning resource-related and environmental aspects are not independent of either informational support, or measures and their algorithmic resolution. Thus, the achievement of these tasks of various aspects of waste issues requires a unified scientific-methodological, legislative, and organizational-regulatory base, and should be based upon common informational support and integrated databases and methods of information analysis.

All this constitutes the methodological and organizational aspect, within the framework of which the following tasks are to be accomplished:

- **development of methods of defining the resource value of waste, as well as waste classification system;**
- **creation of informational, and resource and technology data banks;**
- **creation of a data base on waste issues, and a decision-making support system;**
- **expansion of informational and analytical system capabilities, and use of these in waste-issue decision-making;**
- **adoption and implementation of the Law on Wastes, and economic, administrative, and other incentives for the utilization and neutralization of wastes.**

According to the specified tasks, the main measures for the usage of the most valuable types of wastes include:

- **increase in the volume of metallurgical slag processing - granulated slag, pumice, slag wool with extraction of metal raw materials (for further melting of the metal), processing in 5-6 years of the entire volume of produced slag;**
- **provision for the utilization of wastes with metal content (slurry, scale, grate bar, and agglomerating dust) at metallurgy enterprises, following the introduction of new technologies and capacities for slag utilization, and using leftovers in the cement industry instead of pyrite cinders;**
- **expansion of the usage of ash and ash slag from TPP for the production of concrete (instead of gravel, sand, and cement) by building of installations for divisionally separate units at the TPP;**
- **doubling in 5-6 years the production of wall ceramics from coal processing wastes, and their addition to raw material mixtures at operating brick factories;**
- **expansion of the production of gypsum and building materials of phosphogypsum, and the organization of preparation and supply of phosphogypsum for the amelioration of saline soils;**
- **increase of limestone waste usage for production of powder lime and cement, and the provision of the preparation and delivery of limestone and sulphur wastes for lime treatment of acid soils in agriculture;**
- **full processing of wood wastes into chips for technological purposes, and briquetting of cuttings and sawdust for their use as fuel or for hydrolytic yeast production;**

- regeneration of all casting mold compositions and consecutive reduction of the need for additional deliveries in molding sand and usage of leftovers in construction material production.

### **23. Military Activity and Military-Industrial Complex Conversion**

Conditions for the accomplishment of environmental policy in the military sphere and for conversion of the military-industrial complex are:

- ecologization of state military and technical policy;
- improvement of environmental outlook and environmental legal awareness among military authorities, personnel, and MIC employees;
- research and development for the purpose of evaluation, improvement, and stabilization of environmental conditions in the areas of deployment of military units and facilities, including foreign activities;
- introduction of an ecological registration system of facilities in the Armed Forces, the organization of a system for environmental monitoring in garrisons and at MIC enterprises, and incorporating it into the national system of environmental monitoring;
- compulsory individual liability for breaches of environmental legislation by military service personnel, including that of foreign troops temporarily located on the territory of Ukraine, and personnel at MIC enterprises;
- development and implementation of a comprehensive program of environmentally safe activities of the Armed Forces of Ukraine in the future.

To achieve steady and secured environmental safety of military activities and MIC conversion, the main efforts should be aimed at:

- formation of a database of environmental conditions at defense facilities and the possibilities to use MIC conversion for the elimination of damage inflicted on the environment and the improvement of the environmental situation in the Armed Forces of Ukraine;
- development and production of modern environmental protection machinery and equipment for the Armed Forces of Ukraine;
- inclusion of defense facilities into the state system of environmental monitoring of Ukraine;
- solution of issues related to the division of the Black Sea Fleet and its coastal infrastructure;
- efficient nature management, and environmentally safe use of facilities, land, forests and water areas designated for the defense of the State for military training and production;
- promotion of mutual trust, exchange of information and cooperation between the Ministry for Environmental Protection and Nuclear Safety and authorities of the Armed Forces of Ukraine with respect to issues related to environmental conditions and the efficiency of environmental protection in the area of defense;
- elimination of the effects of environmental damage inflicted by military-defense activities and, in particular, compensation for losses incurred by the temporary location of foreign troops on Ukrainian territory;
- promotion of open and unbiased information on environmental issues of military activities by the mass media of Ukraine.

### **24. State System of Environmental Monitoring**

Environmental monitoring is the collection of data on the environment by updated means, and evaluating it in order to forecast the state of the environment in which society lives, and conditions for the functioning of ecosystems, so as to be able to adopt management

**decisions regarding environmental safety, nature conservation, and efficient nature management.**

**Establishing and operating a State System of Environmental Monitoring should promote the implementation of national environmental policy which provides for the following:**

- **environmentally efficient use of nature and socioeconomic potential of the state, maintenance of an environment favorable for society;**
- **effective - from the socio-economic and economic point of view - resolution of problems resulting from environmental pollution, adverse natural phenomena, and technogenic accidents and disasters;**
- **development of international cooperation with regard to biodiversity conservation, protection of the ozone layer, protection from anthropogenic climate change, protection of forests, and forest recreation, transboundary environmental pollution, and rehabilitation of natural conditions on the Dnipro, Danube, Black and Azov seas.**

**The State System of Environmental Monitoring is an integrated information system for collecting, storing, and processing information for sector or comprehensive evaluation and forecast of conditions of the natural environment, and development of justified recommendations for the adoption of effective social, economic, and environmental decisions at all levels of state executive power, and improvement of appropriate legislation as well as adherence to Ukraine's obligations in international environmental agreements, programs, projects and measures.**

**The State System of Environmental Monitoring should be established and operate on the basis of the following principles:**

- **systematic monitoring of environmental conditions and technogenic objects which affect the environment;**
- **timely supply and processing of monitoring information at sector and general levels (local, regional, and national);**
- **comprehensive use of environmental information which is input into the system by agency services for environmental monitoring and other suppliers;**
- **realistic primary, analytical, and forecast environmental information and coordinated normative, organizational, and methodological support of environmental monitoring carried-out by appropriate services of ministries and agencies of Ukraine as well as other central bodies of executive power;**
- **compatibility of technical, informational, and software support of its integral parts;**
- **immediate supply of environmental information to concerned executive bodies, other bodies, enterprises, organizations, and institutions;**
- **accessible environmental information for the population of Ukraine and world community.**

**Environmental monitoring is carried out under a long-term State Program which defines joint and coordinated -- with regard to goals, tasks, territories and objects, time (periodicity) and means of implementation -- actions of State executive agencies, enterprises, organizations and institutions irrespective of their forms of ownership.**

**Establishment of the State System of Environmental Monitoring should ensure achievement of the following main goals:**

- **to increase the adequacy of actual conditions of the environment and its information model formed on the basis of the data obtained through systematic studies conducted by special services of ministries and agencies, enterprises, organizations and institutions, as part of their information activities, research work, and scientific research;**
- **to improve on-line supply and accuracy of primary data due to precise methods, modern control and measuring devices, and methods of computerizing the processes**

of collection, accumulation, and processing of environmental information at all levels of state administration and local self-government;

- to increase the level and quality of information services provided to consumers of environmental information at all functioning levels of the system on the basis of network access to distributing sector and integrated data banks; comprehensive processing and use of information in the decision-making process.

