

ENVIRONMENT MANAGEMENT IN POLAND

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Introduction

Environmental management has become in the recent years an important problem domain of sciences concerning management. It developed as the result of the actions aiming at overcoming the global ecological crisis, implementing new technologies and increasing the ecological awareness of society. Subsequently with the development of science and practical achievements, the subject and object of management have changed. In the 1960s the main problem was conservatory protection of the environment, in the 1980s the focus was placed on environmental protection management whereas presently such problem concerns the rational usage of natural resources, amenities, forces and processes taking into consideration especially the maintenance of biological diversity and climate protection. The superior aim of environmental management science is ensuring stable natural bases for the existence and growth of humankind. Management system of usage, protection and shaping of the environment has been inscribed in the general system of state management and constitutes one of its elements.

In the previous century the concept of environmental management referred to the activities undertaken at all management levels, from the state to an enterprise. Presently, this science has developed so considerably that the science of environmental management in an enterprise has been developed. This elaboration does not comprise the problems concerning the management of fossil fuel resources, protection of the Earth surface and spatial management.

This publication is devoted chiefly to environment management at state level and at particular levels of the territorial division. The publication was divided into ten chapters which can be characterized in terms of groups. The first five chapters include description of the environment management system in Poland.

The first chapter is the only part of this book that has theoretical character. The chapter includes the basic concepts, presents the theoretical model of environment management system and shows the analysis of the macrosystem society-economy-environment as the management subject and object.

The chapters 2-5 include presentation of particular elements of the environment management system. There were described general legislative regulations with division into: the regulations of constitutional character, international, union and national ones, as well as management measures such as system organization, ecological information and outlays on environmental protection and sources of financing them. In chapters 4 and 5 there were described management measures and instruments – ecological policy, sustainable development strategies and environmental protection programs and plans as well as instruments: legislative and administrative, economic, of voluntary usage and of social influence.

Chapters 6-10 concern management of the main elements of the system – respectively: natural protection, protection of the atmospheric air, water management, waste management and ecological safety. Description of each of these elements was done in accordance with the model of management system by isolating management organs and institutions, instruments and management subject and object.

The book constitutes the basic monograph for studying environmental protection management. Its contents respond to the contemporary curriculum of this subject which was elaborated at program and methodological conferences organized by Tadeusz Borys in Jelenia Góra. Environment management is the subject of various study levels: BA, complementary MA studies, postgraduate and doctoral studies in the following specializations: management, economics, environmental protection and spatial economy. Furthermore, this publication may serve as the supplementary literature for the following subjects: “economy vs. environment” and “international environmental protection”.

This book will be useful also for practitioners, but above all for directors and employees of institutions (offices) handling various aspects of environment management, for managers and substantive employees of companies making use of the environment and in the natural environment.

In the contemporary reality everyone who does not know, does not understand or does not appreciate the problems of environment management cannot be a good politician, manager or an employee of the civil service. Solution of environmental problems is one of the most important challenges of the present time that decide upon further development of humankind.

The book is also published in both English version by the Białystok University Press and in Russian by the Belarussian National Technical University in Minsk.

Chapter 1

THEORETICAL ASPECTS OF ENVIRONMENT MANAGEMENT SCIENCE

1.1. Key concepts in the environment management science

Every science employs specific concepts that enable the presentation, analysis and assessment of the investigated phenomena or problems. The concepts employed in the environment management science can be divided into the general and detailed ones. The general concepts describe the science, facilitate understanding of what is the essence of deliberations and analyses, whereas the detailed ones concern a particular problem or its elements. In the environment management science one can classify as the group of general concepts: administration, management, governing and administrating, whereas as the detailed concepts – environment administration, making use of the environment, environment exploitation, environmental protection, shaping of ecosystems and landscape, the environment management and environmental management in an administration unit.

Administration is a basic process of human activity that enables the existence and development in both biological and social terms. In the theory of economics it is perceived as a decision-making process that is conditioned by limitless human needs and by the limitedness of resources. It forces individuals and society to continue making choices between the possibilities of using natural resources and preserving the capability of auto-renewability of ecosystems on all levels of their organization, between the needs of the present and future time, and finally, between the satisfaction of various needs, which are often alternative towards each other. The right choice ensures: stability of usage, growth of

the national income and social welfare on the national or regional level, profit on the business level and higher quality of life within a household. Lack of such effects is often defined as being uneconomical or as the inability to administrate.

Environment administration implies using natural resources and amenities in order to satisfy personal and social needs of people (from communities to nations) and at the same time:

- reducing losses and keeping maximum caution in changing ecosystems or geological formations along with exploiting non-renewable resources;
- supporting natural processes that are subjected to anthropopressure while using renewable resources, with the purpose of providing durability and efficiency of their functioning;
- sensible usage of natural amenities, forces and processes so as not to stop the natural circulation of matter, energy and information in ecosystems¹.

The purpose of environment administration is to provide economic and social development and to maintain the proper basis for long-term progress of *Homo Sapiens*, including the preservation of the biological diversity on all levels of nature's organization: landscape, ecosystem, species and genes.

Administration subjects are natural resources, forces and processes as well as the environment amenities. Resources can be non-renewable, e.g. mineral (coal, metal ores, gravel), renewable within a longer time span, e.g. soil, tree stand and they can be also renewable within a shorter period of time, e.g. grass or other annual and perennial plants. A complex problem which requires knowledge and reason concerns administration of non-renewable and renewable resources within a longer period of time. A specific resource are environmental amenities. Making use of forces, processes and amenities does not cause consumption of them. There is possibility of long-term usage of the environment amenities, provided that it will not result in destruction of the environment, which will cause their decline.

The environment administration is principally associated with an arable farm or forest area because these occupy the largest area of the ecosystems of agricultural use (in Poland approx. 90% of the country's area). Administration is also at work in water areas (fishery) or in the fossil fuel areas (mining industry). From the historical point of view, the concept "environment administration" was synonymous with ensuring the existence and living conditions of growth of human beings, i.e. of a person, family and nation, for a long period of time. The period of industrialization led to the differentiation of administration elements. The following main problems emerged: using administration, gaining

¹ **Ecosystem** is ecological configuration composed of biocoenosis and its environment (biotope) in which there is mutual interaction of living organisms and inanimate part of the environment, ensuring flow of matter, energy and information.

resources and using natural amenities in an economically conditioned way, irrespective of ecological consequences.

Scientific theories created by industrial civilization and also political and constitutional assumptions were favorable to such approach. The Cartesian paradigm² had prevailed in scientific studies until the 1970s. The administration process was analyzed in configuration of those elements that enabled the assessment of the economic effectiveness of the given enterprise and of the capital involved. Not enough attention was paid to the assessment and valuation of other results of actions. It was environment administration in separation from real conditions. In reality, every ecosystem has its own potential³, capacity⁴ and productivity⁵ in certain anthropogenic loading. Therefore, using resources and amenities can be neither infinite in terms of quantity nor discretionary in terms of kinds of elements used for economic purposes. Hence environment administration must be perceived through the prism of the functioning of the macrosystem society-economy-environment.

The environment administration comprises four fundamental processes:

1. usage of the environment (resources, forces, processes and amenities) which is sometimes termed as direct usage;
2. usage of the environment by economy, i.e. indirect usage;
3. environmental protection;
4. shaping of the environment (ecosystems and landscape).

Making use of the environment is the basis of biological processes of all organisms. Every organism in its own typical way uses particular natural resources and amenities. The purpose of using the environment is to preserve the basic biological processes. With reference to people these are: breathing, using clear water, gathering and direct way of consuming produce (fruits, herbs, mushrooms), creating niche for our development (home, backyard), observing nature in creative activity – namely scientific, cultural and educational, as well as making use of amenities of nature for recreation and full recovery of physical strength. The way and range of making use of the environment primarily depend on cultural and civilization determinants of the given society. To some

² The Cartesian paradigm (or Newton-Cartesian paradigm), also known as atomistic or mechanistic paradigm, enables “cognitive decomposition” of the reality into parts and thus to recognize the entirety. The entirety is perceived as the sum of parts which, as Aristotle had already noticed, is more than just the sum of its constituent elements. Such perception of the reality was one of important primary reasons of the contemporary ecological crisis.

³ Environment potential means occurring on a certain area reserve of natural resources (soil, water, minerals, forest stands, fish, crops) and environment amenities the structure and quality of which match man’s biological and economic needs.

⁴ Capacity of ecosystems is their capability of bearing anthropogenic loadings while using the environment and exploiting it.

⁵ Productivity of ecosystem is the amount of produced dry mass on one day per 1 m² of area (it oscillates around 0-20 g).

extent, this process can be controlled, thus affecting non-economic behavior of people or implementing changes in the natural environment.

Usage of the environment is using natural resources, forces and processes for economic purposes on a permanent basis. It is connected with: administrating of area and space; using animate and inanimate natural resources as well as natural carriers or sources of energy (e.g. the power of wind or water); using natural processes, for example photosynthesis, for cultivation; removing waste to the environment with the aim of enabling its natural assimilation. The range of using the environment largely surpasses the scale of its direct usage. It is only to a small extent aimed at satisfying direct biological needs while its main purpose is the realization of social and development civilization needs that frequently result from artificially created fashion.

In the process of using the environment it is obligatory to draw attention to the following aspects: exploitation of non-renewable resources in time with the aim of maximizing their usefulness; preserving sustainability in resources' renewing on the level of their usage scale; preserving productivity and resistance of ecosystems to anthropogenic burdens; non-economic (ecological and social) functions of resources during their exploitation (using and exploiting); natural (ecological) limitations in usage and exploitation of each resource (exploitation of a certain resource should not lead to negative changes in the environment, mainly in ecosystems).

Environmental protection is – in the light of general administration process – directing or reducing the usage of animate and inanimate natural resources and amenities with the aim of providing the continuity of their usage and of preserving the proper quality of biosphere elements. Environmental protection is expressed in:

- limitations of personal freedom, especially with reference to administrating private possession of natural resources and amenities;
- constraints concerning the kind and scope of running business activity in a certain ecosystem;
- rationality of administrating natural resources by means of: complex transformation of resources absorbed from the environment; frugality in using materials, energy and raw materials; reduction in the amount of solid, liquid and gas pollutants;
- making outlays on the maintenance of those specific nature structures or processes that were unbalanced as the result of their anthropogenic loading;
- implementing ecological education of the society.

Environmental protection ought to: guarantee both normal functioning of ecosystems, provide their high productivity and the ability to neutralize anthropogenic burdens, ensure growth of populations of species living in these ecosystems and preservation of auto-reproduction of processes. An important task of

environmental protection is to maintain the bases for the functioning and development of both present and future generations.

A special kind of environmental protection is the protection of biosphere. Its objective is to limit the anthropogenic impact of natural processes on the global scale. Presently, the main problem concerns reduction in the emission of gases that cause changes in climate (mainly carbon dioxide and methane) and decline of the ozone layer (especially freon and halon), reduction in the amount of heavy metals, radioactive elements and chemical compounds that are artificially synthesized and unknown in nature as well as rationalization in the usage of water. It is also necessary to counteract the intensification of such new hazards as the hazards ensuing from the usage of bioengineering and nanotechnologies or from the influence on energetic and magnetic processes of the Earth.

Processes of environmental protection developed intensively particularly in the middle of the 20th century. For a longer period of time their main purpose was to create the conditions for maintaining the high efficiency of using ecosystems, mainly in agriculture, forestry and fishery. This purpose changed radically at the turn of the 20th and 21st centuries. Presently, the main aim of protective processes is to preserve biological diversity on the Earth as the chief condition of the further existence and development of humankind as well as protection from radical climate changes.

The environment shaping is deliberate implementation of changes in ecosystems and landscapes⁶; i.e. man's assistance in such direction of their development that will guarantee a high level of their self-reproduction and simultaneously bring the greatest possible economic and social benefits, both for the time being and in the nearest and further perspective.

The environment shaping lies in:

- reduction in some ecosystem or landscape elements which are most frequently overdeveloped due to man's earlier intervention;
- compensation, i.e. supplementation of missing (mostly eliminated by man) links of mass and energy circulation as well as formation of new chains in this circulation with the aim of increasing ecosystems' productivity, assimilation capacities or improvement of esthetic and microclimatic amenities of the environment as they have impact on the conditions of man's life and development;

⁶ The concept "landscape" has not been explicitly defined. In hitherto work it is perceived as the highest form of nature organization, i.e. isolated area comprising a group of ecosystems whose self-reliant functioning would be much weaker and less dynamic than in the given group. In architect perspective landscape was perceived as the environment's physiognomy, formal expression of its essence [*Sterowanie* ..., 2003].

- recultivation, i.e. reconstruction of degraded ecosystems by means of eliminating factors that cause degradation, e.g. excessive salinity or excessive dehydration;
- shaping of landscapes, in accordance with the requirements of preserving biological and ordinary diversity, i.e. environmental conditions of human existence, which were shaped in the process of evolution.

The environment management is practical science and activity linked with: designing, implementing, controlling and coordinating the processes of the environment administration. The processes of using, protecting and shaping the environment take place in the social, economic and nature-based spheres. It means that the management of these processes must comprise many activities, from ecological education in the society via instruments of pro-ecological reorientation of the economy to the recommendations concerning the way of administering in specific ecosystems. A characteristic feature of environment management is the object of governing which comprises society, economy and the environment. It means that biotic and abiotic processes, which take place in the environment, may be and are, in fact, the subject of control, which, to a large extent, shows the difference between two concepts “environment management” and “ecological management”.

Ecological management deals with adjusting business and non-business activity of the society to the given state – the potential and capacity – of ecosystems. Therefore, the objects of ecological management are only the economy and society. In managing activity, with reference to the environment (e.g. in long-term planning) only the directions and probable effects of natural evolution of nature are taken into consideration.

Environmental management in an organizational unit is managing of the processes of using, protecting and shaping the environment, in integration with the general system of managing a unit. It comprises: organizational structure, planning, procedures, processes and resources serving implementation and management of a unit in the way that will take environment-related problems into consideration. The environment management, and particularly environmental management in a company are related to the concept of ‘**environmental problem**’. Such problems appear in the process of the environmental management, for example the inappropriate usage of soils is related to water and/or wind erosion, pollutant emission as well as to the retention reservoir silting. Environmental problem always concerns the relationship between man and environment. It can be perceived as the relation man-environment-man.

Environmental services comprise natural amenities, forces and processes as well as the effects of their existence and functioning that provide values which are indispensable for the life and development of humankind and for the course of natural economic processes. Environmental services can be perceived from a biological and ecological perspective or from a social and economic

point of view. From the former perspective, service implies the functioning of all the natural processes thanks to which man's habitat ensures high quality of natural bases of man's life and development (this type of services is frequently termed as "environment services"). From the latter perspective, environmental service implies everything that has considerable significance for the normal course of administration processes, e.g. decomposition of waste, self-purification of air and water, circulation of nutritive substances in nature, production of honey, pollination of cultivated plants. Presently, there can be isolated four groups of environmental services:

1. resource services, e.g. genetic resources, medical substances, decorative materials;
2. cultural services, i.e. non-material benefits reaped owing to nature, e.g. facilitation of education, creative inspiration, leisure and recreation;
3. regulatory services, e.g. purification of water, prevention of erosion, natural control of the growth of pests and pathogens;
4. supportive services, e.g. photosynthesis, formation of soils, circulation of nutritive substances.

In 1997, the international panel of economists and scientists led by R. Constanza isolated a package of environmental services, estimated the value of each of them and evaluated the sum of this package as worth \$33 billion. The result of these calculations can be interpreted in the following way: if humankind wanted to renounce free services of the environment, or could not employ them, anthropogenic protheses and processes would require the expenditure of \$33 billion. This is more than world gross income amounted in that same year to (\$18 billion). In reality, supplementing natural ecosystems with their artificial equivalents is impossible either in economic or physical terms. As availability of environmental services is decreasing, their meaning and value will increase rapidly.

Stable and sustainable development means such a way of running business activity, shaping and using environment potential and also such organization of social life that would ensure dynamic development of new (in terms of quality) production processes, management systems, stability of using natural resources and improvement (in the initial period), and then maintaining the high living standard of people – individuals, families and societies.

In the definitions of sustainable development two principal features of this idea are exposed: sustainability and durability. The **state of sustainability** means the necessity of shaping and maintaining proper and the best, from the perspective of the administering result, relations in the macrosystem economy-society-environment. According to B. Fiedor it does not concern sustainability in the way it was described in the standard theory of growth (which is compared to equalizing of savings and investments, or demand and supply), however, in wider meaning, which may be called quality dimension. Sustainability means

ensuring the realization of economic and social objectives in the process of growth, maintaining at the same time high quality of the environment and availability of its resources, taking into consideration time and space dimension [Fiedor et al., 2002].

With reference to the systems theory, one may claim that sustainability concerns development relations in the macrosystem environment-economy-society and within each of these systems. Relations between systems may be direct and indirect as well as general and specific ones. Direct relations always take place between two systems, e.g. between the environment and economy or between the environment and society. Indirect relations include: effect of the economy on the environment via society and on society by the environment, and also the effect of society on economy via the environment. Equalizing of relations does not imply unification of the rate at which isolated systems develop, it is just impossible; it means only adjustment of the range and rate of changes within one system to the changes in the other systems.

Stability of development is understood in accordance with one of the first definitions of this idea, included in the Report of the World Commission on Environment and Development [Nasza..., 1991]. This document states that the key purpose of sustainable development is to provide respectful life to people of present and future generations, which means satisfying the present needs, without depriving the future generations of the possibility to satisfy their needs. The concept of *need* may be understood differently by the present and future generations. Some needs, however, will remain unchanged over a long period of time, including the needs linked with individual development and with sustainability of the existing *Homo sapiens*. The basis of sustainability is thus man as an individual, social group, nation and the whole humanity. Providing sustainability perceived in this way requires the development of economic and social sphere as well as the maintenance of the natural basis of human existence, which, if it is possible, has most in common with those created in the evolution process. Man is an element of the ecosystem, therefore one of the conditions of man's development is the presence of other nature components, both animate and inanimate ones.

1.2. The concept of the environment management system

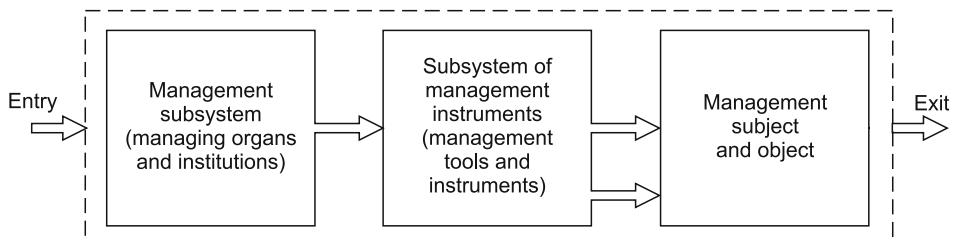
The environment management can be analyzed through the prism of various theories and in various configurations. System approach can be considered as the most rational one. It ensues from the fact that management science includes few statements that have the character of universal rights and a wide range of influence. Every region, branch and company require consideration of their specific elements and processes. The systems theory enables isolation of mate-

rial and abstract elements and processes that can be interesting for a scientist and treatment of them as the entirety from a certain point of view. Such approach is known as system approach, whereas the isolated part of the reality that is interesting for a scientist is known as the system. Systems function and are related to the surroundings thanks to the circulation of matter, energy and/or information. Ecosystems function due to simultaneous flow of these three propelling media, while the systems of management function on the basis of information.

Systems are easily subjected to modeling, i.e. to simplified reflection (graphic, mathematical or descriptive). A model shows only those features of the system (subsystems, elements⁷ as well as conjugations and relations⁸) that are important from the point of view of the aim of the analysis. The process of modeling implies imagination of an object as “black box” that facilitates investigation of propelling media at the entry and exit from the system, as an object with its internal structure or as a process [Myers, Kaposi, 2004].

In management of a real object there are two spheres: the managed sphere and the managing sphere. The managed sphere is called management object, whereas the managing sphere comprises the managing system and management instruments. The general system model of management is presented in figure 1.1. It constitutes the basis for isolating from reality the environment management system and enables its description. There are various relations between the management system and the management object. These relations can be primary and secondary, one-sided or both-sided and domineering or informative. From a cybernetic perspective, the relations between management system and management object can adopt the form of regulation, directing, management or steering (figure 1.2.).

Figure 1.1. General model of management system



⁷ **Subsystem** is part of the system with specific properties coupled or related to other elements of the system. Every subsystem may be divided into smaller subsystems. The smallest component of division is called an element.

⁸ **Conjugation** is mutual interaction of subsystems or elements within a system. Relation is the connection between at least two systems or subsystems or between elements in a system.

Figure 1.2. Relation between management system and management object

Type of relation:	Management system:	Direction of relations:	Management object:
regulation	man or technical (mechanical) system		technical (mechanical) system
steering	optional complex system		optional complex system
directing	man		group of people, animal or technical system
management	man, group of people		complex system with participation of people

– domineering relations – participation in management

Source: own elaboration on the basis [Poskrobko, 1998].

Regulation is such a way of affecting the system the objective of which is to neutralize unfavorable deflections, with no violation of the model of system’s behavior model. When these deflections are eliminated by changing binding norms of system’s behavior, this type of influence is called steering. In environmental protection, regulation processes can perform only supportive role, e.g. regulation of protective facilities and automatic measurement instruments.

Directing is a process of voluntary or constrained direction of human actions aiming at achieving success in collective action as to reach the goal of an organization (system). The essence of this process is the coordination of joint efforts on the expected level. It concerns: choosing, indicating or imposing, via negotiation, of a common mission or goal which people acting as the team should strive to achieve; launching of such directing system that will guarantee harmonization of time, place, way, quantity and quality of fragmentary actions on the level indispensable for reaching the target of collective action.

Management is the concept broader than directing, however, it is associated with it by the majority of society. Presently, this concept is defined as organizational and directing activity that is based on knowledge and is run with the aim of efficient and effective usage of organization’s resources – people, capital and materials. In management, there often emerges a political aspect linked with the possession of production means and the way of selecting such governing teams as a supervisory board, a managing board of a company or council and board of a territorial unit. Skill and efficiency of management are closely connected with generation, selection, transfer and usage of information.

Steering is a more general concept. It refers to many natural phenomena (activities) of organizational, technical, economic, social and natural type. In the system theory, steering is defined as the purposeful effect of one system or configuration on another one with the aim of obtaining or enforcing particular behaviors or changes in processes that take place in a steered object. In economic sciences steering means indirect influence on business entities, and it belongs to the same group of undertakings enforcing behavior of economic system as regulating, directing and managing.

Steering of the processes of using, protecting and shaping the environment has the character of all-embracing steering with definite structure of regulators and autonomic elements. This process encompasses many stages and is purposeful and deliberate, in which optimal solutions, in terms of choosing ways and methods of reaching objectives, are searched for. A specific feature of complex systems is their diversified subjectivity to steering and selective 'acuteness' to the operation of steering norms. Some of them may, for example, act deliberately, as they display high level of self-regulation under the influence of steering incentives (signals), whereas others "absorb" these signals, not reacting to their operation in an expected way. Steering can take place also in an indirect way. While acting in one system one can, to some extent, change the behavior of systems conjugated with it. In practice, such a situation takes place in the steering processes of administrating environment only when by enforcing or directing pro-ecological behaviors of people and companies we are willing to achieve effects in the environment.

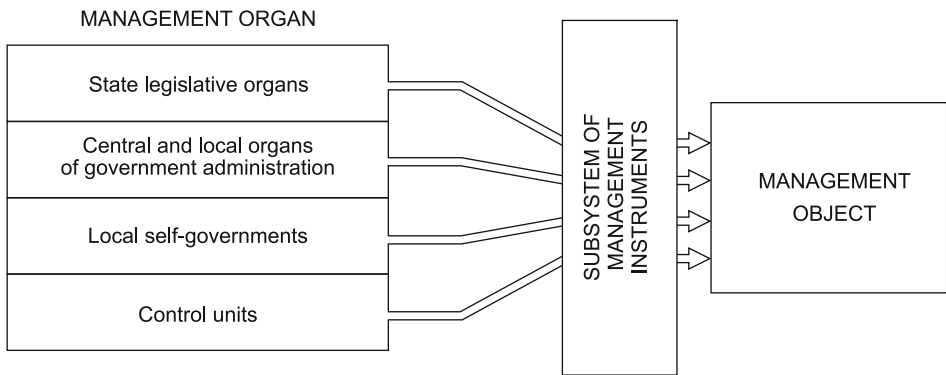
In environment management, the concepts of steering and management can be perceived as certain types of synonyms. This group of concepts comprises also governing and administrating. **Governing** means shaping of the external conditions in which economically autonomous and self-reliant legal entities function. Making universal laws, the governing body affects the deciding parameters in the governing sphere. The moment the governing body (e.g.: municipality) interferes in the functioning of the governed body as a unit, it becomes the governing or administrating body. In environmental management, governing is an element of a system.

Administrating is such a way of directing in which the administrating body is a performer of decisions imposed by a superior institution. Limitations in executive power, first and foremost, involve depriving of the right to self-deciding about the goals and ways of using resources of an organization.

The general model of management system with reference to the environment must be detailed both in the managing sphere and in the management object. **Management system** of administrating environment processes in the systems approach may be divided into the managing subsystem in terms of organs

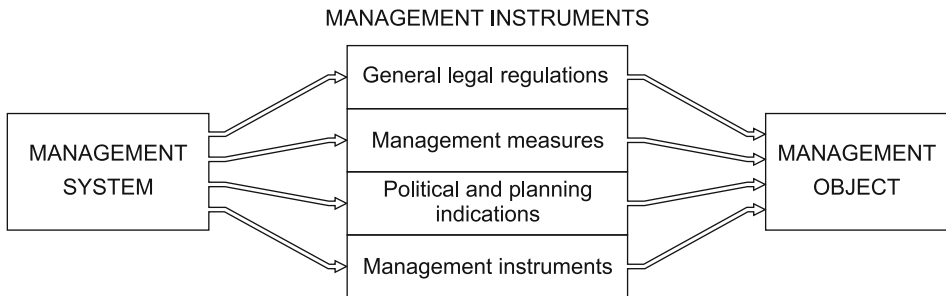
and institutions⁹ and the subsystem of management instruments. In institutional configuration the subsystem includes: legislative organs (The Seym, Senate, President and Cabinet), government administration organs, local governments, control units and independent pro-ecological organizations. (figure 1.3.). In this subsystem there are created principles, conditions and ways of managing particular elements of the environment: atmospheric air, water, land area, nature, ecological safety – and undertaken management decisions concerning the functioning of the entire environment management system.

Figure 1.3. Developed model of the subsystem of management organs and institutions



Source: own elaboration on the basis [Zarządzanie..., 2007].

Figure 1.4. Developed model of the subsystem of management instruments



Source: ibid. fig. 1.1.

⁹ The concept “institution” in management science may be perceived as the entity of managing system: office of decision-making organ that has public character and tackles with a certain range of issues, or it can be understood as set of legal norms concerning a particular domain.

The subsystem of the environment management instruments can be divided into four groups: general legal regulations; management measures; political and planning indications; management instruments. The position of this subsystem in the environment management system is shown on figure 1.4.

General legal regulations comprise relevant bequests included in the Constitution of the Republic of Poland, penal code, civil code, administrative procedure code as well as bequests from the European Union treaty and from the Poland accession treaty into the EU. Management measures are the instruments that ensure organizational, informative and financial bases of the system's functioning.

Political and planning indications comprise bequests that in a direct or indirect way concern the usage and protection of the natural environment in politics and in development programs, starting from the level of the European Union to territorial self-governments and branches of economy. There can be isolated: program of environmental activities of the European Union, state ecological policy, environmental protection programs of territorial self-governments and various branch policies, e.g. water management policy, state energy policy, strategy of sustainable usage and of preservation of biological diversity of state. The second level of this system comprises detailed action plans, e.g. waste management plans, nature protection plans prepared for national parks and landscape parks, nature reserves and Natura 2000 areas and finally plans of noise reduction in towns.

The environment management instruments comprise several dozen positions. This is a diversified spectrum of detailed management instruments. There are several classifications of these instruments. The most frequently used one comprises the division into the following instruments: legal and administrative, economic, voluntary and instruments of social influence.

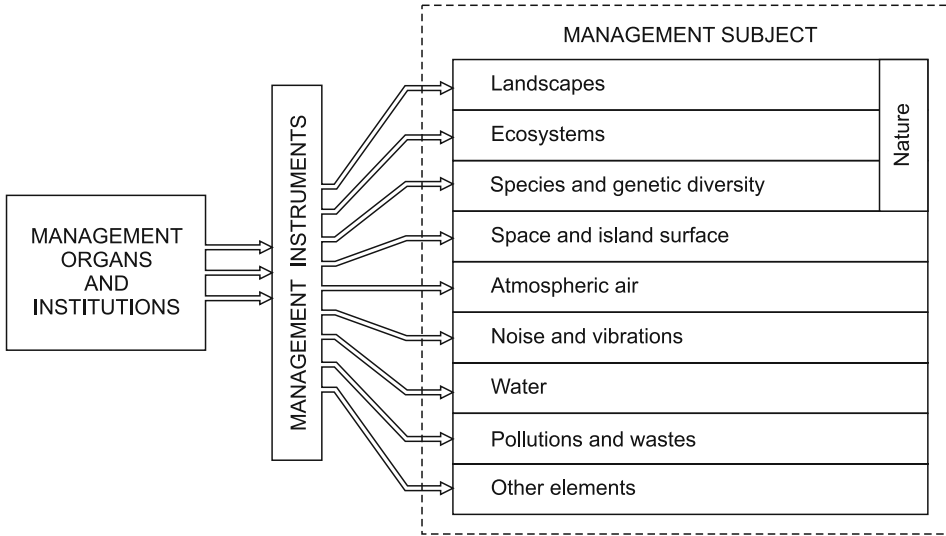
Management object is the most complex problem in the theoretical aspect. In environment management this concept comprises both the management subject and the entities influenced by management instruments. Management subject is the widely perceived natural environment, i.e. the following levels of life: bio-geographical, ecosystem, species and genetic, as well as environment elements – space and land surface, atmospheric air, noise and vibrations, water as well as pollutions, wastes, radiation and ionizing radiation (figure 1.5.).

Management object are the entities at which instruments are addressed, and it mainly concerns management instruments. These are: individuals, groups and communities, economic entities and various organizational units. People and economy exist and function in nature and thanks to nature.

In systems approach, the management subject and object perceived in the aforementioned way create a certain entirety, i.e. the macrosystem society-economy-environment. In accordance with the principles of sustainable development, the environment is managed by means of influencing particular sys-

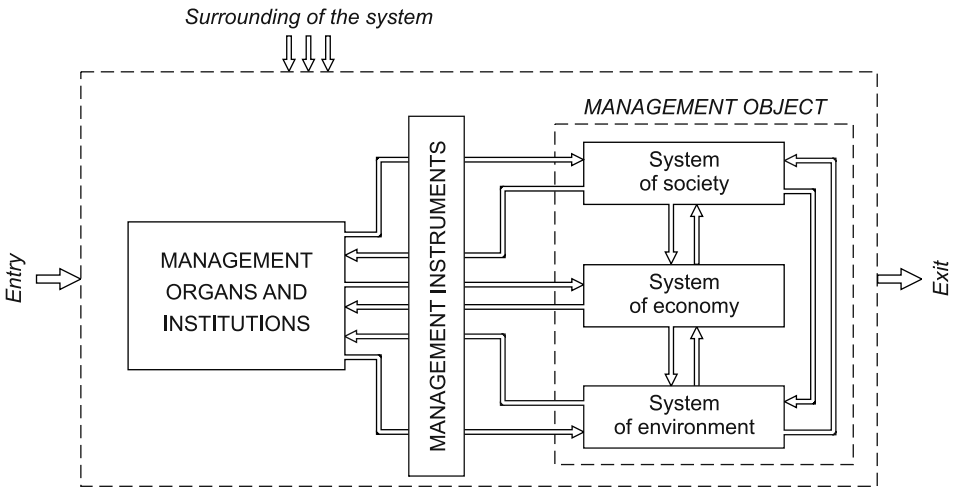
tems of this macrosystem. The general model of management object is presented in figure 1.6.

Figure 1.5. Environmental management subject in a system model



Source: *ibid.* fig.1.1.

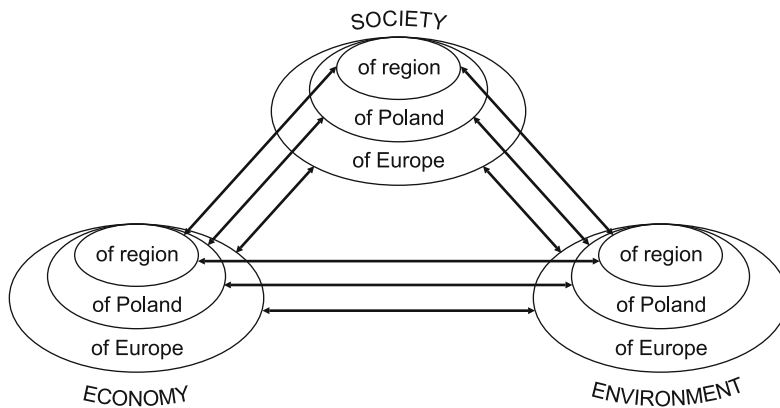
Figure 1.6. General model of environment management object



Source: *ibid.* fig.1.1.

Management object is a part of the reality which directly or indirectly participates in the processes of environment administration and it must comprise all spheres in which processes of using, protection and shaping of environment take place, i.e. society, economy and the natural environment. Therefore, it is assumed that the macrosystem society-economy-environment is an object of environment management. The agent linking basic systems isolated in it is the circulation of mass, energy and information. Each subsystem of this macrosystem comprises an element of a larger unit or includes elements of smaller ones. If, as the basis of analysis the area of Poland is taken, it constitutes the subsystem of an analogous macrosystem of Europe. Similarly, the area of Poland constitutes the macrosystem, the elements of which are macrosystems of particular regions (figure 1.7.).

Figure 1.7. Relations and conjugations in the macrosystem society-economy-environment



Source: *ibid.* fig.1.1.

Society, economy and the environment create a macrosystem with very strong internal connections. Excessive loading of ecosystems and environment degradation cause economic slump and decline of the community that in the given area (in the environment) created its smaller or larger 'civilization'. History, also the most recent, witnessed well-known declines of civilizations and desertification of areas caused by too strong burden of the environment (e.g.: Shale region in Africa, and presently South-Eastern China). Another reason of macrosystem's collapse may be depopulation in some area. In Poland, for example, depopulation of villages in the so-called eastern wall region has caused the downfall of agriculture and unprompted expansion of forest ecosystems.

Management object displays strong reversible effect on the subsystem of institutions, and directly also on the set of used management instruments. The entire environment management system is conjugated with the state management system, and to a smaller scale – with the management system of district, province and municipality. The conjugations are strongest in the sphere of institutions and management object, whereas they are considerably weaker in the subsystem of management instruments.

One cannot, for example, isolate the community of an isolated region constituting a part of the country from the society inhabiting this country. Local community will remain under the pressure of international and general national and state civilization activities even when its activities in the given area will be unfavorable for the environment and after some time also for the economy and for the remaining part of the society. It is similar to other fundamental systems of the configuration. Region's economy is generally part of country's economy and it rarely constitutes a distinct, relatively closed configuration. Therefore, changes in the region's economy, which are indispensable from the perspective of environmental protection, may be conducted only when they are correlated with changes in the entire economy or when country's economy may react to changes in the region's economy.

The problem of external relations in the "environment" system is an even more complex issue. On the one hand, circulation of mass, energy and information (as the condition of living processes) takes place on various levels, creating thus relatively self-contained ecosystems even in a relatively small area. On the other hand, however, the processes occurring on lower levels are always conditioned by the processes occurring on higher levels. The state of the environment of a region (area), isolated in any chosen place of the globe, will be always dependent on the state of global ecosystem (biosphere) and zone ecosystems that are characteristic of the given climatic zones.

1.3. Analysis of the macrosystem society-economy-environment as management object

The isolated macrosystem society-economy-environment has an extremely complex character. In the systems theory there is well-known dependence that the more complex the system is, the more general its description will be. Therefore, the analysis of this macrosystem has been restricted merely to the identification and description of these elements (subsystems) and conjugations which are most essential from the point of view of environmental management. An additional, very important aspect is assessing the extent of susceptibility of recognized elements and conjugations to steering signals.

1.3.1. The system of society

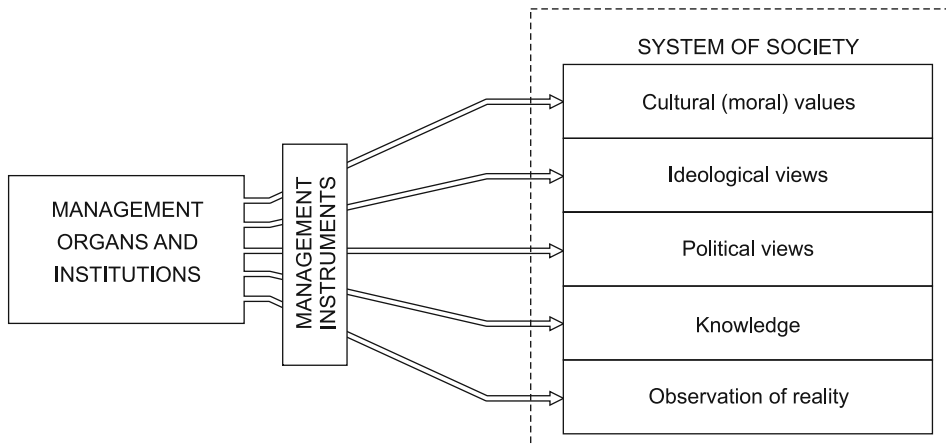
In every management system the most important entity is man. In the environment management considerably less attention is drawn to the behavior of individual people (except for environment management in a company), whereas considerably more attention is paid to social behaviors. Analysis of the system of society – as an object of the environment management – is hampered by the fact that it has complex structure and still unrecognized properties of functioning.

The attitude of man (as an individual in a society) to environmental problems is shaped mainly under the influence of:

- prevailing cultural values and esthetic norms that are connected with them;
- mainstreams of social and philosophical as well as religious ideas having society's acclaim;
- social and political ideas propagated by political formations;
- natural, technical and humanistic knowledge.

Each of these factors constitutes the object of pro-ecological effect of steering norms (figure 1.8.).

Figure 1.8. Elements of the system of society as an object of steering norms' effect



Source: *ibid.* figure 1.1.

In encyclopedic view, **culture** is defined as the entirety of material and spiritual output of humankind as such or of particular nations and epochs, as well as the totality of models, standards and products of human behavior in all spheres of human activity. In literature concerning management the following definition

is exposed: culture signifies (...) *schematic ways of thinking, feeling and reacting, acquired and conveyed mainly by symbols being the creations of groups of people and including substantiation in the form of artifacts*. [Zarządzanie..., 2006, p. 593].

In the way the environment is perceived and treated there are clear differences between Euro-American culture, shaped under the influence of Christianity and liberal ideas and Eastern culture, influenced by: Hinduism, Buddhism, Taoism and Confucianism. The main drawback of Western culture was not noticing or not acknowledging the environment's role in generic and social development of man.

From the point of view of modern biology, man is not the anti-natural being. Culture is a specific process shaped under the influence of an entire group of natural factors. Humankind gained the ability to adjust the environment to genetically conditioned needs and its genes to the environment. In the past centuries people lived and worked in conditions that were completely different from non-industrial surrounding (in Poland – Upper Silesia, Łódź). It was possible thanks to the accelerated evolution. Part of population had diseases and died too early, whereas others became biologically immune. If two biologically immune people formed a family, their children could be genetically immune. Excessively polluted air became a normal state for them. However, it was burdened with a high mortality rate.

As Z. Piątek states, *Peculiarity of humankind is the possibility of adjusting to the environment by using two streams of information – biological <<flowing in the river of genes>> and cultural one transferred via tradition* [Piątek, 2008, p. 133]. Our behavior towards the environment is shaped mainly by cultural instruction that enables learning in the meantime individual and social development of the ways of preserving and evaluating the environment. It means that there is a real possibility of shaping, or just initiating, new culture, which can be called **ecological culture**. This concept implies a way of intellectual and material, theoretical and practical acknowledging and using nature respecting its rights. Shaping of ecological culture has become more apparent in the last decades of the 20th century.

Moral norms for a long period of time have not managed to regulate the relation of man to the environment. However, the fact that environment degradation caused by one group of people negatively affects living and health conditions of other groups triggered the search for regulations in this area. Ecological ethics deals with this issue. The key postulate of ecological ethics is linked with refraining from making deeds that pose threat to the natural environment, in accordance with the command “Do good, avoid evil”. Making such deeds becomes immoral. Shaping of proper attitudes towards the environment must begin with conscience that is sensitive to ecological problems and with shaping friendly behaviors towards the environment [Kiełczewski, 2001].

Ecological awareness of society is condition and, at the same time, expression of ecological culture. The concept “ecological awareness” is used in a double meaning. In a broader meaning it implies the entirety of recognized ideas, values and opinions about the environment, as the place for the existence and development of man (society), common for definite social groups in a given historical period. In narrower, more axiological meaning, ecological awareness is the state of people’s knowledge, views and visions about the role the environment plays in human life, its anthropogenic loading, extent of exploitation, hazard and protection, including the state of knowledge about the ways and instruments of managing usage, protection and shaping of the environment.

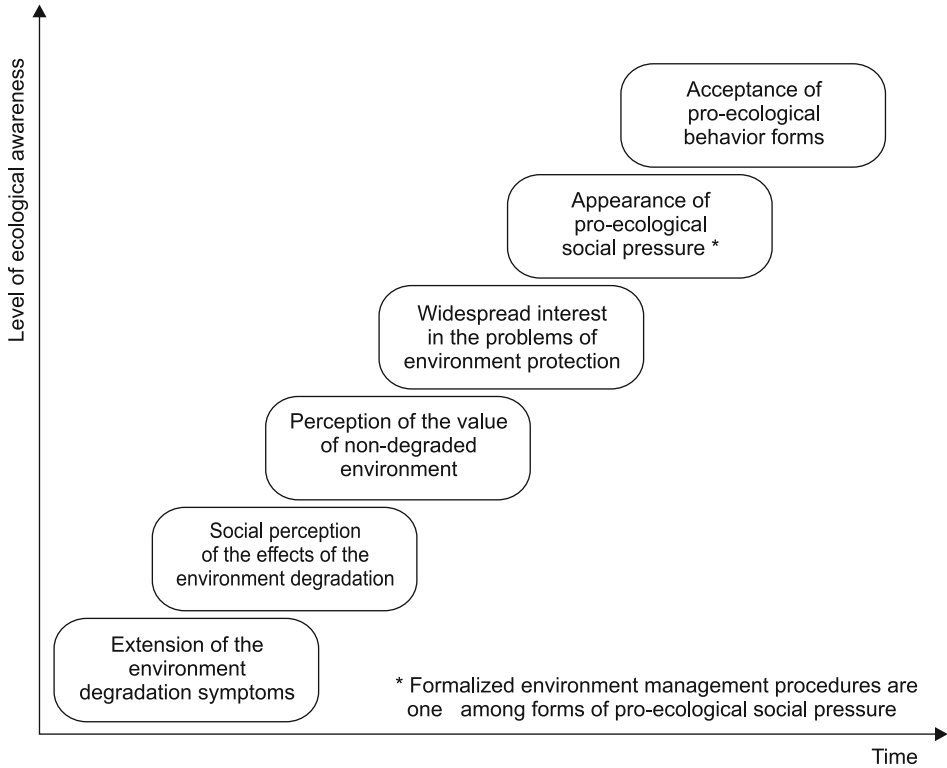
There is mutual dependence between social awareness and individuals’ awareness: social awareness depends on individuals’ awareness, yet it is not a sum of them, whereas the awareness of individuals is shaped under the impact of social awareness in the process of integration, synthesis and transformation of available information. This information can be common, constituting vision of everyday practice, or theoretical, constituting the effect of social education and becoming familiar with the principles governing the reality that man is surrounded by.

Ecological knowledge is the least general knowledge of processes taking place in the biosphere and ecosystems as well as of the relationships between society and the environment, between various spheres of human activity and the environment, and familiarity with the possibilities of counteracting various ecological hazards and instruments of the environment management.

Ecological imagination is a specific disposition, capability of predicting ecological effects of taken actions, ability to view and entirely comprise the relations between individual or organized (social) human activity and natural processes, capability of designing actions compatible with the requirements of ecological knowledge.

Shaping of ecological awareness is a complex process which takes place depending on the extent of social acceptance of ideas and moral norms as well as deepening knowledge of ecological effects of various forms of administrating and treating the environment. Changes in the environment (particularly negative ones) have decisive impact on shaping the awareness of society, and thus on the esthetic values and behavior norms. In the areas subject to large anthropogenic loading, the incentive that strongly influences pro-ecological direction of social awareness is the perception of the effect that pollution and environment’s degradation have. People are overtaken by specific anxiety and attempt of making new assessment of the problem. There arise new forms of social behavior which evolve from local initiatives of individuals to ecological movements having the character of political parties. Finally, there emerges society’s need to make a revision of these values, views and opinions which had shaped the prevailing way of treating the environment (figure 1.9.).

Figure 1.9. The process of shaping society's ecological awareness



Source: *ibid.* figure 1.1.

The process of shaping ecological awareness of inhabitants in protected enormous areas takes place in a slightly different manner. The factor that creates ecological awareness is making others aware of the beauty and value of the surrounding nature. It is shaped both under the influence of local traditions, of people's own experience (under the impact of having contact with the environment of degraded areas), and under the influence of the assessments of people from the outside, most frequently tourists, scientists or family members who live in different conditions. A particular form of shaping society's pro-ecological awareness is 'participating' education, i.e. education in the process of active work for the benefit of the protection of the environment in ecological organizations.

The state of ecological awareness may be defined only on the basis of research. In Poland it was initiated in the 1980s, whereas proper research on a representative group from all Poland's area is conducted on a regular basis by Public Opinion Poll Center (CBOS) by request of the Institute of Sustainable Development. The most recent research was conducted during the period

2008-2009. In the past two decades the preferences of respondents have changed clearly. Environmental pollution, among 12 threats of humankind, during the period 1992-1997 was on the positions 1-2, between 2000 and 2004 on the positions 4-5, whereas in 2008 it was on the sixth position. There was considerable decrease as regards the perception of the threat caused by the ozone hole, i.e. from 48-51% of answers during the period 2000-2004 to 40% in 2008. Simultaneously, however, there was increase as regards the perception of anthropogenic threat to the climate, there were four times more answers in 2008 when compared with 1997 and there were two times more such answers in comparison with 2004. As proper was assessed also the state of the environment in the place of abode. The conviction that the environment is excessively polluted was expressed in 1992 by 47% of respondents, while in 2008 only by 23% [Bołtromiuk, 2010].

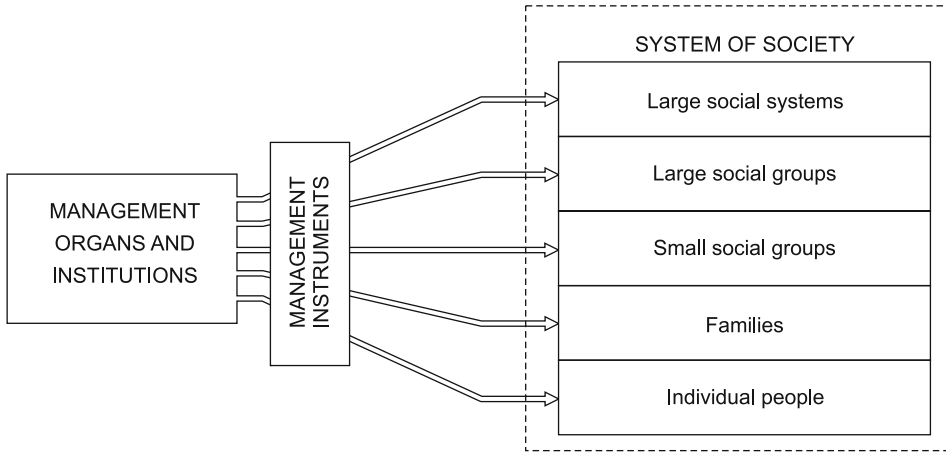
In the system of society the object of **influence of management instruments** can be the following levels of society's cultural organization:

1. Large social systems, e.g. religious groups. Influence in this area is possible as the result of change in ideological doctrines. It can be exemplified by pro-ecological attitude to the environment in the Catholic Church doctrine, to which special attention was paid during the pontificate of Pope Paul VI, and especially John Paul II.
2. Large social groups, e.g. political and occupational formations. These groups' involvement in the problems of environmental protection, particularly in the implementation of ecological issues into their activity programs, may prove to be an efficient way of shaping pro-ecological social behaviors.
3. Small social groups – local communities, company teams, associations, foundations. They are indirectly susceptible to steering, in the frameworks of large systems and social groups, and directly, by means of social education and steering instruments such as commands, bans, bonuses, penalties.
4. Families. Important steering factor is in this case inspired self-education and usage of economic and moral incentives.
5. Individual people (individuals). People are in a direct or indirect way the principal object of influence of steering norms (management instruments). Susceptibility of particular people on the functioning of these norms depends on their belonging to social groups and large social systems and to pro-ecological, comprised or anti-ecological attitudes shaped within these systems, and also on the character of education and on the awareness shaped in family home.

The model of management system with isolation of levels of society's cultural organization is presented in figure 1.10. Practice shows that the most efficient is steering that affects at the same time all areas and levels of society's cultural organization. Therefore, it ought to concern all professional groups,

especially politicians, decision-makers, managers and also workmen and farmers.

Figure 1.10. Levels of society's cultural organization as an object of steering norms' influence



Source: ibid. figure 1.1.

In steering of the system of society one should take into account the fact that indispensable revaluations take place with a certain time delay, and the smaller this delay may be, the wider is the range of influence ways, starting from creating new philosophical views, revision of religious doctrines to public education and various socio-technical methods. Cultural awareness determinants have essential effect on the functioning of the institution of environment management system.

1.3.2. The system of economy

Economy is the main object of the influence of managing norms. Economic activity has always been connected with using the environment, which is always linked with human intervention into the natural processes of mass, energy and information circulation in ecosystems. When intervention has the character of anthropogenic loading of ecosystems, there follows reversible influence of the environment on economy, which triggers economic and social losses.

Economic losses are quantified losses which appear in business activity as the result of contraction of degraded environment. They may be divided into: biological losses created in farming, animal breeding, losses in productivity of forests, grasslands and farmlands; material losses caused by deterioration in the

quality of natural resources and materials used in industrial processes; losses in fixed assets (e.g. corrosion); losses in environmental services. The sum of these losses conditions economic efficiency of the economy.

Social losses, i.e. measurable and non-measurable losses in the conditions of society's life. One can list the following: losses connected with loss of good health (increase in the absences connected with sick leave, increase in budget outlays on travelling to the place of recess in clean environment) and those related to the worsening of good disposition due to excessive noise, bad smells, smog.

The process of using the environment is dependent on climatic, social, technical, as well as political, constitutional, demographic and urban conditions. The following internal system factors determining the extent of the environment load in the process of its usage can be listed:

- not adjusting the given type of business activity and its range to the existent natural conditions;
- irrational, in natural and economic terms, way of using natural resources, forces, natural processes and amenities of the environment;
- using ecologically imperfect production techniques and technologies;
- creating by man products, the usage (implementation, exploitation) of which poses threat to the environment;
- removing to the environment of those production and 'living' wastes that are not subject to biological decomposition (that are extraneous to ecosystems) or are in the amount largely exceeding the environment's assimilation capacity (utilization capability).

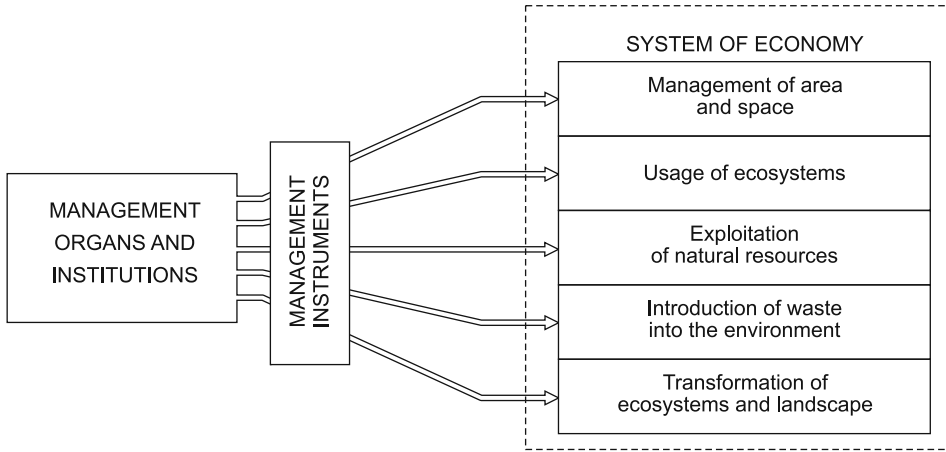
While analyzing the way main sectors of the economy affect the environment one can distinguish direct causes of anthropogenic and technological environment load, which should be the subject of environment management instruments. These are: administration of area and space; usage of ecosystems (forests, farmlands, grasslands and waters); exploitation of natural resources; introduction of economic and 'living' wastes into the environment; transformation of ecosystems and landscape (figure 1.11.).

The objects of steering in the system of activity spheres are municipal economy along with: urban activity, industry, agriculture and gardening, forestry together with hunting, and tourism. Each of these activity spheres requires the usage of specific pro-ecological management instruments (figure 1.12.).

In literature concerning pro-ecological topics steering economy has been thoroughly described. At this moment just a few remarks can be made. Impact of the economy on the environment is dependent on such conditions of constitutional character as:

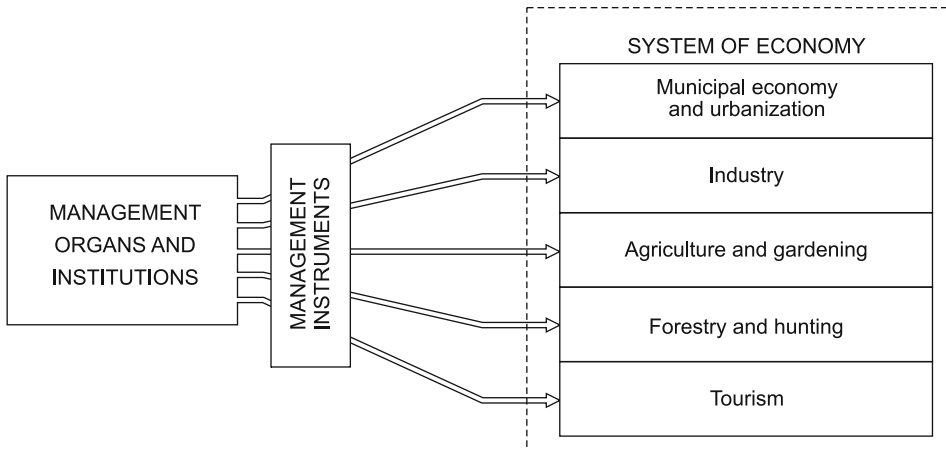
- structure of economy and structure of industry;
- system of economy management, mainly with regard to stimulating innovation character;

Figure 1.11. Main economic processes as an object of steering norms' effect



Source: ibid. figure 1.1.

Figure 1.12. Main spheres of economic activity as an object of steering norms' effect



Source: ibid. figure 1.1.

- absorpency in terms of raw materials, materials and energy, increasing quality and ecological character of production processes and goods, reducing absorpency of economy in terms of transport;
- subsidizing of raw materials and energy;
- unequal loading with work tribute, capital and also economically used environment resources and amenities.

The environment management system ought to stimulate companies' **ecological responsibility**. Two types of such responsibility may be distinguished: real responsibility, resulting from the existing regulations and the principle "Polluter pays", and connected with future activity of the newly established company; potential responsibility, resulting from the influence exerted on the natural environment by a company. Potential responsibility is not subject to system regulations (with aid of standard management instruments) and must be object of individual regulations, e.g. within the frameworks of negotiations between organs of government or local government and company's board.

There is a problem with the protection of ecological grounds, which (from the point of view of a private owner of lands) are simply fallow lands. Ecological grounds play invaluable role in ecosystems' functioning, therefore they need to constitute certain value also for their private owners, otherwise – as experience of highly developed European countries shows – there will be reduction in environment's potential and ecosystems' capacity.

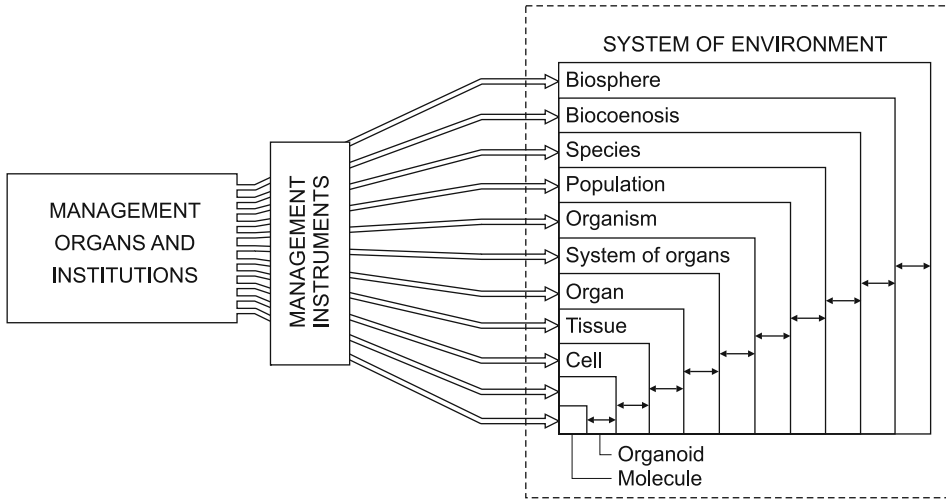
1.3.3. The system of the environment

The environment is above all the subject of management, although it can be considered also as an object because by means of management activities a certain state of ecosystems or quality of resources is achieved.

The natural environment is a specific system. Owing to complex life processes, it has the capacity of energy accumulation and auto-renewal (self-reproduction). Ecologists distinguish eleven life levels: molecular, organic, cellular, tissular, of organs, organs system, organism, population, species, biocoenosis and biosphere. Many of these levels have been subject to human activity since ancient times. As a result of natural selection man shaped desired features of plants and animals used for farming.

Modern level of knowledge facilitates involvement into natural processes at all life levels. However, it is worth becoming aware that every intrusion at lower level of life triggers changes at higher levels while intrusion at higher levels affects lower levels. The essence of the environment management is making choice of such elements that would prevent undesirable effects on particular life levels. The concept 'undesirable' in the first place should be defined from the perspective of influence that these changes have on the quality of life and durability of humankind growth, and then from the perspective of effect on the environment and economy. General model of steering environment in the arrangement of levels of life is presented in figure 1.13.

Figure 1.13. Levels of life as an object of steering norms effect



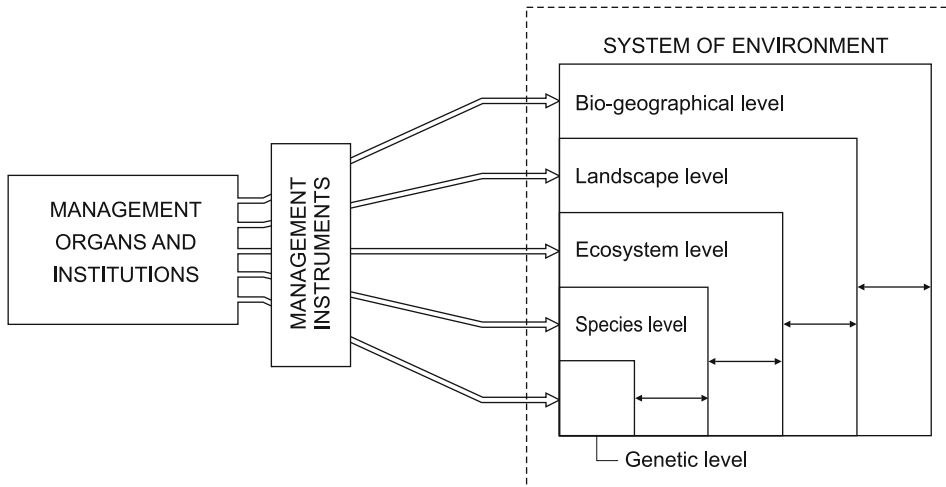
Source: ibid. fig.1.1.

The subject of managing influences can be:

- at the level of biosphere – emission of gases causing disappearance of the ozone layer and greenhouse effect;
- at the level of biocoenosis – deforestation, deecologization of area as a result of industrialization of agriculture;
- at the level of species – creation of chimeras (combination of various species), elimination of species perceived by man as harmful;
- at genetic level – disappearance of races, variants or forms of a certain species;
- at molecular level – creation of genetically modified species.

Each of these undertakings requires usage of diverse management instruments.

Perception of the environment through the prism of life can be perceived as “object” steering. It differs from the process steering in that it can be realized at particular levels of nature’s organization. The following levels can be distinguished: genes, species, ecosystem, landscape and bio-geography (figure 1.14.). It means that steering instruments are directed at stimulating or preventing definite anthropogenic effects on the processes taking place at certain level of nature’s organization. It provides considerably greater possibilities of arranging management instruments than in the case of steering.

Figure 1.14. Levels of nature's organization as the object of steering norms' effect

Source: *ibid.* figure 1.1.

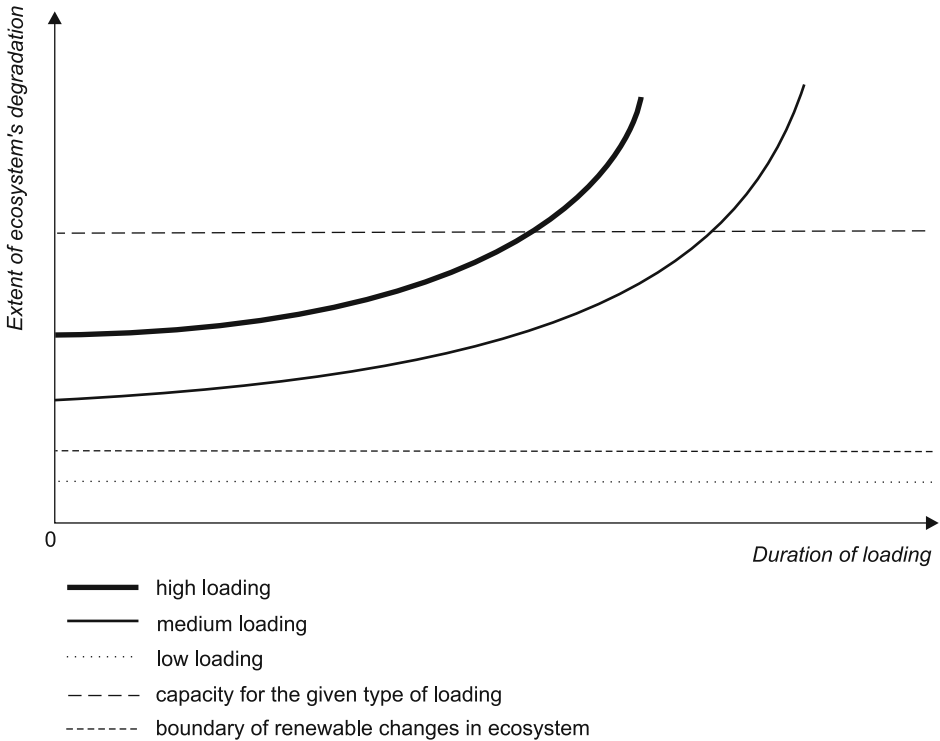
Through individual, group (e.g. family) and team (as local, regional community or nation) activities man affects the environment in general terms. At the present level of knowledge there cannot be identified effects of most influences with life levels. Every influence can be temporary (period) or permanent. In temporary loading, even considerable, there are not always changes in threatened objects or natural processes. It depends on their flexibility, i.e. on the capacity of temporary change of the existent state under the impact of external factors and of return to the starting point when these factors cease to operate (figure 1.15.).

Exceeding of the limit of system's capacity or the ability of element (e.g. species) to sustain loadings of certain type causes hazard to them, whereas exceeding of the limit of reversible changes leads to their degradation, auto-destruction¹⁰, and consequently to ecological catastrophe. Four states of ecosystems that are burdened in an anthropogenic way can be distinguished: normal, hazardous to ecological balance, critical and catastrophic (concerning ecological catastrophe).

Normal state is when ecosystem's loading does not exceed its capacity and does not change the character of the ecosystem, and normal flow of matter and energy takes place. In the normal state it is possible to implement new (natural and artificial) cells of mass and energy flow that enable increased productivity of ecosystems for economic purposes.

¹⁰ Auto-destruction is regeneration changes unfavorable for its development in organism or in ecosystem.

Figure 1.15. Resistance of natural objects (elements) and processes on long-term uniform loadings



Source: *ibid.* figure 1.1.

State of hazard to ecological balance is the effect of emerging anomalies in the functioning of cells in mass and energy flow; the anomalies were caused by environment loading (mainly by pollution or transformation) of the environment. In this state ecosystems do not change their character but they can lose their natural resistance and flexibility to individual short-term loading (e.g. in emergency cases) and decrease their capacity.

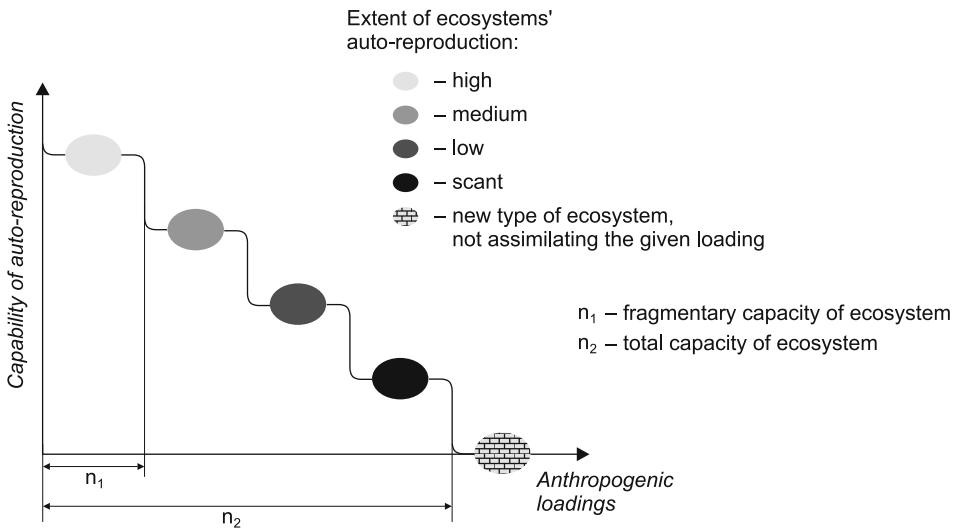
Critical state occurs when there is considerable loading of ecosystems kept at the borders of their capacity. Every increase of loading or maintenance of the border loading for a longer period of time may lead to the ecological catastrophe. There occur disturbance of the stability of ecosystems and gradual worsening of the environment quality¹¹. The environment in the hazardous state nega-

¹¹ **Environment quality** is such composition of ecosystem that ensures its desired productivity and ability of self-reproduction in the conditions of certain loadings.

tively affects not only man, his health and growth but also economic status of a given region. Preservation of normal productivity of ecosystem requires a decrease in the degree of loading and introduction of anthropogenic “protheses” facilitating flow of matter and energy.

Catastrophic state (state of ecological catastrophe) occurs when ecosystems no longer perform their basic service functions, considerably reduce the ability of auto-reproduction in present form. Type of ecosystem changes gradually, e.g. pastures transform into deserts, high forest changes into bushes and perennials. In the state of catastrophe, the environment negatively affects man’s organism (this may cause illnesses), and triggers disturbances in economic activity. Even partial restoration of the state prior to loading requires elimination of the mainspring of degradation and recultivation of ecosystem. The course of the phenomenon of reducing self-reproduction of ecosystems under the influence of anthropogenic loading is illustrated in figure 1.16.

Figure 1.16. Dependence between the degree of loading and capability of systems of auto-reproduction



Source: *ibid.* figure 1.1.

The capacity of ecosystem (environment) can be considered from the perspective of various natural loadings, e.g. the capacity of Białowiecki Forest in terms of bison population or the capacity of Wigierski National Park in terms of beaver population and anthropogenic loadings. In the environment management the main focus is on the loading caused by economic activity.

Ecosystems in the natural state (without man's intrusion) strive for the state of the so-called Pareto dynamic equilibrium. It means that the amount of biomass produced and spread in a time unit in them is more or less the same. However, natural and anthropogenic ecosystems such as farmlands, grasslands, orchards, forested areas in a short period of time produce much greater amount of substances than it is simultaneously decomposed in natural processes. It happens owing to the fact that mass and energy flow was simplified by man. Such ecosystems are not sustainable. The simpler the system is, the larger amount of work and capital is needed to preserve it.

Every loading of the environment incurs indirect and direct effects. Direct effects of anthropogenic loading of the environment may be reversible, as the result of terminating pollution and auto-reproduction of ecosystems, as well as man's protective activity, and also irreversible (permanent). These effects can be divided into: non-admissible, when they lead to irreversible changes in ecosystems or cause man's morbid conditions; temporarily admissible, however requiring fast eradication as not to allow irreversible changes to take place; admissible within the frameworks of economic profitability, when prevention of them is inefficient. Indirect effects manifest themselves outside ecosystem, mainly in the economic and social spheres, e.g.: people's illnesses that are conditioned by the environment, lowering the efficiency of productivity and also pollutions and transformations of other ecosystems.

Direct and indirect effects of excessive loading of the environment are treated as **ecological losses** and in major part they may be identified with economic losses. Losses are socially superfluous usage of productive factors as the result of irrational administration (and also elemental disasters), including loss of resources and the ability to provide services as well as worsening of the environment amenities. Losses include also a decrease in expected benefits, i.e. limitation of economic effects as a result of operating in the polluted environment.

Losses may be classified according to various criteria, e.g. perpetrator of devastation, subjects suffering from losses, environment's components – subject of excessive loading – e.g. losses on the grounds of air pollution, water pollution, pollution and degradation of soils as well as degradation and destruction of flora and fauna; losses in natural resources and in environmental services. Determination of ecological losses is obligatory for the proper steering of the processes of the environment management because it enables undertaking of effective protection activities.

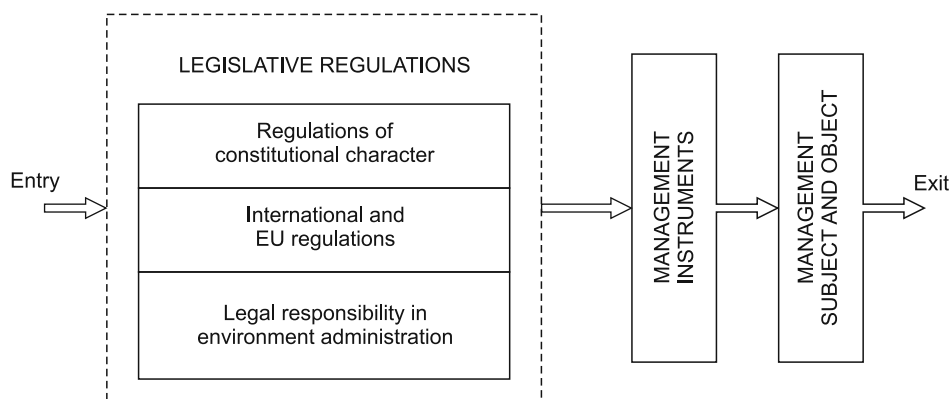
Chapter 2

GENERAL LEGISLATIVE REGULATIONS

General legislative regulations are legislative national and international institutions that affect behaviors of people and the functioning of society and economy. These regulations are applicable to all the spheres of the macrosystem economy-environment-society, i.e. all the spheres that could be isolated theoretically, and also problem and detailed systems functioning in the reality. From the point of view of the systems theory, the general legal regulations in problem and detailed systems can be divided into two groups: external towards environment management system and the internal ones.

External regulations affect all the spheres of people's life including their activity in terms of the environment management. They direct and reinforce the operation of instruments within a system. General legislative regulations in the environment management comprise regulations of constitutional character, international and EU regulations as well as legal responsibility in the environment administration (figure 2.1.).

Figure 2.1. General legal regulations in the environment management system



Source: own elaboration on the basis [Poskrobko, 1998].

They are mainly the subject of research in law sciences and only to some degree in sciences related to management. Therefore, this book presents them only in an encyclopaedic way.

2.1. Regulations of constitutional character

Regulations of constitutional character include general regulations that define the character and constitution of state, basic laws and responsibilities of citizens and the ownership of resources and components of nature as well as problem regulations, e.g. tax system or general principles (frames) of the functioning of environment management system.

General regulations ensue from the basic law – the Constitution of the Republic of Poland¹. The document states that (...) *The Republic of Poland shall be a democratic state ruled by law and implementing the principles of social justice* (Art. 2). *The system of government of the Republic of Poland shall be based on the separation of and balance between the legislative, executive and judicial powers.* (Art. 10, act 1). *The basis of the economic system is a social market economy, based on the freedom of economic activity, private ownership, and solidarity, dialogue and cooperation between social partners* (Art. 20). *The basis of the agricultural system of the State shall be the family farm* (Art. 23).

The constitution considers environmental protection as one of the most important responsibilities of state, on equal terms with ensuring independence and inviolability of the territory and safety of citizens (Art. 5). At the basis of environmental protection is the constitutional principle of sustainable development, which is in accordance with the indications of the United Nations Conference on Environment and Development (1992) and with the resolutions of the Treaty of Amsterdam from 1997 concerning the formation of the European Union (Art. 2). Therefore, the concept of sustainable development is the basic principle of economic, social and ecological policy of the state, region and basic local units. The natural environment was listed among the key values that are protected by the Constitution (Art. 74 and Art. 86). The basic law imposes the responsibility to: preserve the environment in the state that does not pose threat to man's health, and thus does not violate the natural bases of man's existence (Art. 68, Act 4); ensure the ecological security² by public authorities (Art. 74, Act 1);

¹ Constitution of the Republic of Poland of 2 April 1997 (Dz.U. of 2004, No. 78, par. 483).

² **Ecological security** is understood in a wide perspective as security from unfavorable effect of business activity on the environment, ensuring available water resources that are proper in terms of quality, preserving agricultural production space, maintaining (or even increasing) for-estation, biological diversity and protected areas as the place of recreation and recess of people.

support by public authorities activities of citizens for the protection and improvement of the state of the environment (Art. 74, Act 4).

Constitutional responsibility of taking care of the state of the environment was repeated with details in the Act on Environmental Protection³, which implies that (...) *public administration organs, legal persons and other organizational units and physical persons have the obligation to take care of nature which is national heritage and richness (art. 4, act 1)*. The Constitution specifies the main obligation and universal law in terms of environmental protection:

- *Everyone shall care for the quality of the environment and shall be held responsible for causing its degradation (art. 86),*
- *Everyone shall have the right to be informed of the quality of the environment and its protection (art. 74, act 3).*

The universal obligation concerns everyone, both a physical person and an organizational unit.⁴

According to J. Sommer [2005], the Constitution divides the rights of citizens into the ones the vindication of which is possible on the basis of this act (it concerns Art 64, Act 4) and the ones the vindication of which is possible on the basis of the respective acts specifying constitutional regulations (e.g. Art. 74, Act 3). The evidence of the importance of environmental problems is the bequest in the basic law which implies that ensuring environmental protection can be the reason of limitation in terms of using constitutional freedoms and rights only by the virtue of the act, naturally (Art. 31, Act 3). All the constitutional bequests concerning responsibility for taking concern of the environment and its protection can be executed only on the basis of statutory regulations.

The problem of the ownership of environment components is considered in Polish law from two points of view: the right to the common usage of the environment and both civil and legal circulation. It is regulated by “component” acts. In the Environmental protection Law it is stated that in accordance with the act common usage of the environment is applicable to everyone and that it comprises usage (...) *without using installations, with the purpose to satisfy needs of persons and household, including recess and sport (Art. 4, Act 1)*. Almost identical definition of this institution was included in the Water Law⁵: *Common usage of water serves satisfaction of needs of persons and household or farm without using special technical devices, and also for recess, tourism,*

³ Act of 16 April 2004 on nature protection (Dz.U. of 2004, No. 92, par. 880 and Dz.U. of 2005, No. 113, par. 954 and Dz.U. of 2005, No. 130, par. 1087).

⁴ Organizational units are legal entities that run commercial business activity (production and service companies) and non-commercial one (non-profit, mainly foundations) and social organizations.

⁵ Act of 27 July 2001 – Environmental Protection Law (uniform text, Dz.U. of 2008, No. 25, par. 150); Act of 18 July 2001 – Water Law (Dz.U. of 2001, No. 115, par. 1229, with further alterations).

water sports and on the principles defined in separate regulations, amateur fishing (Art. 34, par. 2). It does not include (...) *excavation of stone, gravel, sand and other materials from internal waters (...), cutting plants from waters or coastline and inserting sewage* (Art. 34, par. 3).

A specific aspect of common usage of the environment is free access to forests that are the possession of the State Treasury and collection of the undergrowth produce for one's own needs (Act on Forests⁶). Entry to a forest and the stay there are conditioned by constitutional bans and obligations. Forestry service can introduce a permanent ban on entrance to certain areas, which constitute mainstays of animals, or a temporary ban, for example owing to the hazard of fire. In the place comprised by permanent or temporary entry it is forbidden to collect undergrowth produce (black berries, mushrooms, medicinal plants). Polish law does not regulate the common usage of other elements or amenities of the environment, e.g. microclimate although local self governments are entitled to establish and collect a climate fee.

The ownership of natural resources in civil and legal perspective was defined in legal terms with reference to surface and underground waters and mineral deposits. The Act of Water Law states that sea internal waters, inland flowing surface waters, underground waters and lands covered with flowing surface waters are the possession of the State Treasury. Stagnant waters and waters in ditches constitute the property of the owner of this estate (Art. 10 and 12). Waters that are the possession of the State Treasury or of local territorial units are public waters. Flowing public waters are not subject to civil and legal circulation, with the exception of cases specified in the act (Art. 10). Fish and other organisms living in water are the benefits the collection of which is earmarked only for the water owner (Art. 13).

Minerals (natural gas, crude oil, coal, metal ores, brines, thermal waters, phosphorites, clay, gravel and marble and others) which do not constitute components of land estate are the property of the State Treasury⁷. Forests in Poland are, to a large degree, public possession. In the total area of the forest area 82.2% is occupied by public forests, whereas 17.8% by private forests. Public forests are the property of the State Treasury and municipalities. In the State Forests there are 7053.1 thousand ha of forests, i.e. 78.1% of the total area of Poland, whereas in the national parks – 2.0% [*Ochrona...*, 2008].

The problem of the ownership of the environment components has still not been solved fully because it is not within economic doctrine either of free market or common private ownership or economy steered by state and common social ownership.

⁶ Act of 28 September 1991 on forests (Dz.U. of 2005, No. 45, par. 435).

⁷ Act on 4 February 1994 – Geological and mining law (Dz.U. of 1994, No. 27, par. 96, with further alterations).

The problem of tax systems requires further discussion. Taxes are compulsory non-returnable benefits collected with the purpose to cover the expenses related to the maintenance of state management system and to secure means for benefits for population by state organs. Tax system is the group of taxes collected in state that comprises types of taxes, their mutual correlation and the way of collecting and sharing income. There are many criteria of classifying taxes. One can distinguish direct taxes that are paid directly by a tax-payer and indirect taxes. Another criterion is the object of taxation, e.g. income and wealth, economic and legal turnover and consumption. In accordance with this criterion, tax systems of European Union member states are similar in basic terms [Kumar, 1999].

Tax system is an important instrument of stimulating the realization of social and economic objectives of state. There is interrelationship between the type and amount of collected taxes and the rate of economic growth. Taxes have impact on the degree of financing and using public goods, they reduce or increase the incomes being at the disposal of particular units and also have influence on the scope of investment in materialized capital and people. Thus, taxes have impact on the people's inclination to work, gain new skills, creativity and enterprise, to produce and invest and also on the extent of using resources. These instrumental possibilities of tax systems enable also pro-ecological direction of economic activity.

Pro-ecological modification of the state tax system was called an *ecological tax reform*. The essence of this reform implies:

- reduction in the taxation of incomes and work (mainly by the cancellation or reduction in income taxes and by the reduction in taxes and social burdens of work);
- increase in the taxation of goods the production and consumption of which is related to the pollution, ecological damages and usage of resources.

Thanks to the ecological tax reform it is possible to achieve at the same time improvement of the state of the environment (by reducing consumption of fuels, energy and materials and also environmental resources, for example water, land area); increase in the number of work positions or increase in remunerations (by lowering fiscal loadings for employers with the costs of employing workers). The shift of tax loading from work and capital on the resources used in production and consumption and on the usage of natural environment amenities ought to take place while preserving the neutral character of tax incomes. It means that: additional incomes resulting from the introduction of ecological taxes ought to be fully used for lowering fiscal loadings of employers and/or employees, mainly on the grounds of social securities and personal taxes [Ekologiczna..., 2004].

It proved to be very difficult to meet these conditions in practice. On the one hand, ecological taxes are perceived by the theoreticians of economics as a good

instrument of internalizing external effects, and on the other hand this internalization faces very strong opposition of various interest groups. The condition of its success is its simultaneous implementation by various countries of the European Union because tax diversifications may violate the conditions of competitiveness within the Union.

Since the early 1990s several countries have introduced initial (pilot) pro-environmental solutions in their tax systems. New taxes concern above all carriers of energy. The most frequently used solution is coal tax and/or energy tax. Reductions in the existing taxes concern indirect costs of work, i.e. social insurances and also tax from physical persons. The most fundamental changes in tax systems were made in Sweden (1990), Denmark (1994), Netherlands (1996), Finland (1997), Norway (1999) and Germany (1999).

The research conducted in Poland shows that the most beneficial for economy is the ecological tax reform that reduces tax loadings of employees for the increase in fees for using the environment. The scenarios of solutions suggested in literature do not show interchangeably the variants that are the source of the double dividend. It is very simple to show variants that are most beneficial for environmental protection policy or variants that are optimal from the perspective of economic and social policy. It is difficult to elaborate a scenario the realization of which would ensure simultaneous reduction in unemployment, economic growth and improvement of the state of the natural environment. The chance for success of ecological tax reform in Poland is the adoption of the assumption that its main objective is the continuation of beneficial changes in the environment, which can be achieved by selecting the scenario concerning the improvement of the state of the environment with the chance of prosperity and the number of working positions, and also with the guarantee that economic growth will not be hampered [*Ekologiczna...*, 2004].

2.2. International and EU regulations

International regulations are included in multilateral or two-sided international agreements which are signed and ratified by state authorities. They can have either global or regional character. They adopt various names: treaty, convention, protocol, pact, statute or agreement. The name of the contract does not have any significance although it frequently indicates its character and territorial range. In environmental protection international contracts of global and regional character most frequently adopt the name of **conventions**, whereas the contracts specifying or developing some of its bequests are known as **protocols**. In general, the sides of such protocols can be only those countries or organizations that signed the convention. Additionally, there are protocols that are open for countries and organizations that are not parties to parent convention. There may also

be **European conventions**, in which signatories are only member states of the European Council. The Constitution of the Republic of Poland states that (...) *after promulgation thereof in Dziennik Ustaw (Journal of Laws) of the Republic of Poland, a ratified international agreement shall constitute part of the domestic legal order and shall be applied directly, unless its application depends on the enactment of a statute* (art. 91, par. 1).

Presently, Poland is the signatory of approximately 40 international conventions, protocols and agreements concerning environmental protection. Most of them were ratified by Poland, and some of them are still in the process of ratification.

In the environment management system in Poland of considerable importance are the following international agreement introduced to the national legislative order:

- The Convention on water and marshy areas of international importance, especially as the living environment of water birds from 2 February 1971 (Ramsar Convention)⁸;
- Convention on the protection of wild European fauna and flora and their natural habitats from 19 September 1979 (Bern Convention)⁹;
- Convention on long-range trans-boundary air pollution from 13 November 1979 (Geneva Convention)¹⁰;
- Convention on the protection of the ozone layer from 22 March 1985 (Vienna Convention)¹¹;
- Convention on biological diversity from 22 May 1992 (Convention signed in Rio de Janeiro)¹²;
- Convention on the access to information, participation of society in making decisions and access to justice in the issues concerning the environment from 25 June 1998 (Aarhus Convention)¹³;
- International Convention on the protection of plants from 6 December 1951 (Rome convention)¹⁴;
- Framework Convention of the United Nations on climate changes from 9 May 1992 (UN FCCC)¹⁵, signed in Rio de Janeiro.

International agreements in the sphere of the environment facilitate solving of difficult supranational ecological problems and serve ecological safety of the country.

⁸ Dz.U. of 1978, No. 7, par. 24 and 25.

⁹ Dz.U. of 1996, No. 58, par. 63, modification of Dz.U. of 2000, No. 12, par. 154.

¹⁰ Dz.U. of 1985, No. 60, par. 311.

¹¹ Dz.U. of 1992, No. 98, par. 488.

¹² Dz.U. of 2002, No. 184, par. 1532

¹³ Dz.U. of 2003, No. 78, par. 707.

¹⁴ Dz.U. of 2001, No. 15, par. 151.

¹⁵ Dz.U. of 1996, No. 53, par. 239.

EU regulations form a separate legal system closely related to both international and national law. They are in force in every member state and on the same principles as the national law. They are not superior to national regulations. Formally, the sources of union law are four groups of norms.

1. Law instituted by legislative institutions of the Union. Instituted law is divided into: primary law included in founding treaties of Unions, Treaty of the European Union and in the agreements concerning accession to the European Union; secondary law comprising legal acts formed by the EU managerial institutions: European Parliament, European Union Council and the European Commission.
2. Not instituted law which is formed as the result of verdicts the Court of Justice of the European Union established on the basis of the general EU legal principles.
3. International agreements signed by the European Union with third countries. These are treaties, contracts or conventions concerning widely perceived economic or social issues, including the usage and protection of the natural environment.
4. Agreements signed by member states with the purpose to settle the issues that are closely related to the activity of the Union in which union institutions were not given proper rights.

The treaty establishing the European Union predicts three types of legal acts that can be employed by the European Parliament, Council and Commission with the purpose to execute their competences. These are: regulations, directives, decisions and also recommendations and opinions. By using such regulations the EU policy in the sphere of environment is implemented.

Decrees are the acts of direct regulation of general and normative character that can be compared to national constitutional regulations. They grant rights and impose obligations on proper organs, institutions and courts or member states and citizens of the Union they can be applicable to. Direct binding force of regulations means that they do not require any additional implementation activities to the national law. The example of regulations in the sphere of “environment” can be the Regulation (EC) 761/2001 of the European Parliament and Council of 19 March 2001 allowing voluntary participation by an organization in a Community eco-management and audit scheme (EMAS)¹⁶.

¹⁶ Official Journal of the European Communities 114/1 of 24 April 2001. For further deliberations it is worth mentioning here that in Polish legislative system in order to refer to the European Union Official Journal the short form “Dz.Urz.U.E” is used, whereas the form “Dz.Urz.W.E” is used to denote the Official Journal of the European Communities. However, in this book authors adopt the term Journal of Acts (Dz.U.) similarly as it is used with reference to acts and decrees of Polish legislative and government organs), which is in accordance with the Declaration of the Prime Minister of 16 September 2005 on the shortened form of the Official Journal of the

Directives are acts that are directed by legislative organs of the European Union to all member states. Directive specifies the objective and deadline of reaching it. The selection of forms, methods and means of reaching the objective depends on the member state. Directives are the main (primary) instrument of the EU environmental protection law, especially with reference to specifying uniform European ecological standards and harmonizing internal legal systems of member states.

Directives may be of two types: framework and detailed ones. Framework directives have characteristic features of general guidelines or “branch” policy, whereas the detailed ones indicate uniform EU way of solving a certain problem. In terms of the subject of regulations directives can be classified into four groups:

1. defining norms of environment quality;
2. regulating emission of pollutions (in solid, liquid or gas form) by industrial companies;
3. determining ecological requirements of technologies and also technical constructions and products, e.g. cars;
4. specifying ecological product norms.

In environment management system of particular importance are framework directives, among others:

- Council Directive 96/22/EC of 27 September 1996 on the assessment and management of air quality¹⁷,
- Council Directive 96/21/EC of 24 September 1996 on the integrated system of preventing and controlling pollutions¹⁸,
- Directive 00/60/EC of the European Parliament and Council of 23 October 2000¹⁹ establishing the frameworks of common activity for water-related policy;
- Council Directive 92/43/EC of 21 May 1992 on the protection of natural mainstays of fauna and flora²⁰,
- Council Directive 79/409/EC on 2 April 1979 on the protection of wild birds²¹,
- Council Directive 96/82/EC on 9 December 1996 on the hazard of serious failures by some types of industrial activity²².

European Union and the Official Journal of European Communities (M.P. of 2005, No. 57, par. 781).

¹⁷ Dz.U.L.296 of 21 November 1996.

¹⁸ Dz.U.L.257 of 10 October 1996.

¹⁹ Dz.U.L. 327 of 22 December 2000.

²⁰ Dz.U.L. 206 of 22 July 1992.

²¹ Dz.U.L.103 of 25 April 1979.

²² Dz.U.L.10 of 14 January 1997.

Decisions are legal acts of individual character. Unlike regulations they do not have general character. They may be addressed at member state, organization or physical person. Decisions are binding for the addressee.

Recommendations and opinions are acts without binding force which still enable union organs expression of statement concerning a certain issue. They are an important information instrument, they may, among others, suggest objectives and tasks that should be achieved in the future, can be guideline for decision-making processes inside member states.

Decrees of the European Court of Justice have important impact on law-making activities of the European Union organs also in terms of environment management. The Court is entitled to make interpretation of the decisions referring to environment administration, examines repeals from national environmental decrees. Most motions addressed at the Court concern not adjusting the law of member states to the requirements of directives. The Court decrees shapes individual right in relation to particular case subject to settlement on the basis of union law [Perkowski, Kiercel, 2005].

2.3. Legal responsibility in environment administration

Responsibility is the property of human behavior which implies possibility, necessity or readiness to face the consequences of one's own actions. Legal responsibility means facing the consequences of the activities that are forbidden by law or in opposition to the law indications. In management the responsibility means response to the expectations of system that can be either appropriate or inappropriate. In environment management system responsibility is associated chiefly with the sense of causation, as response to activities. There are isolated three types of responsibility: civil, penal and administrative.

Civil responsibility in environment administration implies bearing, by an organizational unit²³ or a physical person, of the consequences predicted by civil law or as the state of affairs assessed negatively from the point of view of its influence on the natural environment.

In Polish law civil responsibility may be contractual and in tort. Contractual responsibility results from not meeting or inadequate way of meeting the obligations binding the parties. Responsibility in tort is responsibility for illicit acts, irrespective of alternative legal relation between the parties. Civil responsibility in tort may have the character of responsibility for damages or preventive responsibility. Responsibility for damages is linked with the concept of damage. It is assumed that any detriment afflicting casualty, both of material and non-

²³ Organizational units are companies and organizations that do not run any business activity.

material character, may be perceived as damage. Damage of material character may cover both loss suffered by the property of the injured party, and loss of profits which the injured party could expect. With reference to the damages resulting from the influence on the environment caused by damage to property, it is mainly damage caused by pollution of water, air or soil, and it may be manifested by poisoning of fish, damage to the harvest, intoxication of bees, damage to land surface, and also illnesses of respiratory, nervous and hearing system that are conditioned by the illnesses generated by radiation.

Damage (including damage to the environment) as such does not generate the obligation of redressing it. The obligation of damages occurs when it results from the reason for which law holds someone responsible.

Such indications are included in the Environmental Protection Law. It states that:

- everyone who is directly endangered by harm caused by unlawful effect on the environment may demand from the subject responsible for hazard or the subject infringing the state compatible with law to take preventive measures up to ceasing activity;
- responsibility takes place irrespective of fault, i.e. also without fault, also when the institution is actuated by the force of nature (which is underlined in Civil Code) and when it is not actuated, e.g. waste landfill;
- responsibility for the damage caused by affecting the environment does not exclude the situation in which activity triggering damage is run on the basis of administrative permit, and the range of operation holds within limits defined in this permit.

Preventive responsibility in environmental protection arises at the moment there appears a threat of damage (mostly direct one). Then the responsibility does not concern the redress of damage but prevention of its occurrence, therefore it is called preventive responsibility. Negatory claim is its model form. The aim of the claim is to cease doing harm to the environment and also to restore the state consistent with the law²⁴. A claim for preventing damage may concern facilities and constructions²⁵. According to W. Radecki, negatory claim may also ensue from the subjective law to the environment. Making use of the natural environment, beautiful landscape, local microclimate or other environment amenities may be perceived as a personal good, such as health, freedom, free-

²⁴ Art.144 Civil Code is frequently mentioned here: *While executing its law the owner of real estate ought to refrain from taking actions which would disturb usage of neighboring estates to excessive extent that may result from social-economic allocation of the estate and local connections.*

²⁵ Article 222, § 2 Civil Code formulates this problem in this way: *Against the person that infringes property in any other way than depriving the owner of actual ownership of the object, the owner is entitled to make a claim demanding to restore the state consistent with the law and to cease making violations.*

dom of conscience or inviolability of residence, and ought to be protected likewise by virtue of Art. 23 and 24 of Civil Code²⁶ [Górka, Radecki, Poskrobko 2003].

2.3.1. Penal responsibility in environmental protection

This type of responsibility results from committing socially harmful deeds termed as offences, as well as deeds causing minor social harm called misdemeanors. Penal liability is regulated by the Penal Code, Petty Offences' Code, the Environmental Protection Law and other environment-related acts.

In the Penal Code four groups of offences have been distinguished:

1. Protection of the environment from pollutions and other impurities. This group includes the following offences:
 - pollution of water, atmospheric air or soils by substances or ionizing radiation (Art. 182, § 1 p.c.),
 - unlawful storage, removal, recycling, neutralization and transport of waste or substances (Art. 183, § 1 p.c.),
 - transport, collection, storage, abandonment or leaving nuclear material or other source of ionizing radiation inadequately protected (Art.184, § 1 p.c.).

The hitherto behaviors are treated as offences only when their effect posed hazard to life or health of people or extensive destruction of plants or animals. If such an offence is committed intentionally it is punishable by the term of imprisonment, whereas when it is not committed intentionally – the punishment may be the following: fine, penalty of restricted liberty, penalty of deprivation of liberty to two years.

This group also includes such offences as:

- failing to maintain in a proper state or failing to use at all facilities protecting water, atmospheric air or soils from pollution or devices safeguarding against radioactive or ionizing radiation (Art. 186, § 1 p.c.),
- location or admission for usage of a building object or set of objects without protective facilities required by law (Art. 186, § 2 p.c.).

Such acts, when committed deliberately, are punished by fine, penalty of restricted liberty or penalty of deprivation of liberty to two years.

²⁶ *Personal interests, in particular health, freedom, veneration, freedom of conscience, surname or nickname, image, confidentiality of correspondence, immunity of residence, scientific, artistic, invention and rationalization work or activity remain under protection of civil law, irrespective of protection envisaged in other provisions (art.23). The one whose personal rights have been violated by someone's action may require preventing this activity unless it is legal (...)* (Art.24,§ 1).

2. Protection from destroying plants and animals. The following offences are distinguished (Art. 181 p.c.):
 - generating extensive destructions in the world of plants or animals;
 - generating substantial damage as a result of destroying or harming plants or animals in the nature-protection area;
 - generating substantial damage as a result of destroying or harming plants or animals covered by the protection of species, regardless of the place the action was made.Such acts, when committed deliberately, are punished by fine, penalty of restricting or depriving liberty to two years, whereas the acts committed not deliberately – fine or by the penalty of restricting liberty.
3. Protection of areas protected by law. The following offences are distinguished:
 - destruction or minimization of the natural value of the area or area protected by law;
 - illegal erection of a new building object or extension of the already existing building object or running business activity which poses hazard to the environment or nature-protected area for nature or landscape related reasons or in the lag of such area;These deliberately committed offences are punished by fine, penalty of restricting or depriving liberty to two years (Art. 188 p.c.).
4. Assaults against the environment. This group comprises offences listed in Penal Code and other legal acts as well. These are:
 - causing fires in forests or release of ionizing radiation (Art. 163 p.c.);
 - causing spread of animals or plants plague (Art. 165 p.c.);
 - prevention or impediment of control in terms of environmental protection (Art. 225 p.c.);
 - trees clearing in forest with the aim of appropriating it (Art. 290 p.c.);
 - initiating works posing hazard to water devices near those devices (Art. 125 Water Law);
 - destroying watersides, lands under water or water devices (Art. 125 Water Law);
 - excavation of minerals without concession or in opposition to conditions stated in it (Art. 118 – Geological and Mining Law),
 - unlawful removal of waste from Poland abroad (Art. 47 and 48 Act on Waste).

In the sphere of penal responsibility for offences against the environment a significant role is played by the regulations of the **act on responsibility for**

prohibited actions under the threat of penalty²⁷. According to this act a collective entity is a legal person or organizational unit not having legal status, however, having legal capacity, excluding State Treasury, units of territorial self-governments and their unions. Collective entity bears responsibility for an illicit act committed by a physical person while performing their work (professional) duties. Among 13 groups of offences listed by the legislator there are acts of Penal Code from the chapter concerning offences against the environment, the Act on Substances and Chemical Preparations²⁸, the Act on International Waste Circulation²⁹, the Act on Genetically Modified Organisms³⁰.

Collective entity is subject to responsibility if the fact of committing a prohibited act was corroborated by a lawful sentence convicting this person, by conditional sentence discontinuing proceedings in a criminal case or proceedings in case of revenue offence. There may also be issued a verdict on granting this person the permission to freely submit themselves to responsibility or there may be court's verdict on remitting proceedings against it due to the circumstance barring punishment of the offender. The premise of responsibility is guilt in a choice or supervision or organizational guilt. The proceedings concerning penal liability of collective entities are instigated on the application of Prosecutor, Chairman of Office of Protection of Competition and Consumers or an injured person.

2.3.2. Penal responsibility for misdemeanors

Penal responsibility for misdemeanors is a significant supplement to the offences against the environment. The term of misdemeanor is applicable to both action and abandonment of actions causing disturbance of the environment quality or impediment in the functioning of system managing processes of usage, protection or shaping of the environment. The environmental protection law lists misdemeanors against the environment in as many as 32 articles. The following misdemeanors were listed:

- exploiting installations without required permit or while violating its conditions, exceeding allowed emission standards, not complying with obligations and bans introduced by the so-called smog decree;

²⁷ Act of 28 October 2002 on liability of collective entities for offences prohibited under the threat of penalty (Dz.U. of 2002, No. 197, par. 1661).

²⁸ Act of 11 January 2001 on chemical substances and preparations (Dz.U. of 2003, No. 189, par. 1852).

²⁹ Act of 30 July 2004 on international waste circulation (Dz.U. of 2004, No. 191, par. 1956).

³⁰ Act of 22 June 2001 on genetically modified organisms (Dz.U. of 2001, No 76, par. 811 and Dz.U. of 2002 No. 25, par. 253 and Dz.U. of 2002, No. 41, par. 365).

- not informing about breakdown, not notifying plant's activity of increased or large risk, not implementing safety system in such a plant;
- violating the ban of introducing to circulation or repeated usage of some dangerous substances defined by law;
- abandonment of collecting, providing or transferring various types of information, e.g. for the needs of national environment monitoring;
- not making required, periodical continuous or introductory measurements of emission extent from installations, not presenting the results of measurements to the proper organ, not storing these results for the period demanded by regulations;
- abandonment of making already finished reclamations of land surface;
- not complying with limits, bans or obligations defined in the act carried out by the municipality board, which constituted limitations concerning the functioning of installations or using devices emitting noise;
- not making decisions issued by proper organs, it mainly concerns not complying with decisions hindering activity that poses hazard to the environment;
- not ensuring protection of the environment in the area in which construction works are run.

Furthermore, other pro-environment acts indicate certain violations, e.g. the act on waste treats mixing various hazardous waste and normal waste with each other as misdemeanor. The essence of misdemeanor lies simply in disobedience to the bans resulting from the act, executive regulations or administrative decisions, irrespective of their effects. Therefore, these are misdemeanors having no effects. Committing a misdemeanor is punished by fine, penalty of restriction of liberty or reprimand.

Jurisprudence in the cases concerning misdemeanors belongs to magistrate courts. A motion for punishment may be made only by Public Prosecutor and, in some rare cases, also by an injured person. Authorizations of Public Prosecutor in cases concerning misdemeanors against the environment are also, apart from police and prosecutor's office, in the hands of:

- rangers in the cases concerning misdemeanors committed against forest envisaged in regulations of petty offences' code;
- directors of national parks and officers of park guard empowered by them, in the cases of misdemeanors envisaged in the nature protection act;
- guards of National Fishing Guard in cases on misdemeanors envisaged in the fishing act;
- guards of National Hunting Guard and hunting guards in the cases of hunting misdemeanors.

Legal action is a basic form of realizing responsibility for misdemeanors. However, the legislator has also envisaged **mandatory proceedings**, treated as

substitution and conditional (dependant on the offender's consent who may, but does not have to, subject himself to mandatory proceedings). The fine by punitive mandate may come to maximum 500 PLN, i.e. 1/10 of what court may impose for the misdemeanor. However, the fact that mandate is generally imposed right on the spot where a misdemeanor was committed and just after it was committed makes punishment efficient.

2.3.3. Administrative responsibility

Administrative-legal responsibility in the sphere of environmental protection implies the possibility of launching legal means with reference to a particular subject which are realized in forms and procedure specific for administration [Ciechanowicz, 2003]. Administrative responsibility is irrespective of guilt. The usage of a sanction may be imposed even if there is only a possibility that harm may be done to the environment or human health. Sanctions are imposed in the form of administrative decision issued by the following organs: Environmental Protection Inspection, prefect, starost, village-mayor, mayor or president of a town, State Fire Station, National Sanitary Inspection, organs of maritime administration and customs.

The proceedings concerning environmental protection are instigated by the organ on the application of administration organ or prosecutor, social organization and Spokesperson for Human Rights. However, social organization may put forward such motion provided that administration case is closely connected with its statutory objectives and the need to do that ensues from the protection of social interest. Administrative decisions are made as the result of the proceedings.

Administrative decisions concerning environmental protection include, among others:

- impose the obligation of minimizing the negative effect on the environment on a subject;
- order restoring the proper state of the environment;
- impose the obligation of making payments for the damage made to the environment, in the situation when restoring of the previous state is impossible;
- forbid production, import from abroad or introduction to circulation those products that do not meet the requirements of environmental protection;
- impose financial administrative penalties;
- cease activity which poses hazard to the environment to a large extent or is harmful to human life or health.

Environmental protection law frequently deviates from the general model of administration proceedings due to the participation of larger part of society or numerous examples of organs' cooperation and owing to specialists' assess-

ments made prior to making decisions. Attention is also paid to limited principles of durability of ultimate administrative decision – numerous solutions enabling change or lifting decision excluding general rules of the code of administrative proceedings.