Ministries and other central executive bodies -- which, within their competence, receive and process data on environmental conditions and take appropriate decisions on the normalization or improvement of environmental situation, efficient use, and quality of natural resources -- are the agents of the State System of Environmental Monitoring, responsible for compulsory implementation of the State Program of Environmental Monitoring.

The informatization in the State System of Environmental Monitoring of Ukraine should apply to the processes of sector of environmental activities and their integration at the local, administrative and territorial, and national levels, which respectively include:

- territories of urban industrial agglomeration, sanitary protection zones of large enterprises (including NPPs), large water reservoirs, nature conservation zones, and other specially determined areas;
- the territory of the Autonomous Republic of Crimea and the territories of the oblasts of Ukraine;
- territories of industrial regions, basins of large rivers, and Ukraine on the whole.

The territory of the country is divided according to the level of environmental risk into zones for which norms are established permitting or prohibiting certain types of production, economic and other activities, taking into consideration environmental, social, and economic conditions.

The principles of territory zoning, and the list of prohibitions and restrictions on economic and other activities for respective categories of territories, are determined by competent executive bodies of Ukraine.

Generally, crisis and background environmental monitoring is implemented under special programs dependent on its designation.

General environmental monitoring comprises places, parameters, and periods -- optimal with respect to their number and location -- for study of the environment, which enable the support of decision-making processes at all levels of sector and national environmental activities on the basis of evaluation and forecast of the environmental conditions.

Crisis environmental monitoring comprises intensive examination of natural objects, sources of technogenic influence located in regions of environmental stress, in zones of accidents and hazardous natural phenomena with adverse environmental effects for the purpose of timely response to crisis and emergency environmental situations and the adoption of decisions on their elimination, creation of normal conditions for life, and economic activity of the population.

Background environmental monitoring comprises a long-term comprehensive research of specially determined objects in nature conservation zones in order to evaluate and forecast the change in the conditions of ecosystems located at a remote distance from industrial and economic facilities, or to obtain information to determine the average statistical (background) level of environmental pollution in anthropogenic conditions.

## **25. A Single National System of Emergency Prevention and Response**

The purpose of creating a unified state system for the prevention of accidents, disasters, and emergencies, and responding to them is the systematic control of environmentally dangerous facilities and processes of the technogenic environment for the regulation of safety conditions and development of technogenic load; prevention of accidents, disasters and emergencies and their forecasting and minimization of impact.

**It is necessary to work out and introduce appropriate programs at the national, regional, and local levels for this, in particular:**

**(a) to create a system of interconnected bodies of executive power to solve the issues of accident prevention, improvement of readiness for them, and overcoming the effects of accidents and disasters;**

**(b) to develop a legislative basis and a package of other legal acts for the regulation of technogenic and environmental safety that would take into account peculiarities of the ecological threat to the technogenic environment of Ukraine and meet the norms of countries with a developed technogenic macrostructure:**

- **develop and introduce a system of unified state control over the circulation of especially dangerous materials, substances and equipment;**

**(c) to develop a scientific and methodological basis of regulation and planning of technogenic and environmental safety:**

- **to develop and introduce methods for revealing and assessing environmentally dangerous kinds of activity;**
- **to develop methods of evaluating and forecasting the possibility of occurrence of dangerous and emergency situations;**

**(d) to create problem- and object-oriented automated systems of risk evaluation and emergency forecasts;**

**(e) to develop and implement a regulatory and methodology basis for a system of accident prevention and overcoming their effects, including:**

- **organizational and technological schemes and mechanisms of control and forecasting of accidents and emergency situations;**
- **procedures on the cooperation of state bodies and public organizations in preventing accidents, improvement of readiness for them, and overcoming of their effects;**

**(f) to integrate a state system of Ukraine related to accident prevention and response into an international system of notification and support in the event of an accident;**

**(g) to introduce mandatory environmental insurance for environmentally dangerous productions.**

#### **IV. MAIN MEASURES FOR THE BALANCED USAGE AND RENEWAL OF NATURAL RESOURCES**

##### **26. Land Resources**

**The State policy for the protection and efficient usage of land resources is determined by a system of legal, organizational, economic, and other measures which have a nature protection, resource conservation, and rehabilitation focus.**

**A land inventory of populated areas, industrial enterprises, other enterprises, organizations and institutions of transportation, communications, defense, forest resources, and other land is carried out; and the areas that are used inefficiently or for nontargeted usage identified. State- and communally-owned lands are determined; and lands for research and development and specialized agricultural production, nature conservation, health resorts, recreational, and historical-cultural purposes are reserved, and a state rehabilitation fund is created for cultivated lands which require measures to renew their fertility. A land registry evaluation is carried out; scientific, methodological, and regulatory documentation is created to determine basic land prices; a state system of land resource quality management is established and its place among state administration bodies is identified; and a definition of the principles dividing the responsibilities of the state, landowners, and land users with regard to land resource protection is stipulated.**

The structure of cultivation is optimized, and highly productive, ecologically stable landscapes are formed of which the re-cultivation of ploughed lands is reduced to 50%, the share of meadows, hay and pasture lands is increased to 17-20%, and forests to 20%, the area of land for the nature protection fund is made equal to a world average level (5%). The soil-protection system is to consist of land cultivation, contour-ameliorating territory arrangement, with enlarging areas of chisal soil cultivation, ploughing land compaction, with strip arrangement of cropland and fallow-land, first priority alkalization and conservation of highly eroded and declivity landowners and users. Projects are developed on contour-amelioration organization of territories, according to which actions are taken to carry out protective afforestation, to construct anti-erosion hydrotechnical facilities, and proper operation is provided.

The re-cultivation of damaged lands, the area of which is over 190,000 ha, the rejuvenation of their soil cover and recovery for agricultural production is one of the most important problems. The re-cultivation of lands should be accomplished based on landscape environmental principles which envisage an optimum ratio of various directions of rehabilitation of damaged territories, the creation of highly productive cenosis, the increase and rejuvenation of fertility of re-cultivated soil, and the prevention of the negative effects of technogenic entities on the environment.

An important aspect of efficient land resource usage is the improvement of the environmental state of irrigated land, where flooding, secondary salinity, water erosion, ruining of natural soil structure etc., are detected. Attention should be paid to the efficiency and reconstruction of existing irrigation systems for the development of such technologies of water usage which would consider the physiological need of agricultural crops and changes to the microclimate of irrigated lands, and ensure corresponding harvests without land degradation.

To improve the state of drained land, it is necessary:

- to develop scientifically based criteria for the evaluation of drainage consequences during the phase of design and implementation;
- to increase within the structure of cropped lands the proportion of perennial grasses area to 50-60% of drained land;
- to ensure that two-way water regulation systems constitute around 70% of drained land area.

The grounds for the directions of efficient land resource usage and introduction of economic and technological measures for the renewal of their environmental function will be provided by:

- establishment of soil pollution levels for releases from industrial and agrochemical facilities; the development of soil environmental classification of lands, as well as crisis conditions criteria and environmental stability characteristics of landscapes; and regionalization of the territory of Ukraine according to these indicators;
- development of soil protective and ameliorative land usage models in specific natural climatic conditions, conducting corresponding design and exploration, taking into account forms of land usage;
- creation of a surveillance system for land resource conditions and forecasting social and environmental effects of changes, etc.

## **27. Efficient Use and Rehabilitation of Water Resources and Ecosystems**

The long-term goals of the policy of the efficient usage and rehabilitation of water resources are:

- reduction of the anthropogenic pressure on water bodies;
- achievement of environmentally safe usage of water bodies and water resources to meet the economic needs of society;

- provision of environmentally stable functioning water bodies as an element of the environment with the preservation of properties of a water ecosystem to renew water quality;
- creation of an effective structure of management and mechanisms of economic regulation of the protection and use of water resources.

For the stage-by-stage implementation of the designated objectives, comprehensive measures should be carried out in the following priority directions:

- (i) protection of surface and underground water from pollution;
- (ii) ecologically safe use of water resources;
- (iii) renewal and preservation of the favorable hydrological condition of rivers and measures against the detrimental effect of waters;
- (iv) improve the system of management of the protection and use of water resources;
- (v) reduction of the influence of radioactive pollution.

*(i) Protection of Surface and Underground Water from Pollution*

The strategic goal is the achievement of the ecologically safe usage of water resources. This guarantees the environmental safety of water bodies, balances the harmful effects on water resources, and ensures their ability of self-cleaning and self-rejuvenation.

The main goals are:

- reduction in water bodies of the amount of biogenic substances, petroleum products, pesticides, heavy metal ions, radionuclides and other harmful substances;
- litter-prevention in water bodies;
- improvement of normative and legal as well as economic and environmental bases with the goal of improving the quality of water bodies;
- improvement of a system of monitoring, recording, and control over the pollution of surface and underground waters, and the development and introduction of an identification system and instrument control over all stationary pollution sources of surface waters with the creation of a corresponding information database.

The above-mentioned goals will be achieved by:

- regulation of existing wastewater disposal systems at communal housing facilities with the aim of the complete stoppage of discharge into water bodies of untreated and insufficiently treated wastewaters from communal housing and provision of the required level of wastewater treatment according to established norms and standards;
- regulation of the existing wastewater disposal system at economic facilities with the goal of the complete stoppage of discharge into water bodies of untreated and insufficiently treated wastewaters from economic facilities, provision of the required level of treatment of wastewater according to established norms and standards with the application of the best existing technologies, and provision of such a level of wastewater treatment that corresponds to design parameters of treatment facilities;
- regulation of existing runoff water from agricultural lands with the aim of further development of land by the creation of an ecological balance in agricultural production and the achievement of anti-erosion stability of agricultural landscapes;
- elimination of discharges into water bodies of untreated wastewater from enterprises of intensive animal husbandry by building manure-accumulation tanks, transfer to litter management raising of animals, etc.;
- organization of existing wastewater disposal to eliminate discharges into water bodies of untreated surface wastewaters from the territories of cities and towns. This will prevent littering of water bodies and the discharge of polluted wastewaters in places where their volumes fundamentally impact environmental, sanitary, and hygienic conditions of water bodies;

- avoidance of pollution of underground waters by development and introduction of an identification system and improvement of the control over all existing and possible sources of pollution of underground waters with the creation of a corresponding system of management and information data base.

***(ii) Ecologically Safe Use of Water Resources***

The strategic goal is the provision during the process of water resources usage of the priority of nature functions over economic, efficient usage of surface and underground water, and wide-scale implementation of water saving technologies in all sectors of the national economy.

The main goals are:

- reduction of the volumes of water consumption and wastewater disposal with the implementation of intensive means of water management;
- reduction of water losses and polluted wastewater discharges by improving the technological processes in metallurgy, coke-chemical, coal mining, and other branches of industry;
- reduction of the industrial usage of potable water by replacing it with mineralized underground and mine waters;
- usage in industry of recycled and reusable water at a level of 97-97.5% of the total volume of water that is consumed by industrial enterprises.

The above-mentioned goals are achieved by the following:

- introduction of the ecosystem regulation of the needs of water consumption;
- organization and increase of the technical and technological levels of special water usage by taking nature protection measures, developed by economic objects, as well as sectoral scientific and technical and investment, regional and local environmental programs, provision of water use metering;
- implementation of low-water and water-free technologies, reuse of wastewater, closed (nonwaste) systems of production water supply.

***(iii) Renewal and Preservation of the Favorable Hydrological Condition of Rivers and Measures Preventing the Detrimental Effect of Waters***

The strategic goal is the improvement of the overall environmental state of water bodies of the Dnipro River Basin that provide for the stable functioning of natural ecosystems and harmonious development of economic complexes in this basin.