2.4. Problem legal regulations

This group includes legal acts defining elements of environment management system, especially the ones defining rules and conditions of using the environment, way of organizing the system, planning, information distribution. Regulations of this group may be divided depending on a degree and character of regulation, into problem and detailed ones.

The following laws have the character of a national problem:

- Act – Environmental Protection Law;
- Act – Water Law;
- Act on Planning and Spatial Administration;
- Act on the Protection of Farming and Forest Lands;
- Act on Waste;
- Act on Publicizing Information about the Environment³¹.

Environmental Protection Law (POŚ)³² plays a leading role in environment management system. It defines: the principles of environmental protection and the conditions of using its resources, while taking into account requirements of sustainable development; defines precisely a range of ecological policy of the state and territorial self-governments, conditions of introducing substances or energy to the environment; the principles of establishing costs of using the environment (mainly ecological charges); obligations of administration organs and also responsibility and sanctions for not complying with regulations.

³¹ Act of 27 March 2003 on planning and spatial management (Dz.U. of 2003, No. 80, par. 717, with further alterations); Act of 3 February 1995 on the protection of farming and forest lands (Dz.U. of 1995, No. 16, par. 78); Act of 27 April 2001 on wastes (Journal Law of 2001, No. 62, par. 628 with further alterations); Act of 3 October 2008 on publicizing information about environment and its protection, participation of society in protection of the environment and about evaluations of influence on the environment (Dz.U. of 2008, No. 199, par. 1227).

³² Act of 27 April, 2001 Environmental Protection Law (Dz.U. No. 62, par. 627, with further alterations).

Detailed national regulations concerning the environment administration are regulated by tens of acts, e.g. waste management, apart from the problem act, is regulated by six detailed acts. Of great importance are also acts which form particular institutions of environmental protection system, e.g. the Act in Environmental Protection Inspection³³ or the act that establishes environmental protection board³⁴.

³³ Act of 20 July 1991 on Environmental Protection Inspection (uniform text, Dz.U. of 2002, No. 112, par. 982).

³⁴ Act of 3 October 2008 on providing information concerning the environment ... (op.cit).

Chapter 3

ENVIRONMENT MANAGEMENT MEASURES

The concept “environment management measures” may be applied to such parts of a system that unite its elements and enable its proper functioning. In this publication the category of measures includes: system organization, with particular consideration of organs and institutions of environment management, ecological information system and the system of financing protective activities.

3.1. System organization – organs and institutions of environment management

In the theory of management an organization is perceived and analyzed through the prism of an object, an attribute, an activity and an object. Through the prism of a subject, an organization is considered as an isolated holistic element of human activity that is characterized by the features of organization, i.e. purposefulness, complexity and separateness of structure. These are systems that were purposefully isolated from the surrounding – economic entities, institutions – internally organized with isolated elements and with certain internal and external connections (conjugations) with the surrounding. Every organization must have a purpose of its existence and functioning, human resources and technical equipment.

Through the prism of an attribute an organization implies such type of relations between elements of the system or between a particular element and the entirety of system that ensures that all parts contribute to the success of the entirety, and that the entirety contributes to the success of a part (element of the system).

Through the prism of an activity an organization emphasizes the process of organization. Organization may comprise: formation of an organization (unit or institution) that runs a particular activity in order to reach a certain objective or organization of economic and social processes or participation in the organization of natural processes. Every organization has a certain organizational structure, i.e. a set of ordered elements and the entirety of purposefully specified dependencies between them that enables proper functioning of the entirety and achievement of certain objectives. The main objective of organizational structure is the creation of possibilities and improvement of the efficiency of the system functioning.

Internal structure (organization) is also in the environment management system. The concept “organization of environment management system” denotes a group of organs and institutions, economic entities and social organizations that handle usage, protection and shaping of the environment and also the mutual conjugations and relations enabling the flow of information and achievement of management objectives.

In the structure of the environment management system in Poland the following groups of entities can be isolated:

1. State legislative organs.
2. Central organs of governmental administration.
3. Local organs of governmental administration.
4. Local territorial units of municipalities, districts and provinces.
5. Control units.
6. Management object, i.e. production and service companies, households and social groups.
7. Non-governmental ecological organizations.

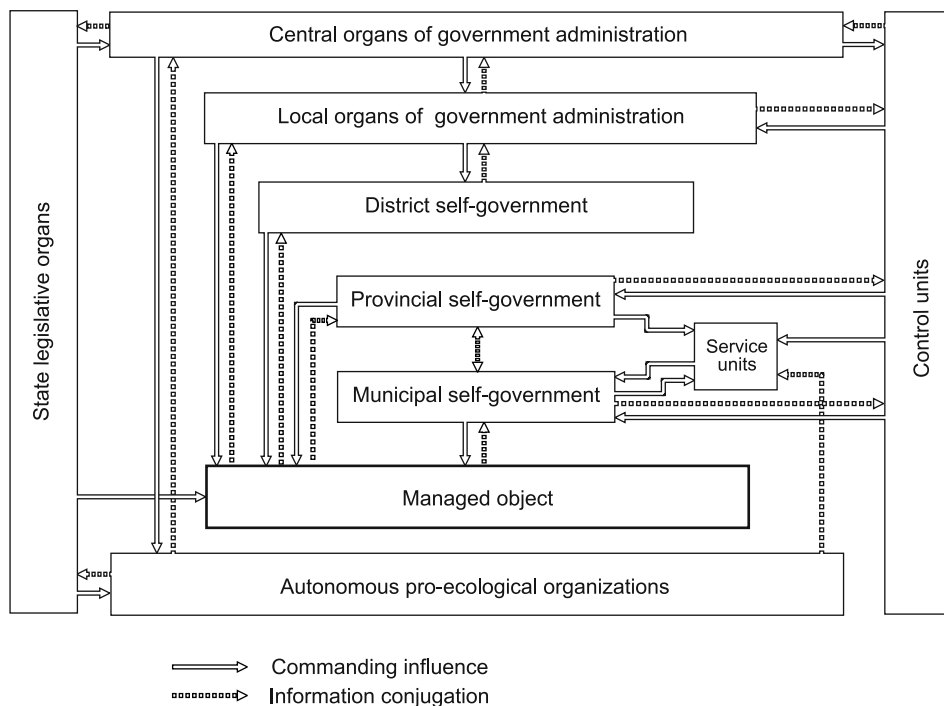
Organization of environment management system in Poland is presented in figure 3.1. Organs and institutions may be grouped also from the point of view of the leading role they play in the environment management system. There are isolated:

1. Legislative organs, i.e. state: Sejm, Senate and President of the Republic of Poland as well as the Cabinet; governmental: Minister of Environment and governor; self-governmental: district self-government, province council and municipality council.
2. Executive organs, i.e.: **organs of central governmental administration:** Minister of Environment – General Director of Environmental Protection, Main Inspector for Environmental Protection, President of the National Water Management Authority, President of the National Atomic Energy Agency, President of the State Mining Authority¹; **territorial organs of**

¹ Organization and tasks of governmental administration organs supervised by the Minister for the Environment were described in problem chapters.

- governmental administration:** regional director of environmental protection, district director of environmental protection, governor; **self-governmental executive organs:** district board and marshal, province board and starost, municipality prefect, mayor or town president.
3. Offices of executive organs, i.e.: **offices of central governmental administration:** Ministry of Environment, General Directorate for Environmental Protection, National Water Management Authority, Main Inspection for Environmental Protection, National Atomic Energy Agency, State Mining Authority; **offices of local governmental administration:** regional directorate of environmental protection, district inspectorate of environmental protection; **offices of territorial self-government:** marshal offices, provincial counties, municipality or town offices.
 4. Specialized service units.
 5. Control institutions: Supreme Chamber of Control, Polish Sanitary Inspection, Environmental Protection Inspection.

Figure 3.1. Organization of the environment management system in Poland



Source: own elaboration.

Subject competences of governmental organs with regard to the environment management² is illustrated in figure 3.2. The Ministry of Environment has the greatest range of competences and responsibilities. The ministry is an organ of central governmental administration established to perform public tasks in the spheres of “environment” and “water management”. The sphere “environment” comprises such spheres as:

- protection and shaping of the environment and also rational usage of its resources;
- protection of atmospheric air and climate;
- protection from ionizing radiation and noise;
- waste management;
- nature protection in its various forms: national and landscape parks, nature reserves, Natura 2000 areas, individual protection of species and formations of nature as well as preservation of biological diversity at all its levels: genes, species, ecosystems and landscapes;
- geology and management of natural resources;
- forestry, including protection of forests and forest lands;
- hunting;
- allotments;
- genetically modified organisms.

The sphere “water management” comprises such activities as:

- protection and rational usage of water resources;
- maintenance (together with infrastructure) of inland surface waters;
- construction, modernization and maintenance of inland water ways;
- anti-flood protection.

While realizing the tasks described in these sections, the Minister of Environment performs such activities as:

- creation of state ecological policy;
- elaboration and supervision of the realization of the *National Plan of Water Management*;
- supervision of the system of trade in emission permits, including the establishment of National Administration of Emission Permit Trade System;
- maintenance of state services: National Hydrological and Meteorological Service, National Geological Service, Nature Protection Service, Forest Service, National Hunting Guard;
- ensuring the functioning of the system of information on the environment and information on waste management, taking into consideration especially

² During the period 2008-2012.

the management of used electrical and electronic equipment as well as batteries and cars withdrawn from use;

- organization and management of the national register of environmental organization and environmental verification within the Eco-Management and Audit Scheme – EMAS;
- issuing of integrated permits and interrelated collection and providing access to information on the best available technologies and techniques of production;
- supervision of creation, transport and release of genetically modified organisms;
- control of compliance with the requirements of environmental protection and analysis of the state of the environment.

The Minister for the Environment performs the tasks of governmental administration related to nature protection with the aid of The Main Conservator of Nature (most frequently this is the position of undersecretary of state). The Conservator supervises the realization of tasks concerning national and landscape parks, nature reserves, species protection, Natura 2000 areas, issues permits on conducting research on GMO, on closed usage of GMO and also issues permits on the release of GMO into the environment. The competences of the Main Conservator of Nature include appointment of members of the National Council of Nature Protection.

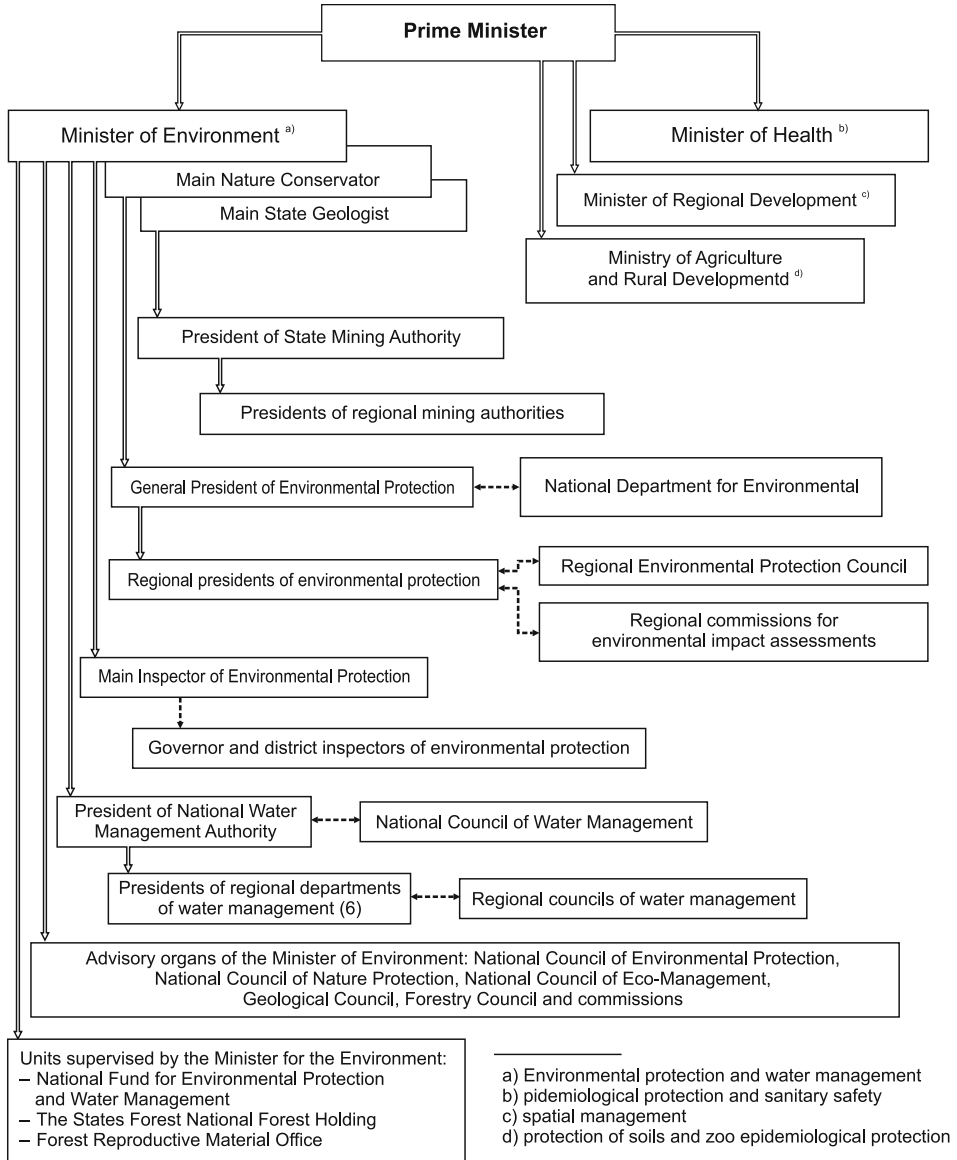
The Minister of the Environment is also the central organ of geological administration that performs tasks in this sphere with the aid of the Main Geologist of the country (usually this is the position of the Undersecretary of State). The responsibilities include, among other things: signing agreements concerning the establishment of mining activity; issuing concessions on geological explorations and usage of resources; approving of geological documents; managing of geological information and management of the system of exploitation fees.

Some problems related to the usage, protection and shaping of the environment are included in the competences of other ministers: Minister of Regional Development is responsible for spatial management; Minister of Agriculture and Rural Development superintends protection of soils and zoo- epidemiological protection; Minister of Health – epidemiological protection and sanitary safety.

The Minister of the Environment uses the services of advisory and opinion-making organs – i.e. of councils and commissions. Minister uses, among other things, advice of:

- **National Environmental Protection Council**, which mainly works on giving opinions about the directions of policies in the field of environmental protection and sustainable development of the country, drafts of legal acts, presenting suggestions of activities and initiation of scientific and research-development programs in the field of ecology, environmental protection and sustainable development;

Figure 3.2. Central and regional organs of governmental administration in the environment management system



Source: *ibid.* figure 3.1.

- **National Nature Protection Council** is involved in assessing the way environmental protection act was accomplished and in assessing the realization of state strategy of protection and sustainable usage of biological diversity, as well as in giving opinion about various types of program documents concerning environmental protection (strategies, plans, programs) and legal acts;
- **Geological Council** prepares opinions concerning geological activity, including proposals and motions leading to create environment conditions and rational administration of mineral resources and underground waters, geology and spatial planning;
- **Forestry Council** deals with giving opinion about the proposals of activities done for the benefit of forests protection, enlarging forest resources, as well as handles giving opinion about the assessment of the realization of forest policies and with the assessment of forests' condition and also scientific and research-development programs;
- **State Commission of Eco-management** deals with initiating actions serving the promotion of environment management system, particularly in small and medium companies as well as with analyzing the way they function.

The analysis of certain problems solved by the Minister of the Environment comes within duties of such commissions:

- **Commission of Mineral Resources** – it handles the assessment of the adequacy of determining resources of mineral deposits and methods of making geological works;
- **Commission of Geological and Engineering Documentations** handles the assessment of projects, documentations and other geological elaborations concerning the adequacy of determining geological and engineering conditions for the needs of construction;
- **Commission of Hydro-Geological Documentations** deals with the assessment of geological projects and documentations concerning underground waters;
- **Commission Regarding Genetically Modified Organisms** deals with giving an opinion about motions concerning putting forth agreements or permits for actions relating to GMO, giving an opinion about legal acts drafts and assumptions of the state policy concerning GMO and biological safety.

The Minister of Environment supervises organizational units: National Fund for Environmental Protection and Water Management, The State Forest National Forest Holding, Forest Reproductive Material Office.

National Fund for Environmental Protection and Water Management (NFOŚiGW) is the unit of the system of financing enterprises from the sphere of environmental protection and water management. It became autonomous in 1989. The organs of NFOŚiGW are supervisory board and directorate. The personnel and structure of the board are specified by the Minister of Environment.

The directorate is composed of president and deputies. The activities of NFOŚiGW are concentrated upon financial, organizational and substantial support for programs and projects serving the realization of national ecological policy. In particular, they concern the realization of investments in the protection of waters, atmosphere and land area as well as water management, geological works leading to the identification of deposits of natural resources, ecological education programs, monitoring of the environment and protection of nature, especially forests.

State Forest Holding “State Forests”, being a national organizational entity, does not have legal status, but merely represents the Treasury in the domain of managed property, i.e. forests belonging to the Treasury, however, excluding forests being in the control of national parks and being part of Agricultural Property Agency of Treasury. While holding management State Forest Holding “State Forests” controls forest management, administrating lands and chattels connected with forest management. It also keeps register of the Treasury property and establishes its value. Organizational units of the forest holding are: General Directorate of State forests, regional directorates of state forests, forest districts and divisions.

Forest Reproductive Material Office holds a National Register of Forest Basic Material and Register of Suppliers of Forest Reproductive Material. The office issues certificates of the origin of reproductive material and permits for import of such material from non-EU countries.

The Minister of Environment is the founding organ of **departmental research and development units** that handle scientific and research works and provide consulting services and information. There are five institutes in the department: Institute of Environmental Protection – National Research Institute, Polish Geological Institute in Warsaw, Institute of Meteorology and Water Management in Warsaw (with departments in all districts), Institute for Ecology of Industrial Areas in Katowice, Forest Research Institute in Warsaw (department institute supervised by the Minister of Environment since the State Forest Holding “State Forests” does not have legal status).

The Minister for the Environment is directly responsible for two organizational units: the Environment Information Centre and Central Institute of Instructing Personnel of Environmental Protection and Water Management.

3.1.1. Governor

A governor is the organ of governmental administration in the province. The governor supervises the provincial inspector of environmental protection, State Fire Service, Police and also the organs of territorial self-government (mainly foremen) realizing the tasks of governmental administration. The governor is responsible for performing the strategy of the government and for adjusting it to

local conditions. The tasks of the governor include activities in the spheres of: environmental protection and management, water management and water protection, nature protection and hunting.

Among detailed tasks the following ones can be listed:

- giving an opinion on the study of conditionings and directions of spatial management of municipalities and local spatial management plans;
- creating areas of restricted use for investments listed among enterprises that can have considerable impact on the environment;
- preventive activities in case of failures causing uncontrolled dispersal of genetically modified organisms;
- issuing decisions on environmental conditionings of the realization of such enterprises as: construction of roads, railways, overhead electrical and energetic lines, installations for the transport of crude oil and gas as well as of artificial water reservoirs;
- imposing, by the virtue of decision, of the responsibility to make preventive and reconstructive activities and of to make measurements of the emission of pollutions and to organize natural monitoring if the entity using the environment does not fulfill this obligation;
- making register of organizational units implementing the System of Eco-Management and Audit and organizing collection spots and stations of vehicles' disassembly;
- issuing decrees concerning the recognition of a certain area as a reserve, landscape park or area of protected landscape as well a changes in their borders or elimination;
- determination or elimination through administrative decisions of the spheres of protecting mainstays of plants and animals comprised by the protection of species;
- handling issues concerning the State Hunting Guard.

3.1.2. District self-government

Local administration in a district is complex within one office – district marshal – who organizes work of the board of the district and of the marshal office. Organs of district self-government do not have control over province and municipality and they are not the organs of higher degree in administrative conduct.

Organs of district self-government are: district government as a self-contained and controlling organ, and district board as an executive organ. The only tasks of the government are: establishing acts of regional law, enacting district's strategies and programs, passing plan of spatial planning of district and

budget. District self-government controls the operation of the board and district local organizational entities.

District self-government adopts the policy of development, which comprises the following objectives: preserving the value of the natural and cultural environment for the present and future generations and both shaping and maintaining of spatial order. This strategy is realized by district programs. Such self-government conducts such policy of development that includes, above all: preserving and expanding technical infrastructure of significance for the district, rational usage of natural resources and shaping of the environment according to the principle of sustainable development, as well as promotion of amenities and development of district's possibilities.

The most significant tasks of district self-government's organs as regards the usage and protection of the environment include, among others:

- compiling district's program of environmental protection, plan of spatial planning of the district, district's plan of waste management, and approving of geological works' projects;
- giving concession for searching, recognizing or extracting unprotected mineral resources and common minerals in the area larger than 2 ha or with annual excavation exceeding 20 000 m³;
- approving of projects of geological works on the deposits of common minerals, intakes of underground waters with the capacity higher than 50 m³/h, hydrological conditions related to dehydration, geological and engineering works for the needs of spatial management plans and linear investments;
- handling issues related to fees for making use of the environment, product fee and fee for controlled substances;
- making register of packages introduced on domestic market and subjected to recovery and recycling;
- organizing control of the entities using the environment;
- issuing permits on introducing gases or dusts into the air for the investments that can considerably affect the environment;
- issuing integrated permits;
- approving of instructions on the exploitation of dumping grounds;
- issuing permits that authorize one to the participation in the community or state system of trade in emission permits;
- consulting projects of self-governments' plan documents (e.g. district plan of waste management) or regional institutions (e.g. project of the conditions of using waters of basin).

3.1.3. Province self-government

Legislative and controlling organ in a province is the province council. Executive power is held by board and prefect who is the director of province administration. The board performs its functions with the assistance of province county and directors of province services, inspection and guard (headquarters of the province's State Fire Service, province inspectorate of construction supervision).

Province performs public services of non-governmental character, including the tasks connected with environment administration. They concern public order and safety (protection from fire and flood), spatial and ecological order (arrangement plan, construction supervision, water management, agriculture, forestry, inland fishery and environmental protection).

Province self-government may initiate coordinating actions in realizing non-district tasks in terms of providing water, sewage draining, heat engineering or waste management. Starost, on the other hand, realizes own public tasks imposed by virtue of acts and regarding governmental administration and endowed on the basis of agreements with units of territorial self-government on the level of a municipality or a district.

The tasks of province self-government include:

- elaborating province program of environmental protection and plan of waste management;
- supervising economy in forests that do not belong to the Treasury;
- issuing concessions for search or excavation of small amounts of common minerals (up to 2 ha or 20 000 Mg);
- issuing decisions concerning the exclusion of farmlands from production and recultivation of degraded lands;
- conducting analysis of the quality of soils;
- issuing of permits for emission of air pollutions, water legal permits for collection of water and disposal of sewage and for the production of dangerous waste;
- issuing decisions on environmental conditionings of the realization of investments (undertakings) that may have impact on the environment;
- issuing decisions aiming at the protection of soils from erosion and mass movements;
- issuing decisions connected with keeping dumping ground;
- issuing decisions connected with running activity in the sphere of waste management;
- keeping register of forms of individual protection (nature monuments, documentation positions, ecological arable lands, natural and landscape groups) as well as the register of plants and animals comprised by species protection that live in the district.

Starost is entitled to make controls of compliance with the regulations of environmental protection, including the right to impose the elimination of activity that has harmful effect on the environment.

3.1.4. Municipality self-government

Municipal self-government's range of operation comprises public issues of local character, including fulfilling collective needs of the community. These are such issues as: spatial order, area administration, environmental protection, providing water, sewage system, draining municipal sewage, keeping cleanliness and order, organization of selective collection, storage and disposal of municipal waste.

Duties of community organs include cases concerning the ordinary way of using the environment, not regulated by laws, and:

- elaborating, approving and realizing of the municipal program of environmental protection;
- elaborating the study of conditionings and directions of municipality's spatial planning and local plans of spatial management;
- earmarking areas of protected landscape, if the governor fails to do so;
- ensuring the functioning of the system of selective collection and removal of municipal waste;
- arrangement plan of areas that is neither suitable for building nor is used in agricultural terms;
- issuing permit for removing trees and bushes from the real estate's area;
- specifying the requirements of environmental protection concerning the exploitation of installation the emission from which does not require permit, if it is necessary because of social or ecological reasons;
- supervising adequacy of storing and accumulating waste;
- making decisions about environmental conditionings of investments realization.

The system of institutions of the environment management in Poland is particularly expanded and frequently it does not have full competences of particular units responsible for a certain problem. The relations between institutions are very complex, with equivocal dependencies, complex transfer of information and unclear responsibility. The system requires firm powers, which may result in the improvement of its effectiveness and efficiency of functioning.

Autonomous ecological organizations in Poland are very diversified in terms of organizational forms, area and way of acting as well as ideational attitudes. Among several hundreds of organizations only some have several hundreds of tradition and considerable contribution to the protection of nature and the environment. These include, among others: League of Nature Conservation,

Polish Society for the Protection of Birds, the North Podlasiian Society for Bird Protection, Polish Society of Wildlife Friends “proNatura”, the Polish Ecological Club, WWF – Poland.

3.2. Ecological information

3.2.1. The essence and importance of information in environment management system

In common understanding, information means ascertainment of the state of affairs, certain message delivered in the form of an announcement. It is certain contents transmitted from a sender to a recipient by means of a certain language or code. It may have also a form of analyses, guidelines, facts, ideas or models, shown in a certain form and rendering the reality.

Basic features of information include: value, utility, quality, topicality, completeness, conciseness and veracity. Information value results from the benefits obtained by its user. The more rational and satisfying decisions on the basis of possessed information are made, the higher their value is. A degree of information value may be its quality, perceived as the entirety of proper features of a described object, phenomenon or system. Information quality is defined indirectly by means of the so-called measurements of data quality. They include quality meters: in defining data – compliance with standards, guidelines, clarity, precision, correctness; in data contents: completeness, importance, utility of data for management decisions, topicality affirmed on the basis of random selections, compatibility of replicated, distributed and redundant or derivative data.

Information quality is determined by the following properties:

- relevance – it is important to obtain information relevant to certain situations; states of information surplus should be eliminated;
- completeness – it is important to obtain all the possible (required) information for certain situation, states of information shortage should be eliminated;
- topicality – it is important to make needed information accessible in appropriate time; outdated information should be eliminated;
- conciseness (brevity) – it is important that information has concise and understandable form; these features make information useful for immediate use;
- utility – information is indispensable and useful for making decisions.

Information in the system may be made in a twofold way: as a product and as a process. Information as a product may be subject to the following irregular-

ities: information loading, ambiguity, ‘anemia’, inconsistency and inadequate presentation. Information irregularities perceived as a process include: unreliability, ‘memory loss’, distortion, lack of feedback and ‘information retention’ (table 3.1.).

Table 3.1. Information malfunctions

Handling of information	Kind of information malfunctions	Effects of malfunctions
Information as a product	Information loading	<ul style="list-style-type: none"> • Prolonging of time needed for seeking information • Increasing the costs of processing information • Lowering the user’s motivation • Inadequate quality of undertaken decisions
	Information ambiguity =	<ul style="list-style-type: none"> • Making inappropriate decisions
	Information anemia or weakening of ‘frame of reference’	<ul style="list-style-type: none"> • Inability to aggregate information in ordered sets • Quasi-blindness • Excessive partitioning of tasks in management process • Lack of the holistic way of perceiving information
	Information misrepresentation	<ul style="list-style-type: none"> • Conveying different contents of information (half-product)
Information as a process	Information retention	<ul style="list-style-type: none"> • Emergence of information overload • Excessive partitioning of information processes
	Information distortion	<ul style="list-style-type: none"> • Emergence of ambiguous information • Modification of the meaning of transferred information
	“Information infarct”	<ul style="list-style-type: none"> • Information accompanying a product reaches a receiver with a certain delay

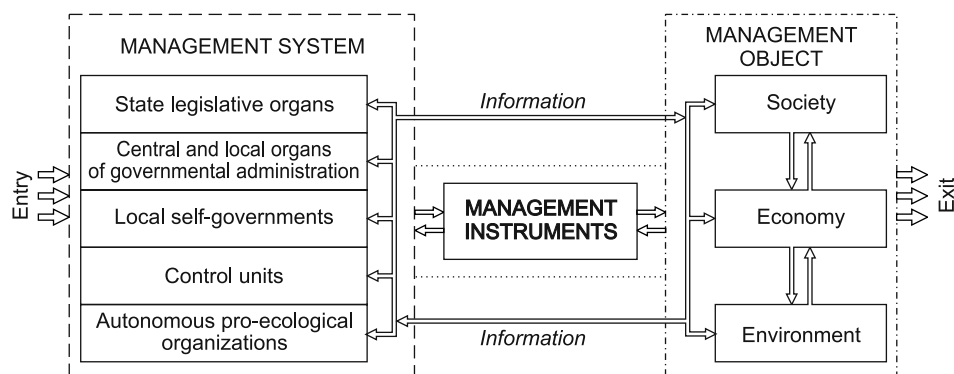
Source: own elaboration.

In every system, and also in the environment management system, information should inform about:

- the surrounding, which is important for the functioning of a certain system (entry information);
- the situation inside management system and functioning of conjugations between subsystems and elements;
- the functioning of management instruments;
- state, directions and rate of changes in the managed object, particularly taking into consideration pressure on the natural environment;
- the relations between systems of the managed object;
- the effect of environmental management system on the surrounding.

Areas and main information flows in this system are presented in figure 3.3.

Figure 3.3. Information in the environment management system



Source: *ibid.* figure 3.1.

Ecological information is part of general information that ensures the functioning of environment management system and describes the consequences of undertaken actions. The most popular way of perceiving the concept “ecological information” is its subject depiction, as information about the environment or as information concerning the environment. Information about the environment was also defined on legal-administrative ground, owing to the regulations concerning the access to information about the environment. It is linked with the definitions accepted on the international forum and accepted in Polish legal order. Aarhus convention³ describes information concerning the environment as any information in written, visual, oral, electronic or any other material form and it concerns: the state of environment elements and interrelationships between these elements; factors which have or may have impact on environment elements as well as calculations of gains and losses and also other economic analyses and assessments used while making decisions concerning the environment; the state of people’s health and security, conditions of human existence of cultural meaning and building objects if they affect or may affect environment elements or factors.

³ Article 2 of the Convention concerning the access to information, participation of society in making decisions and in access to fairness in the issues concerning the environment of 25 June 1998 (Dz.U. of 2003, No. 78, par. 707).

Legal regulations of European Communities⁴ as well as Polish regulations⁵ were based on such approach to ecological information. They determine information catalogue which may be made accessible to citizens by public organs, and also rules of this access. Information about environment management system comprises data characterizing the way processes of environment administration take place at a company level on a regional and country scale, and also on international and global scale.

Ecological information should be treated as a specific kind of information relating to the state of the natural environment and effect on the environment ensuing from human business activity. Isolation of this category is first and foremost linked with the subject range of information, and secondly, with kind of decision processes. Therefore, information needs connected with the functioning of environmental management system are complex and comprise many various aspects: level of anthropogenic loading of natural environment, taking into consideration sources and kinds of this loading; state of ecosystems and their reaction to pressure of various kinds; functioning of particular kinds of ecological policy instruments; state of society's ecological awareness and reactions of various subjects to the environment management instruments.

Ecological information is supplemented with economic and natural information; yet the latter is still developing. Information resources of ecosystems are classified as particularly rich and complex. People are only now getting familiar with them and using them as much as they can. Ecological information is generated, transformed, transmitted, collected and made accessible in three basic systems: environment monitoring, public statistics and in administrative system (office information). Scientific research constitutes the complementary source of ecological information.

3.2.2. System of information about the environment in the European Union

Collection, transformation and popularization of information about the environment in the European Union takes place at three levels: official reporting – European Commission; environment monitoring – European Environment Agency (EEA); statistics – Statistic Office of the European Union (Eurostat).

⁴ 2003/4/EC Directive of the European Parliament and Council of 28 January 2003 related to public access to information concerning the environment and annulling the Council Directive 90/313/EC (Dz.U.L. 41 of 14 February 2003).

⁵ Act of 27 April 2001 – Environmental Protection Law (Dz.U. of 2001, No. 62, par. 627, art. 19) and Act of 3 October 2008 of providing access to information about the environment and its protection, participation of society in environmental protection and about assessments of environmental impact (Dz.U. of 2008, No. 199, par. 1227).

Reporting within offices is related to the realization of acts of the EU law. Every directive defines the obligation of a member state as regards passing to the Commission information about activities and measures taken in order to implement it. Some union legal acts define the detailed range of information and data to be transmitted, and also the form (schemes, formats, questionnaires) in which they should be delivered. In relation to regulations in the field of the environment, information is collected by the European Commission's Environment Directorate – General.

European Environment Agency is responsible for monitoring of the environment. It is an institution founded within the frameworks of the European Union in order to provide reliable and objective information about the environment. Agency members include 31 states, including 27 member states of the European Union as well as Iceland, Lichtenstein, Norway and Turkey.

The main source of information submitted to the European Environment Agency is the European Network of Information and Environment Observation (EIONet). The agency is responsible for network extension and coordination of activities accomplished by it. Agency's database concerns mainly environment quality, including:

- quality of atmospheric air (meta data and stations of *European Air Quality Monitoring and Information Network* – EUROAIRNET as regards pollutions);
- emission to air in compliance with the requirements of EMEP (*European Monitoring and Evaluation Programme*) and IPPC (*Integrated Pollution Prevention and Control*⁶) and also air quality according to EuroAirnet;
- quality of surface and underground waters;
- quality of sea environment;
- protected areas;
- usage of land areas according to CORINE Land Cover (*Coordination of Information the Environment; CLC*) – one of subject areas concerning usage of land;
- local contaminations of land.

Data about the environment, which is collected by the European Environment Agency, constitutes the basic information source for international society about the state, hazard and actions taken for the benefit of environmental protection. The results of collected information, mostly in international configuration, are presented in publications of various kinds.

Statistical information is collected by Statistic Office of European Union – Eurostat. This EU office collects statistical data and information concerning all domains of social-economic life, including the ones concerning the environ-

⁶ The Council Directive 96/61/EC of 24 September 1996 on integrated prevention of pollutions and their control (Dz.U.L.257 of 10 October 1996).

ment. The role of the European Statistical System (ESS) lies in harmonization of statistics in close contact with national statistics offices.

The basic source of information collected by Eurostat are questionnaires (Eurostat/OECD Joint Questionnaire) submitted by member states. Information from the domain of the environment is collected in the form of detailed application forms submitted every two years and concerns:

- emission of greenhouse gases;
- absorbency of energy in economy;
- transport structure;
- quality of urban air;
- municipal waste;
- participation of renewable energy sources;
- protection of natural resources – especially habitats of rare species, mainstays of birds as well as protection of sea waters and fish resources.

Eurostat is also concerned with economic aspects of environmental management – outlays and costs of environmental protection, and additionally with environment industry and employment in the environmental protection sector. Ecological information in economic perspective is collected in the frameworks of *Shared Environmental Information System* (SEIS). It comprises two subsystems: calculation of outlays on environmental protection (financial perspective) and calculation of resources usage (physical perspective). In most member states appropriate information systems are still being created. In Poland, since 1996 research on environmental protection's operating costs and outlays on the investments serving environmental protection has been conducted, whereas calculation of resources usage is still being elaborated.

The issues concerning information about the environment and information important from the perspective of environment management are also the subject of Organization of Economic Co-operation and Development (OECD) concern. In its frameworks there is a system of collecting and popularizing data and information about the environment that is partly common with Eurostat. Particularly precious source of data and information about the environment lies in the databases elaborated and updated by OECD. They mostly comprise database of: economic instruments of environmental protection; environment-related taxes; pesticides; chemical risk assessment models; transboundary movements of waste destined for recovery operations.

Data collected by means of the questionnaire are the basic source of information about the state of the environment and its protection at international level. This information is made public in the form of environmental reports.

3.2.3. System of information about environment in Poland – State Monitoring of the Environment

Monitoring of the environment is the system of measurements, assessments and forecasts of environment's state as well as of collecting, transforming and publicizing information about the environment. National Environment Monitoring (PMŚ) has functioned in Poland since 1991. Organization, coordination of PMŚ and studies of environment's state, observations and assessments of its state are known as the duties of Environmental Protection Inspection. PMŚ's task is to inform administration organs and society about the quality of environment elements, about compliance with the environment quality standards and areas in which these standards are violated, and what is more, about changes in the quality of natural elements and about reasons of these changes. Research conducted within the frameworks of PMŚ is made periodically with the use of unified methods of collecting, storing and transforming data. Information sources for PMŚ are:

- measurements made by obliged administration organs and information rendered accessible by other administration organs;
- measurements of environment's state, extent and kind of emission as well as record made by entities obliged to do so;
- other information, obtained for a fee or free of charge.

In the PMŚ system three sections are distinguished: environment quality, emission as well as assessments and forecasts. The section of environment quality comprises monitoring of the quality of air, inland surface and underground waters, waters of the Baltic Sea, quality of soils, extent of noise, electro-magnetic fields and ionizing radiation as well as the quality of forests and nature. The section of emission comprises monitoring of the pollutions emitted to air, waters and monitoring of waste. The section of assessment and forecast comprises:

- analyses and assessments of state of environment's particular elements in combination with pressure factors;
- analyses and assessments of certain problems and phenomena taking place in the environment;
- forecast of phenomena course, mainly on the basis of analyzing trends while using modeling;
- analyses and assessments of the interrelations between processes taking place in the environment and socio-economic development of the country.

The tasks of State Environment Monitoring are accomplished in national, regional (district and inter-district) and local networks. Furthermore, already 12 base stations of the Integrated Monitoring of the Natural Environment (ZMŚP) have been organized. However, regular measurements are made only in 7 stations. This is a model of geo-ecosystems' functioning. ZMŚP's objective is to provide data for the determination of the current state of ecosystems on the ba-

sis of long-term observation cycles, presentation of short-term and long-term transformations of the natural environment in the conditions of climate changes and rising anthropopressure. A basic object of research is river or lake catchment within reach of which are located test research areas comprising all types of ecosystems in the analyzed landscape. Information generated in the frameworks of PMS is used by entities of government and self-government administration for the needs of operational environmental management.

3.2.3.1. Statistical reporting

Statistical data is collected from various sources: GUS reports, reports drafted by resorts, administrative information systems, expertise, elaborations and own calculations. Researches within the frameworks of public statistics take place on the basis of “Program of statistical research of public poll” approved by the Cabinet by decree-law. The program of research is presented in details in subject and object range of research. Opinion polls comprise the following issues:

- natural conditions;
- resources and changes in using land’s area, hazard and protection of lands;
- forest resources;
- resources, changes and usage of mineral resources;
- resources, usage, pollution and protection of waters;
- pollution and protection of atmospheric air;
- protection of nature, landscape and biological diversity;
- waste;
- ionizing and non-ionizing radiation;
- noise;
- controlling and social activity for the benefit of the environment;
- objects of small water retention.

A subjective range of statistic research made by GUS comprises business entities that directly use the environment and entities of government and self-government administration that are responsible for collecting official information about particular issues. The program of statistical research defines thematic range and kind of reports, which are expected from particular groups of entities and institutions, and also deadlines for submission and addressees of particular reports. Kinds of annual reports concerning the environment along with their thematic range are presented in table 3.2.

Apart from the listed reports, public statistics comprises already mentioned official information systems such as, for example, resort report of the Ministry of the Environment, Ministry of Agriculture and Rural Development, information collected by the Institute of Meteorology and Water Administration, Main

Inspectorate of Environmental Protection and National Fund of Environmental Protection and Water Management and also other state offices whose competences include the collection of information concerning various aspects of environment management.

Table 3.2. Statistical forms concerning environment management issues

Symbol of report	Name of report
Encl. to F-03, SP, SG-01	Enclosure to reports F-03, SP, SG-01 part 4 – capital assets, concerning investment outlays serving environmental protection and water management and obtained material effects
L-01 and L-01/a	Report about forests of the Treasury and Resources of Agricultural Property of the State Treasury
L-02	Report about afforestations
L-03	Reports about forests belonging to physical and legal persons (excluding the Treasury)
OS-1	Reports about emissions of air pollutions and about the state of purifying devices
OS-3	Report about administration of water, and sewage and loads of pollutions
OS-4	Report about taking water for irrigations in agriculture and forestry as well as about filling up fish-breeding ponds
OS-5	Report from treatment plant of urban and rural sewage
OS-6	Report about waste (excluding municipal waste)
OS-7	Report about protection of the environment and landscape
SG-01	Statistics of municipality: forestry and environmental protection
M-06	Report about water supply systems and sewage systems
M-09	Report about waste removal and neutralization of municipal waste
OS-21 and OŚ-22	Specification of resources and data about the deposit and about changes in these resources
OŚ-24 and OŚ-25	Specification of resources and data on the documented deposits of crude oil and natural gas as well as on changes in these deposits
OŚ-26 and OŚ-28	Specification of documented deposits of medicinal water and thermal water as well as changes in these deposits
ZOŚ-5	Information about resources of surface waters
ZOŚ-6	Data on the quality of sediments from bottoms of rivers and lakes
OŚ-3	Report on the functioning of Environmental Protection Inspectorate with regard to protection from noise
OŚ-2b	Report on protective activity of provincial inspectors of environmental protection
OŚ-4r; OŚ-4p	Annual and six-month reports on revenues on the grounds of payments for using the environment and redistributing these revenues
OŚ-4w/n	Report on management of provincial/state Environment and Water Management Fund
OŚ-29k	Questionnaire on the running costs spent on environmental protection
RRW 12	Report on the realization of regulations concerning protection of farming and forest lands as regards collection and usage of funds from the Farming Land Protection Fund

Source: own elaboration on the basis [*Program badań...*, 2008].

Some of this information is collected on special forms of statistical reports. The reports concerning packaging waste are marked with symbol OŚOP:

- OŚOP-1 – report on the amount of due product payment;
- OŚOP-2 – report on the amounts of packages and products introduced into Polish market, and on reached amounts of waste recovery and recycling of package waste;
- OŚOP-3 – information on the amounts of packaging waste collected and transmitted for recovery and recycling by municipality, and about incurred expenses.

Within the frameworks of public statistics system in Poland there functions Bank of Regional Data. It includes information about socio-economic, demographic and social situation and about the state of environment in relation to provinces, districts and municipalities and also in regions and sub-regions. Data has been rendered available in the configuration of domains, in territorial section and time series since 1994.

3.2.3.2. Official information and scientific research

Official information comprises collections of documents created on the basis of regulations and in connection with applying law from the domain of environment management. Various organs of government and self-government administration, at local, provincial and central level have competences in this domain. Particular legal acts connected with widely understood the environment management define information duties of certain entities – environment users and administration organs. Collections of official information in thematic configuration are identical with the realm of research of public statistics in the field of “the environment”. Subjects keeping records are ministries, main offices; e.g. Head Office of Geodesy and Cartography, State Mining Authority, entities subject and supervised by the Minister of Environment and Bank of Environmental Protection (BOŚ).

The most essential collections of official information concerning the environment are created in provincial inspectorates of environment protection. In accordance with the environmental protection law district databases of information about using the environment comprise data on:

- amount and types of gases or dust emitted to the environment and data on the basis of which these quantities were determined;
- amount and quantity of used surface and underground water;
- amount, state and content of sewage poured into waters or ground;
- information obtained from documentation submitted by subjects making use of the environment in connection with making payments.

Data concerning waste is collected and assembled by proper offices (village-mayors and mayors, prefects, governors) in provincial databases of waste that are handled by province marshals. According to the act on waste, the bases include information concerning the production and administration of waste as well as the record of permits. With reference to package waste appropriate database is run by the Minister for the Environment. On the basis of the reports submitted by province marshals information collected there is about: packages produced, imported and exported from Poland; packages introduced on the market; packaging waste subjected to retrieval and recycling and reached retrieval and recycling levels and also about the amount of due product payment.

Scientific research constitutes supplementation of information system of environment management, first of all by means of verification of data derived from monitoring and reporting and – on a smaller scale – by providing additional information about problems not comprised by statistical reporting or not sufficiently covered by it. Information resulting from scientific research in terms of the widely understood domain of environment management is generated owing to the fact that scientific projects are accomplished by department investigation entities, PAN institutes and universities. During the period 1996-2008 the Ministry of Environment annually subcontracted realization of 30-50 research projects and expertise. They concerned scientific (expert) assistance for designing, implementing and assessing national ecological policy and detailed problems being solved.

Data published in yearbooks *Ochrona Środowiska* (available in both paper and electronic version) is based on research and statistical reports, information from ministers also the results of measurements, controls, assessments and analyses made within the frameworks of operation of Environmental Protection Inspectorate, State Sanitary Inspection, services measuring radioactive radiations and specialist services: hydrological and meteorological, geological, of forestry and nature protection. Additionally, expertise and reports, cataloguing and scientific elaborations are used. Data from those sources was grouped in nine sections that comprise: environment components – land area, soils and minerals, water, air, flora and fauna, with particular consideration of the forest environment and nature protection; factors of hazards – industrial and municipal waste, noise and radiation; activity for protection and control of the environment; economic aspects of environmental protection and international comparisons.

3.3. Outlays on environmental protection

3.3.1. Definition and amount of outlays on environmental protection

Outlays on environmental protection are not the only additional identifiable outlays that are earmarked for environmental protection, reduction of pollutions or repair of environmental losses. This group does not comprise outlays on activities that may have positive impact on the environment, but their main aim is to satisfy other needs, for example increase in profit, safety and working hygiene or improvement of the effectiveness of production⁷.

Activity for the benefit of environmental protection may be of two kinds:

1. Neutralization of pollutions – defined as methods, technologies, processes or equipment earmarked for collection and reduction, removal (emission to air, sewage, waste) and utilization of pollutions just after they were produced, and monitoring of the pollution extent. Neutralization of pollutions takes place mainly by means of using methods, techniques or end-of-pipe equipment (filters for purifying waste gases, waste-water treatment plants, landfill sites).
2. Prevention of pollutions production – defined as methods, technologies, processes or equipment earmarked for prevention or reduction of pollution at its source with the aim of reducing their impact on the environment. Prevention of the emergence of pollutions may comprise various types of activity. These are: modification of equipment or technology; change of technology into new, improved one; modernization or redesign of products, introduction of raw materials' substitutes or using renewable raw materials; changes in the types of usage, repairs of appliances, management.

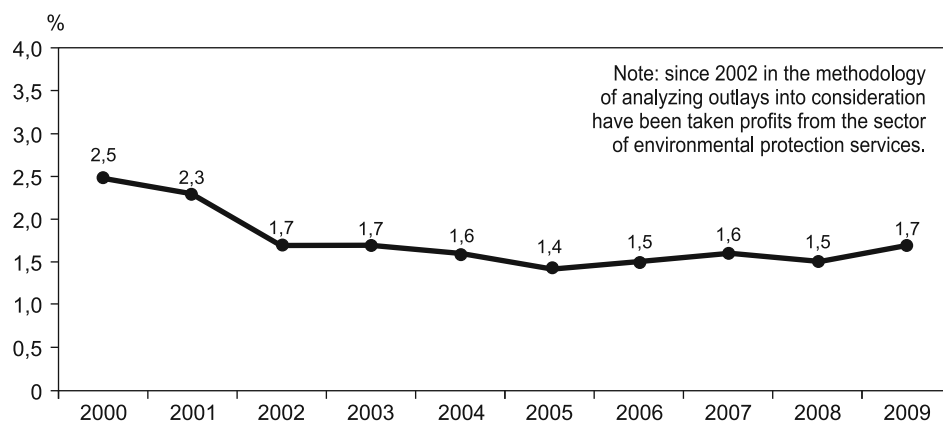
Outlays on the protection of the environment protection in state economy are taken by companies, public sector, sector of environmental protection services and households.

The sector of companies comprises all entities classified according to Polish Activity Classification (PKD) outside the public sector and the sector of the environmental protection services. Entities in the sector of environmental protection services run activity that is characteristic for the benefit of environmental protection (as basic or second-rate activity), which is important from the perspective of their incomes. It concerns waste management, sewage draining, sanitary services.

⁷ Commission Recommendation 01/453/EC of 30 May 2001 on the recognition, measurement and disclosure of environmental issues in the annual accounts and annual reports of companies (Dz.U.L. 156/33 of 13 June 2001).

Outlays on environmental protection constitute the sum of investment outlays and operating costs of protective actions. In Poland in 2009 they amounted to more than PLN 43.5 bn and constituted 3.4% of GDP. The outlays were mainly made by households – 54.4%. Outlays on environmental protection, excluding expenditure of households, in Poland in 2008 amounted to PLN 21.9 bn, which constituted 1.7% of GDP (figure 3.4.). During the period 2002-2009 the total amount of outlays comprised the current costs – approx. 60%, and investment outlays – approx. 40%.

Figure 3.4. Participation of outlays on environmental protection in gross domestic product (in %).



Source: own elaboration on the basis [Ochrona..., 2006, 2010].

3.3.2. Outlays on environmental protection

Investment outlays on environmental protection comprise outlays on methods, technologies, processes, equipment or its part, the main aim of which is to collect, neutralize, reduce or eliminate pollutions or environmental losses that result from company's investment activity. [The Industry..., 2005] Investments in environmental protection may comprise capital assets (grounds, buildings and edifices, machines and equipment) and other investment outlays.

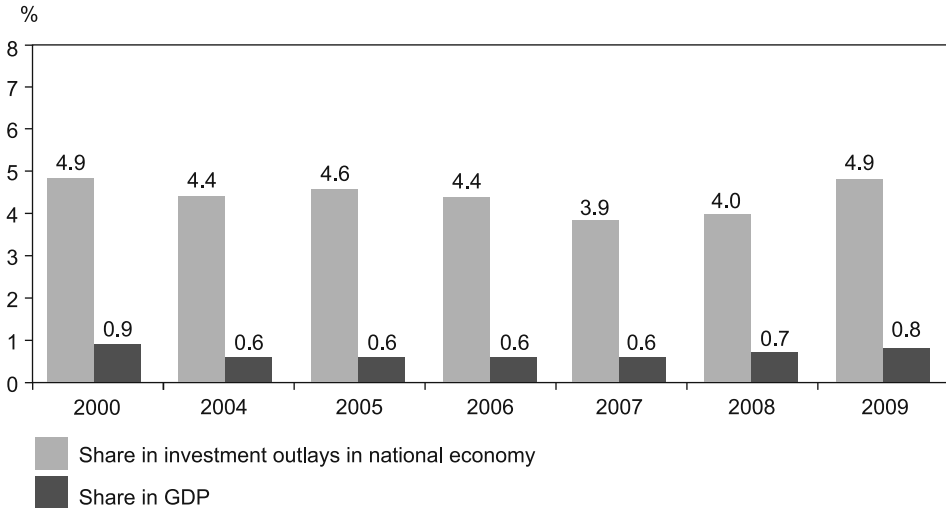
The concept "fixed assets" should imply new and existing goods, purchased, made on one's own or acquired by financial leasing of period longer than one year, and also all the additions, changes and renovations that prolong life or increase the productivity of fixed assets.