The main goals are:

- renewal of rivers by the creation of water protection zones and riparian areas, their clean-up and organization along with corresponding measures regarding water removal in their water drainage basins;
- improvement of the hydrological, morphological, and hydrochemical systems of water bodies and water courses with the aim of creating conditions for the balanced development of biotes and sustainable usage by humans;
- promote an increase of fauna and flora in water bodies;
- creation of such features of river channels, banks and riparian areas which provide an opportunity to develop self-regulating biosynthesis;
- maintenance of the water recovering capability of landscapes, optimization of their structures, and provision of the ecological balance of natural processes by achieving optimum correlation of various types of cultivated lands in water catchment river basins.

For the achievement of the above-mentioned goals, it is necessary:

- to create and organize water protection zones and riparian areas;
- to support the established regime on territories of water protection zones and riparian areas;

- to renew and support a favorable hydrological regime and sanitary conditions of rivers;
- to strengthen river banks;
- to prevent the harmful actions of waters (building of hydro-technical facilities, protective dams, etc.);
- to develop and introduce norms for ensuring adequate water flow of rivers and other water bodies and their environmentally safe water usage;
- to develop and introduce criteria of safely permissible level of anthropogenic loads and a forecast of the conditions of water bodies;
- to complete an ecological inventory of small rivers and other water bodies;
- to improve a system of monitoring and control over the state of water bodies, water protection zones and riparian areas, zones of sanitary protection, etc.

***(iv) Improve the Management System for the Protection and Use of Water Resources***

The main goals are:

- improvement of a system of management of water usage, protection of waters, and renewal of water resources;
- introduction of principles for the improvement of ecological conditions of water bodies on the basis of the watershed approach, on the principles of which water protection programs of the regions, oblasts and individual populated areas, will be developed and introduced.

The above-mentioned goals can be achieved by the following:

- creation of organizational mechanisms regarding the provision of acceptable administrative decisions and their financial provision on the watershed principle;
- development of a normative and methodological basis of an ecological and investment activity and the functioning of an management infrastructure at river basins;
- development and coordination of directive documents and a normative and methodological basis of a system of monitoring, recording, and control over water consumption, protection of waters, and renewal of water resources in the basins of the Dnipro, Siversky Donets, Dnister, Southern and Western Buh rivers, etc.;
- creation (design, corresponding arrangement, etc.) of the watershed geoinformational systems with databanks of ecological and water management information.

***(v) Reduction of the Impact of Radioactive Pollution***

The strategic goal is the reduction of the impact of radioactive pollution on the conditions of water bodies.

The main goals are:

- isolation of surface waters polluted by radionuclides near to the Chernobyl NPP and catching of surface runoff from the polluted territories of Belarus, reduction of the drainage into water bodies of radionuclides, prevention of radioactive pollution of ground and underground waters from wells which are not in use;
- introduction of a scientifically based technology of water protection activity in zones under the influence of the Chernobyl NPP, and the prevention of other cases of radioactive pollution of water systems.

The implementation of the above-mentioned water-ecological policy should be implemented on the basis of the development and step-by-step introduction of nature protection measures, established by the State and regional programs of ecological improvement of water basins.

**An important condition for carrying out a policy of efficient usage and renewal of water resources and ecosystems in the next few years is the need for the implementation primarily of measures which do not need significant capital costs, in particular:**

- **raising the general culture of production;**
- **strict compliance with the technological norms of the consumption and usage of water resources;**
- **maintaining at an appropriate level the condition of existing treatment facilities and equipment;**
- **prevention of accidents;**
- **provision of timely collection of litter and clean-up of urban areas; strict control by environmental protection agencies of pollution from urban areas;**
- **compliance with legislation regarding a regime of usage of riparian areas and water protection zones; control over the preservation and use of organic and mineral fertilizers, toxic chemicals, detergents, petroleum products, etc., in order to prevent their discharge to water bodies.**

## **28. Mineral Resources**

**The goal of the program on the protection, efficient use, and rehabilitation of mineral resources are:**

- **balanced mining and processing of mineral resources under conditions of economically sufficient supply to industry, power generation, construction, agriculture;**
- **provision of the maximum reserve of minerals;**
- **re-cultivation of lands;**
- **minimized deep burial of wastes, due to the absence of closed geological structures.**

**The following must be carried-out to achieve this objective:**

- **definition of the public production needs in mineral and fuel energy resources, in terms of balance, sufficient volume, integrity, and ecological safety;**
- **development of environmental requirements for the protection, efficient use, and rehabilitation of mines under new economic conditions.**

**The development of the mineral raw materials complex of Ukraine is to be carried out in the following directions:**

**(i) expansion and strengthening of the mineral raw material base for operating enterprises that use mineral raw materials (oil, natural gas, coal, uranium, ferrous metals, titanium, non-metals and construction materials) which are mined in Ukraine;**

**(ii) creation of a national mineral raw material base for operating enterprises, that use imported raw materials (lead, zinc, copper, tin, tungsten, molybden, tantalum, niobium, phosphorites, etc.) and new non-traditional raw materials base (lanthanoids, yttrium, scandium, platinumoids, gold, diamonds) for the needs of aerospace, instrument-making, radioelectronics, electro-technical industries, etc;**

**(iii) maximal recovery of mineral raw materials from technogenic deposits;**

**(iv) geological survey and evaluation of the mineral raw materials base of the global ocean, primarily in the Black and Azov Seas.**

## **29. Atmospheric Resources**

**Urgent atmospheric stabilization measures to be introduced to normalize environmental state and stabilize the condition of air basins, are as follows:**

- **improve the effectiveness of atmospheric protection by the enforcement of technological discipline at industrial enterprises;**
- **revise the list of main air pollutants which are subject to rating;**
- **improve the regulation system for pollutant emissions.**

**The following measures are to be taken with this purpose:**

- set up air quality standards, coordinated with international system of standards;
- create a new system of ecological regulation with the introduction of technological standards and norms concerning the creation of pollutants during technological processes;
- develop technological regulations for basic pollutants, taking into account modern technologies;
- develop target programs aimed at short-, medium-, and long-term gradual decrease of air pollution in cities which currently have increased levels of air pollution;
- carry-out the transition to international standards and regulations related to air quality.

### **30. Flora and Forest Resources**

The main directions of state policy in the sector of protection, usage, and renewal of flora resources are:

- improvement of the legal and normative base regarding the protection, usage, and renewal of flora;
- implementing measures for the prevention of technogenic processes which negatively impact flora units;
- population monitoring;
- inventory of the growth areas of rare and endangered species of plants that are included in the *Red Book of Ukraine*;
- regulation of issues on the import to and export from Ukraine of flora, especially those which are included in the Convention on International Trade of Species of Wildlife and Flora in Danger of Extinction;
- making order in the collection of wild plant raw materials by enterprises, institutions, organizations, and citizens;
- introduction of a permit system for use of units of the plant world and introducing payments for special use of plant resources.