Investment outlays on environmental protection are the sum of outlays on investments neutralizing pollutions and investments that prevent the production

of pollutions. Investment outlays on preventing the production of pollutions include:

- separately identifiable investments – they comprise separate identifiable methods, processes, technologies, equipment. Their main objective is environmental protection, therefore total outlays on investments of this kind should be treated as the outlays on environmental protection;
- integrated investments – they comprise methods, processes, technologies and equipment integrated with operational activity or production process, difficult to define as separate components preventing pollutions; in such cases only part of outlays should be treated as outlays on environment protection; it may be defined as the difference between the amount of outlays on realized investment and the cheapest available alternative technology of similar functions and properties and in which aspects of environmental protection are not taken into consideration; if there is no possibility to compare outlays on the purchase of this technology they may not be included into environmental protection; the total value of outlays on environmental protection expressed by their participation in the total of investment outlays during the period 2000-2009 oscillated around 3.9%-4.9%, which constituted 0.6-0.8% of gross national income (figure 3.5.).

Figure 3.5. Total share of investment outlays on environmental protection^a in investment outlays in national economy and per unit of gross domestic product (in %)

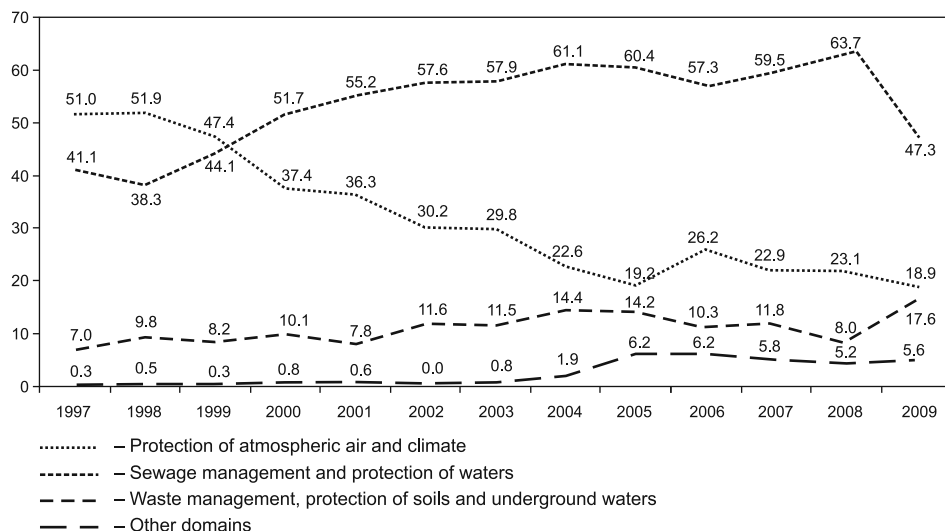


Note: ^a Without outlays on water management

Source: *ibid.* figure 3.4.

The analysis of investment outlays' structure according to the domains of environmental protection between 1997 and 2009 enabled isolation of two sub-periods (figure 3.6.) During the period 1997-1999 most funds were spent on the protection of atmospheric air and climate (more than 50% of the total outlays) and on sewage economy and protection of waters (approx. 40%). After the year 2000 the outlays on water protection dominated decisively (55.2%-63.7%) – their level reached its highest value in 2008 (63.7%) whereas in 2009 it decreased to 47.3%. The second most important outlays were on air protection, whose share displayed continuous falling tendency when compared with the year 2005, but in the following year there was considerable increase (to 26.2%), whereas during the period 2007-2008 it oscillated around 23%. In 2009 it decreased to 19.6%. The share of outlays on waste management between 2000-2008 on average amounted to 11.1%, yet it considerably increased in 2009 so that it was higher than the average of several years and it oscillated around 17.6%.

Figure 3.6. Shaping of investment outlays' structure according to the domains of environmental protection during the period 1997-2008 in Poland (in %)



Note: ^a The analyzed structure of investment outlays does not take into consideration the outlays on research and development and also the outlays on environment management, education, trainings and information, owing to the lack of data from the previous years of this period. Other domains include: reduction in noise and vibrations, protection of biological diversity and landscape and also protection from ionizing radiation.

Source: *ibid.* figure 3.1.

Information in the division into prevention of influences (mainly formation of pollutions) and reduction of influences depends on the direction of investing. In 2009 the outlays on air protection were in two thirds directed at the actions preventing pollutions, and in one third – for reduction in pollutions. In sewage management and water protection almost the entirety of outlays was addressed at the reduction in pollutions, whereas in waste management two thirds of outlays were earmarked for this purpose, whereas one third was devoted to other activities. The costs of another activity refer mainly to management as well as to trainings and information (table 3.3).

Table 3.3. Outlays on environmental protection in 2009 in accordance with the character of investments (in %)

Directions of investing	Total	Prevention of influences	Reduction in influences	Measurements and control	Other activities
Air protection	100.00	66.15	33.1	0.3	0.1
Sewage management and water protection	100.00	0.2	99.5	0.1	0.2
Waste management	100.00	1.2	66.5	0.0	32.3
Protection of soils, protection of underground waters	100.00	88.5	6.7	0.6	4.2
Reduction in noise and vibrations	100.00	31.1	68.3	0.6	-
Protection of biological diversity	100.00	93.7	-	-	6.3
Protection from ionizing radiation	100.00	-	100	-	-

Source: own elaboration on the basis: [*Ochrona...*, 2010].

3.3.3. Running costs of environmental protection

Running costs of environmental protection are the costs of service and of continuing activity (technology, process, equipment). Their main objective is to prevent, limit, neutralize or eliminate pollutions and any other environmental losses resulting from the current activity of a unit. The running costs include:

- costs of remunerations, including surcharges;
- costs of purchasing materials and energy;
- payments for hire, including rents and leasing payments (for operational leasing);
- costs of purchasing services, including research and development ones;
- public payments.

Running costs are divided into the costs of own actions and payments and purchases of environment services. **Costs of own actions** constitute work costs, costs of purchasing goods, raw materials and media used for environmental protection as well as payments for the lease of environment equipment. **Payments and purchases of the environment services** comprise all the payments made to external entities (public and private) with the aim of decreasing the negative effect of a unit on the environment.

Data concerning the running costs in Poland has been available since 2002. During the period 2005-2008 they were systematically rising, mainly as the consequence of handing down new protective devices to be used. In the fixed prices from 2008 the net running costs of environmental protection in 2005 amounted to PLN 7 811.4 m, whereas in 2009 as much as PLN 10 922.7 m. The structure of the running costs according to the domains of environmental protection in 2002-2009 was slightly different than in case of investment outlays. The running costs were born mainly for sewage management, protection of waters and waste management – table 3.4.

Table 3.4. Structure of the running costs according to the domains of environmental protection in Poland during the period 2002-2008 (in %)

Specification	Years				
	2002	2004	2006	2008	2009
Protection of atmospheric air and climate	15.3	19.3	19.8	18.0	18.1
Sewage management and water protection	40.6	30.1	21.4	28.9	29.0
Waste management	23.8	26.5	31.3	21.1	15.1
Protection of soils and also underground and surface waters	3.8	2.2	2.5	9.7	10.6
Protection of biological diversity and landscape	5.4	7.5	3.5	7.9	9.4
Reduction in noise and vibrations	0.4	0.5	0.6	0.4	0.6
Protection from ionizing radiation	0.2	0.1	0.1	0.1	0.1
Other activities related to environmental protection	10.6	13.8	20.8	13.9	17.1
Total	100.0	100.0	100.0	100.0	100.0

Source: *ibid.* table 3.1.

The running costs of environmental protection, excluding households, in 2009 were made in 50.4% by the public sector, 41.3% by the business sector and in 8.3% by the service sector of environmental protection.

The running costs in 2009 to a major degree (84.1%) were made on the realization of own enterprises, and only one sixth (15.9%) for payment of ordered services. Owing to the type of undertaken activities 54.5% were the costs of functioning of “end-of-pipe” devices, and 45.5% were the costs of functioning of the devices that prevent pollutions. The payments for economic use of the environment made in 2009 amounted to PLN 1.874 m. They constituted 16.6% of the total running costs that were made [Ochrona..., 2010].

3.3.4. Expenses of households on environmental protection

Expenses of households on environmental protection are classified in the following way.

1. Payments made on services connected with environmental protection: sewage removal or sewage disposal; waste removal (garbage, dewatered sludge cake).
2. Expenses on the purchase, installation and construction of devices and products directly serving environmental protection, for example: installation of divisors, heat meters and thermo-regulators; installation of devices purifying chimney gases; purchase and assembly of energy-saving windows; warming of the building; connection to the sewage system; construction and keeping of individual sewage plants (sub sewage plants) in motion; construction of adjacent devices for waste neutralization; purchase of containers and garbage liners; construction of protective obstructions for migrating frogs (mainly on roads); formation of crow's nests; construction of fences and screens against noise and construction of hedges.

The expenses on environmental protection in households in 2009 amounted to PLN 23.4 bn. In comparison with the year 2005 they were 25.1% higher (in prices comparable to 2009). These expenses are divided into two groups: charges for removal or disposal of impurities (in 2009 they constituted 27.4% of the total expenses); expenses on the purchase, assembly and construction of devices and products serving environmental protection – 72.6% of the total expenses (table 3.5.). Households spend more than half of their expenses on undertakings serving protection of the air and climate, such as the exchange of windows into the energy-saving ones, insulation of houses, improvement of the effectiveness of heating systems.

Table 3.5. Structure of expenses for environmental protection in 2005 and 2009

Specification	2005	2009	2005-2009
Total expenses of households (in bln PLN in prices from 2009)	18.7	23.4	25.1%
Share in the total expenses (in %):			
charges for disposal of impurities or for disposal and treatment of sewage	21.9	18.7	- 3.2
charges for removal of solid waste	9.5	8.7	0.8
purchase, assembly and construction of devices and products serving protection: of air, water and land surface	58.5	61.1	2.6
protection of bio-diversity and landscape, protection from noise and vibrations.	6.4	6.3	-0.1
	3.6	5.2	+1.6
Total	100.0	100.0	-

Source: [*Ochrona...*, 2010].

3.4. Sources of financing environmental protection

The system of financing environmental protection is an integral part of the national financing system. It is a group of institutions, economic instruments, principles and regulations defining the ways and mode of collecting and earmarking money resources on pro-ecological enterprises. The Polish system of financing environmental protection was shaped before Poland's integration with the European Union and it is based on different philosophy and law sources. EU regulations are characterized by the technological approach that obliges environment users to strictly obey product and emission standards. In the Polish law of environmental protection the activity for the benefit of environment protection has for years been directed at environmental effects.

Financial means on the realization of undertakings serving environmental protection may come from public, private or foreign resources. Financing of undertakings, both of investment character and current activity, takes place from the following sources:

- own sources of companies;
- own sources of municipalities;
- bank credits and loans taken by companies and municipalities;
- ecological funds;
- state budget and self-government budgets;
- aid from abroad;
- other sources, for example, from ecological funds, own taxation of local communities.

The outlays on environmental protection in Poland are financed mainly from own sources of companies and municipalities. Units of the sector of environment protection services cover their expenses using the incomes from the services they provide. Sources of financing differ in terms of structure in case of investment outlays and current activity. Table 3.6 presents the structure of sources of financing pro-ecological investments in Poland in the years 2000-2009.

Table 3.6. The structure of sources of funds earmarked for investment outlays in environmental protection (in %)

Specification	Year					
	2000	2002	2004	2006	2008	2009
Own means of companies:	53.4	46.6	30.2	30.2	32.7	19.2
Own means of municipalities			17.9	15.3	17.5	26.8
Bank credits and loans	11.7	12.3	8.3	11.4	9.6	9.4
Budget funds – central and self-governmental	5.4	4.8	2.8	2.7	3.8	3.1
Ecological funds	20.0	26.1	24.1	17.6	16.6	18.3
Funds from abroad	3.9	4.2	12.2	19.2	16.3	18.9
Other sources	5.6	6.0	4.5	3.6	3.5	4.3
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: [Ochrona..., 2006, 2010].

The analysis of the structure of financing investment outlays indicates increase in the share of ecological funds in financing protective enterprises (from approx. 23% during the period 2002–2004 to approx. 17.5% between 2006 and 2009). There has been observed also very high increase in the share of foreign funds after Poland's accession to the European Union, i.e. from approx. 4% in the first years of the last decade to more than 18% during the period 2006–2009.

Bank credits and loans can be also considered as own means (reversed in time) of companies and municipalities. In 2009 they constituted 55.4% of investment outlays.⁸ Budget funds are directed at the realization of protective enterprises in budget units, mainly in national and landscape parks. Funds of ecological funds are earmarked mainly for investment subsidies (in the expenses of district funds in 2009 they constituted 29.9%), subsidies for the realization of the current tasks (18.1%), surcharges to the interest rate of credits and loans from the means of funds (2.0%), amortization of credits and loans from the

⁸ This data is exaggerated because part of outlays of households can be show in the sector of environmental services.

means of funds (11.8%) [*Ochrona...*, 2010]. Foreign means are mainly the means of the European Union and of other programs, e.g. of the Norwegian Fund or Swiss Fund.

Ecological funds in Poland are a specific source of financing protective enterprises and water management. They handle the obtainment and redistribution of realization of priority enterprises that serve environmental protection. In Poland there are: funds of environmental protection and water management (National Fund) and district funds, Fund of Protection of Farming Lands and Forest Fund.

National Fund for Environmental Protection and Water Management (NFOŚiGW) and district funds have legal status. These are para-bank institutions where money funds are administered by the board that had been chosen earlier by the supervisory board. The board is responsible for the realization of ecological policy in this area as well as for rational and effective administration of possessed assets. Municipal and district funds do not have legal status. Funds of these funds supply municipality's or district's budget.

Funds of ecological expedient funds are earmarked for financing:

- ecological investments realized thanks to the means from the European Union and own funds;
- research, popularization of their results, and also technical development in terms of environmental protection and water management;
- elaboration and implementation of new techniques and technologies, particularly the ones concerning emission and usage of water, and also effective usage of fuels;
- prevention or removal of the environment pollution effects whenever a subject responsible for it cannot be identified;
- ecological education and promotion of pro-ecological activities and principles of sustainable development;
- usage of local sources of renewable energy;
- tasks connected with increasing forestation of the country and with prevention and elimination of damage caused by biotic and abiotic factors;
- prevention of natural disasters and elimination of their effects for the environment;
- activities connected with preventing and eliminating serious breakdowns and their effects.

National Fund for Environmental Protection and Water Management is principally concentrated on supporting, in financial terms, of environmental protection and water management investments that have all-Polish and extra-regional importance and scope as well as local tasks which are important from the perspective of the environment. Funds of the National Fund, apart from the activity comprised by financing from provincial funds for the environment protection and water management, may be allocated for:

- development of industry producing technical funds and control-measurement apparatus which serve environmental protection and water management;
- development of specialist executive potential which serves realization of investment for the benefit of environmental protection and water management;
- expansion of measurement stations' network, laboratories and centers of information processing serving the assessment of the state of environment;
- realization of complex research, development and implementation programs serving environmental protection and water management as well as programs of ecological education;
- assistance in the realization of district and extra-district programs of environmental protection, programs of air protection, programs of protection from noise, plans of waste management and plans of water management;
- realization of other tasks serving environment protection and water management ensuing from the principle of sustainable development, defined in the plans of National Fund's activity.

National Fund uses the following financing forms.

1. Financing using credits – these are loans given by National Fund; credits given by banks from means of National Fund; syndicates, i.e. co-financing enterprises together with banks; credit lines obtained from means of National Fund and administered by banks;
2. Subsidy financing – investment and non-investment subsidies, surcharges to bank credits, amortizations;
3. Capital financing – comprising stocks and shares in newly established or already existing companies with the purpose of achieving ecological effect.

Detailed criteria of the way the enterprises are chosen to receive funds from National Fund and provincial funds are defined annually by the resolutions of supervisory boards. Units of the local self-government, companies, institutions and offices, as well as universities, non-governmental organizations, public administration and physical persons may be solely proponents applying for funds of provincial funds and National Fund for Environmental Protection and Water Management.

The main sources of **incomes of ecological funds** are the profits from charges and financial penalties for using the environment, from exploitation and concessive charges and product payment as well as financial incomes, including those on the grounds of interest from loans and credits, remaining operational incomes and extra profits. Additionally, funds' incomes may be voluntary payments, bequests, donations, material considerations and means from funds as well as receipts from the enterprises organized for the benefit of environmental protection and water management. In the case of the National Fund and provincial funds there may also be revenues on the grounds of emission of own bonds

and other receipts connected with the activity of these funds. The share of revenues on the grounds of ecological charges and fines between ecological funds of particular grades was shown in table 3.7.

Table 3.7. The share of particular funds in incomes on the grounds of ecological charges and fines (in %)

Categories of ecological charges and fines	Funds for environmental protection and water management			
	municipal	provincial	district	NFOŚiGW
Fine for removing trees and bushes	100.0			
Fine for drop of saline mine waters and emission of NO _x	20.0	10.0	45.5	24.5
Fine for storing waste and fines linked with inappropriate storing	50.0	10.0	26.0	14.0
Charges for using the environment and particular usage of waters and water devices, fines for violating rules of using the environment	20.0	10.0	45.5	24.5
Product charges for packages			29.4	68.6
Product charges for air conditioning and refrigerating appliances, accumulators, batteries and elements, technical oils, unloading lamps and tires				98.0

Source: own elaboration on the basis [*Ochrona...*, 2006].

The sources of revenues of environmental protection and water management funds during the period 2005, 2007 and 2009 are presented in table 3.8. The data presented in the table implies that:

- municipal funds were to a large degree supplied by the municipal incomes from charges and fines for using the environment as well as from charges and fines for cutting trees and bushes, in total this amounted to 97.4% of incomes;
- provincial funds were, in general, supplied only by provincial part of incomes from charges and fines from using the environment (in 2009 – 98.1%);
- district funds were supplied by district part of incomes from charges and fines for using the environment (in 2009 – 66.9% of incomes) and from financial revenues from granted credits and loans as well as from bonds or interest rate of free means (in 2009 – 20.3%) and also from the surplus of incomes into municipal funds above the level that is allowed by law (in 2009 – 10.5%), these incomes concern only a small number of municipalities in the country;

Table 3.8. Revenues of funds of environmental protection and water management in the years 2005, 2007 and 2009

Source	2005		2007		2009	
	PLNm	%	PLN m	%	PLN m	%
Municipal funds						
Charges and fines for using the environment (sewage management and protection of waters, protection of atmospheric air and climate, waste management)	306.6	65.6	427.1	67.7	584.0	71.3
Charges and fines for removing trees and bushes	137.3	29.4	176.4	28.0	213.6	26.1
Fines for violating the requirements regarding environmental protection	3.9	0.8	0.7	0.1	0.7	0.1
Others	19.4	4.2	26.2	4.2	20.5	2.5
Total	467.2	100.0	630.4	100.0	818.8	100.0
Revenues of provincial funds						
Charges for using the environment	122.9	96.4	165.3	97.6	185.6	97.9
Fines for violating requirements regarding environmental protection	1.8	1.4	0.3	0.2	0.3	0.2
Others	2.7	2.2	3.7	2.2	3.6	1.9
Total	127.4	100.0	169.3	100.0	189.5	100.0
Revenues of district funds						
Charges for using the environment	519.1	63.2	679.0	69.2	706.0	66.8
Other charges	4.3	0.5	6.2	0.6	-	-
Fines for violating the requirements regarding environmental protection	6.5	0.8	1.2	0.1	1.2	0.1
Surplus of municipal and provincial funds	95.0	11.5	101.1	10.3	110.8	10.5
Financial revenues	185.9	22.6	185.0	18.9	214.4	20.3
Other revenues from increases in fund	10.4	1.6	7.7	0.8	23.8	2.3
Total	821.2	100.0	980.2	100.0	1056.2	100.0
Revenues of NFOSiGW						
Charges for using the environment	284.8	39.0	367.3	26.3	380.8	22.7
Charges related to mining activity	199.7	27.3	216.6	15.5	217.0	13.0
Product charges	6.3	0.8	6.4	0.4	3.7	0.2
Charges related to submitting applications for integrated permit	4.6	0.6	2.3	0.2	1.2	0.1

Source	2005		2007		2009	
	PLNm	%	PLN m	%	PLN m	%
Charges from the act – water law	4.7	0.6	6.4	0.4	9.1	0.5
Charges related to the act on recycling of vehicles withdrawn from exploitation	-	-	505.2	36.1	239.1	14.3
Charges related to introduction of substances decreasing the ozone layer	-	-	2.8	0.2	2.3	1.5
Charges related to trade in emission permits	-	-	0.2	??	24.3	1.5
Other charges	6.6	0.9	2.7	0.2	-	-
Fines from the act Energy Law	-	-	89.9	6.4	796.2	47.6
Fines for violating the requirements of environmental protection	3.5	0.5	0.7	0.1	-	-
Financial revenues	219.1	30.0?	187.8	13.4?	-	-
Other increases in the fund	1.1	0.2	9.7	0.7	-	-
Total	730.4	100.0	1398.0	100.0	1673.7	100.0

Source: own elaboration on the basis [Bartniczuk, Ptak, 2011].

- National Fund for Environmental Protection and Water Management used various sources during the analyzed period; in 2005 the revenues of this fund was to a large degree composed of charges for using the environment (39.0%), charges related to mining activity (27.3%) and financial revenues (30.0% of the total incomes). In 2009 the sources of revenues considerably changed due to introduction of new instruments. The main sources of revenues were fines from the act of Energy Law (47.6%). The share of charges for using the environment amounted to 22.7%, of charges related to mining activity – 13% and of charges related to unrealized recycling of vehicles withdrawn from exploitation – 14.8%. These are transient sources of funds of the NFOSiGW. Along with progress in protective activity the incomes from these charges decrease. This concerns: product charges (during the period 2005, 2007 and 2009 their share in the total incomes amounted to 0.8%, 0.4% and 0.2% respectively; the charges for non-realization of recycling of vehicles withdrawn from exploitation (in 2007 they constituted 36.1% of the total incomes, and in 2009 they came to only 14.3%); and fines for non-realization of the required levels of share of renewable sources of energy in the total mass of combusted fuels.

The funds accumulated on the accounts of particular funds serve financing of protective undertakings. The expenses of environmental protection and water management funds during the period 2005, 2007 and 2009 are presented in the

table 3.8. During the analyzed period the greatest share in expenses was of water management and protection of waters (on average more than 45%, but in 2009 it was even 60.2%), the second largest share was of protection of atmospheric air and climate (on average approx. 20%, but in 2009 14.8%). In the arrangement of particular funds dominating position was taken also by water management and protection of waters, excluding provincial funds where the greatest share in expenses was of undertakings serving protection of air and climate.

Table 3.9. Expenses of funds on environmental protection and water management in the years 2005, 2007 and 2009

Financed spheres	2005		2007		2009	
	PLN m	%	PLN m	%	PLN m	%
Municipal funds						
Sewage management and protection of waters	170.1	37.0	153.9	32.6	231.2	36.5
Protection of atmospheric air and climate	84.2	18.3	77.0	16.3	98.0	15.5
Waste management	47.5	10.3	59.5	12.6	88.5	13.9
Other spheres	157.8	34.4	181.4	38.5	216.0	34.1
Total: municipal funds	459.6	100.0	471.8	100.0	633.7	100.0
Provincial funds						
Sewage management and protection of waters	22.8	15.9	24.2	17.6	23.5	14.3
Protection of atmospheric air and climate	50.9	34.5	44.1	32.0	49.6	30.1
Waste management	30.6	21.3	29.5	21.4	39.6	24.0
Other spheres	39.2	27.3	40.0	29.0	52.1	31.6
Total: provincial funds	143.5	100.0	137.8	100.0	164.8	100.0
District funds						
Sewage management and protection of waters	909.1	54.9	1076.1	55.8	1216.5	59.5
Protection of atmospheric air and climate	382.1	23.1	490.9	25.5	452.0	22.1
Waste management	125.5	7.6	121.1	6.3	132.6	6.5
Other spheres	238.7	14.4	239.6	12.4	143.4	11.9
Total: district funds	1655.4	100.0	1927.7	100.0	2044.5	100.0
NFOSiGW						
Sewage management and protection of waters	587.0	40.2	354.8	25.9	1755.8	69.7
Protection of atmospheric air and climate	232.0	15.9	458.4	33.5	194.9	7.7
Waste management	83.1	5.7	88.1	6.4	116.6	4.6
Other spheres	557.3	38.2	468.2	34.2	454.0	18.0
Total: NFOSiGW	1459.4	100.0	1369.5	100.0	2521.2	100.0

Financed spheres	2005		2007		2009	
	PLN m	%	PLN m	%	PLN m	%
Total: all funds						
sewage management and protection of waters	1689.0	45.4	1609.0	41.2	3227.0	60.2
Protection of atmospheric air and climate	749.2	20.2	1070.4	27.4	794.5	14.8
Waste management	286.7	7.7	298.2	7.6	377.3	7.0
Other spheres	993.0	26.7	929.2	23.8	965.5	18.0
Total: funds for environmental protection and water management	3719.9	100.0	3906.8	100.0	5364.3	100.0

Source: ibid.table 3.6.

Fund of Protection of Farming Land has functioned since 1982. The fund's revenues include:

- amounts due related to the exclusion of farming lands from production, i.e. one-off charges related to the exclusion of lands from production (in 2009 they constituted 5.6% of incomes);
- annual charges related to exclusion of farmlands from production, i.e. charges related to non-agricultural usage of lands excluded from farming production (in 2009 they constituted 88.3% of incomes);
- charges related to non-realization of the task of taking and using humous layer of soil;
- donations and other incomes.

The basic range of the fund activity is protection of farming lands which is perceived as the entirety of procedures preventing worsening of the state of soil and its destruction as well as restoring fertility of soils destroyed by means of their recultivation and improvement of their applied value. In 2009 the expenses of the fund on protective undertakings amounted to PLN 150.2 m, including, among others: adjustment of fallow lands to the needs of farming production and their recultivation (0.15% of all the expenses); farming usage of recultivated lands (0.05%); fertilization of soils (0.6%); construction and renovation of water reservoirs serving small retention (3.9%); construction and modernization of roads for the needs of agriculture (89.9%).

The priority of expenses on construction of roads in the Fund of Farming Land Protection has remained since its formation, i.e. for almost 30 years. As the result of the accession to the European Union in 2004 Poland has had access to Union funds which, to a large extent, are directed at the sector of environmental protection. The basic EU funds, in the frameworks of which it is possible to finance enterprises from the domain of environmental protection, include:

- Fund of Cohesion, whose aim is to provide assistance for the countries where national gross income per capita does not exceed 90% of European union's average;
- Structural Funds: European Fund of Local Development (EFLD), European Social Fund (ESF), European Fund of Agricultural Orientation and Guarantee and Financial Instrument of Steering Fishery (FISR).

In the Operational Program “Infrastructure and Environment” more than 20 billion € was allocated for environmental protection and water management, which, after supplementing with own sources, makes it possible to accomplish the investment of 26 billion€. In 2009 the value of subsidies from this fund amounted to €1226.6 m, which constituted 88.9% of the foreign aid on environmental protection. Other means were from the European Regional Development Fund, Norwegian Financial Mechanism and European Economic Area Financial Mechanism (2.4%) and%) and Financial Instrument LIFE+ (0.7%). Funds from the foreign aid were earmarked mainly for protection of waters and water management (80.8%), protection of air and climate (6.3%), protection of land area (7.8%) and other activities (5.1%).

In the environment management system a significant role is played by technical measures. These are devices used for keeping pollutions that are in exhaust fumes or are emitted to atmosphere in chemical processes, sewage plants, water treatment stations, instruments for waste sorting, neutralizing and storing, as well as instruments for the protection from noise and vibrations, and others. This problem is the subject of many publications available on the Polish market of scientific literature. Therefore, it has not been discussed here.

Chapter 4

POLITICAL AND PLANNING INSTRUMENTS

Political and planning instruments concern: aims, directions, principles or ways of acting and also specify the instruments serving the achievement of the established objectives¹. This group includes ecological policy, sustainable development strategy and also programs and plans of usage, protection and shaping of the environment. With reference to every issue the theoretical aspect has been signaled and the existing documents binding in 2010 have been analyzed.

4.1. Ecological policy

4.1.1. Theoretical aspects of ecological policy

In the classical theory of Aristotle's policy, this concept was understood as the capability of governing the state with the aim of achieving common good. Thus, one may assume that ecological policy is a deliberate and purposeful activity of state, local self-governments and business entities in the domain of environment management, i.e. as regards the usage of its resources and amenities, as well as the protection and shaping of ecosystems or chosen biosphere elements. The realization of an ecological policy perceived in this way takes place by means of making the general state policy as well as problem and section policies "more ecological", as well as by means of formulating general aims, principles and directions of acting in the sphere of the environment in a certain period of time.

¹ Political and planning instructions are analyzed also in the subchapter 7.3.1.

The **subject of ecological policy** is the natural environment, and its status is assessed from the point of view of biological, social and economic needs of people. The basic indication of creating ecological policy is ensuring the natural bases of health and good quality of people's lives. However, as J. Śleszyński rightly notices, not everything is protected in the environment, and norms of its protection are adjusted neither to the weakest nor to the most fragile biosphere elements. *In fact, even human population is not protected in the way that takes into consideration the weakest or the most fragile specimen* [Śleszyński, 2000, p. 152]. It is worth emphasizing the rightness of such way of showing ecological policy, since there are other, more radical views about this issue.

Many groups of social ecological movement, particularly those representing the mainstream of the so-called deep ecology, are of the opinion that the subject of ecological policy ought to be any life forms, whereas their destruction is allowed only in order to satisfy the basic human needs [Kielczewski, 2001]. Such approach is undoubtedly noble, however, it is also irrational and unrealistic. Its approval would be synonymous with the necessity to accept the principle of staying away from all forms of people's civilization activity, as well as the recognition of the principle of subjecting all aspects of man's existence to environmental protection. Yet, the majority of society perceive the problems of environmental protection on equal terms with other life objectives and ambitions and simultaneously strive for reconciling them with one another without specifying clearly a certain hierarchy. Undoubtedly, this ought to take place also in the sphere of ecological policy.

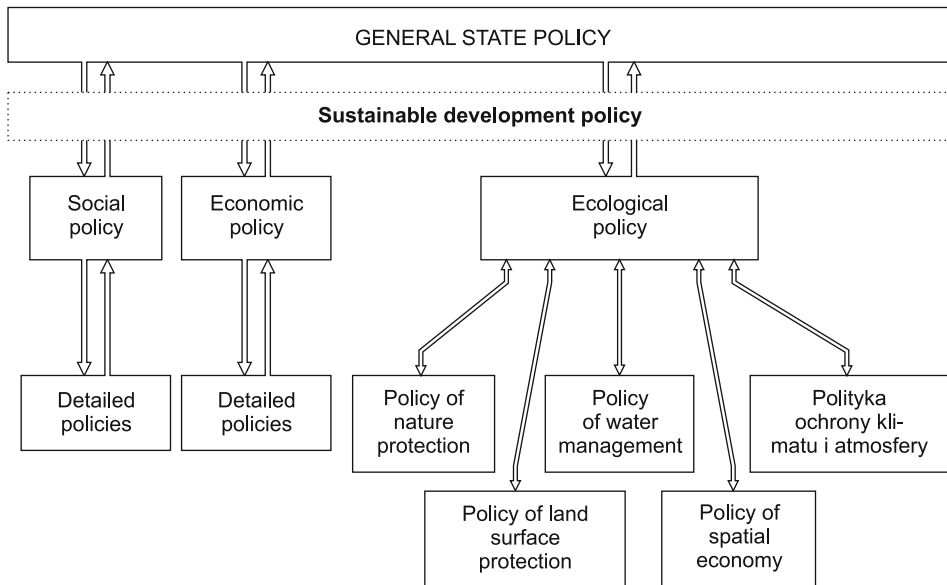
The second, in terms of importance, subject of ecological policy are social needs. Protection of some objects, areas or ecosystems is introduced because they constitute national heritage, place of worship, recreation, scientific research and education or they fulfill other needs. The third most important subject are economic needs. Satisfaction of them must be regulated in the way that does not limit biological and social needs, and at the same time it does not lead to economic stagnation and to limiting growth in the social welfare.

The hierarchical way of perceiving needs in ecological policy is in accordance with the idea of sustainable development and ensues from the fact that many resources, amenities and services of the natural environment have the character of public goods which are widely available and are usually priceless as well. This induces environment users to the excessive exploitation of them, and thus to the destruction of the environment. Therefore, intervention of the state, which is supposed to make the usage of the environment more rational, is indispensable.

Ecological policy is linked with economic and social policy, and harmonization of these policies triggers development of **the policy of sustainable development**. It is the policy that comprises the implementation of changes of civilization character in economic, social and ecological sphere in the direction that

is compatible with the idea of sustainable development. First of all, this policy ought to ensure fulfilling the needs of both present and future generations and preservation of natural and cultural heritage without any detriment to society's civilization and economic growth. It is worth emphasizing that sustainable development is the constitutional standard of the Republic of Poland. The position of sustainable development policy in the general state policy is presented in figure 4.1.

Figure 4.1. The position of sustainable development policy in the general state policy



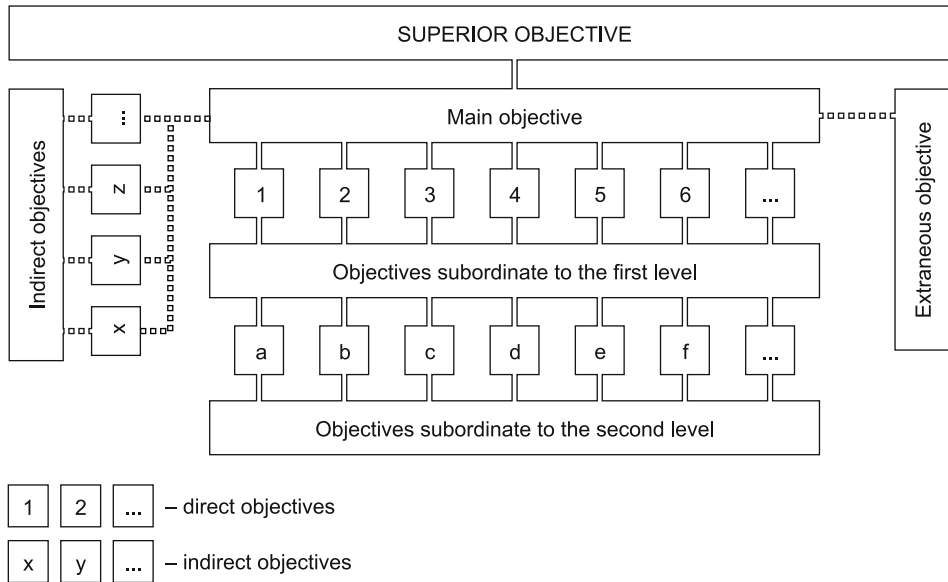
Source: own elaboration.

The way of conducting ecological policy depends on the general conditionings of the state policy. Politics is the game of interests of various social groups, therefore it is dependant on cultural values, habits, fashions and customs accepted by people, as well as on particular material and non-material interests or even emotions. Therefore, it constitutes the reflection of yearnings, ambitions, views and political pressures in the society. Furthermore, politics is conditioned by socio-economic system. Two political systems may be distinguished: liberal and socio-democratic. Liberal ecological policy refers to individual initiative and responsibility in the sphere of environmental protection. It is frequently based on solutions that aim at placing on the market the goods and services of the environment, i.e. at covering it with the system of market prices. Socio-democratic policy preferably puts emphasis on state's responsibility for envi-

ronmental protection and its standards as well as on linking ecological policy with economic and social policy.

Ecological policy ought to be efficient, effective and fair. Efficient ecological policy is such policy that solves the problems linked with environment management. However, the achievement of objectives of this policy ought to be considered in the light of indispensable outlays and expected (assumed) effects. Fairness of ecological policy lies in loading with the costs of environment preservation those entities that obtain benefits or those that contribute to its pollution. There may be some discrepancies between these principles, therefore in practice it is very difficult to elaborate a model of equitable ecological policy. There appears a view that fair policy may be associated with a socially accepted policy.

Figure 4.2. Structure of objectives in ecological policy



Source: *ibid.* figure 4.1.

Every policy has particular objectives and sets both principles and instruments of realization. **Objectives of ecological policy** constitute the problem of theoretical and practical character. In literature it is emphasized that the purpose of every policy may be expressed only by using a bundle of objectives which are contingent on each other in a direct and indirect way. A bunch of objectives is opened by a superior objective (figure 4.2.). It defines a far-reaching view that will be put into practice by a policy. The main objective stems from a cho-

sen strategy, defines the way of reaching the superior objective. This strategy is “partitioned” into minute objectives which comprise ordered objectives of first, second and alternatively other levels of hierarchical arrangement in relation to the main objective as well as indirect and extraneous objectives that are directly connected with the main objective.

Principles of ecological policy define the way in which it is shaped and implemented. They are dependant on many conditionings, *inter alia*, on the character of the general policy of the state, the state of the natural environment, degree of development and state of economy, public moods, international commitments. Three groups of such principles may be distinguished:

- defining the character of ecological policy (e.g.: efficiency, objectivity, impartiality etc.);
- defining the relations between ecological policy and also economic, social and international policy;
- directing the instruments of realizing ecological policy.

The principles of ecological policy were elaborated by the Organization for Economic Co-operation and Development (OECD) and by the European Union, and also resulted from practice of many countries, including Poland. In the first decade of the 21st century the following principles of ecological policy have been exposed:

1. **The principle of sustainable development** with particular focus on equal treatment of social, economic and ecological arguments, which means the necessity to treat ecological policy as one of the basic problem policies of state on equal terms with economic and social policy.
2. **The principle of integrating** ecological policy with sector policies, which indicates the necessity of taking into consideration ecological objectives on a par with economic and social objectives.
3. **The principle of equal access to the environment**, which is treated in the following categories: intergenerational justice, interregional justice and justice within a group, balancing of chances between man and nature.
4. **The principle of regionalization** which is understood as: regionalization of general state instruments of ecological policy, acknowledgement of the right of local self-governments to define regional ecological requirements to business entities, coordination of regional policy with the regional policy in Europe.
5. **The principle of socialization** of ecological policy means creating institutional, legal and material conditions for the participation of citizens, social groups and non-governmental organizations in the process of shaping the model of sustainable development.
6. **The principle “Polluter pays”** means that the entity using the environment is financially responsible for complying with the requirements in terms of

its protection and for the damages resulting from its activity, irrespective of whether its activity is lawful or not.

7. **The principle of prevention** means compliance with the following hierarchy of protective actions: preventing the creation of pollutions and other nuisances; recycling, i.e. closing the circulation of materials and raw materials, retrieval of energy, water and raw materials from sewage and waste as well as economic usage of waste instead of storing them; “end-of-pipe” protection with the implementation of *integrated approach* to limit and eliminate waste and other hazards.
8. **The principle of foresight** implies that the implementation of new solutions, especially in the domain of biotechnology and modified organisms, ought to be done only under the condition that there is scientifically proved certainty that their implementation (usage) yields results.
9. **The principle of using the best available, economically justified techniques and technologies** means that ecological burden of technologies is the chief aspect of its assessment.
10. **The principle of subsidiarity** indicates placing the competences and decision powers concerning environmental protection at such level of management (province, district, community) that will ensure efficient and effective way of making decisions.

Instruments of management (measures and tools) ought to enable the achievement of specified objectives and provide compatibility of ecological policy with economic and social policy.

In ecological policy one can isolate several detailed policies. These are: the policy of nature protection and preservation of bio-diversity, policy of climate and atmosphere protection, water management policy, policy of land surface protection (these three policies combined with each other are termed as environmental protection policy) and spatial management policy (spatial policy).

The policy of nature protection dates back to 1926. The State Council for Nature Preservation (PROP) elaborated the assumptions of conservational protection of nature. In reality, these assumptions had the character of nature protection policy although they did not have such name. They were realized over many decades despite the radical change of borders and socio-economic system of state after WW II. On the basis of these assumptions two acts on nature protection were elaborated, on 10 March 1934 and on 10 December 1949, the latter of which was in force for more than 40 years. In Poland there was created one of the first in the world coherent ideas of conservational environmental protection which comprised protection in terms of national parks, nature reserves, nature monuments and protected species. In the 1980s and 1990s this concept was supplemented with such forms as: landscape parks, areas of protected landscape, ecological grounds, documentation positions as well as natural and landscape groups.

At the turn of the 20th and 21st centuries the policy of environmental protection was reinforced thanks to the concept of preserving biological bio-diversity, which comprises not only wild species, types and races but also the domesticated ones. Owing to that a map of nature mainstay was made in the 1990s, i.e. the map that depicted places in which not less than 1% of European population of particular species live or one among 100 biggest places of appearance of species or habitats in Europe, or one of five most important positions of species or habitats in the region. From 2004 to 2009 areas of special protection of birds and areas of special protection of habitats were set within the framework of the European Ecological Network “Natura 2000”. In 2003, the Polish government approved of the document “State strategy of protection and sustainable usage of biological diversity” (amended in 2007). The superior aim of programmed activities was to preserve the richness of biological diversity on a local, national and global scale at all levels of nature organization: of genes, species, ecosystems and landscapes.

Water management policy emerged in the period between two world wars on the basis of practical activities related to water management that were made already in particular annexed territories. In the Polish People’s Republic till the late 1970s water management was one of the specific policies of the state. In the 1980s it was included in the environment protection policy. In the first years of this century another isolation of water management policy took place. The National Water Management Authority was established as an autonomous administration unit supervised by the Minister for the Environment. Regional Water Management Boards were made independent from regional and local administration and they are gradually becoming managers of water in catchments.

The policy of environmental protection constituted another mainstream of the contemporary ecological state policy. According to J. Śleszyński environmental protection policy is the form of a socially organized action which leads to reaching the objectives connected with the protection of natural environment elements (water, air, land surface and climate) through the accomplishment of logically ordered undertakings, the scale and extent of which depend on the available means and technical possibilities of realization [Śleszyński, 2000]. Environmental protection policy arose from economic policy, unlike nature protection policy and water management policy which shaped by themselves. For a longer period of time environment protection has been perceived as one of the elements of economic policy. In the 1970s functioned the concept “economic policy in the domain of environmental protection”.

In the 1980s environmental protection policy evolved in parallel with the policy of nature protection and spatial policy. The following institutions began their involvement in it: state organs – Parliament, Supreme Control Chamber, ministries; provinces, communities and state business entities. Courts started to adjudicate in criminal cases, civil suits (compensation and nugatory cases).

In the first years of this century two detailed policies emerged in the sphere of environmental protection policy: policy of atmosphere and climate protection and the policy of land protection. The former concentrates on the purity of atmospheric air, protection of ozone layer of atmosphere and counteracting of anthropogenic emission of greenhouse gases. Presently, land protection policy is the collection of actions, similar to the environmental protection policy beforehand. It comprises: geological diagnosis of the country and usage of minerals, protection of farming and forest lands, waste management. Waste management was entirely subordinated to the Minister of Environment as late as in 2009, however, there are still difficulties with the realization of it owing to different interests of units supervised by other ministers. In 2010 there is still no uniform policy of waste management in Poland.

The problem of protection of soils is handled also by the Ministry of Agriculture and Rural Development. Various actions are taken and specific tasks were specified in state ecological policy, yet at the present stage there are no bases for forming such detailed policy.

Spatial management policy dates back to the first years when Poland gained independence. It appeared in the 1920s, firstly in the sense of architectural management of landscape and then it comprised the issues of economic and non-economic usage of land area. In Poland spatial economy is not the responsibility of the Minister of Environment. It is the task of the Minister of Regional Development. The assumptions of spatial policy, which were adopted in 1997, do not correspond with the present reality. There has been still a heated debate concerning the new concept of spatial management of state, but there is no consensus or political standpoint of authorities.

Each problem-related and detailed policy can be either reactive or preventive. Bogusław Fiedor [2002, p. 256-257] describes these characteristics in the following way:

- reactive ecological policy is understood as the realization of undertakings the main aim of which is to eliminate or minimize the pollutions and waste created in the processes of production and consumption and also to reduce ecological burden of the already existing pollutions and waste;
- preventive ecological policy implies stimulating in economy the shift from the so-called dirty technologies to clean technologies which are characteristic for a relatively low level of pollutions.

In Poland over the last two decades ecological policy slowly evolved from reactive into the preventive one. This process has not finished yet.

4.1.2. State ecological policy

The first Polish document entitled *State Ecological Policy* was elaborated and approved of in 1990 when new authorities faced the urgent need to solve

difficult environmental problems of state as well as noticed the necessity to adjust environmental policy to market realities and to base it on the principle of sustainable development. In this document it was clearly stated that the obligation of environment protection constitutes an element of proper administration and is required by legal regulations. Every regulation that refers to the usage of the environment and its protection applies to all economic entities in the *equal* degree and must be strictly obeyed, with no deviations or exceptions. In the then Polish reality these statements were almost revolutionary.

The document *State Ecological Policy* played a crucial stimulating role in relation to all state structures in their pro-environmental activities. It largely contributed to raising ecological awareness of the society. Furthermore, the expenditures on environmental protection investments increased. In Poland in 1988 they amounted to \$ 0.5 bn, in 1991 \$ 0.8 bn, whereas in 1998 as much as \$ 2.8 bn (1.6% GNP). Legal and economic mechanisms of ecological policy were implemented systematically.

All this contributed to the fact that the pressure on the environment significantly decreased and its parameters improved. Among others things, during the period 1990-2000 the emission of dust into air decreased by 75%, the emission of sulfur compounds – by 53%, whereas the emission of nitrogen compounds decreased by 35%. As a result, air pollution decreased, particularly in industrial areas. The amount of non-treated sewage drained off to rivers dropped by more than 77%, which improved the quality of river waters, especially from the point of view of physical-chemical indicators. During the analyzed period, the area of protected lands increased, area of landscape parks rose twice, whereas the area of national parks and nature reserves increased more than 1.8 times. The improvement of the state of the environment in Poland became the fact that had impact both on the improvement of social moods and on the improvement of administration effectiveness.

While creating a document named *Second Ecological Policy of the State* for the years 2001-2010 the following initial assumptions (a set of ecological policy objectives) were made:

1. Environmental protection is the obligation of citizens and public authorities which, through their policy, ought to provide ecological safety to the present and future generations.
2. Man is of superior value in the state policy. It means that health of society considered as a whole, comfort of the environment in which local communities live and work as well as life and health of every citizen constitute the principal and undeniable criterion in the accomplishment of ecological policy at every level: in the living and working place, at a local, regional and national level.
3. Man and man's activity are closely linked with the natural system. Preserving balance in this system requires consistent and combined management of

access to environment resources as well as the elimination and prevention from creating negative for the environment effects of economic activity, as well as rational usage of natural resources.

4. Ecological safety of society and economy requires not only the introduction of protective measures against hazardous impact on the environment that is made by business activity run in Poland and abroad, but also providing appropriate available water reserves, preserving farming production area, increasing forestation of the country and increasing the size of protected areas;
5. Poland preserved substantial areas of large biological diversity, relatively favorable population state of various species, their races, types and forms existing on open habitats – in forests and also on farming and waste lands.

The primary objective of the State Second Ecological Policy was to provide ecological safety of Polish society in the 21st century. **The main objective**, on the other hand, is the efficient regulation and control of using the environment as not to pose hazard to quality and durability of natural resources. It was indicated that it requires initiation and accomplishment of many tasks of strategic character such as:

- shaping of macroeconomic policies so that they are conducive to the implementation of sustainable development principles;
- adjusting sector policies to the principle of sustainable management and protection of natural resources and also implementation of pro-ecological production patterns;
- limiting pressure of consumption on the environment by shaping of its pro-ecological patterns and pro-ecological system of values in accordance with the principle of sustainable development;
- improvement of the environment quality in all elements (air, water, soil, ecosystems, species and their natural habitats, climate, landscape) and in all country regions;
- increase in biological diversity, improvement of conditions in which ecosystems function, making forests natural anew, water drains and water-marshy areas, increase in esthetic landscape amenities and esthetics of man's closest surrounding in the place of abode;
- providing society with the access to information about the environment, possibility of taking part in the decision-making and court procedures in cases concerning the environment.

The essential strategic task of *State Second Ecological Policy* was to provide compatibility of this policy with the directions and range of activities approved in ecological policy of the European Union.

In 2001, the new act was adopted: environmental protection law². This act introduced the principle of temporary elaboration of an ecological policy inter-related with the Sejm term of office. It ought to be elaborated by the government and approved of by Sejm at the beginning of the term of office for four years with the perspective of projecting tasks for the following four years. The act implies that ecological policy aims at creating conditions that are indispensable for the realization of environmental protection (art. 13) and ought to specify in detail: ecological objectives, ecological priorities, levels of long-term objectives, type and schedule of pro-ecological activities, indispensable means for the realization of objectives, including legal and economic mechanisms and financial measures (art. 14). In this legal state the role of state ecological policy was reduced to performing the function of general guidelines in the sphere of usage and protection of the environment for the first decade of the 21st century.

Presently,³ the binding document approved of by the Sejm is *State ecological policy during the period 2009-2012 with the prospect till 2016*. In this document seven courses of system actions were accepted:

1. Taking into consideration the principles of environmental protection in sector strategies. As an urgent task was considered the improvement of the methodology of making assessments of influence on the environment for strategic documents, creators of these documents and assessing people.
2. Activation of market for environmental protection, activating of such legal, economic and educational mechanisms that would lead to the development of pro-ecological production of goods and to shaping of conscious attitudes of consumers in accordance with the principle of sustainable development. These actions ought to comprise complete internalization of the external costs related to the pressure on the environment.
3. Environment management, and in particular, popularization of environment management systems within companies. Among the tasks leading to the achievement of the aim the following ones are mentioned: popularizing among society the EMAS sign⁴, ISO 14001⁵ and CP (Clean Production) norms as the marks of environmental quality of a company; raising the prestige of a public institution having the certificate of environment management; introducing promotion (additional points) of “green orders”.
4. Participation of society in actions for environmental protection. The main aim of this action is to raise the ecological awareness of the society, in ac-

² Act of April 27, 2001 – Environmental Protection Law (uniform text, Dz.U. of 2008, No. 25, par. 150).

³ In 2012.

⁴ Voluntary system of audit and environment management within a company or an office within the frameworks of the European System of Eco-Management and Audit (compare with subchapter 3.1.).

⁵ ISO 14001 norm “Environment Management”

cordance with the principle “think globally, act locally”. Shaping of ecological awareness ought to be directed at raising pro-ecological consumer behaviors, pro-ecological habits and responsibility for the state of the environment. The achievement of this aim requires, among other things, improvement of the methods of making accessible information about the environment and its protection, development of ecological education in schools (among teachers, children, teenagers), promotion of pro-ecological labeling.

5. Development of research and technological advancement, improvement of the role of Polish research institutes in the implementation of ecological innovations in industry and in the production of environment-friendly products as well as the improvement of environment monitoring system.
6. Responsibility for the losses in the environment, creation of the preventive system of counteracting losses in the environment and of executing the realization of the obligation to repair a damage.
7. Reinforcement of the rank of spatial planning by means of: implementing, in spatial management plans, methodical methods of using ecological and physiographic elaborations and prognoses of influence on the environment; implementing the assessment of influence on the environment, study of conditions and directions of spatial management; elaborating the plans of protecting Natura 2000 areas; implementing the concepts of ecological corridors; releasing from building in the areas threatened by floods.

In the policy there were mentioned also actions that refer to particular domains (spheres) of the environment. In each of them specific tasks were presented for realization, for example:

- as regards nature protection – elaboration of the National Strategy of Managing Innovative Extraneous Species and of the National Strategy of Protecting Large Predators;
- as regards the protection and sustainable development of forests – elaboration of the national program of increasing forestation level, increase in the retention capability of forests;
- as regards the rational management of water resources – gradual introduction of payments for using water resources depending on the influence of water intake or of another way of using water on the environment; marking out flooding areas; modernization of melioration systems;
- as regards the protection of land surface – counteracting of anthropogenic degradation of farming lands, meadows and also water and marshy areas; elaboration of the national strategy of soil protection;
- as regards the management of geological resources – reinforcement of the protection of unmanaged deposits of minerals in spatial planning; increase in the state of documented deposits of energetic raw materials;
- as regards the quality of atmospheric air – solving (till 2016) of the problem of reducing emissions from large sources of energy, especially as regards

the emission of small dust with the granulation of 10 µm and 2.5 µm; eliminating (till 2016) of the emission of substances destroying the ozone layer, initiating actions related to the gasification of carbon;

- as regards water protection – ensuring (till 2016) 75% reduction in the total loading of phosphore and nitrogen in municipal sewage; completing (till 2013) the construction or modernization of sewage plants with increased elimination of biogenes for all towns that are bigger than 15 000 PE⁶;
- as regards waste management – increasing the recovery of energy from waste, closing waste heaps that do not meet standards; elimination of transferring to waste heaps used electrical and electronic equipment as well as used batteries and accumulators; completion of the organization of the national system of collecting and dismantling car wrecks; ensuring selective collection of municipal waste;
- as regards the influence of noise and electromagnetic fields – preparation of reliable assessment of the exposure of society to above-average noise and elimination of “hot spots” of the influence of noise and electromagnetic fields;
- as regards chemical substances in the environment – creation of an effective system of supervision of chemical substances admitted on the market.

The realization of tasks specified in *State ecological policy during the period 2009-2012 with the perspective till 2016* will require the outlays of PLN 66.2 bn (based on prices from 2007), including the outlays on water protection – PLN 36.1 bn, protection of atmospheric air – PLN 19.3 bn, waste management – PLN 6.7 bn, and other actions – PLN 4.1 bn. It is assumed that these outlays will be made using private funds in 43%, whereas the others will come from public funds, including the funds of self-government units: 11%, funds of ecological funds: 21%, state budget: 5% and means from abroad, mainly from the European Union: 20%.

4.1.3. Ecological policy of the European Union

Ecological policy, or more precisely the policy in the sphere of environment, in terms of realization activities, was initiated in the European Union in 1972, whereas in terms of legal provisions as late as in 1987. In the Uniform European Act the chapter “Natural Environment” was added. Further extension of legislative, executive, regulating and controlling competences of the Union in the domain of administrating the environment took place in the European Union Treaty (Maastricht treaty) in February 1992.

⁶ The shortened form denotes population equivalent.

Ecological objectives, the accomplishment of which European Union is striving for, refer to the widely understood ecological aspects of administration process, and also to the category of sustainable and durable development. Therefore, the primary objective of Union's ecological policy is to provide, in a long run, such economic growth and durable improvement of the living standard (consumption of goods, services, both material and non-material ones) that will not lead to the deterioration of environment status and will ensure access to its resources and amenities (esthetic, psychological, cultural, recreational) for the future generations. Justification to solving economic, environmental and social aspects in a concurrent way is the possibility of achieving the synergy effect. They mostly complement one another, bringing effect of double benefit, economic and ecological aspects.

Programs of environmental actions served the accomplishment of the objective understood in this way. These programs not only defined the principles and objectives of the present ecological policy, but also played the role of "the catalyst" of organizational activity and legislative activity of the Community (union) in the sphere of environment management. So far there have been realized six programs. The next program of actions concerns the period 2012-2020 (when this publication was being written it was in the stage of making settlements). Each of these programs had a specific aim and tasks for realization. The main assumptions of the programs were illustrated in table 4.1.

In the Sixth Program of Actions "Environment 2010: Our Future, Our Choice" it was stated that sustainable development may not be reached only through an ecological policy. Thus the Program represents merely environmental dimension of a wider strategy for Union's sustainable development. It is an instrument which helps to provide pro-ecological direction of other problem-related and sector policy [Szósty ..., 2000] and also an important, but not the only document that ought to be taken into consideration while forming the tasks and objectives of Polish ecological policy. Very important bequests are also in other documents.

1. Accession Treaty which implies that after 2015 the Republic of Poland ought to be a country that meets all standards of environmental protection that are binding in EU member states.
2. Package of climate and energy decisions of the European Union.
3. Amended directive concerning the range of industrial emissions the so-called new IPPC.
4. Directive establishing the frameworks of EU action in the sphere of water management (framework water directive) and the directive establishing frameworks of EU actions in the sphere of the sea environment.
5. Package of EU directives concerning waste management.

Table 4.1. Programs of Environmental Actions of European Union

PROGRAM	Priority actions
1972-1975 First Program of Environmental Actions	<ul style="list-style-type: none"> • Forming the strategy of pollutants' control, specifying the basic principles of the common policy of environment protection • Initiating works on community standards and other environmental regulations
1976-1981 Second Program of Environmental Actions	<ul style="list-style-type: none"> • Determining priorities with reference to particular areas of environment protection policy and other fields of economy, especially the protection of surface waters and atmospheric air • Emphasizing importance of structural and technological changes in economy as a method of reaching ecological objectives
1982-1986 Third Program of Environmental Actions	<ul style="list-style-type: none"> • Defining priorities and methods of accomplishing preventive actions in the sphere of water and air and protection from noise and vibration • Regulating economy of waste and hazardous chemicals • Development of environmental protection technology <p>Availability of environmental resources for future generations</p>
1987-1992 Fourth Program of Environmental Actions	<ul style="list-style-type: none"> • Reinforcing direct regulation (legal-administrative) • Using economic instruments (taxes, charges, ecological insurances, subsidies and public subventions) • Development of information and monitoring systems (CORINE) connected with the present emission of pollutants and their concentration as well as environmental protection costs • Elaborating new, more restrictive standards of emission/ambient circulation for particular components of the environment • Elaborating assessments principles and procedures of the way investments affect the environment, initiating works on "ecological inspections" and other normative and non-normative methods of ecologization of companies management • Improvement of access that public opinion has to information about environment status and its hazards • Prevention of hazards creation was considered as a priority action
1993-2000 Fifth Program of Environmental Actions 'To Sustainable Development'	<ul style="list-style-type: none"> • Sustainable administration of such natural resources as: water, air, areas saved in their natural state, coastal zones, natural resources • Integrated control of pollutants and prevention of waste creation • Improvement of environment quality in urbanized (municipal) areas • Reduction in use of energy from non-renewable sources
2001-2010 Sixth Program of Environmental Actions "Environ- ment 2010: Our Future, Our Choice"	<ul style="list-style-type: none"> • Counteracting of changes in the climate • Counteracting excessive usage of renewable and non-renewable resources • Preservation of biological diversity • Reduction in production, usage and exploitation of solid toxic chemicals accumulated in the environment

Source: own elaboration.

European Environmental Agency is involved in monitoring the way the programs of environmental actions are accomplished (compare also with the subchapter 3.2.2.). Its objective is to coordinate, and especially to investigate,

the effects of Union actions in the sphere of environmental protection, mainly monitoring of its state, as well as organizational facilitation of co-operation with third countries in terms of solving environmental problems of continental and global character.

Adjustment of Polish regulations to the European Union's regulations took place when the ecological policy of the Union belonged to the most dynamically developing range of their operation. After Poland joined the European Union in 2004 it was necessary not only to eliminate failures but also to implement new directives (e.g. to issue integrated permits for the emission of pollutions from industrial installations, introduced by the force of IPPC directive). An essential problem were and still are the high costs of adjustment, which ensue from: replacement of out-of-date technologies with new, more pro-ecological ones; equipment of the existing factories with the devices that protect the environment; sanitary infrastructure of towns and villages (sewage system, sewage plants, collection and storing of waste).

The adjustment of the Polish law to the regulations of the European Union demonstrated difference in the quality of environmental conditions of Polish society's life in relation to other countries in Europe. In Poland it is impossible to create new backlogs in environmental protection because this country will be still perceived as underdeveloped. All developed countries take care of their environment, Poland as a member of the European Union must do that as well. Production companies need to adjust to union standards in terms of environmental protection because after the completion of transient periods they may be accused of *eco-dumping* and lose their good image and markets. At the same time, companies may not be loaded with environmental protection costs to such an extent that it will deteriorate their competition capacity on homogenous European market. Municipalities must solve the problem of sanitary equipment of towns and villages for the sake of living standard of inhabitants and also under the pressure from the external surrounding, e.g. tourists.

4.2. Strategy of sustainable development

The viability of an ecological policy depends not only on the correctness of the adopted principles, guidelines, objectives and instruments of their realization, but also on their compatibility with the long-term strategy of sustainable development. This document indicates the target state (vision) of programmed object, formulates strategic development objectives and the way of achieving them, i.e. it forms the path of reaching the objective.

In the Polish planning system the strategy of sustainable development is a voluntary document, however, without this document it is difficult to elaborate good tactical programs and realization plans required by law. The choice of

a strategic way of local entity's development takes place on the basis of the analysis of the existing reality. SWOT analysis is used while defining strong and weak points of an entity as well as its assets and threats. The diagnosis of the existing state enables identification of strategic development problems, formulation of mission and vision as well as specification of strategic development objectives.

Mission is the superior development objective. It ought to provide an answer to two questions:

1. Why does the entity exist? The answer may not be formal, resulting from statute, however, it must be related to a specific reality.
2. What is the main task, primary objective of the entity's functioning? Chosen strategic development objectives ought to serve the accomplishment of this objective.

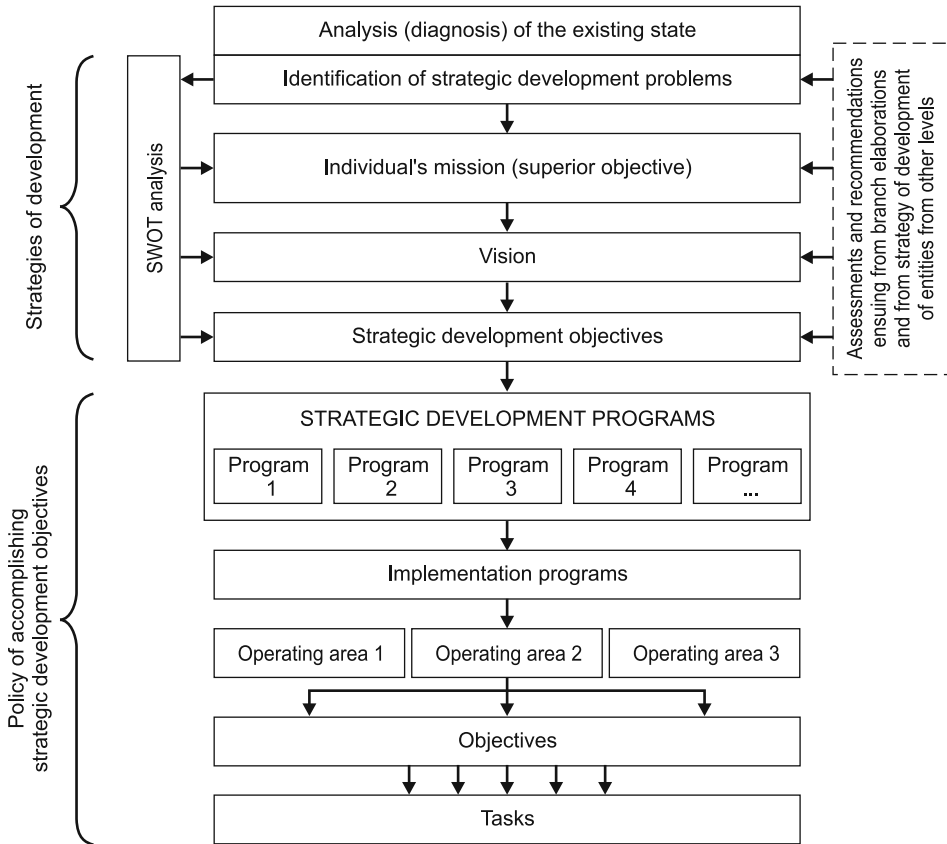
Vision enables forming answer to the question: Where are we going and what are we planning to achieve? The vision should include description of the entity in the desired period, the present state of economy, society and environment, which ought to be achieved by the specific choice of a development path.

Strategic development objectives include selection of the way in which target state and entity's mission are achieved. A characteristic feature of the proper choice of strategic objectives is ensuring balance and sustainability of development in the arrangement of spheres and between them. The realization of development objectives should provide economic growth, well-being of community and improvement – or at least not deterioration – of the state of the natural environment in a local entity. In municipalities and districts there is a tendency to form a large number of development objectives. It is denying of the essence of strategic programming – there may be only several strategic development objectives. Yet, they must be chosen in the way that their accomplishment will become the driving force of sustainable development for the whole organizational unit.

The functioning and development of each local entity ought to be perceived as the process of continuous growth of society's living standard. Economy, society and environment of a certain area are constantly developing and changing, as the consequence of which also the living standard undergoes change. Therefore, it is crucial to understand the relations between various factors of sustainable development and their changeability in time. It will make it possible to pinpoint directions and frameworks for the development of particular fields and also to show the possibilities of solving detailed problems.

The strategy of sustainable development may neither replace nor double specialist programs and sector or problem policy. The basic elements of strategy building and their position in long-term program of sustainable development of local entity are demonstrated in figure 4.3.

Figure 4.3. Elements of long-term program of sustainable development of local entity



Source: *ibid.* figure 4.1.

Long-term strategies of sustainable development of state and territorial units in Poland were elaborated for the first time at the turn of the 20th and 21st centuries, mainly in 2000. In the creation of state ecological policy a leading role is played by the document *Polska 2025. Long-term strategy of stable and sustainable development* [2000]. It was prepared by the then Governmental Centre of Strategic Studies⁷.

In the aforementioned document it was assumed that the main aim of state policy ought to be ensuring better well-being of Polish families and the sense of safety. The concept “well-being” was meant as the satisfaction of material needs

⁷ In cooperation with the Ministry of Environment and with the aid of a large group of experts.

and life in the healthy environment which is both shaped and created by man. There was adopted also broad interpretation of the term “safety”, which was understood as social, health-related, territorial (internal and external) safety, but also as universal ecological safety, i.e. *such stimulation of development processes that they pose hazard to the environment to the smallest degree* [Polska..., 2000, p. 7]. Safety was perceived as the realization of the principle of social fairness: intragenerational, which means that the reduction in the areas of poverty and counteracting of social marginalization in material, educational and both information and informatics sense; intergenerational, which means (...) *rational usage of material resources and preservation of them in a good state that enables to achieve in the future economic growth that will be compliant with the aspirations and needs of future generations* [Ibidem].

As correlative objectives were perceived: reduction in the distance between the development of Poland and of highly developed countries, development of knowledge-based economy, environmental protection, protection of cultural heritage. In the sphere of environment quality and rational usage of resources there were set long-term objectives that can be quantified by using such meters as:

- degree of reducing the difference between actual environment pollution perceived as the concentration of pollutions in air, water, soil and the scientifically justified admissible pollution;
- amount of used energy, materials, raw materials and water and also the amount of produced waste and emitted pollutions per the amount of production and per unit of national income;
- relation of costs to the obtained ecological effects as the indicator of the assessment of investment programs and projects in environmental protection and non-material social benefits obtained as the result of the improvement of the state of the environment;
- technical and ecological characteristics of materials, devices and products.

In the document *Polska 2025. Long-term strategy of stable and sustainable development* it was stated that ecological policy ought to aim at social policy and serve raising life quality of the entire society. It is indispensable to integrate environmental protection with management and functioning of economic sectors using legal and economic mechanisms.

In the sphere “environment management” of importance are policy objectives specific for particular spheres of protective actions:

- in waste management – prevention of their production, solving of the problem of waste “at its source” and retrieval of raw materials (recycling), reduction in the absorbency of production in terms of materials and energy;
- in water protection – ensuring sewage treatment in every housing estate with more than 2000PE, and in other areas, the usage of individual sewage plants; increase in the retention of waters;

- in air protection – reduction in the emission of air pollutions and greenhouse gases per production unit and GDP;
- as regards chemical and biological safety – introduction of the system of full control of environment hazards related to the production, transformation, distribution, storage and usage of chemicals and genetically modified organisms;
- as regards extraordinary environmental hazards – improvement and reconstruction of the existing system of monitoring and warning population and of the rescue system;
- as regards the protection and maintenance of the desired biological diversity – implementation of pro-ecological methods and good practices of management in various economic sectors;
- in forestry management – identical treatment of three main functions of forests: ecological (protective), productive and social [*Polska...*, 2000].

The present ecological policy to a considerable degree realizes strategic aims in this area that were adopted for the first quarter of the 21st century. Parallel to the government strategy, in 2002 the document entitled *Strategy of Poland development till 2020* was formed. *Synthesis*, which was elaborated by “Poland 2000 Plus” by the Forecast Committee at the Presidium of the Polish Academy of Sciences. For the creation of it the selected method was the discussion involving committee experts representing various domains of science. In methodological aspect this is not a typical strategy, but rather a study which cannot be compared with governmental elaboration nor does it double it. The document draws attention to (...) *the increase in environmental hazards – climate warming, weather anomalies, worsening of water balance* [*Strategia...*, 2000, p. 18] but as solution of them was perceived the realization of such priorities as:

- maintenance of the high rate of economic growth higher than the rate of development of developed countries, especially members of the European Union;
- modernization and thorough reconstruction of the structure of economy towards knowledge-based economy;
- modernization of education system, adjustment to the needs of knowledge-based economy, i.e. improvement of the quality of qualifications, teaching of creativity and initiative;
- increase in the role of science and research background [*Strategia...*, 2000].

In 2006 the document *National strategic framework of reference 2007-2013* [2006] was elaborated for the needs of programming usage of means of the European Union. During the analysis of the state of the environment in 2006 there were indicated the following problems that require solution: insufficient number of retention reservoirs, worsening state of anti-flood bulwarks and housing of flooded areas; lack of effective system of selective collection of mu-

nicipal waste; high emission of air pollutions by professional energy system; increasing pressure of chemical pollution of soils.

The results of the National Foresight Program “Poland 2020” [2008] were published in 2008. The program aims at the specification of priority directions of scientific research and development works as well as implementations and innovations during the period 2008-2020. In the research domain “sustainable development” such problems were indicated as: life quality, sources and usage of energy resources, technologies for environmental protection, new materials and technologies, transport and integration of ecological policy with sector policies, product policy and sustainable development of regions and areas.

Despite the fact that the analyzed documents were elaborated by autonomous groups using various research methods, the conclusions concerning the main directions of development are surprisingly concurrent. Even though the government document *Polska 2025. Long-term strategy of stable and sustainable development* has complete ecological, social and economic dimension, in economic and social aspect it is concurrent with the document of the Forecast Committee of PAN, and in the aspect of research directions it is concurrent with the diagnosis of “Polska 2020”. These documents give rise to the vision of external conditionings of the functioning of environment management system in Poland, including the conditionings and priorities of temporary state ecological policy and program (planning) tasks.

4.3. Programming and planning

Programming and planning are vital elements of management process. Actions related to the natural environment must be planned properly. Each of the elements of the environment must be used by man in various spheres of acting, however, management in one sphere is not always favorable to other spheres. In general, **programming** lies in designing the most desirable events and system states from the point of view of future situation characterized by the objectives of ecological policy, whereas **planning** is linked with dividing objectives into tasks and with elaborating organizational-financial schedules of their realization.

Programs and plans of management, protection and shaping of the environment may be one of the elements in socio-economic planning or autonomous pro-ecological planning. In the programs of socio-economic character environmental protection problems may be presented in an integrated way and directly result from the approved solutions, or may be isolated as a separate problem comprised by programming. Such programs demonstrate how the general policy of state, including ecological policy, will be realized. Autonomous program-

ming simplifies ‘placing’ of management instruments, whereas planning – the realization of protective tasks.

Autonomous pro-ecological planning may have either indicative or directive character. Indicative programming and planning are concentrated on demonstrating the stages of reaching certain objectives of ecological policy. The subjects of their interest are the institutions and offices of environment management system, from the entities that are subordinate to the Minister of Environment to a municipal self-government. The subject of planning of directive character are concrete tasks, e.g. plan of protection of nature reserve or plan of certain investment enterprises. The subject of this type of planning ought to be mainly the entities of implementation type, e.g. boards or head offices of entities functioning in the sphere of environmental protection.

Programming and (or) planning may be applicable to various spheres and various stages of environment management process. Programming (planning) at every stage has autonomous character, however, programs and plans of organs or offices of higher level ought to provide information that is indispensable for pro-ecological planning in entities at lower levels, especially in communities and companies.

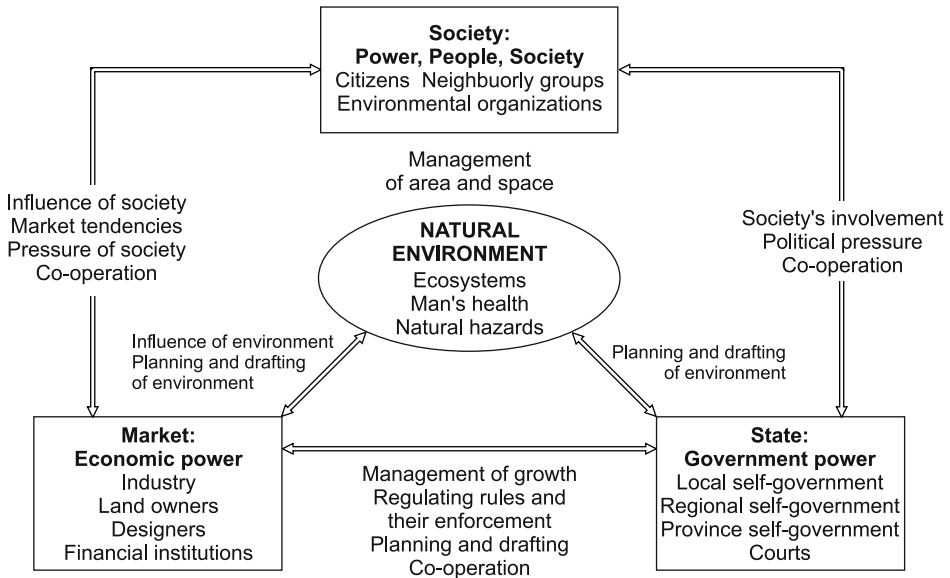
Programming is a complex process participated by:

- society, represented by self-government units, social organizations and particularly groups of interested people;
- entities operating on the market (companies, designers, financial institutions);
- state: Parliament, local self-governments, courts.

Mutual dependence was presented in figure 4.4. Borys T. [2003] calls it inter-sector partnership. In the programming process it fulfills many essential tasks, among other things, it enables: reaching social consensus for planning assumptions and acceptance of the program by all participants, involvement of programming process participants in program realization, improvement of communication between them.

The relations between participants of the process may be either horizontal or vertical. Horizontal relations concern participants of particular local territory, e.g. various entities functioning in municipality, whereas vertical relations – taking into consideration of the interests of a smaller entity, e.g. municipality, in development program of a district or province, and the other way round, of a larger entity in the program of a local entity.

Content, program range and techniques of preparing them may vary. They depend on the entity’s character, the issues comprised by planning and on the importance of a document. Programs may be of general type, when they concern development of entity, local or economic one, and of problem type, e.g. environmental protection.

Figure 4.4. Participants and dependencies in environment planning and management

Source: [Randolph, 2004].

With respect to document's importance, the following programs can be distinguished:

- of decision-making character, approved by legislative organs; they constitute the basis for current internal activities and external co-operation; they are part of the system of managing entity or problem, e.g. usage or protection of the environment;
- of supplementary character – for the most part they are prepared in an optional way, demonstrate conditionings and limitations of development, they are helpful while elaborating projects of various decisions, from annual development and budget plan to business plans of specific enterprises; they are the elements of current management;
- voluntary – recommended by various national and union institutions (e.g. banks, aid programs), they may also be of decision-making or assistance character;
- obligatory (compulsory) – programs required by Polish law and international obligations, they have decision-making character.

Presently, integrated programming constitutes a real challenge. It may comprise the following programs: of general and problem type, strategic and tactical, concerning decision and assistance. Integration of strategic, tactical and operational activities is of particular importance. It would be ideal to elaborate a strategy of community's development for the period of 10 years, with tactical

programs of problem type for the period of 3-5 years, annually partitioned into operational plans and realization projects as its element. Integration of plans related to economic, environmental and social aspects ensures shaping of sustainable development and possibility of obtaining synergy effect, i.e. that gives the effect of a double, or even triple benefit.

In local entities the following documents of program-decision character are prepared:

- plan of spatial management of a district;
- project of conditionings and directions of municipality's spatial management;
- local plan of spatial management;
- program of environmental protection (of a district, province and municipality),
- plan of waste management (national, district and provincial),
- energy plan of a municipality.

In some entities there are prepared such specific programs and plans as: program of ecological education; program of forest management; program of activities for the benefit of using renewable resources of energy; program of protection from noise; program of reacting in crisis.

Environmental protection programs (of a district, province and municipality) are obligatory documents that specify the objectives and tasks of state ecological policy. These documents do not have hierarchical character. They define the principles, directions and priorities of undertakings made for the benefit of the environment, enable effective management of it and, in particular, coordination of protective activities held in the units of self-governmental administration. These documents do not have hierarchical character. They are made once every four years, taking into consideration activities with the prospect of the next four years.

Content and substantial range of environmental protection programs is defined by the environmental protection law. These programs should be adjusted to the competences of organs at district, province and municipality level. Such programs must take into consideration two task groups: own tasks (financed entirely or partly from the funds that municipalities and districts have at disposal) and coordinated tasks (financed from company's funds and from outside subsidies).

Environmental protection programs should include five problem blocks:

1. Reinforcing ecological structure.
2. Limiting emission, minimizing the absorbency of water and materials.
3. Minimizing the absorbency of energy.
4. Improvement of transport.
5. Development of civic activity [Kowalczywska, Kozłowski, Lenart, 2003].

For each of these blocks a set of detailed objectives and main instruments of realization are defined.

A vital element of each environment protection program is defining environmental indicators (concerning mostly two first blocks) enabling description of the direction in which changes take place in the environment and the position of the given district or municipality in regional, national and European arrangement. A full list of indicators should be included in the provincial program. Projects of environmental protection programs are assessed by the executive organs of the territorial self-government of the higher level, whereas in the case of district programs – by the Minister of Environment.

Organs of district self-government make analyses and studies, elaborate concepts and prepare a plan of spatial management in a district as well. **Spatial management plan of a district**, similarly to a strategy, is not a legal act of local law and does not constitute the basis for the issue of a decision about the conditions of building and managing the area.

The spatial management plan of a district takes into consideration the strategy of province's development and also defines:

- basic elements of settling network and their communication and infrastructure interrelationships;
- system of protected areas, including the areas of nature protection and cultural landscape, protection of health resorts and cultural heritage;
- distribution of investments serving the public of more than a local character, especially concerning social, technical infrastructure, transport, tourism, maritime economy and water management;
- problem areas along with rules of their management;
- assistance areas;
- areas exposed to the danger of flood;
- borders of closed areas and their protective zones;
- areas with documented mineral deposits.

Decisions of district's spatial management are introduced in the local plan after the consensus is reached concerning the deadline by which public objective having more than a local character and conditions of introducing them to the plan ought to be accomplished.

A study of conditionings and directions of spatial management in municipality as well as a local plan of spatial management play the most important role in the system of spatial planning. The study of conditionings and directions of spatial management is the document of strategic character which defines municipal spatial policy, including the principles of spatial management. The key objective of the study is to catalogue the prevailing management of municipality's area and to determine intentions in the range of its changes. The study determines directions of municipality area development and pinpoints the areas that demand socio-economic transformations, defines the principles of

managing spatial configurations of various functions which will enable entire usage of the spatial potential, preserving at the same time architectural-landscape amenities, the requirements of environmental protection or the requirements of cultural heritage.

The study defines, among other things:

- directions of changes in spatial structure of municipality and in earmarking of areas;
- areas and principles of environmental protection and its resources, nature protection, cultural landscape and health centers;
- directions of communication and development of technical infrastructure;
- areas in which investments of public objective of local and more than local character are distributed;
- areas for which it is compulsory to make a local plan of spatial management and for which municipality intends to make such a plan, including areas demanding earmarking farming and forest lands for non-agricultural and non-forest objectives;
- directions and principles of shaping farming and forest production space;
- areas subject to the danger of flood and land slippage;
- areas demanding transformations, rehabilitation or recultivation.

Elaboration of the study is required by law, however, the act concerning the study does not have universally binding character, i.e. decisions included in it may not trigger direct effects in relation to the entities that are not linked with municipal organs. However, the decisions included in the study should be taken into account in the project of a local management plan, as they are valid for organs making them.

A local plan of spatial management is an act of local law and as the only one it has binding power not only for municipality's organs but also for other entities that in organizational terms are not subordinate to municipal community. In the local plan it is compulsory to define: earmarking of an area and the lines that divide the areas of various allocation or various management principles, principles of protecting and shaping spatial order, protection of the environment, nature and cultural landscape, limitations and ways of managing areas and objects that are subject to protection, detailed conditions of managing areas and limitations in their usage.

Legal regulations demand elaboration of national, provincial, district and municipal **plans of waste management**. These plans should define the current status of waste management in the area of territorial entity, characteristics of kind, sources and quantity of waste that is subject to particular types of neutralization and to recovery, as well as the existing system of waste collection. They should present specific actions aiming at the improvement of the situation in the sphere of waste management, especially the way of preventing waste production, limitation of their quantity, selective collection and safe management of

municipal and dangerous waste, while showing the way and place of storing them. Furthermore, the plans should contain: prognosis of changes in waste management; organization of the waste management system, implementation costs and the way of monitoring the system's functioning. The plans of waste management at particular levels are positioned in a hierarchical way. It means that provincial, district and municipal plans of waste management should be elaborated according to the plans of a higher level.

Program of protection from noise is prepared for the agglomerations of more than 100,000 inhabitants as well as for the areas indicated in the district program of environmental protection concerning the exceeded noise level. The program's objective is to indicate activities enabling adjusting the noise level to the threshold level. Program of environmental protection from noise ought to be composed of three basic parts:

1. descriptive – comprising: description of the area encompassed by the program, indication of the point at which allowed noise levels are exceeded, specification of basic directions and range of activities indispensable for the reintroduction of allowed noise levels in the environment, providing deadlines of accomplishment and also realization costs and sources of financing the indicated actions;
2. programming, indicating the limitations and duties ensuing from the realization of the program and the way of monitoring its realization;
3. justifying the range of the program, including data and conclusions ensuing from prepared acoustic maps, assessment of realizing the previous program concerning environmental protection from noise, analysis of materials used for program preparation, including documents of policy, strategies, plans or programs, regulations concerning noise emission and permits for noise emission to the environment by entities whose activity has negative influence on the acoustic state of the environment.

Program of forestry management constitutes a voluntary planning document written out at the district level. The program is defined on the basis of the previously made cataloguing of forests' state, in relation to scattered forests of areas smaller than 10 h that do not belong to the Treasury but to a physical person or to land communities. The program should include description of areas earmarked for afforestation, analysis of forestry held in the past as well as determination of tasks concerning: the amount of obtained wood, afforestations and revivals, forest cultivation and protection, hunting administration and needs in terms of technical infrastructure. The program constitutes the basis for simplified plans of forest utilities and prefect's decision defining detailed tasks in forestry in relation to owners not fulfilling tasks included in the program.

Plan of reacting in crisis is an obligatory planning document prepared in a province and defining the undertakings made when a natural disaster appears. Its objective is to ensure that environment system provides a coordinated and

effective way of reacting to critical events which are likely to trigger effects that exceed borders of one district or require the involvement of forces that exceed the possibilities that district has and, in case of events of very large scale – aid from neighboring districts and government administration at a district level. The program is aimed at defining:

- the potential kinds of hazards which are likely to occur in the province, such as: natural disasters, technical breakdowns, extraordinary hazards to the environment, epidemics and invasions;
- functions and tasks of particular organs included in Critical Reaction Unit, especially in terms of providing communication, medical service, evacuation of people, providing them with water and food, social assistance, transport, energy supply, alarming and warning.

In the plan a prefect assigns individuals that are responsible for particular stages of reacting in crisis – preventing, preparing, reacting and restoring. Tasks for reacting in crisis that are anticipated by institutions subordinate to the prefect are presented in the form of functional appendices, called acting procedures. Basic appendices include: informing – warning and alarming population, evacuation of people, animals and stock; medical and social assistance, transport and resources management, coordination and supervision. Critical reacting plan is negotiated with directors of the following units: district police commanding officer, district fire brigade chief, director of sanitary-epidemic station, district veterinary inspector. Units have operational plans prepared by themselves at their disposal.

Activity in the field of education and raising of social awareness constitutes one of the basic conditions of success in the accomplishment of ecological policy. The European Union recommends formation of province, district and municipality **programs of ecological education** that take into consideration also climate changes. In Poland such programs do not constitute a self-contained document but are an element of sustainable development strategy or of the program of environmental protection of a territorial entity (municipality, province or district).

At the state level, the binding document is *Strategy of ecological education* elaborated in the mid 1990s. It is largely out-of-date now as it does not take into consideration many conditionings that are vital for the improvement of the efficiency of educational activities and for raising the ecological awareness of society.

Energy plan of municipality. The obligations related to energy planning are imposed on municipalities by the virtue of the act of Energy Law of April 10, 1997⁸ with further alterations⁹. This act envisages two types of documents

⁸ Act of April 10 1997, Energy Law (uniform text, Dz.U. of 2006, No. 89, par. 625).

related to planning of energy management that can be prepared by a municipality. These are premises to the energy plan of supplying with heat, electrical energy and gas fuels and energy plan. A municipality has the obligation to prepare a project of premises to energy plan every 3 years. The first document with this title ought to be prepared till the end of 2013.

The premises to energy plan ought to include: assessment of the present state of the demand for heat, electrical energy and gas fuels; assessment of predicted changes in the demand for heat, electrical energy and gas fuels; suggestions of undertakings rationalizing the usage of energy, analysis of the possibilities of using local resources of renewable energy, including the possibility of using local surpluses of fuels and energy, taking into consideration combined creation of electrical energy and heat and management of waste heat from industrial processes; analysis of the cooperation with neighboring municipalities with regard to energy economy. The assumptions have the character of an informative document, present the problem and the way of solving it within the possibilities of a municipality.

Energy plan is a document of decision-making character that all the entities functioning in a municipality ought to comply with. Energy plan ought to include, among others: proposals related to the development and modernization of particular systems of supplying with heat, electrical energy and gas fuels in combination with economic justification; schedule of the realization of tasks; predicted costs of the realization of suggested undertakings and the source of financing them.

The energy law approved of by a municipality by the virtue of law gives the municipality authorities the possibility to have its own energy policy, enables it to shape the local energy system, increases safety of supplying with fuels and energy and also facilitates reduction in the costs of energy services. Furthermore, by means of actions specified in the energy plan a municipality can have influence on:

- shaping of the influence of a local energy system on the natural environment;
- ensuring satisfaction of energy needs of recipients by means of diversifying the sources of supplying with fuels and energy, maintenance of strategic reserves and program of emergency actions;
- implementation of anti-monopolistic regulations of the conditions and prices of supplies of fuels and energy;
- access to means from the European Union for the reconstruction and modernization of technical infrastructure in the sphere of energy sector;

⁹ Act of January 8, 2010 on alteration of the act – Energy law and of change of some other acts (Dz.U. 2010, No. 21, par. 104).

- involvement of energy companies in the development of energy infrastructure in a municipality.

The Premises to the energy plan of supplying with heat, electrical energy and gas fuels and energy plan of municipality constitute the basic elements of the energy management system in a municipality¹⁰.

¹⁰ [Poskrobko (ed.) 2011].

Chapter 5

ENVIRONMENT MANAGEMENT INSTRUMENT

5.1. Classification of environment management instruments

In professional literature there are several complementary classifications of the environment management instruments. These are mainly classifications having several stages. The general (first-stage) division is usually dependant on the way a given instrument influences a managed object, whereas the detailed (second-stage) division is dependant on the type of instruments belonging to a certain group.

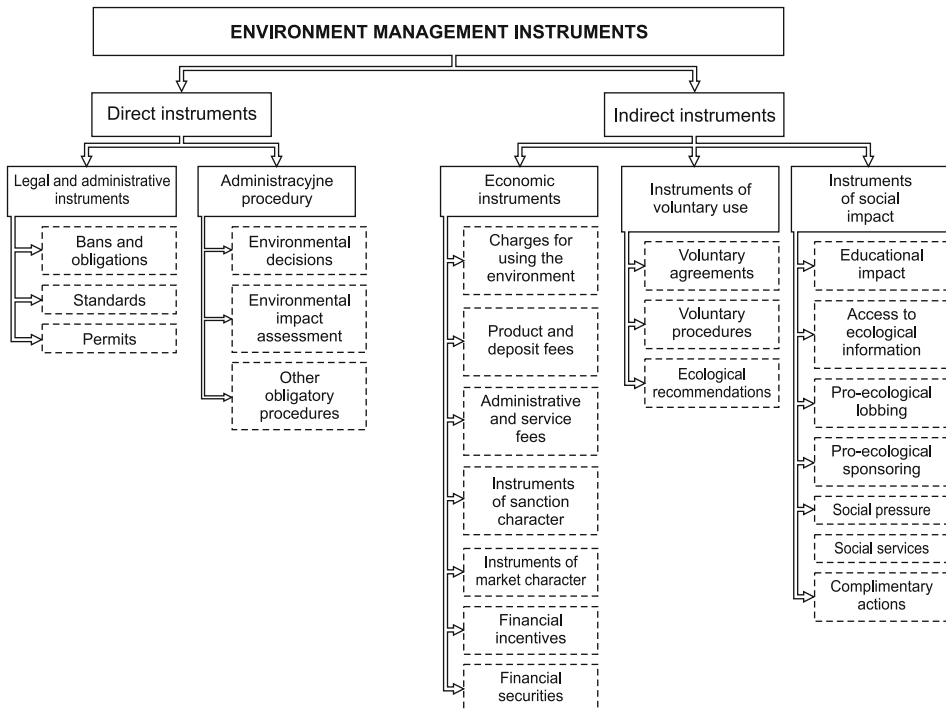
It is possible to distinguish instruments of direct impact (bans and limits) and instruments of indirect influence (incentives, sanctions, agreements, indications and complementary actions). The direct instruments have the character of a legal obligation, whereas the indirect ones may, but not necessarily, be covered by a legal regulation. Instruments that are regulated by law may be applied in a compulsory or voluntary way. From the perspective of management practice, these detailed divisions are of minor significance. Environment management instruments may be divided into five groups in terms of the way, range and subject of influence:

1. Legal-administrative instruments whose objective is to directly regulate the way the environment resources and amenities are used. These may be divided into three subgroups: bans and orders, such as a ban on cutting trees that are classified as nature monuments; standards regarding the quality, emission and product; permits concerning investment, resources, emission, permissions on trade or transit.
2. Administrative procedures – in this group of key importance are environmental decisions and assessments of environmental impact. They constitute

the basis of shaping sustainable development of areas of the territorial division units and functional areas, e.g. Natura 2000.

3. Economic instruments, the tasks of which include: inspiring business entities to economize on using environment resources and amenities; eliminating the products whose production or usage is arduous for both nature and man; internalizing external costs of the influence of production processes on the environment; collecting financial resources on protective undertakings. In the first decade of the 21st century there was observed considerable increase in the spectrum of economic instruments used in environment administration, therefore presently scientists are looking for new ways of classifying them. Taking into consideration the construction of an instrument and the way it has impact on the management object, the following instruments can be distinguished: instruments having the character of public tributes, i.e. all types of charges and taxes for using the environment and its services; product and deposit fees; administration and service fees; instruments of sanction character; instruments of market character; financial incentives; ecological financial securities.

Figure 5.1. The structure of environment management instruments



Source: own elaboration.

4. Instruments of voluntary usage, such as: agreements, procedures of voluntary use as well as ecological reviews and orders the objective of which is to minimize anthropogenic (mainly technogenic) loading of the environment.
5. Instruments of social impact, the objective of which is to shape the society's ecological awareness and its involvement in ensuring and preserving the high quality of natural conditions of people's existence and progress. In this groups one may distinguish: impact of educational character, access to ecological information, pro-ecological lobbying, pro-ecological sponsoring, various forms of social pressure, social service activity, social actions which are complementary for formal actions. It needs emphasizing that the regulation of usage, protection and shaping of the environment in Poland takes place by using almost 100 instruments. The great diversity of instruments ensues from the specific character of both management instrument which comprises, in principle, all life spheres and the management object.

5.2. Legal and administrative instruments

Legal and administrative instruments are the limitations of activity or ways of acting that were established by the legislator (by force of legal acts), the objective of which is to regulate the way the environment is used and to ensure its protection. This regulation has direct impact on the conduct of business entities. The way in which these instruments work is supported by appropriate legal sanctions.

Bans and obligations constitute the most rigorous instrument. Absolute bans are applicable mainly to the industrial emission of compounds that are hazardous to the environment and human health (e.g. arsenic compounds, dioxins), usage of technologies that are hazardous to the environment, initialization of a plant without required protective facilities or they apply to the free access to the area of strict nature reserve. Obligations may be, for example, connected with reductions in production due to the excessive emission of pollutions, closing of the plant due to its arduousness for people and the environment, as well as with the usage of protective facilities, implementation of definite procedure of preparing the assessment of effect on the environment.

Standards (norms) may concern: environment quality, degree of emission, pro-ecological parameters of products, techniques and technologies, type of conduct. *Standards of environment quality* (imission norms) are the requirements that must be met in a certain time period by the environment or its main elements in a particular area. These standards define the maximum permissible concentrations of polluting substances in the atmospheric air, water, soil or the permissible levels of noise or radiation. Standards of the environment quality are determined with consideration for the scale of occurrence and the way sub-

stances or energy affect the environment. They may vary depending on the area. Emission norms are defined on the basis of medical and biological knowledge. In Poland the binding standards of the environment quality are as follows:

1. Standards of atmospheric air quality, i.e. admissible and alarming levels as well as marginal tolerated levels of substances in the air. The standards normalize the emission of such substances as: benzene, nitrogen dioxide, sulfur dioxide, ozone, carbon monoxide, lead and suspended dust.
2. Standards of soil quality – soil is considered as polluted when the concentration of at least one substance exceeds the admissible value, with the exception of a situation when this concentration ensues from its content in the environment. The values of admissible concentrations of substances in soil or land were specified for two metals, two cyanides, benzene and mineral oils, six aromatic hydrocarbons, ten multi-ring aromatic hydrocarbons, seven chlorinated hydrocarbons, eleven pesticides and seven other substances. There were elaborated also special standards concerning the admissible value of heavy metals in soils located on farms where production using ecological methods can take place.
3. Standards of water quality concern surface and underground waters. Values of pollution indicators decide upon the class of surface waters. 57 indicators of pollution of inland surface waters were isolated, and these include, among others: temperature, smell, color, reaction, total suspension, five-day biochemical oxygen demand (BZT₅), chemical oxygen demand (ChZT), dissolved oxygen, nitrogen, phosphates, hardness, conductivity, chlorides, sulfurs, heavy metals, cyanides, aldehydes, insecticides, benzo(a)pyrene, coliforms, pathogenic bacteria. Quality norms of underground waters comprise contents of such pollutions as: nitrates, pesticides and their metabolites, products of disintegration and reaction, substances or ions of ammonium, arsenic, cadmium, lead, mercury, trichloroethylene, tetrachloroethylene, chlorides, sulfurs and aluminium.

In the sphere of water quality standards there are admissible norms of pollutions in drinkable water. Emission norms determine how much and what kind of pollutions may be introduced into the environment from the given source. They are divided into the norms defined individually for a certain source (installation, plant) included in emission permit and universal standards defined by a legal act for particular types of installations or plants. Individual emission norms are specified in administrative decisions that concern: permits for the emission into atmosphere, permits in the system of trade in CO₂ emissions, determination of the admissible noise level, drainage of sewage into surface waters or into land, approval of the program of waste management.

General emission norms (standards) define levels that cannot be exceeded by the specified process. Such standards were defined for the processes of combusting fuels, municipal waste, dangerous waste, for the production of asbestos

and titanium dioxide. General norms concern emission (outside the area that in legal terms is managed by the entity making the installation) of: sulfur dioxide, nitrogen monoxides, carbon monoxide, organic compounds, hydrocarbon, hydrofluoric acid, heavy metals and their compounds, dioxanes and furans, asbestos and chlorine.

Emission norms are aimed at reducing the amount of emitted pollutions, depending on their type, to the level that enables their natural assimilation by ecosystems. Correct determination of emission norms – both for a particular business entity and installation – is a difficult undertaking because permissible emission is dependant on many factors, such as: type and range of pollutions' spreading; influence of certain pollution on human being and particular elements of the environment: animals, plants, soil, water, atmospheric air; toxicity and concentration of pollution; duration of exposition and accumulation of all the previous effects; real resistance of the most exposed element of the environment.

Not every business enterprise demands administrative decision that defines emission norms. Such a requirement applies to installations that result in introduction of gases or dusts into atmospheric air, introduction of sewage to water or soil and also production of waste. Such norms can be enlisted as:

- emission standards from installations, defining the amount of pollutions that can be introduced into the atmospheric air;
- the highest possible values of indicators of pollutions in municipal and industrial sewage, including flowing waters from waste heaps introduced into surface waters or into land;
- the highest admissible indicators of pollutions in household's own sewage introduced into land;
- admissible masses of some particularly dangerous substances that can be introduced in treated industrial sewage.

Technical and technological norms define the type and the maximum amount of pollutions that can be formed in a certain production process or while using a certain device, e.g. a car engine. In the European Union in 1992 there were introduced emission norms of exhaust fumes from internal combustion engines named EURO I. These norms are systematically aggravated, and in 1996 there appeared EURO II norms, in 2000 – EURO III, in 2005 – EURO IV¹ (it has been in force since January 1, 2006). The norm EURO V has already been formed. The maximum amount of compounds emitted into the atmosphere by private car engines and compliant with the norm EURO IV are as follows: for petrol engines: carbon monoxide 0.1 g/km, hydrocarbons 0.1 g/km, nitrogen monoxides 0.08 g/km; for diesel engines: carbon monoxide 0.5 g/km, nitrogen

¹ All EURO norms were introduced on January 1 and came into force after a year of grace.

monoxides 0.25 g/km, hydrocarbons + nitrogen monoxides 0.3 and solid particles 0.025 g/km.

*Emission norms for installations*² are additional emission standards specified by the Minister of Environment for the best available technology³ when integrated permits are issued. They must not be higher than the binding emission standards. In the Environment Protection Law these standards were called boundary emission limits.

Product norms determine pro-ecological characteristics or parameters of the product, the usage or exploitation of which may be arduous for a man or for the environment. They are closely connected with the product's quality. They are determined on the basis of medical knowledge (human health), ecological knowledge (influence on the environment) and technical knowledge (low risk of breakdown of devices and constructions). Product norms specify: physical or chemical composition of a product; procedures regarding conduct of product, its package and labeling; amount of pollutions that can be released during usage.

Norms of proper conduct are established in relation to those activities that are relatively available and at the same time difficult to be monitored and constantly controlled. They may concern such activities as: transport of expired substances of plants protection and packages of used substances, energy saving, behavior of tourists on areas protected by law [Śleszyński, 2000].

Other limitations concern chiefly the emission of smell. It is assumed that in polluted areas smell ought not to occur recognized for more than approx. a dozen days per year. The number of days is specified by state administration or by self-governments. An installation that emits smell must be placed in such distance from housing estates that recognizable smell does not exceed the specified time period. Determination of needful distance of a new installation from housing estates takes place on the basis of olfactometric measurements of smell emissions from the existing installations of a similar type.

Administrative permits are administrative decisions that individualize the requirements of a certain subject. There are distinguished permits of emission type and permits of exploitation and rationing type. *Emission permits* concern introducing substances or energy into the environment. In the configuration of environmental protection domains it concerns: introduction of sewage into waters or land surface; production of waste; emission of noise; emission of electromagnetic fields; integrated influence on the environment. Permits of this type

² **Installation** is a stationary technical device or set of technologically related stationary technical devices (at the disposal of one owner having the status of a legal entity) in one plant as well as construction objects that are neither technical devices nor their sets the exploitation of which can cause emission.

³ **The Best Available Technology** (BAT) is the most effective development level of technologies and methods of running a certain activity which is used as the basis for defining boundary emission levels.

are issued for installations on application of the entity that is in charge of this installation. The motion ought to include, among others:

- description of the possible variants of installation's functioning;
- mass balance and types of used materials, raw materials and fuels along with technological scheme;
- information about energy that is either used or produced by installation;
- extent and sources of the emission of pollutions or other burdensome substances – current or suggested ones – during the nominal exploitation of installation and in the conditions deviating from the normal ones, such as start-up, breakdown and switching off;
- information about the effect of emission on the environment;
- procedures of monitoring technological processes.

The permit may be issued for a definite period, yet it may not be longer than 10 years. The permit ought to define among others: amount of permissible emission in the conditions of the normal functioning of an installation; maximum admissible duration time at which the technologically justifiable exploitation conditions deviating from the normal ones endure; degree and the way of monitoring technological processes and way of conduct in case the measurement apparatus is damaged; the way and frequency of transferring information and data to the organ issuing the permit. The permit is subject to withdrawal or limitation when the installation is inadequately exploited, which poses hazard of worsening the state of the environment to a large extent or a threat to human life or health.

Integrated permit is a specific kind of emission permits. The obtainment of an integrated permit is required for the exploitation of those installations whose functioning, owing to the type and degree of run activity, may generate extensive pollution of particular natural elements or the environment considered as a whole. Such approach guarantees that the level of installation's influence on the environment will be lowered to reach the level that is justified by technical and economic terms. The type of activity and installations for which the obtainment of an integrated permit is compulsory were defined by the EU directive and by the act – Environmental Protection Law. The requirement to obtain an integrated permit concerns mainly large industrial installations such as: power stations, thermal power stations, cement plants, glassworks, ceramics plants, installations for processing of iron and non-iron metals, installations making products of organic and non-organic chemistry, artificial substances, oil and gas refineries, paper-mills, tanneries, food industry installations, installations for intensive cultivation of animals as well as dumping grounds and waste incineration plants.

In the integrated permit the conditions of pollutions' emission are determined in the same way as in normal (non-integrated) permits, although into consideration are taken also those emissions that did not demand permit, espe-

cially: permissible noise level, production conditions and ways of waste management, conditions of consuming water and draining of sewage.

The Minister of the Environment determines the minimum requirements for a certain type of installation ensuing from the best available technology, including: borderline degrees of emission; mutual variant relations between borderline emission degrees concerning gases, dusts, sewage, waste, noise and electromagnetic fields; requirements concerning the absorbency of energy and the absorbency of materials. The motion for issuing an integrated permit ought to include the data that is required in a normal permit and information about emission's influence on the environment perceived as a whole, justification for the suggested emission degree and also the assessment of compatibility with the minimum requirements of the best available technique for an installation. In principle, the essence of an integrated permit overlaps with the essence of a normal (non-integrated) one. Proper organs for issuing integrated permit are prefect and starost.

Exploitation and rationalization permits concern the usage of the environment. These are:

- licenses for searching for or recognizing deposits;
- licenses for extracting minerals from deposits;
- licenses for non-tank way of storing substances and storing waste in orogen;
- water legal permits concerning making water devices, consuming underground water and using sewage in farming;
- permits for cutting trees and bushes.

This group includes, among others decisions that determine the conditions for regulating water sewage, construction of dykes, irrigation works, building dehydrations and other earthworks; decisions about the conversion of forest into arable lands and decisions about conditions for the development of the area. The organs that are proper for issuing exploitation and rationalization permits include: the Minister of Environment, prefect (licenses) and starost as well as the mayor of a municipality (cutting trees and bushes).