Contemporary and future strategies of forest management will be defined by two tendencies:

- growth in the need for wood raw material, given a significant deficit of timber;
- dramatic growth in climate-regulating, protective, sanitary and hygienic, recreational and tourist, and aesthetic role of forests in conditions of environmental crisis.

The first tendency requires the efficient usage of timber, collected from cuts of primary usage as well as from forest management cuts, sanitary and forest renewal cuts. The determining principle for the efficient usage of timber resources should be waste-free forest management.

Significant reverses of additional receipt of raw materials lie in increasing the level of timber biomass use up to 80% (without adverse effects on soil fertility and plant resources) compared to the current level (48%). This will be ensured by the creation and broad introduction of low-waste and waste-free equipment and technologies.

The expansion of the raw materials base of the pulp and paper industry on the basis of the plantation of forests, introduction of resource conservation equipment and technologies in the wood processing industry, use of substitutes and secondary raw materials, will allow from the year 2015 to annually save 2,220,000 cubic meters of wood.

Another tendency will be provided by the review of existing forests into groups and categories of protection, given their ecological and economic significance as well as by increasing the territory that is protected, limitation of regulated anthropogenic load, increase of volumes of works on forest planting, protection and preservation of forests, and

increase of the productivity and improvement of forest composition with regard to tree types.

Renewal of the raw materials base of wild fruit, berries, mushrooms, and medicinal plants is possible mainly by creating artificial plantations. For this, by the year 2000, it is foreseen to annually increase plantations of valuable medicinal plants by an area of 550 hectares, and nut-bearing plants by 120 hectares.

The effective use and renewal of forest resources requires the creation of a complete system of forest monitoring as comprehensive continuous observation, evaluation, and prognosis of its state. Within the framework of the system of State Monitoring of the Environment of Ukraine, the monitoring of forests is to become a means of forest management by the optimization of a system of forest use and prevention of critical ecological phenomena and processes.

### **31. Nature Reserves, Biodiversity Conservation**

The main directions for the development of reservations and preservation of biodiversity and actions to be taken for their implementation foresee:

- creation of an optimum representational network of nature reserve fund of Ukraine;
- reservation of valuable reserve territories and sites during the process of land reform.

The preservation and efficient management of fauna and flora resources will be realized on the basis of:

- organization of comprehensive monitoring of the status of fauna and flora population, and an introduction and maintaining of a state cadastre;
- development and introduction of modern scientific evaluation methods on the optimum levels of biological resource usage;
- development and introduction of state, regional, and international programs for the protection, usage, and renewal of fauna and flora species in danger of extinction due to adverse effect of economic activity.

### **32. Recreational Resources**

The program of rehabilitation and efficient usage of natural medicinal resources envisages:

- development of documentation that will regulate the quality of natural medicinal resources (state standards for all components of natural medicinal resources);
- development and publication of maps and cadasters of all medicinal nature resources;
- implementation of a state program of monitoring the quality of current conditions and usage of natural medicinal resources;
- provision by all enterprises, organizations, and institutions of all property forms exploiting medicinal resources for the development and approval of projects for districts and zones of sanitary protection around resorts, resources, technological schemes for efficient use, and organization of a monitoring and control system;
- development of a methodology of defining the limit and optimum resort and recreational load on territories, taking into account prospects for resort and recreational construction;
- completion of scientific research on the evaluation of prospective recreational territories of national significance, and mapping and their approval as zones or territories ineligible for privatization;
- implementation of medical zoning of resort-recreational territories of Ukraine and the drawing-up of territorial integrated diagrams of environmental protection of the main resort-recreational regions of Ukraine.

## **V. MAJOR PHASES IN IMPLEMENTING THE PRINCIPAL DIRECTIONS OF STATE POLICY OF UKRAINE IN ENVIRONMENTAL PROTECTION, USE OF NATURAL RESOURCES, AND ENSURING ENVIRONMENTAL SAFETY**

The Principal Directions are to be implemented in three phases.

During the first phase (1997-2000), it is necessary to complete and to implement urgent measures restricting the detrimental effect on the environment by the most dangerous pollution sources.

The main tasks at this phase are:

- improvement of legislative and legal basis for environmental protection and efficient use of natural resources;
- development and introduction of an economic mechanism of environmental protection and the efficient use of natural resources;
- creation of a system of comprehensive, full, and adequate control of environmental conditions with simultaneous introduction of integrated interdepartmental environmental monitoring elements;
- implementation of urgent environment stabilization measures;
- development and introduction of environmental educational and training programs, and programs on raising public environmental awareness.

In the second phase (for 10-15 years starting from 1998), it is planned to develop and start to introduce comprehensive programs, oriented at the achievement of a balance between levels of harmful influence on the environment and its ability to recover.

The main tasks of this phase are:

- optimization of the structure of nature management;
- ecologically oriented restructuring of the economy;
- development and introduction in Ukraine of a system of state monitoring of the environment, creation of a system for the analysis of ecological conditions, and forecast, planning and prevention systems regarding the likelihood of harmful factors.

At the third phase, it is planned to create a system of state management for natural resource usage and regulation of the technogenic impact on the environment as a basis of managing sustainable development of society. Fragmentary implementation of these measures has started in 1996, and more wide-scale introduction will be implemented according to the rate of economic stabilization of the country.

The main tasks of this phase are:

- further development of a system of state environmental monitoring, creation of an automated system of ecological conditions evaluation, forecasting of detrimental influence on the environment, planning of actions in case of emergencies on the basis of estimates and scenarios of situation development;
- relevant coordination of efficient natural and socioeconomic potential, taking into account ecological indicators on the basis of sustainable development.

As a result of realization of these Principal Directions, an environmentally balanced system for managing the development of society will be created that will encourage the reproduction of natural properties of the environment and the competent regulation of natural resource usage and productive force development in the country.

## **VI. MECHANISMS FOR THE IMPLEMENTATION OF THE PRINCIPAL DIRECTIONS OF STATE POLICY OF UKRAINE IN ENVIRONMENTAL PROTECTION, USE OF NATURAL RESOURCES, AND ENSURING ENVIRONMENTAL SAFETY**

**The following should be considered as the basic components of implementing the Principal Directions:**

- **state institutional infrastructure for a policy of environmental protection;**
- **legislative and legal mechanisms of regulating the production activities of legal entities and physical persons with regards to protection and use of natural resources and their wastes;**
- **economic mechanisms of nature management, and nature protection activities;**
- **mechanisms for the implementation of international, national, regional, sector, and local nature protection programs.**

### **33. Organizational Basis for Environmental Protection and Efficient Use of Natural Resources of Ukraine**

**The creation of an effective state system environmental protection and efficient use of Ukraine's natural resources has the following goals:**

- **develop and implement a national policy for environmental protection and efficient use of natural resources;**
- **create conditions for efficient enforcement of environmental and nuclear safety policy;**
- **resolve issues related to professional training in environmental protection and implementation of policy for the regulation of environmental and nuclear safety.**

**The following three levels are determined for the purpose of environmental policy implementation: national, regional and local.**

**The functions of the national level of management comprise the following issues:**

- **development of methodological, normative, and legal framework;**
- **development of a policy for nuclear safety regulation;**
- **state environmental expertise;**
- **creation of an economic mechanism for nature management;**
- **regulation of natural resource usage and prevention of environmental pollution;**
- **licensing of ecologically dangerous activities;**
- **state policy on emergency ecological situation zones;**
- **establish standard quality of natural resources;**
- **generation and use of state non-budget funds for environmental protection;**
- **regulation of use of resources of national importance;**
- **state control over compliance with environmental legislation, including nuclear and radiation safety;**
- **environmental audit;**
- **unified scientific and technical policy in protection, efficient usage and renewal of natural resources;**
- **state policy on biodiversity conservation;**
- **environmental safety as a component of national security;**
- **implementation of international agreements and honoring Ukraine's commitments in the framework of these agreements, promotion of interstate relations related to nature conservation;**
- **state decision-making process with due regard given to environmental requirements (monitoring, know-how promotion, pollution inventory, forecast);**
- **environmental education and ecological awareness.**

**The functions of the regional level of environmental management comprise the following issues:**

- **regulation of the use of natural resources of local importance;**
- **setting up pollution standards (norms for admissible emission levels (AEL), admissible discharge levels (ADL), and waste location);**

- introduction of economic mechanisms for environmental management;
- monitoring and inventorying facilities of nature management and environmental pollution;
- state environmental expertise;
- state control over compliance with environmental legislation;
- development of programs for environmental activities, development and implementation of an investment policy;
- informing the public and concerned enterprises, institutions, and organizations on environmental issues.

The functions of the local level of management comprise the following issues:

- local and facilities monitoring;
- state control over compliance with environmental legislation;
- development of local environmental programs and projects.

#### **34. Environmental Legislation System**

The legal framework for environmental protection practiced through the enforcement of environmental legislation should become the effective means for overcoming the environmental crisis. The Principal Directions will be implemented with the help of an environmental law system. The legal mechanism should furnish the Principal Directions with clear goals, formal distinctness, general mandatory nature, and facilitate the regulation of environmental relations, to ensure preventive, operative, incentive, and coercive measures with respect to legal entities and physical persons regarding the use of natural resources and their wastes, as well as liability for the breach of environmental law. The study, analysis, and generalization of practice related to the enforcement of environmental legislation are to be carried out in two directions:

- development and approval of norms for environmental and natural resource management;
- development and approval of a body of environmental and economic indicators of national government control over the state of environment and activities of economic structures.

This involves consideration of the following issues:

- use of natural resources;
- use of technogenic deposits of mineral resources;
- environmental protection;
- ecological safety;
- generalization of environmental control practice;
- generalization of jurisprudence on application of environmental legislation.

#### **(i) Systematization of Environmental Legislation**

The systematization of environmental legislation is to be carried out in the form of codification and incorporation with the determination of priority and perspective laws and legislation.

The codification of priority environmental legislation includes:

- adoption of new (urgent) laws of Ukraine on emergency environmental situation zones, environmental insurance, fisheries, flora, environmental (nature and technogenic) safety;
- amendments to the laws of Ukraine on Environmental Protection; on Fauna; on Natural Reserves, on Atmospheric Air Protection, as well as the Forest Code of Ukraine, the Water Code of Ukraine, the Code on Underground Resources of Ukraine, and the Land Code of Ukraine;
- drafting the laws of Ukraine on recreation zones, health resort and health recreation zones, and zones with special conditions of nature management;

- **drafting the following regulations to be approved by the Cabinet of Ministers of Ukraine: the Rules for Redress of Losses Inflicted by the Violation of Environmental Legislation; Regulations on Environmental Control; Regulations on Environmental Audit; Regulations on Environmental Licensing.**

**The codification of perspective legislation includes:**

- **scientific justification, development, and adoption of the Environmental Code of Ukraine, and laws on the Continental Shelf, on Environmental Information, and on Environmental Education;**
- **development of the following regulations to be adopted by the Cabinet of Ministers of Ukraine: on Certification of Environmentally Hazardous Products; the Procedure for Establishing Limits for Emissions of Pollutants to the Atmospheric and Levels of Hazardous Biological and Physical Influence; the Procedures for Fisheries Management and Fishing; the Procedure and Norms of Payment for the Special Use of Forest Resources and Land Plots of the Forest Reserve; the Procedure for Economic Stimulation, Protection, Efficient Use and Recovery of Forests; the Procedure for the State Inventory of Forests and the State Forest Cadastre;**
- **development and approval of the following regulations of the Ministry for Environmental Protection and Nuclear Safety: the Rules for Withdrawing Objects of Fauna from the Natural Environment for Scientific, Cultural, Educational and Aesthetic Purposes; the Rules for the Use of Animals to Obtain Products of Their Vital Activity; the Rules for Holding, Raising, Use and Protection of Wild Animals in Captivity or Semi-Captivity; Rules for Capturing Rare and Endangered Species of Animals for Reproduction in Special Conditions and for Scientific Research Purposes; the Rules for Import and Export of Fauna Objects; the Rules for the Seizure and Sale of Illegally Captured Wild Animals; the Rules for Redress of Losses Inflicted by Violation of Environmental Legislation; and other acts in accordance with the legislation of Ukraine.**