5.3. Pro-ecological administration procedures

Pro-ecological administration procedures constitute a certain types of conduct which impose recognition and taking into consideration problems in the usage and protection of the environment while taking actions that require administrative decisions. In environment management system of great significance are the procedures:

- of conduct with regard to issuing environmental decision on the realization of undertaking (mainly of investment type);

- of conduct with regard to the assessment of influence that the effects of realizing elaborated plans and programs have on the environment;
- of conduct with regard to the assessment of planned undertakings' influence on the environment;
- of ensuring society's participation in administrative conduct concerning the environment usage;
- of society's access to information about the environment.

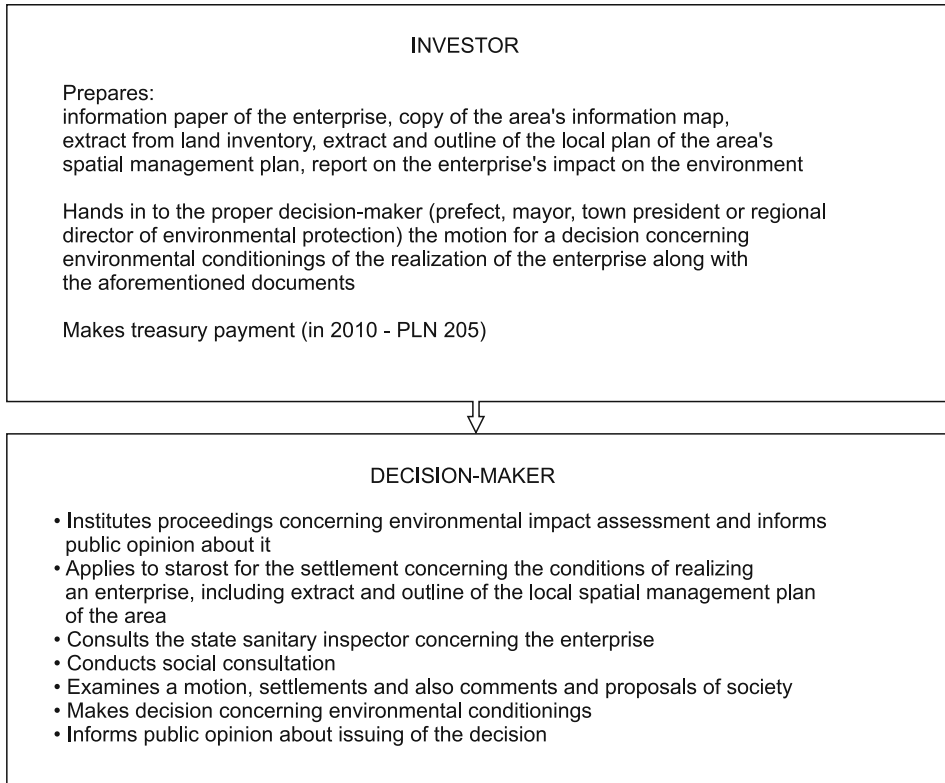
5.3.1. Procedure of conduct concerning issuing environmental decisions

Environmental decision is the condition of approving of construction project and obtaining permit for the realization of undertakings that may have either always or possibly considerable impact on the environment. For example, one may mention such undertakings as the construction or deconstruction of a nuclear object, the search for mineral deposits, the regulation of rivers and construction of anti-flood dykes, the consolidation and exchange of arable lands, industrial investments and the construction of roads and motorways.

As regards the obtainment of environmental decision the procedure of conduct is different for enterprises⁴ that may always have considerable impact on the environment and those that may possibly have impact. The procedure is always initiated by the motion of the entity planning the realization of the enterprise (investor). The motion is enclosed with: the information paper of the enterprise, copy of the investment area's information map, extract and outline of the local spatial management plan (if the motion is sent to a prefect, mayor or town president, this document is not necessary), extract from land inventory. If the investment is perceived as one of the enterprises that always have considerable impact on the environment, the motion is enclosed with the report on the enterprise's impact on the environment. The motion's addressee institutes the proceedings concerning the assessment of environmental impact, examines the motion, settlements and comments of the society, makes a decision concerning environmental conditionings and this fact is publicized (figure 5.2.).

⁴ Enterprise is understood as construction intention or any other intervention into the environment that implies modification or change of the way the area is used.

Figure 5.2. The procedure of obtaining environmental decision for enterprises that can always have considerable impact on the environment

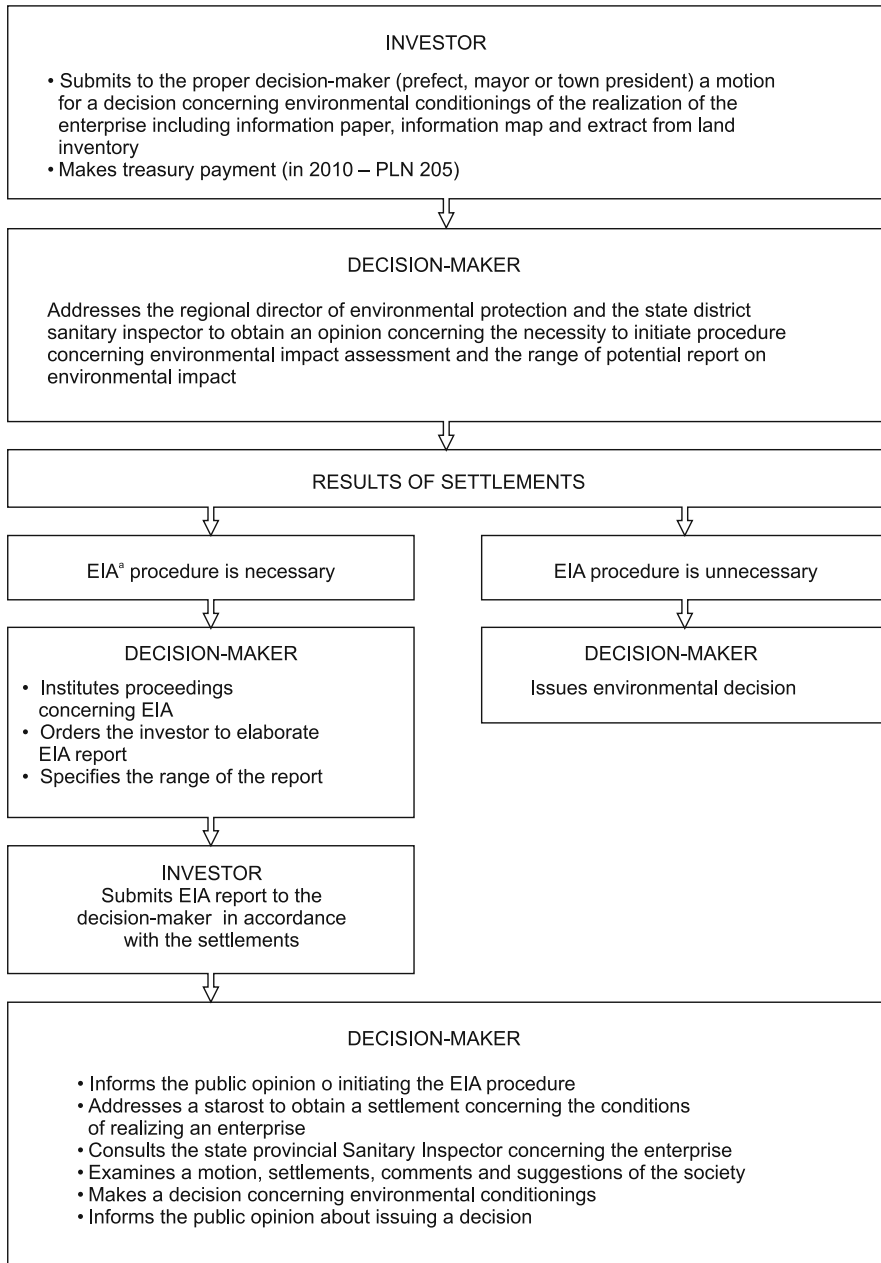


Source: *ibid.* figure 5.1.

Information paper of the enterprise ought to include the following information:

1. Type, scale and position of the investment (or any other enterprise).
2. Area of the occupied estate as well as construction object with the indication of the dominating way of using them and making vegetal cover.
3. Type of technology.
4. Possible variants of the enterprise.
5. Expected amounts: of used water, raw materials, materials, fuels and energy.
6. Solutions protecting the environment.
7. Types and expected amounts of substances or energy introduced into the environment using solutions that protect the environment.
8. Possible cross-border impact on the environment.
9. Protected areas located within the enterprise's range of influence.

Figure 5.3. The procedure of obtaining environmental decision that may have possibly impact on the environment



Note: ^a – environmental impact assessment

Source: *ibid.* figure 5.1.

Decisions concerning environmental conditionings do not generate rights to the investment's area, do not violate ownership rights and qualifications of third parties. The proponent that resigned from the realization of the enterprise can hand in the environmental decision to another investor that is interested in the enterprise.

5.3.2. Procedure of environmental impact assessment

The procedure of environmental impact assessment of planned enterprises comprises: qualification of the enterprises requiring conducting EIA; defining the report's range; report of the enterprise's impact on the environment; social consulting and negotiations and also preparing opinions of EIA; decision-making activities. The enterprises that require EIA are specified by the Cabinet⁵ in an appropriate decree that was elaborated on the basis of the EU directive. With reference to the enterprises that can have considerable impact on the environment the decree specifies the criteria that ought to be complied with by the organ making the decision. Conduct regarding EIA is obligatory in the light of Polish law in case of making decisions regarding the realization of the following enterprises:

- determination of the conditions of construction and management of an area;
- construction or deconstruction of a construction site or change in the way it is used;
- searching, examining and excavating of mineral deposits, non-container storing of substances in orogen as well as storing of waste in underground excavations, search and extraction of mineral materials from mining waste;
- consumption of underground waters, usage of water devices and agricultural use of sewage;
- regulation of waters and formation of water anti-flood dykes;
- melioration, construction drainage and any other farming works that change water balance in the areas with plant concentrations having special natural value, areas of bird hatch, areas inhabited by protected species and fish spawning-grounds;
- consolidation or exchange of grounds;
- transformation of forest into an arable land;
- location of express roads and motorways.

⁵ Decree of the Cabinet of 9 November 2004 on determination of the type of enterprises that may have considerable impact on the environment and detailed conditionings related to qualification of an enterprise for preparing a report concerning the impact on the environment (Dz.U. of 2004, No. 257, par. 2573, with further alterations).

The settlement of the range of the required EIA report depends on the expected degree of environmental hazard and on people's health which ensues from information paper. If the information proves to be insufficient or doubtful, an organ can condition the reply with supplying additional data and complementary explanations.

The report of the enterprise's impact on the environment ought to include:

1. Description of the planned enterprise, including the conditions of using an area in the stage of construction and exploitation, characteristic for the production process, description of natural elements comprised by the expected impact of the enterprise, description of different variants including the variant that is related to not initiating enterprises and is most favorable for the environment.
2. Justification of the choice of the analyzed variants and the selected variants. It should specify the impact of the analyzed solutions on the environment elements (people, fauna, flora, soil, air, climate, material and cultural goods and landscape), and on the state of mutual relations between these elements; show the possibility of occurrence of extraordinary hazards and transboundary flow of pollutions; describe potential considerable impacts on the environment (direct, indirect, secondary, of short, medium and long duration, permanent and temporary), duration of the enterprise existence, range of using natural resources as well as range of pollution emission.
3. Description of prognosis methods used in the report.
4. Description of expected actions aiming at the prevention, decrease or compensation of hazardous impacts on the environment.
5. Comparison of the suggested solutions with other available solutions that are used in practice in Poland and in the European Union. If an enterprise is related to the usage of an installation comprised by the obligation to obtain an integrated permit, the report ought to include comparison of the suggested technology with the best available one in BREF documents⁶.
6. Indication of whether it is necessary for the enterprise to establish an area of limited usage.
7. Presentation of issues in a graphic form.
8. Analysis of possible social conflicts related to the planned enterprise.
9. Formal information (encountered difficulties, resume using non-specialist language, surnames of people preparing the report, information sources that constitute the basis for making the report).

The opinion concerning the prolonged report is issued by the regional (or national) commission on environmental impact assessment.

⁶ BREF documents – documents of reference concerning the best available techniques prepared by the European IPCC European Office in Sevilla, recommended by the Ministry of Environment.

Social consultations and negotiations imply publicizing (in a typical accepted way) the information concerning the institution of proceedings. Comments and conclusions are collected over the period of 21 days. The organ making a decision may conduct an open administrative discourse and inform all the interested parties about it. The proceedings can be participated by social organizations (not only ecological ones) as the interested parties. An essential element of the consultations is the process of settlements. The report on environmental impact accompanied by the documentation concerning the conduct of environmental impact assessment constitutes the basis for making an administrative decision. The decision may comprise obligations of the investor as regards the prevention, reduction and monitoring of impacts on the environment.

5.3.3. The assessment of the impact of plans and programs realization on the environment

The assessment of the impact that the effects of realizing plans and programs have on the environment is prepared for the schemes of policies, strategies, plans or programs in the sphere of industry, power engineering industry, transport, telecommunication, water management, waste management, forestry, agriculture, fishing, tourism and usage of the area. They are elaborated by administration organs. The assessment is required only whenever the realization of the document has considerable impact on the environment, especially on Natura 2000 areas. The assessments of impact on areas Natura 2000 are demanded also for schemes of other plans and programs.

Classification into considerable and inconsiderable impact is made while taking into consideration the following aspects: the character of actions envisaged in designed documents, their connection with other documents and problems of environmental protection; the kind and extent of the impact on the environment, including the likelihood of occurrence, duration and frequency as well as effects of the influence; characteristics of the area comprised by the influence, their sensitivity to the influence, already existing loading, significance for cultural heritage, used forms of environmental protection, including those envisaged by the international law.

Prognosis of impact on the environment ought to include information about a document (scheme of policy, strategy or plan), the assessment of the existing state of the environment on the areas covered by expected significant influence, and to display the existing environment problems that are crucial for the perspective of a drafted document, as well as:

- detailed analysis of considerable impact on the environment and monuments, including direct, indirect, secondary, accumulated, short-, mid- and long-term, permanent and momentary impact;

- solutions aiming at the prevention, reduction or natural compensation of negative impact on the environment;
- solutions that are alternative to those included in a document scheme, including justification of their choice and description of methods of making the assessment leading to this choice;
- information about possible cross-border impact on the environment.

The approved document is attached with written information about the way of using arrangements included in the prognosis of the impact on the environment, opinions and arrangements of environment protection organ, the results concerning the participation of society in the assessment of the document's scheme and also with information about the methods and frequency of conducted analysis that concerns the realization of document's arrangements.

5.3.4. Other obligatory administrative procedures

Obligatory administrative procedures enhance administrative activity, especially in relation to persons or groups that are interested in solving the problems of environmental protection. For example, three procedures were presented in this subchapter: of access to information, participation of society in the proceedings regarding environmental protection as well as the procedure of issuing integrated permit. Of considerable importance are also the procedures of using genetically modified organisms, however, owing to the limited amount of such cases they were not described in this publication [compare: Baran, 2005].

Procedure of access to information on the environment. In Poland access to information is guaranteed by the Constitution. The Constitution of the Republic of Poland implies that:

- (...) *everyone shall have the right to be informed of the quality of the environment and its protection* (art. 74, act 3);
- (...) *citizen shall have the right to obtain information on the activities of organs of public authority...* (art. 61).

The issue is regulated also by the EU directive⁷ of the European Union and also the act on access to information⁸. The publicized information concerns:

- the state of environment elements such as: atmospheric air, water, land surface, minerals, climate, landscape and natural areas as well as plants, animals, mushrooms and genetically modified organisms;

⁷ Directive 2003/4/EC of the European Parliament and the European Council of 28 January 2003 concerning public access to information about the environment and annulling the Council directive 90/313/EEC (Dz.U.L. 41 of 14 February 2003).

⁸ Act of 3 October 2008 on publicizing information about the environment, participation of society in environmental protection and environmental impact assessments (Dz.U. 2009, No. 84, par. 700).

- emission of pollutions;
- management instruments (policies, legal regulations, plans, programs, agreements);
- reports on the realization of environmental protection regulations;
- analysis of costs and benefits as well as economic analyses;
- state of health, security and living conditions of people.

The aforementioned information is publicized in an oral, written, visual, sound, electronic and any other form. Information passed by third persons must include the source. Information can be made accessible without a written motion or by a written motion. Without written motion the information that is made accessible does not require retrieval in case of the occurrence of natural disaster, natural catastrophe or technical failure.

The entity that demands information on the environment and its protection is not obliged to indicate legal or factual interest. Information that does not require retrieval may be made accessible on the day the motion is supplied, another one – within a month provided that it is possible to prepare data in the desired arrangement. If information cannot be made accessible in a way or form defined in the motion, an administrative organ informs about it, whereas the interested entity does it within 14 days and indicates the possible way or form of making it accessible.

Administration organ does not make accessible the information on the environment and its protection if it concerns single data obtained in the research, issues comprised by the court, disciplinary or penal proceedings and also elaborations that are the subject of author's rights as well as personal data, data or documents the publication of which could cause hazard to the environment or state's ecological security, information about trade value, including technological data as well as state defense and security. The refusal to publicize information takes place by means of a decision. A fee is collected for making accessible information that requires retrieval.

Procedure of participation of society in proceedings concerning environmental protection. In Poland the participation of society in the conduct concerning environmental protection is guaranteed by the Constitution. The Environmental Protection Law implies that: *Everyone (...) has the right to participate in the conduct concerning making a decision regarding environmental protection or adoption of a project, policy, strategy, plan or program of development or restructuring and also the project of study and plan of spatial management* (art. 10). The act of 3 October 2008 on publicizing information on the environment, participation of society in making administrative decisions as well as in elaborating documents and also indicates authorizations of ecological organizations.

Prior to issuing or changing an administrative decision concerning protection, usage or shaping of the environment an administrative organ without unnecessary delay publicizes the information concerning accession to making

environmental impact assessment, enables (for insight) indispensable documentation of the case, accepts comments and conclusions, informs about the date of administrative suit open for society. Comments and conclusions can be made in a written form, in an oral form for protocol, and in an electronic form without electronic signature.

An organ running the proceedings classifies comments and conclusions and in the justification of the decision specifies in what way they were taken into consideration and to what degree they were taken into consideration. An organ elaborating projects of documents of management character publicizes information about the initiation of the elaboration of the project of a certain document and its entity, indicates the possibility of becoming acquainted with indispensable documentation, about the way and place of issuing comments and conclusions. Other activities are similar to the ones conducted while issuing an administrative decision.

Ecological organizations may participate as parties in certain proceedings that require participation of society. Such organization has the right to appeal from the decision made in the proceedings of first resort even if it did not take part in the proceedings provided that this is justified by its statutory aims. In the appeal proceedings an organization takes part as a party. An ecological organization has the right to appeal the decision of the second appeal to the administration court.

The procedure of issuing an integrated permit. An integrated permit is a legal instrument established by the Council directive 96/61/EC on integrated prevention and reduction (control) of pollutions⁹ (IPPC Directive). This regulation was imported to Polish practice by the act of Environmental Protection Law.

The procedure of obtaining an integrated order is complex. It comprises the following activities:

- initial determination of the range and degree of minuteness of the motion concerning issuing an integrated order (pre-conclusion stage), including: identification of possible cross-border impacts (obligatory) and determination of the range of information that could be not made accessible to the public by the applicant (optional);
- formal lodging of a motion (after paying the registration fee) and possibly lodging of a motion concerning exclusion of some information placed in the motion from being published;
- transference of the motion for registration by the Minister of Environment, together with the possible motion concerning initiation of the proceedings regarding cross-border influence on the environment;
- publication of the information concerning initiation of the examination of the motion and informing parties of the proceedings;

⁹ Dz.U.L. 257/26 of 10 October 1996.

- detailed analysis of the motion together with the possible determination of necessary supplements;
- administrative encounter (optional);
- elaboration and issuing of administrative decision concerning an integrated permit;
- publication of information of placing data concerning the permit in the public available register;
- transference of the permit to the Minister of Environment for registration.

The motion for the obtainment of a permit is the basis for negotiations between a company and a proper administration organ. Apart from requirements referring to sector agreements this motion ought to include:

1. information about the influence of emission on the environment as the entirety;
2. information about the existing or possible cross-border influence on the environment;
3. justification for the suggested amount of emission in the cases when the minimum requirements ensuing from the best available technology were not defined via decree or in case of deviations from these amounts (art. 208, act 2 of the Environmental Protection Law).
4. document confirming that the proponent is entitled to being in legal transactions;
5. extract and outline from the local spatial management plan, if it was prepared, and decision concerning the conditions of construction and management of the area if the obtainment of it was required;
6. summary in non-specialist language.

The proponent making the installation is entitled to indicate the possibility of meeting the requirements of environmental protection. This is the condition that ensues directly from the definition of the best available technology. The way of making installation may not be perceived as the one that meets BAT requirements if it is not possible to ensure in this way that all legal requirements are met.

It is chiefly the proponent that should prove that when the permit will be binding the functioning of the installation/plant managed by them does not and will not cause violations of: emission standards established in detailed legal regulations; border emission amounts that are characteristic for BAT; standards of environment quality outside the area that in legal terms are their possession, whereas in case of noise emission – in the areas that are protected in an acoustic way, in accordance with the executive decrees and outside the area of limited use (if such area was established).

Both the contents of the motion and the settlements ensuing from discussions may be publicized. The proponent can require certain information included in the documents enclosed with the motion; in such a case the insight into the

documentation for the society will be possible only after the completion of the proceedings that concern making the indicated information confidential. Confidential information must be placed in a separate enclosure to the motion. The public part of the motion is publicized to the society by an organ issuing a permit.

In the situation when the influence of installations on the environment exceeds the borders of Poland begin the proceedings concerning cross-border influence, which causes the extension of the proceedings concerning the issuing of an integrated agreement with the elements of consultation with the organs of other countries in which this influence can take place. The procedure of issuing integrated agreements is a complex and time-consuming procedure. The elaboration of motion takes 2-6 months. The duration of issuing an agreement may be 3-4 months.

5.4. Economic instruments

One of the basic instruments in the realization of ecological policy, next to the mechanisms of direct compulsion, are economic instruments. The decisions made by business entities are affected through them. It mainly applies to the entities making microeconomic decisions.

In the context of environment administration a mechanism according to which economic instruments function relies on creating incentives and information that are transferred directly by means of market mechanism (therefore they are included in indirect instruments). These signals direct actions of environment users (entities, societies or companies). Badly constructed or addressed instrument does not ensure realization of ecological policy objectives. With appropriate instruments the ignorance of signals transferred by them ought to be unprofitable for entities.

Although the idea according to which indirect instruments work is fairly simple, in practice their functioning may trigger unexpected effects. It happens because assumed objectives are realized not directly (as in the case of administrative instruments), but by means of a complex and less predictive system – free market. Therefore, in designing or selecting economic instruments, criteria that aim at minimizing disadvantageous effects ought to be used. These criteria [Fiedor et al., 2002] include above all:

- ecological efficiency (potential and real) – it always refers to certain objectives of ecological policy (e.g. reaching definite standard of imission etc.). Ecological efficiency generally depends on a degree at which particular polluting subjects are capable of reacting to these instruments, i.e. what is commonly defined as their incentive function;

- economic efficiency – formulated as: minimization of the total costs of reaching planned environmental profit or maximization of the relation between ecological benefits and costs that are indispensable for reaching these benefits;
- possibility of implementation – usually depends on a wide spectrum of factors. They include: the existence of legal-institutional basis enabling the implementation of the given instrument, the existence of organizational and technical solutions (making it possible to implement and supervise the functioning of particular instruments), and also their social and political acceptance.

Worldwide, a whole spectrum of economic instruments is used (figure 5.4.). In Poland the longest and most frequently used instruments are those having the character of public tributes. Only recently a greater role is played by more up-to-date instruments, such as various types of financial guarantees (permits) for the emission of pollutions.

In professional literature two basic functions of economic instruments are distinguished. These are:

1. incentive (stimulating) function – involves stimulating entities (both companies and households) to use environment amenities and resources in a rational way;
2. profit-creating (transfer) function – involves accumulating, and then secondary division (transfer) of accumulated means for financing activities that are consistent with ecological policy objectives.

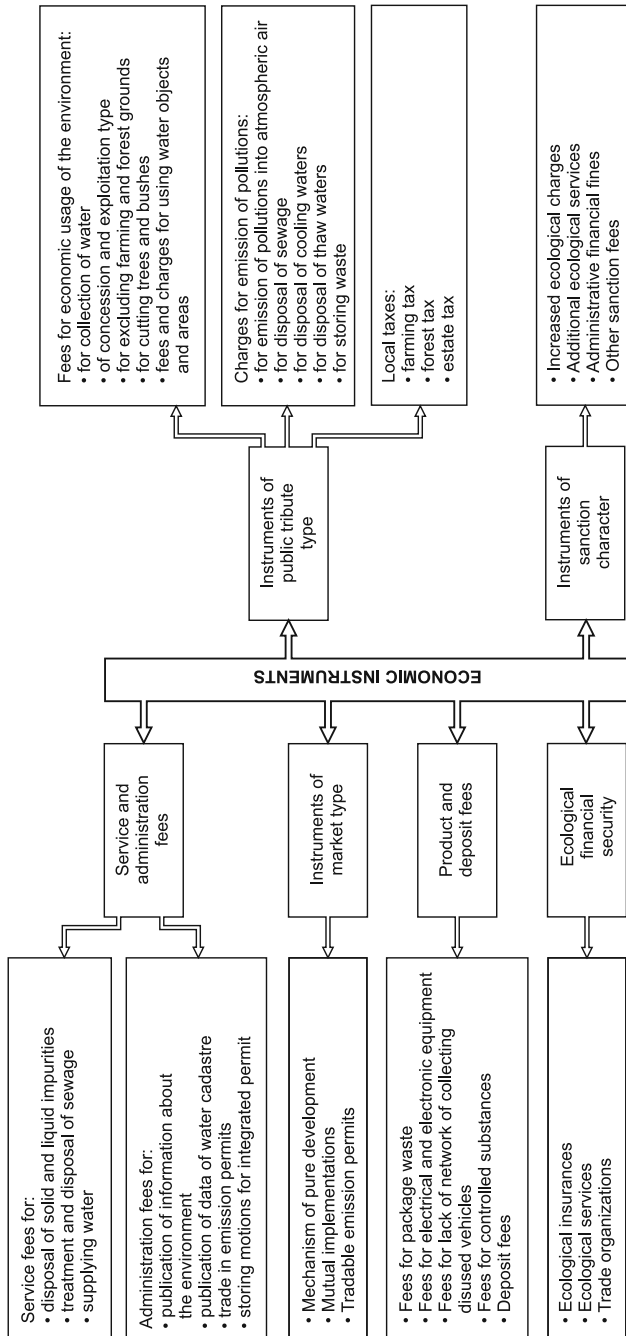
At times there are distinguished two more special functions that constitute a special example of the aforementioned ones:

1. information function – involves conveying signals about essential environmental hazards and the need of proper behavior of entities;
2. fiscal function involving instruments' effect on public budgets in connection with financing environmental protection.

These instruments provide continuous stimulus to reduce the level of emitted pollutions, especially in the case when costs of emission reduction decrease. They create a possibility for a given economic subject to compare the costs of reducing environmental pollution with the level of ecological loadings connected with its pollution.

However, economic instruments have high degree of inertia in implementation. Usually some time passes before the incentive signal reaches the user of the environment through market. Economic instruments do not provide the appropriate level of ecological safety, therefore they ought to perform a supplementary role or the one reinforcing the operation of legal and administrative instruments, as the incentive of economic type to comply with requirements of legal and administrative character.

Figure 5.4. Division of economic instruments



Source: ibid. figure 5.1.

5.4.1. Instruments having the character of public tributes

Instruments having the character of public tributes are taxes and charges. A basic difference between charges and ecological taxes concerns the way of using the incomes reached for their consumption. Incomes from charges ought to be secondarily earmarked for financing the processes of environmental protection and management. In Poland the incomes from ecological charges are accumulated on objective accounts of ecological funds. Ecological taxes constitute basic budget revenues (of country, municipality) and do not need to, although they can, be used for financing pro-ecological investments and undertakings.

The following main types of ecological charges are distinguished: charges for economic use of the environment, charges for pollutions' emission, service charges, usage charges – product and deposit ones.

Charges for economic use of the environment. In a theoretical way, they constitute a non-market price paid by business entities for using resources, both renewable and non-renewable ones, as well as the environment amenities. The most important charges for economic usage of the environment include:

- charges for the consumption of water for economic purposes;
- concessive fees and exploitation fees related to the search and excavation of mineral resources;
- charges for excluding arable areas from agricultural or forest production;
- charges for cutting trees and bushes;
- land tax and forest tax.

Charges for the consumption of water for economic purposes are made mainly by the entities using underground or surface waters which are used for economic purposes. The charges for using water exclude the so-called common usage of waters – which is connected with enabling people to reap non-economic benefits (e.g. recess, fishing) – and also usage of waters from one's own well in order to satisfy the needs of a household. In 2010 two unit rates for the collection of surface water were introduced – basic rate (0,049 PLN/m³) and rate for water for the supply of population (0,035 PLN/m³) as well as three rates for the collection of underground waters – basic rate (0,99 PLN/m³), rate for the supply of population (0,058 PLN/m³) and for the needs of production of food or medicine (0,084 PLN/m³). There were introduced also two other types of coefficients which differentiate the fee depending on the quality of collected water and country's area. The first group of coefficients is different for surface and underground waters, whereas the other one only for surface waters.

As regards the collection of surface inland water there are four coefficients:

1. coefficient 2.8 – if water is not subject to any processes of treatment or if it is treated only in a mechanical way;
2. coefficient 2.0 – while using accelerated filtration;

3. coefficient 1.0 – while using coagulations, floatations and slow filtration or removal of iron or manganese;
4. coefficient 0.6 – while using membrane processes, ion exchange, sorption on active carbon, oxidation by ozone or other oxidants.

The coefficient that differentiates unit rates of fees for the collection of surface waters for a part of the country's area is in accordance with the division into regional directorates of water management. The rates increased by 1.2 occur in the area of RZGW¹⁰ Gliwice, RZGW Poznań, whereas the rates increased by 1.1 in the following districts: łódzkie, małopolskie, podkarpackie, śląskie and świętokrzyskie in the areas comprised by RZGW Warszawa.

As regards the collection of underground waters there were introduced five coefficients:

1. coefficient 2.0 – if water is not subject to any processes of treatment or only disinfection and demineralization;
2. coefficient 1.25 – in the processes of iron removal or oxidation;
3. coefficient 1.0 – for removal of manganese;
4. coefficient 0.5 – removal of ammonia, coagulation or adsorption;
5. coefficient 0.3 – removal of nitrates or heavy metals.

Fee for the exclusion of lands from farming or forest production. The fee is divided into: charge – this is an one-off fee on the grounds of permanent exclusion of lands from farming or forest production; annual fee – on the grounds of using lands from farming or forest production. The charge for excluding farming lands is dependent on the class and type of lands and on the type of soils. The charge is collected in the amount that is corresponding to the value of a certain amount of tones of grain:

- arable lands and orchards on the soils of mineral origin – 350 Mg;
- arable lands and orchards on the soils of organic origin – 450-75 Mg;
- meadows and durable pastures on organic soils – 500-750 Mg;
- meadows and pastures on mineral soils – 150-300 Mg of grain, depending on the class of lands.

The annual fee is paid over the period of 10 years, starting from the time the land is excluded from production, in case of permanent exclusion, and for the period of non-permanent exclusion. Its amount is 10% of the charge. In 2009 the value of 1 tone of wheat amounted to PLN 550.80.

The charge for the exclusion of forest lands is dependent on the type of mainstay type of forest and on the value of 1 m³ of wood. It constitutes the equivalence of 2000 m³ per 1ha in the exclusion of soils of mainstay type “forest”, 1500 m³ per 1 ha of mixed forest, 1150 m³ for 1 ha of mixed wood and 250 m³ for 1ha of dry wood. The average price of wood is announced by GUS (in 2009 it amounted to 152.53 PLN/m³).

¹⁰ RZGW – regional board of water management

The annual fee for excluding forest lands amounts to 10% of the charge and it is made over the period of 10 years in case of permanent exclusion or for the period of temporary exclusion. The annual charge and fee for the exclusion of lands from production in protected forests are 50% higher. For the untimely felling of trees a one-off compensation is taken, the value of which is dependent on the age of this forest stand.

Concession and exploitation fees are related to geological and mining usage of the environment. Concession fee is collected on the grounds of seeking or examining mineral deposits as well as non-container storing of substances and also storing of waste in orogen, also in underground mining excavations. The fees for seeking deposits of minerals vary and they depend on the type of the mineral and on the character of activity (lower in seeking and almost two times higher in examining of the deposit). In 2009 the fees for seeking crude oil and gas amounted to 105.81 PLN/km², rock minerals – 1058.08 PLN/km², mineral coal, therapeutic waters and brine – 529.05 PLN/km² as well as brown coal and thermal waters – 211.62 PLN/km².

Exploitation fee is collected for excavating the mineral from the deposit. The value of this fee depends on the type and amount of the extracted mineral. In 2009, for example, the fee amounted to: for example 3.16 PLN/Mg of fire-clay or ceramic clay, 0.48 PLN/Mg of sand and gravel, 1.88 PLN/m³ of brine, 1.41 PLN/Mg of rock-salt, 2.02 PLN/Mg of hard coal.

The fees for removing trees and bushes (in non-forest areas) are dependent on the type of a tree (4 groups were isolated) and its thickness formulated in centimeters of trunk in circumference (8 groups were isolated – the lowest up to 25 cm, the highest of more than 700 cm). As the consequence, the value of fees is largely diversified, for example cutting of poplar or alder (I group) with toughness of up to 25 cm in 2010 required fees of PLN 12.04, whereas for cutting yew or magnolia (IV group) with the toughness of 501 cm requires the fee of PLN 3004.20. The maximum rate is PLN 3894.45. Fees for cutting bushes depend not only on the area. In 2010 this rate amounted to 222.54 PLN/m².

There is a number of exceptions when the charge is not made. Charges are not made, among others, for cutting trees:

- which are dangerous for people's safety or possessions in the existing building objects;
- which are dangerous to road and railway traffic or to the safety of navigation;
- which are cut in the frameworks of cultivation activities;
- which died or do not augur well for living for reasons that are independent from the estate's owner;
- which belong to the species perceived as arduous (e.g. poplar), if they are supplemented in the nearest vegetation season by trees of other species;

- if the removal of them results from the needs of protecting plants, animals and mushrooms encompassed by the protection of species or if it results from the protection of natural habitats.

The group of *fees and charges on the grounds of using objects and areas related to water management* was distinguished by P. Małecki [Małecki, 2009], includes:

- charges for using inland water paths and water devices which are the property of the State Treasury. This charge is collected for the transportation of people and goods, towing and floating of wood and also even for the shipping of empty trade boats and barges and for using sluices and slipways; in 2009 the rates of these charges oscillated from 0,049 for 1 tone km of transported goods to 13.46 for lockage from 4 p.m. to 7 a.m.;
- fees for dedicating some lands covered by waters that are the property of the State Treasury: fees for lands occupied by water energy objects (in 2009 – 8.13 PLN/m²), towering and declining buildings (1.63 PLN/m²), harbors, marinas, winter resorts and halting spots for ships (0.20 PLN/m²), extraction of stone, gravel and sand (0.31 PLN/m²), extraction of plants from water (0.03 PLN/m²);
- fees for dedicating fishing precincts, annual fee is dependent on the area of precinct, average price of wheat price, fishing type of water and its position in the configuration of Water Management Regional Boards. In 2009 maximum rates were from 0.1 to 0.5 dt of wheat for 1 ha.

Fees for the emission of pollutions are paid for introducing material and non-material pollutions into the environment. The fee is supposed to show the financial dimension of introducing pollutions into the environment within the frameworks of the possessed permits. The fees are collected for:

- emitting gas and dust pollutions into the air;
- disposing sewage into surface waters or into soil;
- disposing cooling waters;
- disposing precipitation and thaw waters;
- placing waste on the heap.

Fees for the emission of pollutions into the air in Poland are collected for releasing 67 volatile substances – gases and dusts. The basis for diversification of unit rates of fees is the toxicity of released pollutions. While accepting toxicity of SO₂ as the basis for non-organic compounds the fee for the emission of unit of very toxic arsenic is more than 700 higher than the fee for the identical unit of SO₂.

Unit rates of fees were determined for each of the released substances. In 2010 they oscillated from 329.06 PLN/kg of arsenic, asbestos, benzoalfapyrene, nickel and dioxins, 164.54 PLN/kg of freons, some halon, cadmium, mercury or polychlorinated bifenyls to 0.46 PLN/kg of sulfur dioxide and 0.25

PLN/Mg of carbon dioxide. Thus, the total amount of fee for the emission of air pollutions depends on the type and amount of released substances.

In the case of lack of possibility of direct determination of the amount of released pollutions there was introduced possibility of lump sum calculation. This separate system of fees was introduced for the emission of pollutions in reloading of engine benzines, from cauldrons of low capacity of less than 5 MW, fuel engines as well as breeding and cultivation of poultry. The unit rates of fees for the gases introduced into the air during reloading of engine benzenes depend on the type of technical operation and the amount of reloaded fuel. In 2010 this fee, for example, for filling containers with solid roof amounted to 5.14 PLN/Mg, whereas in case of underground containers – 2.73 PLN/Mg, car tanks – 1.48 PLN/Mg.

Unit rates of fees for gases and dusts introduced into the air in 2010 from cauldrons of the nominal heating capacity of less than 5 MW were dependant on the type of cauldron and its nominal heating capacity. For example, for the emission from the cauldron heated with coal with mechanical fire grate with a dedusting device having the heating capacity of less than 3 MW the fee amounted to 15.38/Mg, when the capacity was 3-5 MW – 14.37 PLN/Mg of combusted coal. In case of cauldrons heated with coke the fees amounted to 20.43 PLN/Mg and 16.37 PLN/Mg respectively. In case of cauldrons heated with wood the uniform fee was 3.92 PLN/Mg. For cauldrons heated with oil the fee in 2010 was diversified depending on the amount of sulfur in the fuel – if there was less than 0.5% of sulphur – 8.13 PLN/Mg, from 0.5 to 1% – 9.98 PLN/Mg, from 1.0 to 1.5% – 15.82 PLN/Mg. For the cauldrons heated with gas the unit rate depended on the type of gas (with large amounts of methane or nitrogen) and on the heating capacity of the cauldron. For liquid gas there was only one rate: 1.57 PLN/Mg.

The rates of fees for gases and dusts introduced into the air from combustion engines depend on the type of vehicle (passenger cars, low-speed cars, rail cars, amphibian vehicles), degree to which European emission norms are fulfilled (not compliant with the norms – registered for the first time till 31.12.1992; compliant with the norm Euro I – registered from 01.01.1996, compliant with the norm Euro II – registered from 01.01.1997 to 31.12.2000, compliant with the norm Euro III – registered from 01.01.2001 to 31.12.2005, compliant with the norm Euro IV – registered after 01.01.2006 as well as the engines with the document confirming compliance with the requirements of the Euro V norm) and on the type of fuel (petrol, liquid gas propane-butane, diesel oil and biodiesel). For example, in 2010 the unit rate for gases and dusts introduced into air by engines not compliant with the Euro norms in cars having the total weight of less than 3.5 Mg amounted to 61.44 PLN/Mg of petrol, 40.27/Mg of liquid gas, 18.07 PLN/Mg of diesel oil and 14.75 PLN/Mg of biodiesel and by the engine with the document confirming compliance with the Euro V norm

amounts to 6.12 PLN/Mg of petrol, 6.43 PLN/Mg of liquid gas, 3.87 PLN/Mg of diesel and 3.24 PLN/Mg of biodiesel.

The unit rates of *fees for gases and dusts introduced into air from poultry keeping* depend on the type of flock (reproductive flock, laying hens, hen broiler, chicken, turkey, helmeted guinea fowl, goose and duck) and also on the type of breeding (cage-free, bedding or cage system with an open container for droppings, cage system with mechanical drying of droppings). For example, in 2010 this rate for laying hens in cage system with drying of droppings amounted to 6.12 PLN/100 posts/year, and for farming turkeys in cage-free or bedding system it amounted to 33.18 PLN/100 units/year.

Fees for pollutions introduced in sewage into surface waters and into grounds are dependant on the type and concentration of pollutions as well as on the place where sewage is produced. Pollutions are characterized by six indices:

- five-day bio-chemical demand for oxygen (BZT₅)¹¹;
- chemical demand for oxygen marked by the bi-chromate method (ChZT)¹²;
- basic suspension;
- total of chlorides and sulphates (Cl + SO₄);
- volatile phenols;
- heavy metals and toxic organic compounds.

Unit fees for pollution that are formulated using the indicator of biological or chemical demand for oxygen are diversified and depend on the spot the sewage comes from. The basic rate in PLN for kilogram was determined for industrial sewage, whereas for other sewage differentiating coefficients were introduced, and for the sewage of the living type the rate amounts to 0.3 for BZT₅ and 0.4 for ChZT, for municipal sewage 0.4 and 0.5 respectively, whereas for other sewage 0.5 of the basic rate for BZT₅ and 0.7 for ChZT. In 2010 the basic rate was 3.69 PLN for 1 kg of BZT₅ and 1.47 PLN for 1 kg of ChZT, 0.45 PLN/kg of suspension. One-off fee for chlorides and sulfurs in 2010 in the area of lower catchment of Wisła (RZGW in Gdańsk) amounted to 0.0123 PLN/kg, in the other part of the country – 0.043 PLN/kg, for volatile fenols – 39.30 PLN/kg, heavy metals and dangerous organic substances – 107.49 PLN/kg.

Fees for releasing cooling waters are dependent on the temperature of released water. For releasing water with the temperature of 26°C no fees are collected, for water with the temperature of 26-31°C the unit rate in 2010 amounted to 0.58 PLN per 1 dam³ (1000 m³), 32-34°C – 1.18 PLN/dam³ and with the temperature of 35°C – 3.65 PLN/dam³.

¹¹ BZT₅ indicator signifies the amount of oxygen that is necessary for oxidation of substances included in sewage (mainly of organic type) within five days.

¹² ChZT indicator signifies the amount of oxygen taken in the process of chemical oxidation of sewage.

Fees for releasing precipitation and thaw waters are calculated in annual dimension and the unit rate is diversified depending on the type of area. Five types of such areas were isolated:

1. industrial and storage areas, transport bases (in 2010 the annual fee amounted to 0.25 PLN/m² of area);
2. areas of harbors and airports (0.060 PLN/m²);
3. area of roads and parking lots with hermetic surface located in industrial areas 0.049 PLN/m²;
4. area of roads and parking lots with non-hermetic surface (0.074 PLN/m²);
5. area of roads and parking lots with hermetic surface located in towns with population density exceeding 1300 persons per km² (the rate of fee in 2010 amounted to 0.036 PLN/m²).

All unit rates of fees for pollutions in waters released into lakes are two times higher.

Fees for storing waste (placing of waste on waste heaps) are paid one-off. The values of unit rates depend on the type of stored waste. 1054 types of waste were isolated and these were divided into 20 groups, and each of them into sub-groups and types depending on the degree of their impact on the environment. In 2010 22 rates were isolated, including non-segregated municipal waste, waste plant mass, waste from wood – 104.20 PLN/Mg, gravels and bottom ashes 21.4 PLN/Mg, waste from artificial substances – 28.00 PLN/Mg, lead batteries and chargers – 198.08 PLN/Mg, devices containing freons – 202.93 PLN/Mg.

Local taxes function at the level of municipality where they perform a certain role in environment management. In Poland three local taxes are distinguished: farming, forest and estate tax.

Farming tax is collected from lands classified as farming arable lands or lands with trees and bushes located on arable lands, except for lands comprised by business activity which is different than of farming type. The value of tax constitutes the financial equivalence of 2.5 quintal of wheat for 1 conversion ha of lands. In 2010 the farming tax for farms amounted to 85.25 PLN/ha (2.5 q × 34.0 PLN/1q), for other lands the equivalence of 5,0 q of wheat (in 2010 it amounted to 170.50 PLN/1 ha). Farming tax is not levied among others, for farming lands of V, VI and VII class, lands with trees and bushes on arable lands, non-arable lands, ecological farmlands, lands occupied by water reservoirs serving supplying of population, lands below anti-flood dykes and located between dykes.

The payers of farming tax are entitled to investment allowance on the grounds of expenses made for the construction or modernization of objects serving environment protection, for the purchase and installation of water-butts, devices supplying household with water and devices serving the usage of natural energy sources (wind, biogas, sun, water fall) for the purposes of production.

Forest tax is collected for the lands classified as forests. The basis for taxation is the forest area formulated in ha. The unit rate of forest tax constitutes the financial equivalence of 0.220 m³ of wood (the price of sale is announced by GUS). In 2010 the rate of forest tax amounted to 30.04 PLN/ha (0.220 m³ × 136.54 PLN/m³). The forest tax is not applicable to forests of less than 40 years old and ecological farmlands. For protected forests and forests included in nature reserves and national parks the rate of forest tax is decreased by 50%. Owing to this local self-governments unwillingly approve of the creation of new or increase of the existing national parks.

Estate tax is collected from estates that serve neither farming nor forest activity, i.e. for lands, buildings and constructions. The basis for taxation is the area of the land, usable area of the building and the value of construction which is the basis for the calculation of amortization. In 2010 the maximum value of estate tax rates amounted to:

- from lands related to business activity – 0.77 PLN/m²,
- lands near lakes – 4.04 PLN/ha and the other lands – 0.39 PLN/m² of area,
- from residential buildings – 0.64 PLN/m² of usable area; from buildings related to running business activity 20.50 per m²;
- from constructions 2% of the value that constitutes the basis for amortization.

This tax allows for numerous allowances and as free from tax are the lands located in the areas comprised by strict, active and landscape protection as well as buildings and constructions that are permanently related to land and serve directly the achievement of aims from the domain of nature protection, lands constituting ecological farmlands or non-arable lands.

5.4.2. Product and deposit fees

In Poland these fees constitute a special form of ecological fees. They may be defined as a fee for the unit of product introduced into the environment which potentially hazardous to the environment during usage and at the post-usage stage. These fees are paid by the final users of the product.

Product fees are economic incentive to such utilization of products and packages that is compliant with the law. Each of these fees was formed on the principle of consensus between interested parties: producers and representatives of environmental protection. In Poland the following fees are used:

- product fees for not realizing the obligation of retrieval and recycling of package waste;
- product fees for electrical and electronic equipment;
- fees for controlled substances;
- fees for lack of network of collecting vehicles;

- substitute fee for not purchasing the required amount of renewable energy;
- deposit fee.

Product fees for not realizing the obligation of retrieval and recycling of package waste and some products concern the following products that were withdrawn from usage: packages from artificial substances, glass, aluminium, steel, paper, cardboard and wood (fee for multi-layer packages is not collected); chargers; batteries and galvanic cells and their parts; lubricating oils; tires. For each of these products the legislative obligation of retrieval and recycling was introduced. The required level of recycling in 2010 and the target level in 2014 (in brackets) are as follows: packages altogether 53% (55%); large dimension chargers 60% (60%); small dimension chargers 20% (20%); batteries 20% (40%); lubricating oils 35% (35%).

Non-compliance with these levels of recycling (as well as the levels of retrieval, e.g. for tires 85%) results in the necessity to pay a product fee. The fee is calculated as the product of the fee rate and the difference between the required and achieved level of retrieval (recycling) calculated into the value that is expressed in mass or amount of products or packages. In this form a fee is a sanction for not achieving a certain level of retrieval (recycling) and not a classical product fee that is applicable to every unit of product or package. The obligation to pay the fees applies to entrepreneurs who introduce on the Polish market products in packages or products that are comprised by the obligation of retrieval/recycling or retrieval-related organizations that took over this obligation from entrepreneurs. The product fee is transferred on the account of the proper marshal office.

The rates of product fees in 2010 were as follows:

- for packages – 0.26 PLN/kg of economic glass and 2.73 PLN/kg of artificial materials;
- for nickel and cadmium chargers that weigh: from 50-750 g – 0.53-6.35 PLN per unit; 751-2000 g – PLN 21.16 per unit; more than 2000 g – PLN 27.51 per unit;
- for nickel and iron chargers as well as for batteries and galvanic cells: of button type – PLN 0.04 per unit; having weight 50-2000 g – 0.13-3.26 PLN per unit; having weight of more than 2000 g – 27.51 PLN per unit;
- for lubricating oils – 2.88 PLN/kg;
- for new and old regenerated tires (after retreading) – 2.88 PLN/kg;
- for old non-regenerated tires – 11.50 PLN/kg.

Product fees for electrical and electronic equipment. Entrepreneurs that introduce on the market electrical and electronic equipment or retrieval-related organizations acting on their behalf are obliged to make retrieval and recycling of used equipment to the level specified by the law. The required level of retrieval and recycling (in brackets) is as follows: large dimension devices of households and distributing machines – 80% (75%); teleinformation and tele-

communication equipment and audiovisual equipment – 75% (65%); small dimension equipment of households, lightning equipment, electrical and electronic tools, toys, recreational and sport equipment, devices for supervision and control – 70% (50%); used gas discharge lamps – 80% (80%).

Entrepreneurs are obliged to pay two types of fees:

- 1) registration fee for entry in the register of the Main Inspector of Environmental Protection and annual fee for remaining in this register;
- 2) product fee.

Registration (annual) fee depends on the dimension of the company and on the annual net circulation of the introduced equipment. The rates of these fees in 2010 were as follows: for micro entrepreneurs with the annual revenue of up to PLN 0.5 m – PLN 50, and with the revenue of PLN 0.5-5 m – PLN 100 and of more than PLN 5 m – PLN 200; for other entrepreneurs with the annual revenue of up to PLN 0.5 m – PLN 500, with revenues PLN 0.5 – 5 m – PLN 2000 and of more than PLN 5 m – PLN 4000.

Product fee is paid by an entrepreneur introducing the equipment on the market or by a retrieval-related organization which, on behalf of this entrepreneur, committed itself to retrieval/recycling of the used equipment. The fee is paid for not complying with this obligation – as the product of the product rate and difference between the required and achieved level of retrieval and recycling. The basis for the calculation of product fee is the mass of used equipment expressed in kilograms. The rates of product fees in 2010 amounted to:

- 1.80 PLN/kg of devices of households, tele-information and telecommunication equipment, electrical and electronic equipment, toys, medical instruments, devices of control and supervision as well as distributing machines;
- 18.00 PLN/kg of lightning equipment (fluorescent lamps, high pressure discharge lamps, metal halogen lamps and low pressure sodium lamps).

Registration and annual fee is made on the account of the Main Inspector of Environment Protection, whereas the product fee is paid once a year on the account of a district fund of environmental protection and water management.

Fee for lack of network of collecting vehicles (also known as a recycling fee) is imposed on business entities (producers and importers) that introduce vehicles on the Polish market. The obligation of paying fees is carried by those entities that introduced in a specific year at least a thousand vehicles and did not organize (do not have) a network of collecting exploited vehicles and also smaller entities that cannot ensure such collection. In 2010 the value of fee amounted to PLN 500 per one car. The fee is calculated as the product of the fee rate and the number of cars introduced in a certain year on the country's area for the period finishing with the day the collection of used vehicles has been organized. The fee is paid on a separate account of the National Fund of Environmental Protection and Water Management.