**Codification aimed at the ecologization of comprehensive legislation includes:**

- **priority development and adoption of new laws and other legislation: the Trade (Economic) Code of Ukraine; the Law of Ukraine on Wastes; the Code of Ukraine on Administrative Offences (section on "Administrative Responsibility for Environmental Offences"); the Criminal Code of Ukraine (section on "Environmental Crimes"); Civil Code of Ukraine (section on "Redress of Losses for Environmental Offences" (absolute environmental legal responsibility));**
- **amendments to the laws that determine the status of central and local state executive authorities for environmental protection and use of natural resources; regulate entrepreneurial, investment, innovation, scientific and technical activities, designing, urban construction, production and sale of agricultural products, development of transport, communications and other types of activities capable of having an adverse impact on the environment; as well as to the laws on division of functions of specially authorized bodies for state control over the use of natural resources, environmental protection and environmental safety, etc.**

**Incorporation of environmental legislative acts envisages the systematization of environmental laws and regulations or their individual sections or extracts for the use in educational, scientific and practical purposes.**

**It is expedient to incorporate environmental legislative acts periodically in the form of preparation and publication of commentaries to environmental law and publication of separate collections; compilation of thematic reference books; publication of separate laws with documents based on individual articles; compilation and publication of training courses; preparation and publication of a body of environmental laws and regulations.**

**(ii) Improvement of the Legal Foundations for Management and Control Related to the Use of Natural Resources, Environmental Protection, and Environmental Safety**

Improvement of the legal basis for environmental management and control should be aimed at:

- reorganization of a system of natural resource management bodies and further integration of management functions related to natural resource usage into a unified coordinated functional system;
- expansion of the personnel and powers of regional and local bodies for management and control of environmental protection, efficient use of natural resources, and environmental safety;
- shift of emphasis from state environmental legislative control to the gradual formation of environmental control bodies at the regional level;
- use of basin principle opportunities, taking into account regional and local specific and common features in the development of natural systems and ecosystems;
- agreement of coordinating and control functions of the Ministry for Environmental Protection & Nuclear Safety and the Prosecutor General's Office to enhance the control over compliance with environmental legislation, implementation of state environmental policies, and protection of environmental rights of citizens.

**(iii) Legal Encouragement of Citizens and Their Environmental Associations Towards Environmental Protection**

Legal encouragement to citizens as well as environmental and other associations of citizens should be aimed at the protection of environmental rights of the public, ecological safety, efficient use of natural resources, and environmental protection by the following legal tools:

- developing measures to encourage the use of public opinion in the process of environmental decision-making, especially during the designing and planning of ecologically dangerous facilities, and realization of other activities capable of harming the environment and human health;
- facilitation of public environmental association activity in resolving specific environmental problems of a particular region, city, small town, village, and their involvement in the implementation of appropriate environmental programs and various nature protection measures;
- encouragement of control by public environmental associations, promotion of new forms and methods of cooperation with local executive authorities, and specially authorized bodies for state environmental control.

**(iv) Improvement of Environmental and Legal Education, Culture and Science**

In order to improve ecological and legal education, culture and science, environmental protection activities should include the following:

- expansion of the network of educational institutions (colleges, institutes etc.) specializing in environmental law, establishment of new and reorganization of existing scientific centers, in particular environmental expert centers for research and evaluation of various environmental issues, the use of natural resources, and environmental safety;
- development of new syllabuses, improvement of methods for teaching environmental law (fundamentals of environmental law) and special courses in environmental law in modern conditions to train professionals in law, humanities, and natural sciences;
- definition of priority scientific research in the field of natural resource usage, environmental protection, and environmental safety;

- creation of a Scientific Center of Environmental Law and Legislation within the jurisdiction of the Ministry for Environmental Protection and Nuclear Safety to carry-out comprehensive environmental and legal research;
- foundation of an "Environmental Bulletin" published by the Ministry for Environmental Protection and Nuclear Safety, and other environmental management bodies in order to disseminate reliable ecological information among the public.

#### **(v) Development of Nuclear Legislation**

An important stage in the creation of a system for the legal regulation of environmental safety at nuclear facilities was the adoption of a fundamental piece of nuclear legislation -- the Law of Ukraine *On the Use of Nuclear Energy and Radiation Safety*, as well as the laws of Ukraine *On Management of Radioactive Wastes* and *On Environmental Expertise*, the Water Code of Ukraine, and other laws.

Today, the issue of social and economic protection of the population is especially important in regions where there are located enterprises of the nuclear fuel cycle (NPPs, uranium mining and processing plants), high radiation enterprises, and facilities designated for management of radioactive waste. Given this, the urgent adoption by the Cabinet of Ministers of Ukraine is needed for a number of regulations on social protection of the population, and financing the construction and reconstruction of social and cultural facilities carried-out in zones around operating nuclear power plants.

In accordance with the laws of Ukraine *On Environmental Protection*, *On the Use of Nuclear Energy and Radiation Safety*, and *On Management of Radioactive Wastes*, and in order to realize the rights of citizens and their associations to participate in the development of policy for the use of nuclear energy and radiation safety, one of the priority objectives is to put into effect the Regulations on Public Hearings Related to the Use of Nuclear Energy and Radiation Safety.

To ensure radiation protection of the population of the country, as well as in accordance with the provisions of the Constitution and laws of Ukraine *On Sanitary and Epidemiological Welfare of the Public*, *On the Use of Nuclear Energy and Radiation Safety* and others, the Norms on Radiation Safety of the Public of Ukraine (NRSU-97) were ratified, incorporating modern conceptual approaches.

The adoption of laws on the regulation of ecological safety at nuclear facilities should be revised and harmonized, or new normative and legal documents should be developed related to a wide range of issues, from permits for special water usage and rules of wastewater discharges from collection points to methods for determining the limits for allowable releases into the environment and instructions on the collection of fees for discharges and emissions, etc.

#### **35. Economic Mechanisms of Natural Resources Usage; Financial Measures for Achieving the Goal**

Reforming the economic system and the transition to a market economy should not only improve the efficiency of the national economy, but also promote the elimination of subsidies for the use of natural resources such as energy, minerals and water, and improve the environment due to the introduction of strict measures with respect to the responsibility for mass-scale inefficient use of natural resources.

An environmental audit will acquire more significance for the consideration of environmental requirements during the process of privatization. Putting the environmental audit into practice will facilitate the collection of basic data on enterprises that may become a hazard to the environment from the perspective of their privatization, and determination of tasks in a short period.

Improvement of the existing economic mechanism of use of natural resources and environmental protection, and the formation of stable sources for financing of

environmental activities during transition to a market economy, should become an integral component of the system for the management and regulation of the economy, and should encourage the protection and recovery of the natural resource potential of the country by the creation of appropriate economic conditions (investment, tax, credit, etc.).

The system of financing environmental measures during transition to a market economy is formed on the basis of the following main sources:

- the State Budget of Ukraine and local budgets;
- budget of the Autonomous Republic of Crimea;
- environmental protection funds of all levels;
- funds of enterprises;
- foreign funding and investments;
- other non-budget funds.

Funds from the State Budget are stipulated for the implementation of priority programs and projects which have priority and national importance. The volume of budget funds depends on the level and on the progress of the development of the economy of Ukraine. Non-budget funding should comprise the dominant part of expenses for the implementation of environmental policy. To this end, it is necessary to concentrate payments for pollution of the environment and special use of natural resources as well as revenues from fines and compensations for the breach of environmental legislation in the National Environmental Fund that will operate as a legal entity at the national and regional levels.

To ensure steady revenues for the implementation of environmental measures, priority should be given to the development of an economic mechanism of nature management. The main components of the economic mechanism for nature management should comprise the following:

- payment for special use of natural resources;
- payment for environmental pollution and other types of adverse effects on the environment;
- system of financing and crediting environmental activities (state and local budgets, environmental protection funds, banks, finances of enterprises, foreign funds and investment, etc.);
- ecologization of taxation and pricing systems;
- support for the establishment and development of ecological expertise-industry.

The attraction of foreign investment for the implementation of nature protection programs and projects in Ukraine should facilitate the following:

- active integration of Ukraine into the European and world nature resource processes;
- formation of attractive conditions and an active system of attracting foreign investment into the economy of Ukraine as a whole as well as environmental protection and usage of natural resources.

### **36. Regional Environmental Policy**

Regional environmental policy should be based on the following principles:

- observance of national environmental priorities in environmental protection and use of natural resources;
- division of authority between central and local executive bodies;
- consideration of other regional environmental interests, including outside the borders of Ukraine, according to interstate agreements;
- formation of a mechanism of financial support for environmental protection activities in the regions.

In order to provide regulatory and legal support of the basic directions of regional environmental policy, it is necessary to:

- determine that a fixed share of the gross national product is spent on environmental protection according to the level of pollution in each region;
- balance budget expenditures on environmental protection at the national and regional levels on a proportional basis between contributions from the regions to budget revenues and the status of the environment in a given region;
- create a system of local, regional, and national environmental programs;
- make changes to laws and other normative legal acts concerning the economic base of nature conservation in regions;
- create legislative prerequisites for the privatization of environmental infrastructure of the regions considering the specific conditions of their economic profitability.

For the regions in environmental crisis (Donetsk-Dnipro basin, Azov and Black sea regions, and Polissia), there will be implemented comprehensive priority nature protection measures. Within the state program of economic and social development of the regions, corresponding environmental divisions will be developed and implemented.

The interregional division of state funds for regional economic development should be carried out according to regional ecological crisis priority.

#### VII. ENVIRONMENTAL EXPERTISE

The Principal Directions provides for the development of environmental expertise (i.e., expert environmental review and analysis) in the following areas:

- improvement of legislative provisions of environmental expertise conducted by the Ministry for Environmental Protection and Nuclear Safety of Ukraine, by introducing corresponding changes to the Law of Ukraine *On Environmental Expertise* taking into consideration practical experience;
- expansion of the instruction and methods base of implementing State environmental expertise, in particular, the preparation and implementation of *Instructions of State Environmental Expertise Materials*, and *Registration of Pesticides and Agriculture Chemicals*;
- facilitating (methods, financial, organizational) specialized organizations in the development of state building norms of Ukraine (SBN) on the composition and content of sections of the environmental impact assessment (EIA) in design and planning documentation, and the content of materials of EIA in projects of construction of enterprises, buildings, and facilities;
- aiming the main activities of environmental experts division of bodies of the Ministry for Environmental Protection and Nuclear Safety of Ukraine towards an evaluation of the documentation on the types of activity and objects that comprise increased environmental danger;
- ensuring an increase of the scientific foundations, and comprehensive and objective conclusions of State environmental expertise by wider involvement by the Ministry for Environmental Protection and Nuclear Safety of specialized scientific organizations and the public.

#### VIII. INTERNATIONAL COOPERATION

##### 37. International Agreements

The above-mentioned environmental problems can not be resolved without large-scale and active international cooperation.

This is conditioned by:

- the global nature of many environmental problems;
- the transboundary nature of pollution;
- international commitments of Ukraine regarding environmental protection;

- **benefits from the international exchange of experience and technology, and the possibilities to involve foreign investment.**

**Ukraine is party to over 70 international bilateral and multilateral environmental protection agreements.**

**Ukraine's multilateral agreement obligations imply the harmonization of domestic laws and regulations with existing norms of international law with due regard given to existing international practice during the development of new legislative acts.**

**In future, a significant increase of Ukraine's international environmental obligations should be expected as there are a number of conventions, Ukraine's accession to which (as well as the signing of new ones) would be of considerable political importance for Ukraine and would significantly increase the possibilities of environmental protection, use, and rehabilitation of natural resources.**

**Along with Ukraine's compliance with its obligations implied by multilateral environmental agreements, the further expansion of international cooperation in the following areas will be important:**

- **cooperation with international organizations for environmental protection within the United Nations system (United Nations Environment Programme, UN Economic Commission for Europe, UN Development Programme, International Agency on Atomic Energy, Food and Agriculture Organization, UN Center for Human Settlements, UN Commission of Sustainable Development, Global Environment Facility, etc.);**
- **bilateral cooperation in environmental protection, efficient use of natural resources and nuclear and radiation safety with the governments of neighboring countries, countries of strategic partnerships, and donors within the framework of bilateral agreements, joint programs, etc.;**
- **participation in regional nature conservation measures (Black and Azov seas, Dnipro and Danube rivers, Carpathian Mountains, Donetsk Basin, etc.);**
- **participation in international projects for the elimination of the effects of Chornobyl accident, in particular, within the framework of the Memorandum on Mutual Understanding Between the Governments of the G7 Countries, the European Commission and Ukraine on the Closure of the Chornobyl NPP (implementation of the Plan to Increase Safety of Object 'Ukryttia', completion of the construction of new nuclear power units which will compensate for the loss of electricity-generating capacity at the Chornobyl NPP, problems of radioactive wastes, neutralization of the transport of pollution by air and water courses, etc.).**