Fees for controlled substances are paid by the entities that introduce for the first time into circulation in Poland substances that impoverish the ozone layer and some other substances that are either new or renewed after regeneration. As controlled substances are considered:

- hydrochlorofluorocarbons (38 substances), unit rates of fees for introducing them in 2010 oscillated: PLN 0.50 per 1 kg of chlorofluoroethane, PLN 52 per kg of chloropentafluoropropane;
- chlorofluorocarbons (15 substances), unit rates of fees in 2010 amounted to: PLN 6 per 1 kg of chloropentafluoroethane, 8 PLN/kg for trichlorotrifluoroethane and 10 PLN/kg for 13 other substances;
- bromomethane – unit rate 2 PLN/kg.

The fee is paid once a year on the account of the indicated marshal office.

Substitute fee for not purchasing the required amount of “green” and “red” energy. This is a specific type of fee that was included in this group owing to a similar type of construction of its calculation. The companies that deal with the production and circulation of electrical energy have the obligation to ensure certain participation of energy from renewable sources (“green” energy) and/or cogeneration (“yellow” and “red” energy). The obtainment of energy from these sources is documented by a special certificate of its origin. Such certificate is supplied to the Energy Regulatory Office.

Substitute fee for not purchasing the required amount of energy from renewable sources is calculated as the product of the unit rate of substitute fee (in PLN/MW) and for not complying with the obligation (in MW). The degree of non-compliance with the obligation is the difference between the legally defined and truly approved participation of “green”, “yellow” or “red” energy. The calculation of the substitute fee in case of cogeneration certificates has a more complex character. The unit rate of a substitute fee is updated every year. In 2010 the obligatory participation of energy produced in renewable sources of energy amounted to 10.4% and the substitute fee amounted to PLN 267.95 per each MW of not complied obligation. The obligatory participation of energy produced by units of cogeneration heated by gas fuels or of the total electrical power of the source of less than 1 MW (“yellow” energy) was that the range of obligation amounted to 3.1% (the fee 128.80 PLN/MWU); whereas by the other units of highly efficient cogeneration (“red energy”) the range of obligation amounted to 21.3% and the fee 23.32 PLN/MWU. Fees are transferred on the account of the National Fund of Environmental Protection and Water Management.

Deposit charge is a financial charge imposed on products that are particularly hazardous to the environment. The fee is subject to repayment after the used product is transferred as the waste for recycling, neutralization or storage that is proper ecological terms. In Poland since 4 September 2010 the deposit fee has been binding for car batteries and chargers – PLN 40 and for industrial

batteries and chargers – PLN 35. The retail seller of chargers is obliged to take from the seller a used charger or to collect a deposit fee if the buyer did not pass on the used one. The seller is obliged to the collection of the used charger and to the repayment of deposit fee up to 30 days from the purchase of a new one.

5.4.3. Service and administration fees

Service fees are contractual amount dues for performing a certain permanent service related to the relation of a certain entity with the environment. Most frequently these are municipal services that concern supplying water, disposing sewage and disposing waste and that are provided to households and companies, usually micro and small ones, less frequently the average and large ones. The element of fees for these services is also an appropriate ecological fee.

Service fee for supplying water is dependent on the costs of functioning of a local water pipeline, i.e. the on the costs of collecting, treating and supplying water. These costs include also the fee for the collection of water. In most local water pipelines the participation of this fee in the costs of water pipeline oscillates at 1-3%.

Service fee for disposing and treating sewage is dependent on the costs of keeping sewage system and on the costs of the functioning of sewage plants and/or other treatment devices. The fee is usually dependent on the amount and type of disposed sewage. Sewage plant rarely conducts the entire treatment of sewage and some of the polluting substances are disposed into surface waters. The plant also bears the costs of the removal and placing on the waste heaps the so-called rakings, i.e. the solid substances included in sewage. These two types of fees constitute the element of the costs of disposing and treating sewage and thus also the element of the relevant service fee (usually a few per cents).

The companies handling with water pipelines and sewage system usually monopolize the entire area, therefore the value of the service fee for the supply of water and sewage disposal is set by the municipality council on the basis of the calculations presented by this company.

Service fees for the removal of solid and liquid impurities is the charge for the removal of solid waste and for placing them on a waste heap, burning in an incineration plant or subjecting them to another type of utilization as well as the charge for the removal of liquid impurities from households or companies that are not connected to the sewage system and for taking them into sewage plant. An essential component of the costs of removing solid waste is the fee for placing them on the waste heap. In 2010 the fees for placing waste on the waste heap constituted half of the service fee. The removal of solid and liquid waste does not have the character of monopoly, therefore the municipality council does not specify strict unit rates.

Administration fees are related to running various administrative activities concerning the problems of environmental protection. In most cases these are ordinary administrative fees in the same mode and amount as while organizing other issues. There were established also administrative ecological fees of special character which function in another way than ordinary fees.

Fees on the grounds of applying for an integrated permit are registration fees paying of which is the condition of examining the motion for issuing an integrated permit for a certain installation. The value of the fee is diversified depending on the type of installations and parameters that characterize the scale of the activity run in a certain installation (most frequently this is production capability formulated by the amount of products formed within 24 hours). A certain formula serves calculation of the fee rate. The rates of base fees on the grounds of applying for permit in 2010 amounted to PLN 200 in the case of installations in steel and metallurgic industry up to PLN 1000 in the case of installations for thermal conversion of municipal waste. For the change of integrated permit in relation to making crucial changes in installation the fee is lower by 50% when compared to the ordinary fee. The fees are transferred to the National Fund of Environmental Protection and Water Management.

Fees on the grounds of trade emission permits are incurred by the entities making an installation comprised by the system of emission trade permits. These are two types of fees:

1. fee for the inscription in the National Emission Permit Register – this is one-off fee, in 2009 it came to PLN 450,
2. fee for the concession of tradable emission permits – it depends on the number of permits and on the unit rate of fee for introducing gases or dusts into the air comprised by permits and multiplied by a thousand (this coefficient is not used with reference to carbon dioxide and methane); the charge on the grounds of these fees is transferred directly on the account of the National Fund of Environmental Protection and Water Management.

Fee for publicizing data from water cadastre. This data is usually publicized directly, however, a fee is collected for making a copy of documents and sending, also in an electronic form. In legal terms there were specified minimum and maximum rates for preparing and publicizing:

- cartographic information (in 2009 from PLN 8 for one A4 page to PLN 192 for one A0 page);
- numerical data (from PLN 10 for 100 objects to PLN 250 for more than 100 000 objects);
- descriptive data (from PLN 0.10 for the list of watercourses and catchments to PLN 8 for the list of the quality of underground waters per unit).

The maximum fee for preparing and publicizing information from water cadaster is PLN 1000.

Fee for publicizing information about the environment. Information about the environment is publicized free of charge if it is possible to convey orally or via insight into non-archive documents on the spot in office. Search for information and making copies takes place through written application and is payable: for making the white and black A4 copy – 0.30 PLN/page, colorful copy – 3.00 PLN/page, A3 form – coefficient X2, A2 – X4, A1 – X8 and A0 – X16; for scientific and didactic purposes the general coefficient is 0,5; for sending a copy of documents a fee is collected in compliance with the price list of universal post services. Similar to other countries, in Poland there are commercial organization handling search and preparation of information about the environment and water management in the configuration desired by the ordering entity.

5.4.4. Instruments of sanction type

Instruments of sanction type are special financial consequences of not complying with the regulations of environment protection law [Małecki, 2009]. They include: increased ecological fees; additional ecological fees; administrative financial fines; other sanction fees.

Increased ecological fees are calculated for those entities that use the environment without necessary permits for introducing pollutions into the environment and for excluding farming and forest lands from production. For the emission of air pollutions without permit and for the collection of water and for the disposal of sewage without water and legal permit an entity pays a fee that is increased by 500% in relation to the basic fee. For storing waste without the decision approving of the instruction of waste heap exploitation the accelerated fee is 0.05 of the unit rate of fee for placing waste on the waste heap for every day of storage. An identical dimension of the increased fee concerns the storage of waste without the decision specifying the place and way of storing hazardous waste.

Increased fee is incurred by identified entities for:

- storing waste in the place not earmarked for this purpose (0.1 of the unit rate of basic fee for placing waste on waste heap for every day);
- removing waste in the areas having special natural amenities (0.15 of the unit basic rate for one day);
- placing waste in inland or sea waters (100 times of the rate for placing this waste on the waste heap).

For excluding farming and forest lands from production discordantly with the regulations of law the fee is increased once and amounts to the double value of the basic fee for excluding farming or forest lands without the necessary change in spatial management plans and without the decision enabling exclusion the increased fee amounts to 110% of the basic charge. For not completing

recultivation of devastated farming and forest lands in the required time takes place triple increase in the basic annual rate.

Additional ecological fees are imposed on the entities that did not make the required product fee in the adequate amount or in the required term. Additional fees are collected in the value of half of the required basic product fee by virtue of an appropriate organ. Additional fees are calculated for (in the brackets there is a name of the institution issuing the decision):

- failure to realize the required level of retrieval/recycling of package waste (district marshal);
- lack of network of collecting vehicles (Main Inspector of Environmental Protection);
- controlled substances that impoverish the ozone layer (district marshal);
- batteries and chargers, lubricating oils and tires (district marshal);
- disused electrical and electronic equipment (Main Inspector of Environmental Protection).

Revenues from the additional fees are handled in the same way as the basic fees are.

Administrative financial fines (ecological fines) are sanctions for using the environment without a permit or in violation of the existing rules in the way that is hazardous to man or nature. Most frequently the premise for imposing fines is the failure to comply with environmental standards: violating provisions of the administration decision, lack or invalidity of the decision.

In practice, fines are most frequently imposed for:

- exceeding the amount or type of gases and dusts emitted into the atmospheric air determined in the permit;
- exceeding the amount, state or contents of sewage determined in the permit;
- exceeding the amount of consumed water determined in the permit;
- violating the conditions of the decision defining the type, place and way of accumulating and storing waste, or the decision approving of the instruction of exploitation of waste dump;
- exceeding the noise levels determined in the permit;
- cutting trees and bushes without permit;
- destroying green lands during earthworks.

The mechanism of imposing these penalties (excluding the fine for exceeding the admissible amount of consumed water as well as for cutting trees and bushes) is connected with the fact that after proving exceeding or violating them, district inspector of environmental protection defines hour (dusts and gases) or twenty-four hour (others) extent of the fine, which runs for the whole duration of exceeding or violating. When exceeding or violating ceases, the inspector imposes a definite fine as a product of running punishment or time. If exceeding or violating does not stop till 31 December of a certain year, the

inspector imposes a decisive fine for this period of time, and from 1 January the inspector begins to charge another fine.

Fines for supranormative consumption of water has one-off character. Fines for cutting trees and bushes as well as for destroying green lands are imposed once by a village administrator, mayor or president of a town. One may appeal against the decision taken by the district inspector of environmental protection in connection with fines to the Main Inspector of Environmental Protection, and then a complaint may be forwarded to the Main Administration Court.

Administrative financial fines are not treated as a form of compensation for losses in the environment. Paying a charge does not exempt one from the obligation of making up for it to entities that experienced damage, neither does it exempt one from bearing costs of restoring a primary state of the environment. The efficiency of this instrument is dependant on several basic factors: the certitude of taking a fine, severity and recoverability. The most important among them is *the certitude of bearing penalty* in case of violating definite regulations. It is necessary, therefore, to have an appropriate system of monitoring the environment and efficient legal-administrative system of imposing fines. Severity of penalty ensues from the relation of a fine to the gain (profit). The amount of fines must be determined in such a way that, on the one hand, they would be a severe economic incentive. On the other hand, however, they would not cause loadings leading to the discontinuation of economic activity. Recoverability of penalties takes place in accordance with the procedure of collecting fiscal obligations required in the first run and excluded from arrangement proceedings. There is possibility of adjourning a fine if the polluter initiates an activity that aims at removing the burden, and after its realization there is possibility of canceling the fine.

5.4.5. Instruments of market type

Instruments based on the mechanism of market transactions are built on the principle of the law of demand and supply, with particular consideration of the Ronald Coase's theorem. This is a theoretically described regularity that indicates the possibility of achieving an optimal level of pollutions as the consequence of two-sided negotiations between various users of the environment resources and amenities. This theory was developed by Thomas Crocker who in 1966 suggested the so-called concept of tradable emission permits. His proposal lied in resignation from the control of air quality using direct instruments (norms and standards), determination of the pollution amount by an agency (government) that is responsible for the control of the environment, issuing of an appropriate number of emission permits and also division or sale of permits on the market.

Tradable rights to the emission of pollutions are also termed as: permits, emission certificates, emission certificates, credits of emission reduction. In most general terms this is the subject of circulation on the market of emission permits. Their owner cannot use the right of emitting a certain amount of pollution but can sell this right to another entity. Permits may be then sold and bought on the market of emission rights. The motive of making transactions is the achievement of benefits by the participants, and these benefits are reduced to the choice of the cheapest way of adjusting to the requirements of regulations that regulate the quality of the environment.

The market of emission permits is the market in which the subject of exchange becomes the right to using certain environment resources, and more precisely – its assimilation capacity. The crucial fact is that on the market of emission rights there are principles of free competition. They are identical on each market with free competition. The prices are dependent on the availability of the environment capacity.

The condition of the proper functioning of this instrument is the anticipatory determination of the legislative and institutional frameworks. State must determine the initial conditions of the functioning of the market including: the pool of the permits available on the market, their initial price and the principles of distribution among market members (the so-called primary allocation of permits) while complying with the emission norms that are safe for the environment and human health.

Presuming the universal character of the market the rights to the emission of pollutions become a factor of production. Lack of them can signify partial or complete capability of acting. Therefore, there takes place cooperation between polluters – the one with the possibility of reducing emission cheaper than the cost of permit on the market reduces the emission and the permit is sold to the polluter whose unit cost of reduction is high or to the one that enters the market with production. Demand and supply on the market of rights shape the prices of permits. If there are more buyers than sellers, the demand for permits increases, their price is becoming higher and the total amount of pollution remains unchanged. Furthermore, this instrument may automatically adjust to the changes of external conditions, e.g. to the growth of inflation. However, one of the drawbacks in the market of tradable permits are high transaction costs related to the necessity of constant supervision of the market on the side of state services of environment protection, negotiation and control of making agreements and also the costs of creating institutions that are indispensable for the functioning of this market, such as specific banks or exchanges of pollutions [Ciechelska, 2006].

One can distinguish several types of markets of tradable permits [Fiedor et al., 2002]:

- Markets with full or reduced emission rights. Full market means that the permits comprise the entire legally permitted emission (within the limits of certain emission standards) and are fully transferable between the entities participating in the market of emission rights. Limited (incomplete) market means that both the subject of permits and the range of trade of them is reduced to the values corresponding to the reduction of emission below the legally permitted level.
- Field market – trade in tradable emission permits takes place within the frameworks specified on the basis of appropriate criteria of regions in which the quality of certain environment components is controlled.
- Sector (trade) market means that trade in tradable emission permits takes place in the scale of a certain field, branch, section or any other isolated part of economy of a certain country.
- Market of permits for real emission – the subject of exchange between its participants is the current emission of pollutions calculated in technical units: in terms of weight and capacity. Optionally, there can be used also corrective coefficients that reduce real emission to comparability in physical terms.
- Market for contractual emission – real emission is corrected using the so-called indicators of exchange. In such a case into consideration is taken the fact that within a certain region comprised by permits physically the same emission may cause diversified environmental consequences (hazards).

Markets of tradable permits successfully function in the domain of air protection, where they serve ensuring reduction in the emission of cross-border pollutions the consequences of which have global character (global warming, ozone layer). These are above all: carbon dioxide, nitrogen oxides and sulfur dioxides emitted from stationary sources.

In countries of the European Union trade in emissions was admitted as the instrument of realizing the requirements of the Kyoto Protocol with reference to reduction in the emission of greenhouse gases. This instrument is supposed to serve not only reduction in the emission of greenhouse gases but also the improvement of competitiveness of European companies. Being EU member, Poland introduced market of rights to emit pollutions in 2005¹³.

In accordance with the regulation of the European Union¹⁴ the emission permits are tradable by the virtue of property law indicated with a number in the information register¹⁵. The certificate remains valid in the entire settling period.

¹³ Act of 22 December 2004 on trade in permits concerning emissions of greenhouse gases and other substances into the air. (Dz.U. of 2004, No. 281, par. 2784).

¹⁴ Council Directive 96/61/EC of the European Parliament and Council of 24 September 1996 on integrated prevention of pollutions and their control (Dz.U.L. 257/26 of 10 October 1996).

¹⁵ Tradable permits in the area of the European Union are in the Community Independent Transaction Log (CITL) which is conjugated with the Independent Transaction Log (ITL).

So far in the European Union there have been two such periods: the first one starts on 1.01.2005 and finishes 31.12.2007 and another one is from 1.01.2008 to 31.12.2012. A permit may be introduced into circulation in every year of the settling period. The market of emission permits implies two ways of purchasing them:

1. primary – as the result of bestowing on the basis of the national plan of distributing emission permits;
2. secondary – by purchase. In the circulation may participate both primary (bestowed) beneficiaries and the entities willing to make a purchase.

The obtaining of permits on the primary market takes place on the basis of national allocation plans. Such plans are made on the basis of the limits specified by the European Union in accordance with the accepted aims of reducing emission. In March 2007 the Union Council (leaders of countries) approved of reduction in the emission of greenhouse gases by at least 20% and the increase in the participation of energy from renewable sources in the total usage of energy to 20% till 2020. The level of reduction in emission may be increased to 30% if a new international agreement concerning climate changes will be signed. Also in such circumstances trade in emission permits would comprise also other greenhouse gases. Presently the system comprises only carbon dioxide. It is assumed that after 2013 the emission permits in energy sector will be granted only via auction. Other industry sectors and aircraft will gradually shift to this system of granting permits. Auctions will have an open character: every European business entity will be entitled to buy permits in any member state. Incomes from the system of trade in emission permits increase the incomes of member states.

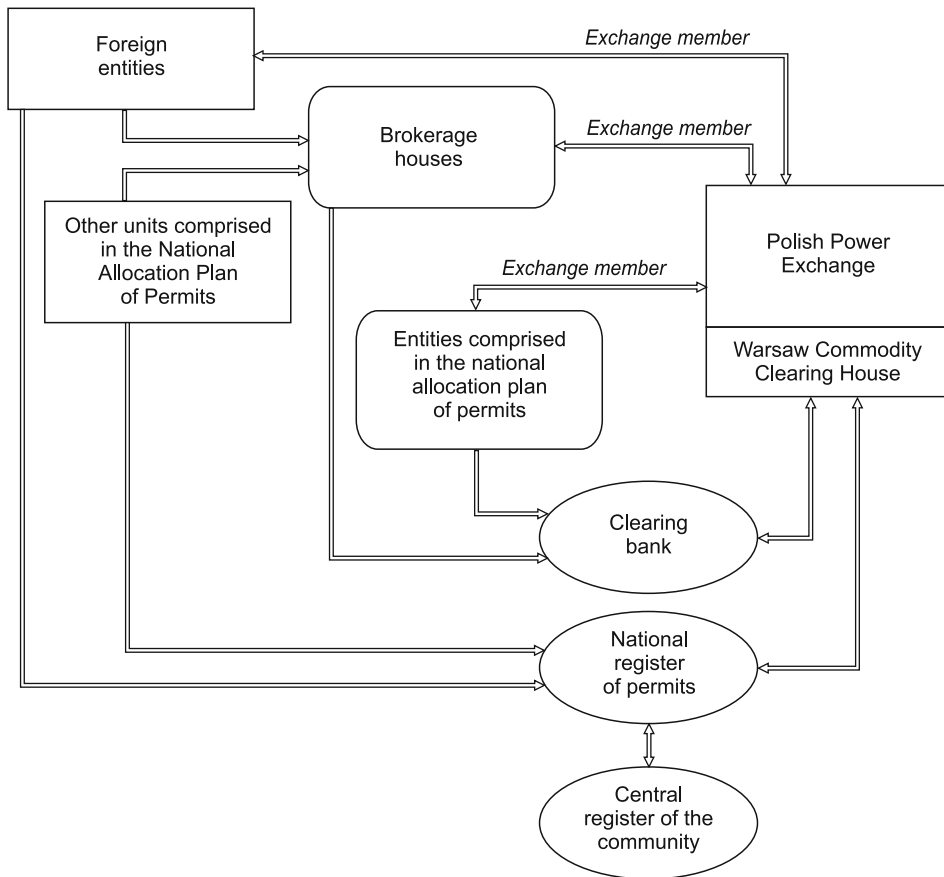
In Poland the system of trade in emission permits comprises the following elements:

1. National Administrator of the System of Trade in Emission Permits, the task of whom is to run the National Register of Emission Permits, elaborate projects of national plans of distributing emission permits, monitor the system's functioning and also to elaborate reports and publicize information.
2. Commodity Energy Exchange is the animator on the market of emission permits. The tasks of the animator include making permanent orders of purchase and sale of instruments recorded in on the Exchange. The Exchange members can include also brokerage houses (one of the first ones was the brokerage house of Environmental Protection House (BOŚ)).
3. Warsaw Commodity Clearing House (WCCH) obtained a permit of the Polish Financial Supervision Authority to make settlements and calculations of the transactions signed on the market of emission tradable permits.
4. *National Allocation Plan of Permits related to the emission of carbon dioxide for the years 2008-2012* approved of by the Cabinet. It was calculated that the number of permits for this period amounted to 1 042 576 975. The

plan specified the total number of permits of the emission of CO₂ for particular types of installations comprised by the system (not all installations are in the system), for new installations and the number of installations that constitute the national reserve for the projects of mutual implementations. Furthermore, the plan includes a number of units of Certified Emission Reduction (CER) and emission reduction unit (ERU).

The structure of the system of emission permit trade in Poland was presented in figure 5.5.

Figure 5.5. Structure of emission permit trade in Poland



Source: [Ranosz, 2008, p. 94].

Joint implementation mechanism (JI) constitutes an instrument that lies in the mutual realization of the projects resulting in the reduction of emission of anthropogenic greenhouse gases or increase in biological absorption of CO₂

(forests) in the country and abroad (compare with subchapter 7.3.2.3.). The mechanism of joint implementation enables acquisition and transfer of units of reduction in the emission of greenhouse gases formed as the consequence of such investment projects. These projects must be implemented in countries that participate in the system of trade in permits. Units of emission that were generated in this way constitute the subject of circulation on the market of tradable permits. Poland participates in joint implementations.

Clean Development Mechanism enables realization of investment projects that result in the emission or increase in the absorption of CO₂ in countries that do not participate in the system of trade in permits for the emission of pollutions (compare with subchapter 7.3.2.3.). The mechanism of acting is identical as in case of mutual implementations. Poland does not participate in the mechanism of clean development.

5.4.6. Financial incentives

Financial incentives are the instruments that activate protective activities of business entities or territorial units by means of external financial aid. To a large degree this aid is addressed at supporting pro-ecological investments and ecological education. Financial incentives have entirely different character than the other economic instruments. This is aid that does not ensue from the functioning of the market mechanism but from the guidelines of policy or from the realization of specified governmental programs.

Financial incentives are frequently used in OECD countries although it raises many controversies among theoreticians and practitioners. Attention is drawn to the fact that owing to this one of the cardinal principles of ecological policy is not complied with – the principle in accordance with which a “polluter pays” because money flows are formed not from the polluters but towards them. Another essential complaint concerns violation of the principle of competition on the free market. The obtained aid signifies the improvement of selected producers’ situation on the market. Subsidy improves the economic position of beneficiaries most frequently without taking into consideration effectiveness of their market behaviors. Aid may be granted in the form of subventions and direct or indirect subsidies.

Subventions. The term “subvention” is generally understood as every form of financial aid granted to autonomous entities however, in environment management the concept of subvention concerns mainly financial support of continuous publications (monthly or quarterly) that constitute an essential aid in ecological education.

Direct subsidies are one-off aid for the realization of a certain undertaking. In financing of protective undertakings direct subsidies have the character of one-off financial aid of pro-ecological undertaking in the amount of several to

several dozen of outlays, which is paid after the completion of the realization of this undertaking or in installments during implementation. The second form of a direct subsidy are surcharges to the interest rate of preferential credits and loans. A subsidy is the difference between the value of commercial and preferential interest rate. The source of direct subsidies may be means from state budget (in Poland it is rarely used), territorial self-governments and ecological funds (used most frequently). The value of direct subsidies granted in 2008 by the National Fund of Environmental Protection and Water Management and EkoFundusz Fund amounted to more than PLN 300 m.

Indirect subsidies constitute the aid financed in the form of diversification in taxes (not used in Poland), tax exemptions or tax allowances. Beneficial principles of taxation regard business activity that is directly related to environment protection, for example in case of entities producing protective devices. Tax allowances can apply to both business entities and physical persons, for example the allowances on the grounds of donations for environmental protection.

In Poland till 2010 apart from the aforementioned tax exemptions and allowances there were also:

- exemption from income tax of taxpayers, the statutory aim of which is activity for environmental protection or social initiatives serving supplying villages with water (it does not concern companies of water pipelines and sewage system);
- exemption from income tax of subventions, subsidies, surcharges and underpayments of services related to the formation, purchase and obtainment of fixed assets serving environmental protection;
- exemption from tax on non-returnable foreign aid for protective activities;
- exemption from income before imposing income tax on donations for the aims of environmental protection, protection of animals and national heritage;
- exemption from VAT in case of services that serve environmental protection and that were financed from foreign aid.

It is worth emphasizing that few people make use of allowances in taxes for physical persons owing to their financial involvement for the protection of the environment and protection of animals.

5.4.7. Ecological financial securities

Ecological financial securities constitute a way of securing claims for damage and their effects created in the environment as the result of company's functioning. Their degree comprises both losses created as the result of unpredictable situations (e.g. technical breakdowns) and as a result of normal functioning of a company.

Financial securities constitute a relatively new instrument in the realization of objectives of ecological policy and in many countries, including Poland, their implementation encounters resistance of legal and institutional nature. A key problem lies in defining legal extent of the concept ecological damage. Lack of non-ambiguity and semantic immensity of this concept hinders implementation of ecological financial securities. Additionally, ecological damage may be direct (as it happens with poisoning as a result of chemical contamination) or indirect.

Ecological pledge is the payment made by an economic entity for the benefit of the institution responsible for maintaining the required state of the environment. This is made prior to this subject starting the undertaking, the realization of which may cause negative ecological consequences. The return of the pledge takes place when the subject meets certain ecological requirements defined by law. In practice, it is an entrepreneur that accumulates means on a separate bank account by making payments starting from the day when the obligation of making payment commenced. Funds accumulated in this way are allocated for the elimination of ecological damage created in the process of company's functioning (e.g. recultivation of post-mining areas).

Ecological insurances are most frequently used with reference to companies whose activity is characterized by high ecological risk, e.g. chemical or pharmaceutical industry. Ecological insurances trigger transferring civil liability for ecological negative effects of influences of subjects causing them on insurance institution (insurer) in return for appropriate payment. Liability of the insurer is formed within the limits of accepted financial limit of the insured party's ecological responsibility, in the frameworks of which the insurer redress damage by restoring the previous state or by payment of financial compensation. Insurances understood in this way may be both of compulsory, ensuing from the compulsion of a certain type of activity or installation imposed by the state, or voluntary.

5.5. Instruments of voluntary usage

In this group three types of instruments may be distinguished:

1. voluntary contracts or ecological agreements,
2. procedures of voluntary usage,
3. ecological recommendations.

Voluntary contracts or **ecological agreements** constitute a group of regulative actions defined as command-compromise method. The essence of these activities is enabling subjects using the environment to influence the shape of commitments they are adopting. The range of commitments and the schedule of meeting them is the subject of the arrangement between administration organs and entrepreneurs or their representatives. The failure to meet the requirements

may result in certain negative consequences, but they do not display characteristics of administration compulsion. Emphasis is placed on large flexibility of this instrument, it may be directed at every subject using the environment and adjusted to reach many objectives of environmental protection. These agreements have supremacy over traditional regulation instruments since they clearly motivate entrepreneurs to constantly reduce the negative influence on the environment.

A formal definition of this instrument is included in the Directive 94/62/EC of 20 December 1994 concerning packages and package waste¹⁶ (...) *voluntary agreement means a formal contract signed by competent authorities of member state and concerned economy sector; the contract must be open to all parties willing to meet its conditions, aiming at taking actions leading to the realization of accepted tasks.* A voluntary contract may concern also a regional and local level. It may be concluded between municipal, provincial or district self-governments and also by a branch or even by one company.

Organization for Economic Cooperation and Development introduced the following classification of voluntary agreements:

- unilateral commitments – ecological programs of a certain type that are taken voluntarily by the same companies that accomplish objectives included in this program according to a schedule they prepared themselves. Entrepreneurs define principles of control of these programs' realization as well;
- contracts concluded between polluters and various interest groups – realization of the commitments made is subject to control by pressure groups; sanction for not complying with the arrangements may be, e.g. boycott of products or services of the company by consumer organs;
- contracts negotiated between industry and public administration – they determine time frameworks for reaching objectives included in the contract, in return for complying with them administration organs refrain from introducing new stricter legal regulations concerning environmental protection; these contracts enable entrepreneurs to negotiate profitable adjustment periods;
- programs undertaken by public administration, which individual companies are free to take part in – these are ecological programs initiated by administration and having open character, i.e. various entrepreneurs may join who will oblige themselves to meet certain criteria.

Contracts of this type ought to meet several conditions:

1. they ought to be executable;
2. they ought to have certain objectives with the indication of deadlines for their realization;

¹⁶ Dz.U. L. of 31 December 1994.

3. they ought to be subject to publication in an official promulgatory organ, alternatively be made public in another way that ensures their availability for the persons concerned;
4. the effects of contract's realization ought to be regularly monitored, reported to competent authorities, and also available to society according to the conditions defined in the agreement;
5. in case of incompatibility with the agreement authorities ensure realization of the objectives through the application of command-administration instruments [Draniewicz, 2005].

Procedures of voluntary usage ensue from various documents of non-obligatory character. These may be technological procedures, the usage of which limits the effect of the installation on the environment or procedures of organization character, which define a way of employees' behavior in the company or a certain working place. The best known are the procedures defined in the norms of environment management in a company. These norms indicate, among others, the ways of: identifying significant environment aspects in an organizational unit; holding ecological reviews and documenting their results; contents of environment management program in a company; making analysis of environmental aspects in good's life cycle; eco-labeling of goods. Banks voluntarily use the procedure of ecological assessment of financed investments. Formal commitment to using such procedure takes place as the result of signing (freely) the relevant UN declaration.

Ecological recommendations do not order, but merely indicate and/or order certain technological, technical and organizational actions or solutions that organizational unit may implement with the aim of reaching higher ecological-economic efficiency of functioning. Recommendations of this type may be of two types: universal or individual. Universal recommendations point at certain actions or solutions that are worth being published owing to their ecological and economic efficiency or owing to their being useful in another specific way. Individual recommendations point at possible solutions in the given unit (company, household etc.).

Ecological recommendations concerning, for example, the protection of climate may have the character of information system on implemented achievements and possibilities of implementing new solutions, particularly in the domain of sparing of energy, possibility of using gases and dusts for economic purposes, as well on new cultivation techniques. They are addressed at business entities, farmers and public service companies. The recommendations may be focused on defining and publicizing priority directions of scientific and research works, especially the most advanced technologies and saving of materials and energy.

Directive 06/32/EC of the European Parliament and Council of 5 April 2006 concerning new directions of actions concerning energy-saving and annulling

the directive 93/76/EEC¹⁷ includes a set of recommendations on saving energy in various economic sectors.

- in public sector it is recommended to: publish samples of saving programs and hold periodical controls of efficiency in heating, cooling and ventilating systems;
- in agriculture it is recommended to: promote energy-saving devices in transport and agriculture, inform users about ways and possibilities of better usage of the existing equipment and about the possibilities of introducing new energy-saving cultivation techniques, use artificial fertilizers in a rational way and use fully local resources of alternative energy from renewable sources for heating buildings on farms;
- in industrial sector it is recommended to: develop power engineering audit (mainly in the sectors connected with large use of energy) and to introduce system of incentives to use energy for heating in a rational way, especially energy generated as a result of industrial processes;
- in households it is recommended to increase the level of technical requirements concerning heating systems in dwelling houses and to introduce regulations aiming at encouraging to install individual measurement systems of heating energy, warm water etc. and also to create audit of energy saving in households.

In Poland the implementation and publication of this type of ecological recommendations is still hardly used in practice. These recommendations, despite not having binding force, may efficiently influence ecological awareness of society and shape certain desired changes in behavior and ways of conduct.

5.6. Instruments of social influence

Instruments of social influence are the instruments connected with shaping human ecological awareness and knowledge. In principle, all instruments of environment management affect subsystems of society – individuals and social groups. Even if an instrument is clearly addressed at economic entity, it still must go through a “filter” of its employees’ awareness in the operational process. Ecological awareness, depending on its state, may enforce, weaken or distort operation of instruments. The instruments of social influence are aimed at influencing individuals and social groups as to direct their pro-ecological behavior mainly in terms of perceiving and complying with obligations and bans as well as reducing the awareness of disturbances in the process of steering with the use of indirect instruments.

¹⁷ Dz.U.L. 114/64 of 27 April 2006.

People's attitude to the natural environment and to the instruments of its protection are shaped by many crucial factors. These may include, for example, current political conditionings, historical and cultural traditions, people's conservative attitude, or even informal codes of behavior of groups or communities. These factors are difficult to distinguish since they change depending on time and regional arrangements. In such a situation used instruments (techniques) of social influence must be of a general character. Psychological and sociological research has proved that social behavior in management process is largely affected, above all, by such factors as the awareness of the essence of the realized process, direct participation in decision-making, degree of compatibility of held actions with individual and social needs and interests. They determine selection of techniques of psychological-social influence.

In steering of the processes of environment administration there are distinguished instruments of social influence of formal and informal character.

Formal instruments are actions which were (at least to some degree) sanctioned by binding legal regulations, or even institutionalized. The main role is played by formal ecological education, access to information about the environment and lobbying in legislative organs. *Formal ecological education* is realized in the process of teaching and bringing up children from kindergarten to PhD studies. Ecological education:

- helps one understand that human activity is shaped both by natural forces and beliefs, values, policy and the state of economy;
- helps one understand the idea of unity of all things and appreciate essence and effects of connection between people, living creatures, non-material matter and space that occurs at various levels and on a various spatial scale;
- shapes the sense of responsibility for the environment on a local and global scale, for the future quality of life of people and other creatures;
- teaches one an individual way of thinking, transferring and receiving ideas, feelings and opinions concerning the environment, especially the idea of sustainable development, many probable visions of future and strategy of changes;
- shapes openness to various points of view at ecological problems, ability of making own judgment based on enriched information, and also the capability of making critical reflection about own views and values;
- enables one to understand the mechanism according to which environmental problems on a local and global scale are created;
- helps one shape the ability of cooperating, planning and organizing in the domain of environmental protection;
- enables one to be familiarized with the environment management system, especially with management instruments, and to acquire the ability to obtain and use information about the environment;

- enables one to attain direct experience from the observations of local environment.

Access to information about the environment is a condition of ecological self-education, raising ecological awareness of society, and also a condition of efficient management of usage, protection and shaping of the environment. In the first run, an efficient there must be implemented system of information inside a system. It is difficult to talk about efficient management if one institution does not know precisely the goal, degree and methods of acting of another one, if in the given office employees do not know about the issues being handled and about the accepted solutions. Moreover, in business entities there is required information about the undertaken protective actions, goals and effects of realizing protective actions and effects that may occur when they are not realized. Information on direct influence of behavior (conduct) of employees on environmental arduousness of a company is also needed. Research conducted by the author¹⁸ in the mid-nineties of the 20th century among employees of particularly arduous companies proved that 95% of the information about arduousness to the environment reached them by means of mass media, not from the information obtained inside the company. The vast majority of offices and companies treat ecological information as confidential and do not provide access to it to large part of society, neither to students nor to their own employees. This is a sphere of management that demands further regulations. A different situation is in those companies that implemented their own environmental management systems in accordance with the norm ISO 14001 or EMAS.

In Poland *lobbing* has been regulated by acts. There is a new job of a professional lobbyist, however, such activity requires registration. Lobbying activities are most frequently run in an informal way in legislative units – Sejm, Senate, district regional councils and also provincial and municipal boards. Lobbyists act on behalf of a certain social or territorial group with the purpose of finding the most beneficial solution for it. If environmental protection is this interest one may call it pro-ecological lobbying. Well organized pro-ecological lobbying involves supplying proper arguments to decision-makers by presenting results of research, alternative solutions, opinions of unbiased experts.

Informal instruments (actions) enable or facilitate people (individuals, groups) to recognize and understand ecological problems, serve citizens to exert impact on the decisions concerning usage, protection and shaping of the environment at various grades of governing without using appropriate legal procedures. The usage of these instruments is neither regulated nor prohibited by law. The Constitution is a direct basis for the functioning of these instruments, especially the freedom of speech and the right to information.

Informal actions demand meeting of at least two conditions:

¹⁸ B. Poskrobko

1. there is a need for active citizens or non-governmental organizations to be prepared for making use of the possibilities created by fundamental civic rights, not in the way that has already been used frequently and is sanctioned by the existing procedures;
2. there is a need for authorities that accept rights and rules enabling the society to participate in the decision-making process even when there are no legal procedures required for that.

Informal instruments (actions) include: informal ecological education, non-conventional information actions, social pressure, sponsoring, social services as well as complimentary or alternative actions. *Informal ecological education* is self-education realized on the basis of information from mass media, activity of pro-ecological social organizations and shaped during discussions within a group of family, friends, co-workers or informal interest groups.

Informative actions include: publication of leaflets, brochures, periodicals, organization of work meetings, meetings, happenings, seminars, training camps, exhibitions and shows as well as electronic information. There is also high efficiency of mass actions and campaigns (e.g. Clean Up the World, refusal to buy certain products, sending appeals to authorities), using the Internet. These actions are relatively efficient, especially when they are directed at active participation of participants (individuals concerned).

Instruments of social pressure include: petitions, collecting signatures or even more radical forms: manifestations, demonstrations and picketing. By means of them citizens and non-governmental organizations force the authorities to make or change decisions, provide access to information, draw attention to serious hazards to the environment or violate environmental law. They have a positive aspect, from the perspective of organizers, since they attract the attention of mass media and thus create indirect pressure on authorities. It is easier then to organize nation-wide actions, stimulate public opinion or obtain support of foreign organizations.

Pro-ecological sponsoring is the voluntary financial or material (by goods) support of social pro-ecological actions. Sponsoring may be of altruistic or business character. Disinterested sponsoring is focused on obtaining any benefits of the sponsored party. Sponsors directly or with the aid of funds earmark financial means, material goods or services for the benefit of the realization of certain actions aiming at environmental protection, ecological education or any other form of shaping ecological awareness of society, regardless of the publicity. Such sponsors regard themselves as patrons. Business sponsoring means supporting pro-ecological organization or actions in return for the services provided by sponsored parties, such as advertisement, information shaping the image of the sponsor or any other benefits. Business sponsoring is aimed at the professionalism of undertaken actions manifesting themselves not only by legal

guarantees of services from sponsoring partners but also in clarity of strategic sponsors.

Social services include such actions as: initiating actions with the so-called hot lines, green telephones, as well as holding information centers for citizens or providing access to the services of lawyers and other experts specializing in ecological issues and working in the units held by non-governmental organizations. Social services are delivered mainly by non-government organizations with the purpose to promote citizens' participation, direct actions of other non-governmental organizations or as to reinforce the efficiency of such actions.

Complementary actions may be used as the complementation of the existing procedures, or in some sense, they may repeat these procedures, however, independently from the actions undertaken by official organs. In particular, these instruments may be used within the frameworks of the procedure of the assessment of the influence on the environment and within frameworks of the procedures of spatial planning. Non-governmental organizations and groups of experts may hold their own research of influence on the environment, independently of the research commissioned within the frameworks of official procedure by the parties concerned (author of a document or investor). They may organize their own public discussions and publish their own reports. They can put forward competitive plans of spatial planning in relation to the official ones, create their own versions of economic development in the region, or alternative ecologically-oriented budgets.

A variety of environment management instruments results from the complexity of the managed object and continuous emergence of new problems in the relations: economy-environment and society-environment. While solving certain well-known problems that were already subjected to appropriate regulation, there always appear new ones that demand solution and, frequently, a new way of reacting. Many premises indicate that in Poland within tens of years the system of environment management instruments will change significantly. The instruments regulating the emission of pollutions are going to lose their present importance (new technologies will, to a large extent, solve this problem). However, the importance of public tributes for using environment elements, resources and amenities will increase.

Chapter 6

MANAGEMENT OF NATURE PROTECTION

6.1. Nature protection as management subject and object

Protection of nature from excessive anthropopressure concerned primarily the securing of the selected objects or areas from destruction. It was defined as conservatory nature protection. Its aim was to preserve from the exploitation, pollution or destruction those nature objects that are precious from scientific, natural, aesthetic, historical and commemorative, social and also, in some cases, from economic point of view, as well as their securing from exploitation or destruction.

In Poland, the protection of endangered species was introduced already by kings in the times of the I Republic. In the 1880s in the then Austrian annexed territory, the Seym of Galicia and Lodomeria introduced the protection of a chamois and a groundhog in the Tatra mountains. In the times of II Republic, there was introduced territorial protection in the form of nature reserves and national parks. The number of these protected areas considerably increased in the times of the People's Republic of Poland. In the 1940s, in the country there were only three national parks, whereas in 1989 there were already 17. At the turn of the 1970s and 1980s, new forms of territorial nature protection were introduced – landscape parks (in 1980 their area already occupied 236,4 000 ha) and the areas of protected landscape (1980 – 642,3 000 ha). The expansion concerned also the quality and quantity range of individual nature protection – apart from the endangered species of animals, plants, fungi and nature monuments

also the protection of nature and landscape complexes, documentation positions and ecological farmlands was introduced.

At the turn of the last century, in Poland began the introduction of the European ecological network "Natura 2000". These are areas that have significance for the Union and are protected with the aim to preserve natural mainstays and species which are important from more than only national (European) perspective and are linked with one another by the net of ecological corridors. The area of NATURA 2000 in a certain bio-geographical area ought to contribute largely to the preservation or reconstruction of features characteristic for this region or to ensuring the protection of those species that the Union is interested in. In the case of animals occurring (living) in large territories, the area that has importance for the Union is the area of the natural occurrence of protected species characterized by physical or biological factors which are crucial for their life or for reproduction.

Contemporary nature protection is linked with the preservation and sustainable usage of resources, formations, amenities and other elements of nature. The objective of nature protection is to: maintain ecological processes and the stability of ecosystems, and to preserve or to restore natural habitats to the proper state; maintain biological diversity, geological and palaeontologic heritage; protect natural amenities, green areas in towns and villages as well as forest stands; shape proper attitudes of people towards nature through education, information and promotion of nature's most interesting or precious formations.

In Poland the following forms of nature protection are used:

- of area protection: national parks, nature reserves, landscape parks, areas of protected landscape, areas of the European network Natura 2000;
- of individual protection: nature monuments, documentation positions, ecological farmlands, nature and landscape sets;
- Forms of species protection: species protection in situ of plants, animals and fungi and species protection ex situ of plants and animals.

There are distinguished four types (degrees) of protection:

1. strict protection that is strictly related to complete and permanent man's intervention in the state of ecosystems, formations and components of nature and in the course of natural processes in the areas comprised by protection and, in case of species, year-round protection of their specimens and stages of their development;
2. active protection – when the need arises it is allowed to make protection procedures with the purpose to restore the natural state of ecosystems and nature components or to preserve the natural habitats and the habitats of plants, animals or fungi;
3. partial protection concerns species of plants, animals and fungi with possible reduction in the number of population and the obtainment of specimens of these species or their parts;

4. landscape protection lies in the preservation of characteristic features of landscape.

Depending on the place where protected species live one can distinguish protection *in situ* and protection *ex situ*:

- *in situ* – is the protection of species of plants, animals, fungi and nature formations in the places where they naturally occur;
- *ex situ* – is the protection of species of plants, animals and fungi outside the places where they naturally occur and also the protection of rocks, fossils and minerals in the places where they are stored. Thanks to the cultivation *ex situ* it was possible to reconstruct many species in their natural environment, including the European bison (in Białowieża).

National park is the area characterized by special natural, scientific, social, cultural and educational values and occupying the area of at least 1000 hectares where the protection comprises the entirety of nature and landscape amenities. National park is created with the purpose to preserve widely understood biological diversity, i.e. the protection of landscape resources and amenities, formations and components of inanimate nature, natural habitats or habitats of plants and fungi, mainstays of animals and with the aim to restore or reconstruct their proper state if it was deformed by man. Formation of a national park, change of its borders or its elimination takes place by the decree of the Cabinet of Ministers. The supervision of parks is the responsibility of the Minister of Environment. In Poland in 2009 there were 23 national parks. They occupied the area of 314.5 thousand hectares. The park that occupied the largest area was Biebrzański National Park (59 223 ha), whereas the smallest one was Ojcowski National Park (2145 ha). The degree of protection in the area of a park can be diversified, there are areas of strict protection and areas of landscape protection. The largest area of strict protection in 2009 has Bieszczadzki National Park (18 557, which constituted 63.6% of its area), whereas Narwiański National Park did not have an area of strict protection.

Polish national parks are appreciated worldwide. All parks were placed on the list of the International Union for Conservation of Nature-World Conservation Union (IUCN-WCU). Till 2009 there were classified 17 Polish parks, among which 15 obtained the category II and two others received the category V. The other six parks still have not been subject to the assessment and classification. Furthermore, six national parks are on the UNESCO list of biosphere reserves.

Nature reserve is the area in its natural or inconsiderably changed state where there are found: ecosystems, natural mainstays and habitats, habitats of plants, animals or fungi as well as formations and components of inanimate nature characterized by special values of natural, scientific and cultural values or by landscape amenities. The consideration of an area as a reserve takes place in the form of management of the regional director of environmental protection.

In Poland in 2009 there were 1451 reserves having the total area of 163,4 thousand ha. There are 9 types of reserves: faunistic (142 objects), landscape (115), forest (712), peat (167), floristic (174), water (34), of inanimate nature (70), steppe (33) and saline (4). In the total area of reserves 2% was occupied by strict reserves, including especially the reserves of forest (1479 ha), peat (817 ha) and of faunal type (462 ha).

As the consequence of the realization of the Convention on water and marshy areas the global network of reserves "Ramsar" was created¹. In Poland this network comprises: Biebrzański National Park, Narwiański National Park, Poleski National Park, Słowiński National Park, National Park "Warta estuary", Wigierski National Park and also: Nature Reserve "Łukajno" Lake, Nature Reserve "Oświn" Lake, Nature Reserve "Karaś" Lake, Nature Reserve "Słońsk", Nature Reserve "Świdwie" and Nature Reserve "Milickie Ponds".

Biosphere reserves are the global form of nature protection. They were designed within the frameworks of the international research program UNESCO "Man and Biosphere" (MaB). Their aim is to achieve stable balance between the state of nature and preservation of cultural values. These are large ecosystems or groups of ecosystems having the area of more than a thousand hectares, being protected and offered for comparative research. Protective requirements that are set for biosphere reserves are higher than those for national reserves. Biosphere reserve must be representative (and not necessarily unique) for characteristic natural ecosystems of particular regions of the Earth and have the base for scientific research. In Poland there were isolated seven biosphere reserves, including four cross-border reserves: Polish-Belarussian Białowiecki Biosphere Reserve, Polish-Ukrainian-Slovakian Biosphere Reserve "Eastern Carpathians", Polish-Slovakian Tatrzański Biosphere Reserve and Polish-Czech Karkonoski Biosphere Reserve as well as three national reserves: Biosphere Reserve "Babia Góra", Słowiński Biosphere Reserve and the Biosphere Reserve "Łukajno Lake". Białowiecki National Park was considered by the UNESCO as the object of global heritage.

Landscape park is the area protected owing to its natural, historical and cultural values. The objective is to preserve or protect nature from hazardous deformations of natural features of the environment and landscape amenities characteristic or unique in the whole region. In the area of landscape park economic activity is held with consideration of protective aims. Landscape park is formed via the resolution passed by the district self-government. The self-government also approves of its statute. In 2009 in Poland there were 121 landscape parks which occupied the area of 2607 thousand ha (8.1% of the country's

¹ The convention on water and marshy areas having international importance, especially as the living environment for water birds of 2 February 1971 (DZ.U. of 1978, No. 7, par. 24 and par.25).

area). In the total area of parks the share of forests was 50.2%, of farming lands – 31.13%, of waters – 3.92% and of nature reserves – 3.38%² [Ochrona, 2010].

Protective zones, which are called cleadings, are created next to national parks and nature reserves. Their objective is to protect areas from hazardous external factors or other unfavorable influences of neighboring lands. In Poland all national parks have protective zones, the total area of which (447.8 thousand ha) is larger than that of the protected area. Also the majority of landscape parks (175) have a protective zone. The overall area of protective area of landscape parks (1502.4 thousand ha) is comparable to the area of the parks where there is lagging. Location of national parks and landscape parks is presented on figure 6.1.

Figure 6.1. Location of national and landscape parks in Poland



² The total number is not 100 because the data does not include the area of roads and populated areas.

Areas of protected landscape comprise areas that distinguish themselves in terms of landscape and have diversified ecosystems and are valuable owing to tourist amenities or they perform the function of ecological corridors. Allocation of such areas has two equivalent aims – protection of nature and landscape and development of tourism. Economic activity on these areas ought not to violate the ecological balance of landscapes, especially as regards the paths of water migration, organic compounds, plants and animals. The areas of protected landscape are formed via the resolution of the district self-government. In Poland in 2009 there were 384 areas of protected landscape. They occupied the area of 7059.0 thousand ha (22.6% of the country area). In the total area of protected landscape the participation of forests amounted to 32.28%, of farming lands 38.71%, waters 2.61% and nature reserves and other protection forms 1.27%.

Areas of the European Ecological Network “Natura 2000” constitute the functionally coherent ecological network created with the aim of preserving natural mainstays and species that are important for preserving the biological diversity in the European Union. These areas ought to be linked by ecological corridors, i.e. fragments of landscape that are developed in the way that enables migration, dispersal and exchange of the genetic pool of species. The network is supposed to maintain biological diversity via protection of not only the most precious and rarest elements of nature, but also the most typical still popular nature arrangements which are characteristic for bio-geographical regions. The creation of network is the responsibility of every EU member state whereas the selection of the way of protecting particular elements is the task of a certain EU member state. The network of Natura 2000 areas comprises the Areas of Special Protection of Birds (OSO), Special Areas of Protection of Habitats (SOO) and the Areas of Importance For the Union (OZW).

Areas of special protection of birds are earmarked with the purpose to protect the population of wild species of birds. In these areas birds have beneficial conditions for living during their entire life or for some period, e.g. at the time of hatch or passage. While allocating OSO into consideration are taken such criteria as: the state of hazard of species in a global perspective, the state of the population of endangered hatching species and the importance of a certain area for migrating birds. There was adopted the following mode of allocating Areas of Special Protection of Birds: governments of member states earmark the suggested areas and make appropriate documentation (defined by the Decision of Commission 97/266/EC³) that is sent to the European Commission.

³ Commission Decision 96/266/EC of 18 December 1996 on the form including information about areas suggested to be included in Natura 2000 (Dz.U.L. of 24 April 1997). Information about the already existing areas is provided in accordance with the form specified by the Commission Decision 11/484/EC of 11 Jul 2011 on the form including information about the Natura 2000 areas (DZ.U.L. 198/39 of 30 July 2011).

The Commission checks whether these areas were allocated in accordance with the accepted criteria and approves of them. In this way OSO areas become the elements of the general European network. In Poland since 2009 there have been 141 OSO areas having the total area of 5 111.8 thousand ha.

Special areas of protection of habitats (SOO) are earmarked with the purpose of permanent protection of natural habitats or mainstay of populations of endangered species of plants or animals or with the purpose to restore the proper state of these habitats. These areas are formed on the basis of such criteria as being representative for the given bio-geographical region of Europe, rarity and the state of preserving a certain habitat and the possibility of denaturalization of its elements. The process of earmarking special areas of protection of habitats takes place in three stages. In the first stage the governments of member states elaborate the national list of suggested areas together with experts and negotiate it with proper local authorities. The result of these works is presented to the European Commission in the form of an official governmental proposal. In the second stage the European Commission evaluates which of the received proposals deserve to receive the status of Areas of Importance For the Union as the potential component of Natura 2000. The areas that represent types of habitats the protection of which is the priority and are earmarked for the protection of priority species automatically become such elements of the network. At the third stage, after the approval of particular areas by the European Commission, member states formally establish special areas of protection of habitats in the area, define the form of protection of each region and, if it is required in the area, elaborate and implement the plan of its protection.

In Poland in 2009 there were 931 SOO having the total area of 3791.1 thousand ha. The areas of Natura 2000 can comprise part or the entirety of the area that is covered also by other forms of protection. The areas of SOO and OSO can be partly or entirely located in the same area. The areas of Natura 2000 are established by the virtue of the decree of the Minister of Environment and are registered by the European Union. The Union partly participates in covering the costs of maintaining the national elements of the network of Natura 2000 within the frameworks of farming and environmental programs and from the financial means of "LIFE+" program. The maximum amount of donations from this program can amount to 70% of the project's costs.

Nature monument is a single formation of animate or inanimate nature and also their concentrations which have special value: scientific, cultural, historical-memorial or scenic. Nature monuments include, among others, splendid old trees, alleys, erratic blocks, rocks and caves. In the year 2009 35 420 natural monuments were embraced by protection, including single trees (29 472), groups of trees (3482), alleys (674), erratic blocks (992), rocks, caverns and caves and others (296).

Documentation post of inanimate nature is the place with geological formations, concentrations of fossils or mineral formations, as well as fragments of exploited and inactive surface and underground excavations. In 2009 there existed 140 such posts occupying the total area of 835.1 ha.

Natural and landscape complex is the place where a particularly harmonious combination of natural landscape with architectural solutions used by people took place. The esthetic values of a certain fragment of natural and cultural landscape were embraced with protection. In Poland in 2009 there were 287 such complexes and they occupy the total area of 86.4 thousand hectares.

Ecological arable land is the remaining part of the ecosystem changed by human activity that deserves protection and has significance for the preservation of unique resources of biological diversity. These are: ornamental ponds, bogs, field concentrations of trees and bushes, dunes, slopes and stony grounds. In Poland in 2009 there were registered and embraced with protection 6628 such objects, having the total area of 45.6 thousand hectares.

Protection of species *in situ* aims at protecting and ensuring the existence of species that are threatened with extinction owing to man's exploitation of the environment and that have particular significance for economy or that rarely occur worldwide, in the country or region. Polish red book of animals in 2002 there were isolated: extinct species (since the 17th century), species that are declined or probably declined, species of high risk – subject to extinction, and also marginal species that do not display regress. Protected species most often include endemits, relicts and species reaching range limit in the given region or species occurring on insular posts.

Two forms of species protection may be isolated:

1. entire protection – as regards the species comprised by this form of protection it is prohibited to obtain them, i.e. crack, cut, kill and hunt them, to collect eggs, to remove them from their natural positions, to dispose, acquire and transfer them abroad;
2. partial protection – the obtainment of such species is allowed only for certain needs, whereas the area of exploitation and permissible amount of harvests are precisely defined; it may be exemplified by gathering of medicinal herbs comprised by partial protection.

Introduction of species protection takes place through the decree issued by the Minister of the Environment in agreement with the minister responsible for agriculture issues. The decree defines the degree and manner of protecting wild species of plants, animals and fungus which are comprised by strict protection, partial protection, including partial protection of protection zones of their mainstay which require determination or posts with indication of the size of these zones. Register of species comprised by protection is held by the General Director of Environmental Protection. The regional director through an administration decision may introduce for a specified period of time protection of those

species of plants, animals or mushrooms that were not embraced by protection by the Minister of the Environment. Through administration decision the regional director may specify mainstay zones and posts of plants and mushrooms, as well as places of reproduction and regular stay of animals comprised by species protection. In the area zones borders are earmarked with special boards showing no entry to unauthorized individuals. Governor prepares the register of protection zones.

The approach to species protection which has prevailed so far does not yield desired effects from the point of view of preserving biological diversity. Not always the endangered species remain in ecosystem since their survival may be dependant on many internal and external, biotic and abiotic factors of the environment, not only on direct anthropopressure. Discontinuance of the exploitation by man (fishing, picking-up) does not guarantee the revival of population in a certain area. Another problem lies in organisms that have not been well-known, such as: bacteria, protozoa, algae or fungi. They play a vital role in the circulation of matter, energy and information in ecosystems. The amount and small sizes of these species exclude the possibility of covering them with full or even partial species protection. In 2009 the register of endangered species in Poland included 2769 positions [*Ochrona...*, 2010]. Species protection also lies in introducing bans of introducing into ecosystems those species that are strangers to country's fauna and may cause loss of balance in a certain ecosystem or the extinction of some native species.

Protection of species *ex situ* comprises the following activities:

- looking for genotypes of species (races, varieties, forms) that are crucial for preserving the biological diversity in a specific area (Europe, Poland, region);
- maintaining (breeding) of specimens of endangered species, collections of varieties in botanic gardens, zoological gardens, aquariums, terrariums or plantations;
- preserving genotypes in gene banks;
- making documentation of collected or cultivated material (specimen, seeds, genes) including systematic description, data concerning bionomy, its environmental requirements and conditions of remaining outside the natural biotope.

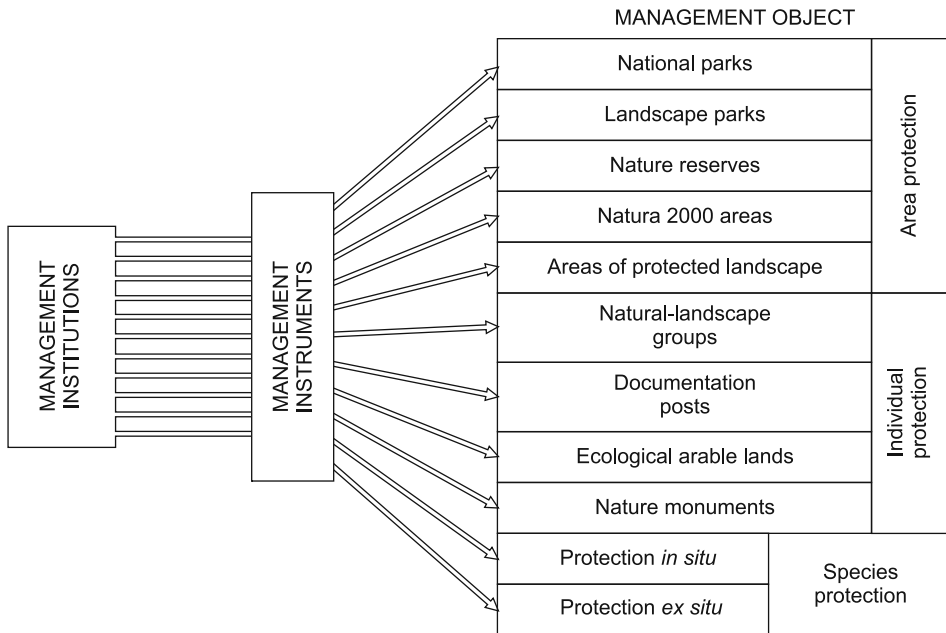
Protection *ex situ* in Poland has functioned for a long time. Some individuals tackling with this issue did this as early as in the 19th century. They have large achievements in the protection of dying and endangered species of plants and animals – both domestic and foreign ones. The best known achievements are: PAN Botanic Garden in Warsa – Center of Biodiversity Preservation in Powsin, UW Botanic Garden in Wrocław, UMCS Botanic Garden in Lublin, UJ Botanic Garden in Cracow, SGGW Arboretum in Rogów, Institute of Plants Cultivation and Acclimatization in Radzikowo, Botanical Garden of Adam

Mickiewicz University in Poznan, Botanical Garden of the University of Warsaw in Warsaw, Botanical Garden of the University of Zielona Góra, Botanical Garden of the Forest Park of Culture and Recreation in Bydgoszcz, Mountain Botanical Garden in Zakopane, Urban Botanical Garden in Zabrze, zoological gardens in Warsaw, Wroclaw and Gdansk-Oliwa.

National Forest Holding “State Forests” introduced a specific form of protection of biological diversity – Forest Promotional Complexes (LKP). These are isolated and particularly precious lands of agricultural forests which obtained the special status from the General Director of National Forests that subordinated business activity to the needs of protecting and promoting forest. The objectives of Forest Promotional Complexes include among others: sustainable preservation or restoration of natural amenities of forests using the methods of rational forest farming and active nature protection and nature-related education of society, mainly children and teenagers.

Apart from ecosystems (habitats), species, races, genetic varieties and forms, nature protection also comprises: the formations of inanimate nature, fossils of plants and animals; landscape, green areas in cities and villages as well as trees. In 200 there were 19 LKP having the total area of 999.2 thousand ha.

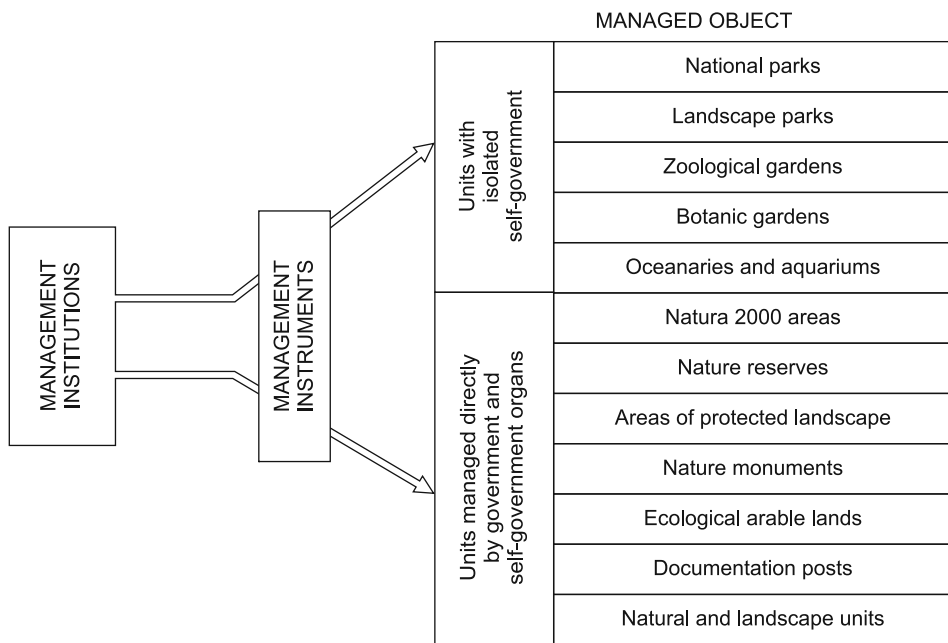
Figure 6.2. Managed object according to the forms and types of nature protection



Source: own elaboration on the basis [Zarządzanie..., 2007].

The isolation of nature protection forms is of considerable importance while designing management instruments. Nature protection as a management instrument can be considered from several points of view. As the basic one can perceive the division in accordance with forms and types of nature protection (figure 6.2.). Managed object can be considered from the point of view of the way of managing particular forms of nature protection. There can be isolated forms of protection with own board and units without board that are controlled directly by the units of governmental administration – regional director of environmental protection, or self government administration – by a prefect, mayor or president of a town. The first group ought to include: national parks, landscape parks, botanic gardens, zoological gardens and oceanaries, whereas the second group would include other forms of nature protection (figure 6.3.).

Figure 6.3. Institutionalization of management object of nature protection

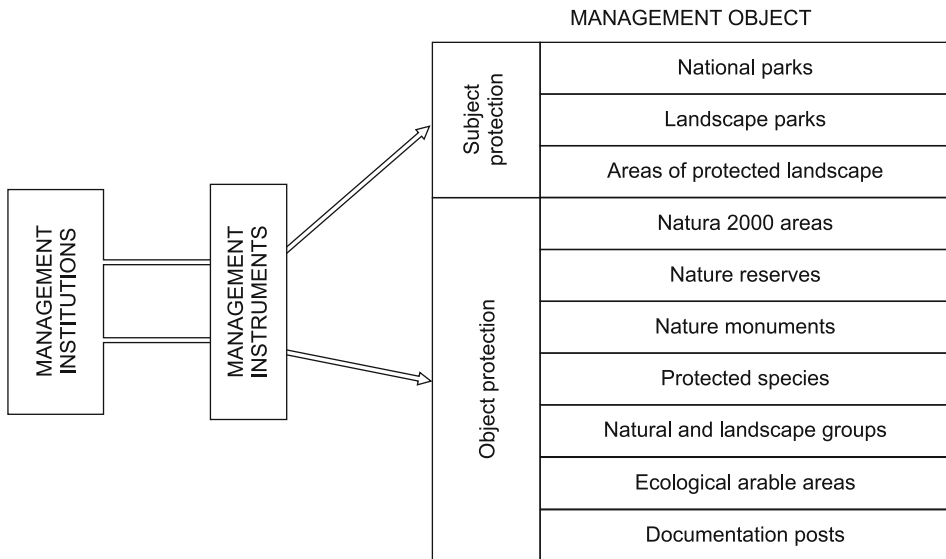


Source: *ibid.* figure 6.2.

From the point of view of the localization of the given protection form there is isolated subject protection and object protection. There exist three forms of subject protection: national parks, landscape parks and areas of protected landscape. The territories of these forms may not overlap. The remaining forms of

nature protection may exist both in the area of national parks and landscape parks and areas of protected landscape as well as independently, being surrounded by areas that are not subject to protection; they may exist partly in the areas comprised by subject protection and partly outside these areas (figure 6.4.). The multitude and diversity of forms of nature protection generates the need to use various instruments of management and their character defines the forms of organizing management system.

Figure 6.4. Subject and object forms of nature protection as management object



Source: *ibid.* figure 6.2.

6.2. Organs and institutions of nature protection management

In the management system of nature protection there are distinguished:

- organs of public administration – i.e. individuals or boards appointed for this purpose and legally equipped with appropriate competences, people and material means;
- offices – i.e. auxiliary apparatus of public administration organ;
- institutions perceived as the offices that individually perform certain activities related to nature protection.

In the sphere of nature protection the organs include: Minister of the Environment, General Director of Environmental Protection, governor, regional director of environmental protection, starost, prefect of municipality, mayor or president of a town, director of a national park (in the area of the park).

Minister of the Environment in the sphere of nature protection handles individual and species protection of nature as well as the protection of forests and forest lands. The tasks in this aspect are conducted with the aid of the Main Nature Conservator. Nature protection is directly related to such competences of the Minister of the Environment as the supervision of the functioning of allotments, hunting or genetically modified organisms.

General Director of Environmental Protection realizes the following statutory tasks:

- implements the tasks of state ecological policy in the sphere of nature protection;
- performs the tasks related to the creation and functioning of the network of Natura 2000 areas and also makes the project of the list of these areas in accordance with the regulations of EU law, supervises compliance with the principles of their protection, elaborates guidelines as regards the protection and functioning, makes register of data, controls the realization of the arrangements of protection plans or plans of protective tasks for these areas;
- submits to the EU the reports and notifications concerning the change of borders of Natura 2000 areas and requires opinions concerning these changes;
- collects data and prepares information concerning the protected areas;
- elaborates programs of the protection of endangered species of plants, animals and fungi;
- issues permits for the creation and running of botanic or zoological garden as well as the decisions regarding their liquidation;
- issues permits for the creation and control of a rehabilitation center for animals and also makes decisions concerning its liquidation.

The General Director of Environmental Protection performs the function of the appeal organ of higher degree in relation to the regional directors of environmental protection.

In the sphere of nature protection **regional director of environmental protection** realizes the following tasks:

- issues decisions concerning formation or liquidation of a nature reserve;
- manages protection of Natura 2000 areas and also creates a plan for protection of these areas;
- holds registers of: nature reserves, landscape parks, documentation posts, ecological farmlands and natural-landscape units;
- makes decisions concerning exceptions from constitutional bans as regards the species comprised by both partial and full species protection;

- introduces for a certain time period (up to 6 months) protection of species in an areas non-comprised by protection in the country;
- makes decisions specifying the degree and conditions of holding works in nature reserves (e.g. cutting trees);
- introduces charges for entry to the nature reserve area (to 6 PLN/person in accordance with the prices from 2008 + annual increase with inflation index);
- prepares plans of protection of reserves or consults and approves of the protection plans prepared by reserve managers and caretakers (e.g. chief forester);
- forms plans of protective tasks for reserves not having protection plans;
- allows for possession, import from abroad and sale, donation or exchange of living animals representing species that are dangerous for human life and health;
- conducts control of botanical and zoological gardens as well as centers of animal rehabilitation.

The regional director of environmental protection performs tasks in the sphere of nature protection using the aid of the regional nature conservator who is at the same time the first deputy of the director.

Similarly as the governor, the **starost** handles nature protection by issuing decisions concerning the usage of the environment.

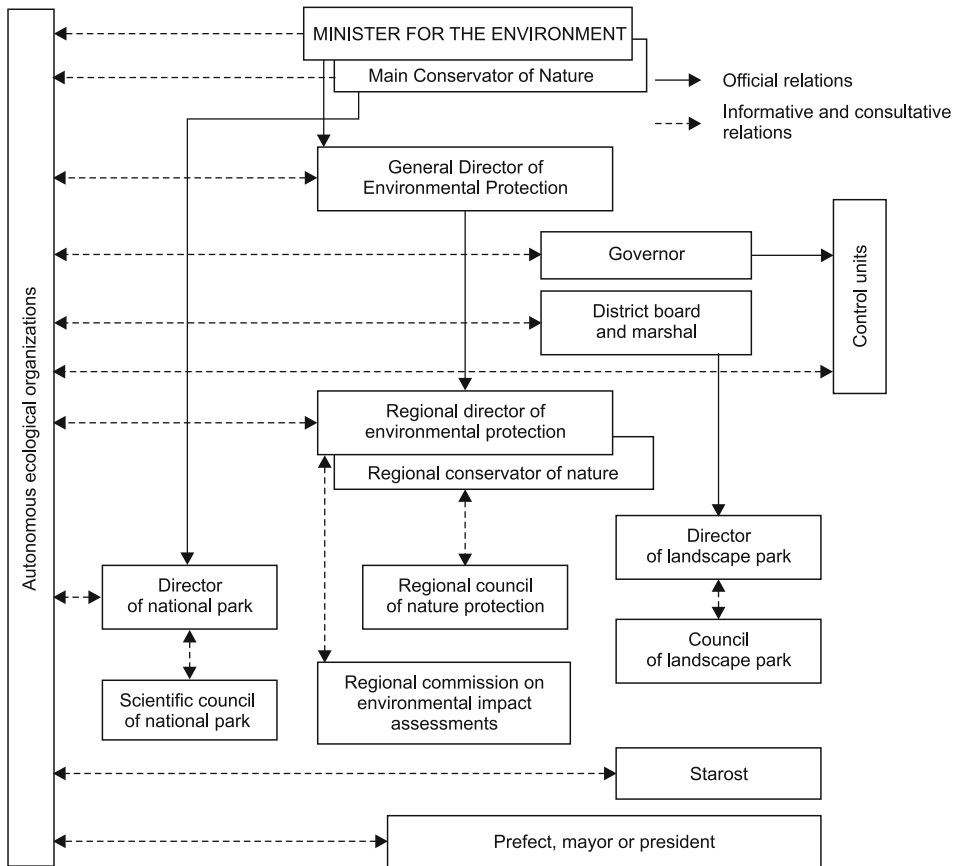
Municipality mayor, mayor or president of a town realizes the following tasks related to nature protection:

- supervises establishing and keeping in a proper state green lands and forest stands;
- prepares documentation concerning the formation of a municipal park;
- issues permits for removing trees or bushes from estate or on the area of protected landscape located in a municipality;
- issues decisions concerning the fine for cutting trees or bushes;
- imposes high administration fines for destructions of green lands and trees or bushes during earthwork or improperly conducted cultivating operations.

Collegiate organs include district self-governments, district boards, councils of provinces and municipalities (towns). They participate in the management of nature protection by creating acts of local law. Councils of municipalities have specific competences in this domain. They may: create municipal parks on the areas covered by tree stand and having the character of parks, and which constitute the possession of a municipality or state treasury and are not subject to the regulations concerning the protection of cultural goods; introduce individual nature protection in the form of nature monument, documentation post, ecological farmland or natural and landscape complex; introduce protection of tree stands and mid-field tree stands in the selected area of municipality.

Each organ of governmental or self-governmental administration possesses isolated units in relevant offices handling nature protection, for example: Minister of Environment – Department of Nature Protection at the Ministry of the Environment; General Director of Environmental Protection – Department of Nature Protection and Department of Natura 2000 areas in the General Directorate of Environmental Protection; regional director of environmental protection – department of nature protection and protection of Natura 2000 areas in the regional directorate of environmental protection (figure 6.5.). Table 6.1. presents the list of organs of administration organs which constitute, manage and supervise particular forms of protection.

Figure 6.5. Organs and institutions handling nature protection in Poland



Source: own elaboration.

Table 6.1. Administration organs which constitute, manage and supervise particular forms of protection

Form of nature protection	Proper forming organ	Managing organ	Supervising organ	Organ establishing protection plan
National park	Cabinet by means of a decree	Director of national park	Minister of Environment	Minister of Environment
Nature reserve	Regional director of environmental protection by means of a decree	Regional director of environmental protection or proper forest inspector	General Director of Environmental Protection or regional director of environmental protection	Regional director of environmental protection
Natura 2000 area	Area of special protection of birds (OSO) Special area of protection of habitats (SOO) Minister of Environment by means of a regulation Proper minister of environmental issues after consulting the European Union	Organ coordinating the functioning of Natura 2000 areas: regional director of environmental protection or forest inspector in the areas of "National Forests"	General Director of Environmental Protection or regional director of environmental protection	Protection plan – Minister of Environment by means of decree. Plan of protective tasks – regional director of environmental protection by means of a regulation
Landscape park	Provincial council by means of decree after consulting the regional director of environmental protection	Director of landscape park	District marshal	District self-government by means of decree after consulting the regional director of environmental protection
Area of protected landscape	Provincial council by means of decree after consulting the regional director of environment protection	Land administrators	District marshal	-

Form of nature protection	Proper forming organ	Managing organ	Supervising organ	Organ establishing protection plan
Nature monument, natural and landscape complex, documentation post, ecological farmland	Municipality council by means of decree after consulting the regional director of environmental protection	Land administrators	Prefect, mayor or president of a town	-

Source: [Kotąńska 2009].

In the management of nature protection of great importance are **nature protection services**. This group includes: directors of national parks and landscape parks; employees of national parks and landscape parks such as: director deputies, main accountant, director of scientific and educational laboratory, main specialist in the issues related to making a park available, conservator of protection grounds and circumferences, forest inspector and forest ranger, guards of park guard. **Director of a national park**, who manages the park and is appointed by the Minister of Environment: represents State Treasury in civil and legal relations as regards the managed possessions of the park, and in the area of the park the director has the competences of an administration organ ascribed to the regional director of environmental protection; realizes the tasks ensuing from the protection plan and issues decrees defining the ways of using park areas for scientific and educational, tourist, recreational and sport purposes; has the rights to run the proceedings of offences and participate in cases at public courts as a public prosecutor.

The tasks of the national park guard are as follows:

- realizing the arrangements of protection plans and protective tasks (e.g. monitoring of natural processes and endangered or rare species, denaturalization of habitats: forest stands, as well as limiting the development of expansive species and counteracting natural disasters);
- informing and promoting in the domain of nature, including running a museum of nature, information and education centers and publishing information and promoting materials;
- conducting scientific research with the aim of defining methods and ways of protecting nature, efficiency of protective actions and recognizing biological diversity;
- maintaining the proper state of technical infrastructure managed by national park;

- making national park accessible to scientific, educational, recreational, tourist and sport purposes.

Combating crimes and offences in protected areas is a vital protective action that park service is responsible for. This task is performed by park guard functionaries. They are entitled among others: to check the identity of suspected individuals, detain and control transport means with the purpose to check their load, to search premises in case a crime or offence has been committed, secure objects that are the crime evidences, control documents concerning the legal status of possessed formations or components of nature.

The tasks of national park's scientific council include especially: assessing the state of resources, formations and amenities of nature; giving opinion about the project of protection plan and protective tasks as well as making the annual assessment of their realization as well as giving opinion about research and scientific programs concerning nature protection; presenting motions and opinions concerning nature protection and the functioning of a national park. The scientific activity of national park is connected with conducting protective actions. It applies particularly to the assessment of the natural changeability of natural phenomena. Scientific research is realized on the basis of long-term research program adjusted to the park's specific natural character. Research works conducted in the park should not lead to the destruction of nature.

Tourist, educational and recreational activities, among others, lie in: organizing and running the natural museum of a park and/or environment educational center; forming tourist (hiking, cycle) trails, building educational trails; running tourist information points; holding classes out in the field with children and youth.

The expenses connected with the maintenance of national park's guard and the costs of realizing tasks of nature protection plan are covered from state budget. Many tasks realized by national parks in the domain of tourism and education, as well as some research tasks are financed by ecological funds and from other sources.

Director of a landscape park or a group of landscape parks is in charge of the park, in accordance with the bill on nature protection. However, the director's management competences are so small that, as S. Kistowski [2004] maintains, the director is responsible only for park's guard. The tasks of director of a landscape park comprise among others: protection of nature, landscape amenities and both historical and cultural values; organization of educational, tourist and recreational activity; putting forward motions to the local plans of spatial management concerning spatial management of areas included in landscape park. The consulting organ of the director is landscape park's council or council of group of landscape parks.

The tasks of landscape park's guard include, among others:

- inventory of natural habitats, posts of plants, animals and mushrooms comprised by species protection and deserving the protection of formations and elements of inanimate nature;
- identification and assessment of the existing and potential internal and external hazards of landscape park and putting forward motion and undertaking actions aiming at the elimination or reduction of these hazards and their effects as well as other actions with the aim of improving the functioning and protection of a landscape park;
- collection of documentation concerning nature and also historical, cultural and ethnographic values; promoting them by means of education concerning nature, comprising children, youth and local society;
- cooperation with territorial self-governments, ecological organizations and other units that deal with nature protection.

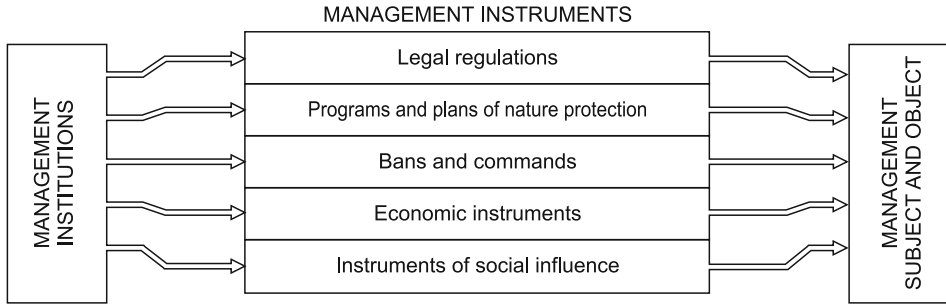
Control units in the sphere of nature protection make control of regularity in the functioning of the system preventing hazards, mainly epidemics of contagious diseases among wild animals and gradation of pests. Control is conducted mainly by: the Supreme Control Chamber – mainly in terms of obeying legal regulations in the sphere of nature protection by territorial self-governments, directors of national and landscape parks, as well as by governors and the Minister of Environment; the National Sanitary-Epidemiologic Inspection and the Veterinary Inspection – when it comes to an epidemiologic hazard.

Autonomous ecological organizations play an inspiring and controlling role. The activity of these organizations in terms of nature protection and preservation of biological diversity chiefly concentrates on: making society aware; exerting pressure on decision-makers for or against undertaking certain actions; creating and supporting new conceptions of nature protection and preservation of biological diversity. In Poland the managing subsystem (organs and offices) is not very coherent, especially when it comes to the creation, management and control of particular forms of nature protection.

6.3. Instruments of nature protection management

Theoretically, instruments of nature protection management create an isolated subsystem comprising those environment management instruments that serve nature protection and preservation of biological diversity. These include: legal regulations, strategies of nature protection and preserving biological diversity, plans of protecting protected areas, commands and bans, chosen economic instruments and social influence. The position of these instruments in management system of nature protection is illustrated in figure 6.6.

Figure 6.6. Instruments of nature protection management in Poland



Source: *ibid.* figure 6.5.

Legal regulations may be divided into international, union and national ones.

These are nine international agreements on nature protection:

1. Convention on biological diversity of 5 June 1992⁴ adopted at the United Nations Conference “Environment and Development” in Rio de Janeiro. It was implemented in Poland on 29 December 1993. The convention’s objective is to preserve and protect the full diversity of life forms in biosphere, as well as its sustainable usage while obeying the rule of fair division of benefits.
2. Convention on water and marshy areas of international importance, especially as the living environment of water birds of 2 February 1971, signed in Ramsar (Ramsar Convention)⁵. In Poland it came into effect in 1978 and is one of the oldest conventions concerning the protection of natural resources. The convention’s aim is to protect and maintain water-marshy areas together with populations of water birds inhabiting these areas or even occurring there periodically.
3. Convention on the protection of wild European fauna and flora and their natural habitats, of 19 September 1979, signed in Bern (Bern Convention)⁶. In Poland it came into force on January 1st, 1996. The Convention’s purpose is to protect wild species of plants and animals, including migrating ones and their natural habitats.
4. Convention on protection of migrating species of wild animals of 23 June 1979, signed in Bonn (Bonn Convention)⁷. In Poland it came into force on 1 May 1996.

⁴ Dz.U. of 2002, No. 184, par. 1532.

⁵ Dz.U. of 1978, No. 7, par. 24 and 25.

⁶ Dz.U. of 1996, No. 58, par. 263.

⁷ Dz.U. of 2003, No. 2, par. 17.

5. Convention on international trade of wild plants and animals of species posed to extinction of 3 March 1973; (Washington Convention; Convention on International Trade in Endangered Species of Wild Fauna and Flora – CITES)⁸. In Poland it was ratified on 12 December 1989.
6. Protocol concerning biological safety of 29 January 2000, part of the Convention on biological diversity of 5 June 1992⁹.
7. *Agreement on protection of small cetaceans of the Baltic and North Sea* of 17 March 1992 signed in 1992 (ASCOBANS)¹⁰. In Poland it came into being in 1996.
8. Agreement on protection of bats in Europe of 4 December 1991 (EURO-BATS)¹¹; in Poland it came into existence in 1996.
9. European Landscape Convention of 20 October 2000¹². The text of this convention was adopted by the Committee of European Council's Ministers on 19 July 2000, and signed by Poland on 21 December 2001. The convention emphasizes the significance of landscape's value and draws attention to the issues that are important for protection and proper development, with particular consideration of the active participation of society in specific decision-making processes.

Legislative regulations of the European Union include directives, decrees and conventions (or other resolutions) of the European Parliament. The problems of nature protection are present among others in the following legal acts:

- Council directive 92/43/EEC of 21 May 1992 on the protection of natural habitats of fauna and flora¹³ (the so called habitat directive). Its main purpose is to ensure biological diversity. The directive imposes on member states the obligation of creating a system of strict protection of endangered species.
- Council Directive 79/409/EEC of 2 April 1979 concerning the protection of wild birds¹⁴ (the so called bird directive). It establishes complex program of protecting all species of wild birds and places that are important for preserving their population.
- Resolution (EC) 337/1997 of the Council of 9 December 1996 concerning protection of wild species of fauna and flora through regulation of trade in them¹⁵.

⁸ Dz.U. of 1991, No. 27, par. 112.

⁹ Dz.U. of 2004, No. 216, par. 2201, prepared in Montreal.

¹⁰ Dz.U. of 1999, No. 96, par. 1108.

¹¹ Dz.U. of No. 96, par. 1112.

¹² Dz.U. of 2006, No. 14, par. 98.

¹³ Dz.U.L. 206, of 22 July 1992.

¹⁴ Dz.U.L. 103 of 25 April 1979.

¹⁵ Dz.U.L. 61 of 3 March 1997.

- Resolution (EC) 338/1997 of the Council of 9 December 1996 concerning introduction in the Union of Convention international trade of endangered species of animals and plants¹⁶, endangered species of 3 March 1973¹⁷.

In Poland, the basic legal act in the analyzed area is the act of 16 April 2004 on nature protection¹⁸. It determines: objectives of nature protection and duties of public administration organs, legal consequences of comprising with protection and also regulates the management of nature resources and elements; forms of nature protection, tasks and manner in which botanic, zoological gardens and rehabilitation centers of animals function as well as the problems of protecting green areas and forest stands; organs and services of nature protection; combating of crimes and offences as well as legal regulations.

The bequests concerning the protection of animate and inanimate resources as well as nature elements are found for example in: environmental protection law¹⁹, Water Law (quality of surface waters, protection zones and areas)²⁰ and hunting law (close seasons of warrantable species)²¹, act on the protection of animals²².

Strategies and programs of nature protection are documents defining the long-term objectives of protective actions (directional programs). Programming in Poland comprises strategies of nature protection at national level as well as strategic objectives of nature protection included in district, provincial and municipal development strategies. Strategy of nature protection may be considered in general sense – as an element of policy of state or territorial self-government – and in detailed sense as a document defining long-term objectives of protective actions. In Poland conservation protection has been the basis for the strategy of nature protection for a long period of time (during the period 1928-1991). As late as in the 1990s began the gradual implementation of the strategy of universal nature protection manifesting itself by taking into consideration problems in the whole system of managing state. This strategy in the first years of 21st century was significantly enriched by the problems connected with preserving biological diversity and the European natural heritage.

In a detailed sense the strategy concerns the problem of biological diversity. The year 2003 witnessed the adoption of the governmental document entitled: *National Strategy of Protection and Moderate Usage of Biological Diversity*. This document points at the need to carry out simultaneously protective actions

¹⁶ Dz.U.L. 61 of 3 March 1997.

¹⁷ Dz.U. of 1991, No. 27, par. 112.

¹⁸ Dz.U. of 2004, No. 92, par. 880.

¹⁹ Act of 27 April 2001 – Environmental protection law (uniform text, Dz.U. of 2008, No. 25, par. 150).

²⁰ Act of 18 July 2001 – Water law (Dz.U. of 2001, No. 115, par. 1229, with further alterations).

²¹ Act of 13 October 1995 – Hunting law (uniform text, Dz.U. of 2009, No. 223, par. 1777).

²² Act of 21 August 1997 on protection of animals (Dz.U. of 2001, No. 230, par. 1373).

at all levels of bio-diversity: landscape, ecosystems, species and genetics. It means the protection of natural or semi-natural landscapes and ecosystems as habitats for the existence of species and man as well as the protection of endangered species, subspecies of races and varieties both in places of their natural existence and outside them. The protection of biological diversity must comprise nature of the entire country, regardless of its elements' status: wild and farming animals, private races and those belonging to the state or territorial self-government, as well as irrespective of the extent of their transformation or destruction.

In the aforementioned document special emphasis is placed on those elements of biological diversity that are rare and from various reasons are endangered to extinction or sustainable transformation. It is assumed that the achievement of strategy's objectives requires usage of all decision-making factors in its realization, i.e. government administration and local authorities), supporting units and the entire society.

Action for the benefit of preserving biological diversity was comprised in four fundamental strategic areas:

1. recognizing and monitoring the state of biological diversity and also both actual and potential hazards;
2. removing or reducing actual and potential hazards of biological diversity;
3. preserving and/or enriching existing and restoring waned elements of biological diversity;
4. joining actions for the benefit of biological diversity with actions that are significant for economy and society.

The actions mentioned above ought to be realized by creating appropriate legal, organizational and also economic and financial mechanisms conditioning the preservation and rational usage of biological diversity resources as well as the widespread importance of the undertaken actions. *The national strategy of protection and moderate usage of biological diversity* constitutes crucial supplementation of ecological policy of state in the area of nature protection.

Programs of protection which are applicable to endangered species of plants, animals or mushrooms are elaborated by the General Director of Environmental Protection. These need to include: description of endangered species and description of the ways of running protective actions aiming at the reconstruction of their population; determination of time and place of making protective actions and pointing at a person responsible for them; information on costs and sources of financing. In national parks and landscape parks there are prepared programs of scientific research, development of tourism and plans of educational actions. These documents are not required by law but ensue from good practices of management.

Protection plan is prepared for national and landscape parks, nature reserves and areas of Natura 2000 network for the period of 20 years with the

fixed date of less than 5 years starting from the establishment of a certain unit. The project of a protection plan is prepared for: national park – director of park, and approved by the Minister of Environment; landscape park – director of park, and approved by the district marshal; nature reserve – regional director of environmental protection and approved by the General Director of Environmental Protection or by the administrator of the reserve or by the supervisor of the reserve, and approved by the director of environmental protection; Natura 2000 area – regional director of environmental protection, and approved by the General Director, or forest inspector, and approved by the regional director of environmental protection.

Works on elaborating protection plans are related to: assessment of the state of resources, formations and elements of nature, landscape amenities, cultural values as well as actual and potential internal and external hazards; elaboration of the concepts of protection as well as elimination or reduction of the existing and potential internal and external hazards; indication of protective actions, with specification of the type, degree and localization.

Protection plan of a park or reserve ought to include:

- characteristic and assessment of the state of nature, analysis of the efficiency of the hitherto prevailing ways of protection, together with the identification of the existing and potential internal and external hazards and the definition of ways of eliminating or reducing them;
- purposes of nature protection and indication of natural and social conditionings of their realization, definition of zones' strict, active and landscape protection, with the indication of the type, extent and place of protective actions in each of them, as well as the indication of places and way of providing access to areas protected for scientific, tourist, recreational, sport purposes and running activity connected with production, trade and agriculture;
- settlements for studies of conditionings and directions of the spatial management of municipalities, local plans of spatial management, plans of spatial management of districts and plans of spatial management of sea inside waters, territorial sea and sole economic zone – concerning the elimination or reduction of external hazards;
- definition of the extent of natural monitoring.

Protection plan for Natura 2000 area ought to include:

- description of its borders and map;
- identification of the existing potential dangers for the maintenance of the proper state of protection of natural habitats and species of plants and animals being the subject of protection and their habitats;
- definition of the conditions of maintaining or restoring the proper state of protection subjects and coherence of the network of Natura 2000 areas that allude mainly to: other forms of nature protection; spatial management; wa-

ter management, taking into consideration the possibility of migration of fish and other water organisms; farming, forest and fishing management;

- indications regarding changes in the existing studies of conditionings and directions of spatial management of municipalities;
- definition of protective activities for the maintenance or reconstruction of protection subjects, including: active protection; maintenance of ecological corridors; distribution of objects and protective devices; water, farming, forest and fishing management in the area; management conditions of the area's lands – indication of the potential areas for development; localization of technical, communicational, tourist and educational infrastructure;
- definition of the ways of monitoring the state of protection of habitats and species being the subject of protection.

Protection plan designed for the national park, nature reserve and landscape park situated within the borders of Natura 2000 area which takes into consideration the above mentioned indications becomes the protection plan for this part of Natura 2000 area. Similarly, the plan of managing forest for the forest inspectorate located in the Natura 2000 area becomes the protection plan of this area.

Since the formation of protection plan the project of protective tasks has been prepared for a national park and nature reserve. This project ought to take into consideration: identification and assessment of the existing and potential internal and external hazards and ways of eliminating or reducing these assumptions and their effects; description of the ways of active protection of ecosystems, with the indication of the type, size and location of particular tasks and description of the active protection of species of plants, animals and fungi; indication of the areas comprised by strict, active and landscape protection.

The plan project of the protective tasks for the Natura 2000 area ought to include description of the borders of the area enclosed with the map; identification of the existing and potential hazards for the maintenance of the proper state of protection of natural habitats, species of plants and animals and their habitats being the subject of protection; aims of protective activities; definition of protective activities with indication of the entities responsible for making them, taking into consideration the place (area) of their implementation, including the ones concerning: active protection of natural habitats, species of plants and animals with their habitats; monitoring of the state of protection of habitats and species; complementing of the state of knowledge about protection subjects and their conditionings. The first plan of protective tasks of a certain Natura 2000 area ought to be made for six years, starting from the date of its establishment, for the period of 10 years.

Commands and bans are the most important instruments in the management of nature protection. They stir controversy in the protected areas that belong to private owners. So far the problem of compensations or damages for lost

benefits connected with the limited freedom of administration on private lands has not been solved. The mature protection act indicates 6 general bans, 27 bans in national parks and reserves, 14 bans in landscape parks, 9 bans in the areas of protected landscape and 5 additional bans concerning the areas of Natura 2000 network. Large part of them is identical for all nature types. As an example may serve bans on:

1. catching or killing wild animals, collecting or destroying eggs, holes, breeding places and other animal shelters and places of their reproduction;
2. obtaining, destroying or ruining plants and mushrooms on purpose;
3. making changes of natural objects, especially making earthworks that cause permanent deformation of area relief;
4. changing water portions, transforming water tanks and water-marshy areas;
5. obtaining natural resources, including rocks, peat and fossils (fossil remains of plants and animals), minerals and amber;
6. destroying soils or changing purpose and use of lands;
7. introducing species of plants, animals or mushrooms, including genetically modified organisms;
8. eliminating and destroying forest stands in the fields, near roads and waters.

The form of a command is the obligatory assessment of what influence on the environment is exerted by every investment that may affect protected area, especially the area included into Natura 2000 network.

Economic instruments supporting nature protection include:

- charges for cutting trees and bushes;
- exemptions from estate tax given to: the owners of: buildings and construction sites in national parks and nature reserves directly serving reaching objectives in the domain of nature protection; lands comprised by strict, partial or landscape protection; lands functioning as arable lands; lands with trees and bushes, excluding those occupied for farming;
- exemptions from forest tax given to the owners of: forests with forest stand being less than forty years old; forests registered to monuments; ecological lands;
- lowering by 50% the rate of tax for protected forests and those included in nature reserves and national parks;
- exemption from agricultural tax given to the owners of lands occupied for water tanks serving providing population with water;
- agricultural-environmental programs, i.e. charges for making on farming land protective actions included in the program;
- fees for the access to national park;
- donations for protective activity in the form of grants, including education of children, youth and adults about nature-related issues;
- compensations for the damages made by: bisons – in cultivations, farming produce or in forest farm; wolves and lynxes – in stocks of farm animals;

bears – in apiaries, stocks of farm animals and farming cultivations; beavers – in farms, forests or fishing farms.

In nature protection management system there are used instruments of social influence: ecological education, access to information, pro-ecological sponsoring, especially the forms of social pressure. Protection of nature and maintenance of biological diversity are, next to climate changes, the largest challenge of the present time as the condition of maintaining continuous development of humankind.

Chapter 7

MANAGEMENT OF ATMOSPHERE PROTECTION

7.1. Introductory remarks

Protection of atmosphere comprises three elements: protection of the atmospheric air, protection of the ozone layer and protection of climate. Protective actions have considerable influence on health of society and on the functioning of natural processes. Pollution of atmosphere as the only among all types of anthropogenic pollution has supranational character and has the largest impact on the course of global natural processes. Science has already proved that violation of these processes is threatened with change of biosphere parameters. Contemporary science is still not capable of predicting precisely the effects of such changes. However, genetic research with large extent of likelihood indicates that human genome is not adjusted to radical changes of atmosphere parameters. It means that further increase in the quantity of emitted pollution which has an impact on these processes may lead to the worsening of man's habitat and will affect man's development condition.

The last decades have supplied more or less crucial evidences in this sphere. Anthropogenic pollution has contributed, for example, to the violation of the process of self-recreation of the atmosphere ozone layer. Over the Northern hemisphere in the 1980s there were periods with the hole in the ozone layer. At the same time, there was considerable intensification of ultraviolet radiation. This radiation is not neutral to the development of life on the Earth. Thanks to the activation of international actions for reduction in the emission of gases that are aggressive towards ozone, there is a chance for reduction in these unfavorable influences. It is estimated that with further reductions in the emission of

chlorofluorocarbons the restorations of the normal state of the ozonosphere may take place in the 50s of the 21st century.

The emission of greenhouse gases contributes to climate changes with effects that are hard to predict, especially for the economy. The emission of gases and dust having the character of poisons, chiefly gases causing acid rains and substances having toxic effect on the living organisms, has unfavorable effects on the regional and local arrangement. They reduce the productivity and diversity of ecosystems and species.

Air pollution in Poland in the 1980s was ranked as one of the highest in Europe. In approx. 10% of the country's area inhabited by 30% of the population the concentration of the main pollutants such as sulfur dioxide, dust, nitrogen oxides and heavy metals constantly exceeded admissible values. In the periods of autumn and winter the pollution caused the formation of smog which is dangerous in terms of health. Material losses that Poland incurred every year as the result of air pollution were estimated in the value comparable to 5% of the national income.

During the period 1990-2004, i.e. starting from the beginnings of the system transformation till Poland's accession to the European Union, there was considerable reduction in the emission of air pollutions, on average, by 45%. The highest advancement was achieved as regards the reduction in the emission of dusts. Emission of dusts in 2004 constituted only 23% of the emission from 1990. In this period the emission of sulfur dioxide was reduced by 61%. The amount of heavy metals emitted to the air was, on average, reduced by 46%. However, there was less success in the reduction in the emission of nitrogen dioxide (by 37%), carbon oxide (by 25%) and non-metal volatile organic compounds (by 20%). The scale of emissions is presented in table 7.1.

Such great achievements in reduction in the emission of pollutions emitted into the air were possible thanks to many factors activated following the political and economic transformation of Poland. The most important achievements include:

- liquidation of many production plants having obsolete technologies;
- reduction in the output of coal and reduction in the production in industry branches with considerable energy and material absorbency;
- increase in the prices of energy causing economical use of it;
- improvement of the quality of coal supplied for the energy system;
- reduction in the number of small boiler houses and furnaces in households as the effect of development of centralized heating systems;
- construction of highly efficient installations that remove sulfur and dust from exhaust fumes;
- universal usage of catalytic converters in cars and elimination of lead compounds in petrol.

Table 7.1. The emission of main air pollutions in Poland during the period 1990-2008

Specification	Measurement unit	1990	1995	2000	2004	2008	2004/ 1990	2008/ 2004
							(in %)	
Sulfur dioxide	Gg ^b	3210	2376	1511	1241	999	38.7	80.5
Nitrogen oxides	Gg	1280	1120	844	804	831	62.8	103.4
Carbon oxide		-	4547	3472	3426	2674	75.3 ^{a)}	78.0
Non-metal volatile organic compounds	Gg	1121	1076	904	896	894	79.9	99.8
Ammonia	Gg	550	380	32,2	317	285	57.6	89.9
Dust	Gg	1950	1308	464	443	421	22.7	95.0
Heavy metals:								
Arsenic	Mg ^c	82	73	50	49	44	59.7	89.8
Chrome	Mg	155	118	84	54	49	34.8	90.7
Zinc	Mg	3091	2580	2173	1597	1444	51.7	90.4
Cadmium	Mg	92	83	50	46	42	50.0	91.3
Copper	Mg	599	465	374	389	349	64.9	89.7
Nickel	Mg	370	312	251	249	174	67.3	69.9
Lead	Mg	1372	937	647	600	551	43.7	91.8
Mercury	Mg	33	32	26	20	16	60.6	80.0

Note: ^a Share of emissions in 2004 in relation to 1995 ^b Gg – gigagrams. ^c Megagrams

Source: own elaboration on the basis [Ochrona..., 2006; Ochrona..., 2010].

After Poland's accession to the European Union, during the period 2005-2008 it was possible to maintain the trend of decreasing emission of sulfur dioxide (in 2008 there was emitted 19% less than in 2004) and carbon monoxide (22% less). In a smaller scale (5-10%) there was decrease also in the emission of ammonia, dust and heavy metals. Almost at unchanged level was the emission of nitrogen oxides and non-metal volatile organic compounds such as: aldehydes and alcohols (aliphatic, annular and aromatic) and their coefficients: amines, ethers and ketones. Also the reduction in the emission of greenhouse gases proved to be a success. During the period 1988¹ – 2004 the emission of carbon dioxide was reduced by more than 32%, whereas the reduction in relation to methane – by 27% and in relation to nitrogen protoxides – by more than 25%. However, between 2005 and 2008 there was rapid and non-substantial

¹ The year 1988 was accepted as crucial for Poland in terms of calculating the emission of greenhouse gases for Poland at the 17th Session of the United Nations Convention on Climate Changes at 7th Session of the Meeting of the Protocol parties in Kyoto (COP 17 UNFCCC), Durban, 28 November – 9 December 2011.

increase in the emission of carbon dioxide and nitrogen protoxide. The trend of decreasing emission remains unchanged only in relation to methane.

There is constant increase in the emission of hydrogen chlorides. Although the absolute value of this emission is not substantial (in 2008 it constituted 0.99% of the total emission of greenhouse gases expressed in Gigagrams of carbon dioxide equivalent) even in such amount it is harmful for the ozone layer (table 7.2.).

Table 7.2. The emission of greenhouse gases in Poland during the period 1988-2008

Specification	1988	1995	2000	2004	2008	2004/ 1988	2008/ 2004
	in gigatrends of carbon dioxide equivalent)					(in %)	
Carbon monoxide	469144	365910	320727	316700	325381	67.5	102.7
Methane	53665	43049	38898	39027	36004	72.7	92.3
Nitrogen protoxide	40334	31012	29715	30005	31698	74.4	105.6
Hydrogen chlorides							
HFC _s	26	26	595	2026	3662	8 times	180.7
PFC _s	250	252	249	285	226	114.0	79.3
SF ₆	24	31	24	23	34	142.0	147.8

Note: HFC_s – fluorohydrocarbons, PFC_s – perfluorohydrocarbons, SF₆ – sulfur hexafluoride

Source: ibid. table 7.1.

The improvement of air quality has had beneficial influence on life of people and on the world of nature. In the entire Poland there has been improvement in the health condition of forests. While in 1992 as many as 45% of trees were largely destroyed in terms of their assimilation apparatus, in 2001 – 31.5%, whereas in 2008 – only 17.7% [*Ochrona...*, 2009]. In farming areas the soil acidification caused by acid rains decreased, which in turn decreased the demand for fertilizing lime. In the so-called Black Triangle at the intersection of borders of Poland, Czech Republic and Germany, and especially in the Izerskie Mountains it was possible to hinder degradation and to start reconstruction of tree stands. The state of air quality in Poland at the turn of the first and second decade of the 21st century despite considerable improvements is still dissatisfactory, when related to both EU norms and the real achievements of many European countries.

7.2. Protection of atmosphere as management subject and object

The subject of atmosphere air protection management is its quality and the emission of pollutions. **Air quality** determines the concentration of solid, liquid and gas substances included in it in a certain period of time and in a certain area as well as the adopted threshold of concentration of these substances in air that is perceived as clean. **Emission of pollutions** means introducing into the environment substances, energy, noise, vibration trembles or electromagnetic field which were formed in the processes of economic and non-economic man's activity. Pollution means also the emission that can be harmful for human health or for the state of the environment, cause losses in material goods, worsen aesthetic amenities or collide with other justified ways of using the environment.

Air pollution is formed by any solid, liquid and gas substances that are in the atmosphere but are not its natural components as well as natural components that occur in amounts that are greater than the state perceived as normal. Air pollution may be primary or secondary. Primary pollution consists of substances that in the air are in the state in which they were emitted (excreted). Secondary pollutions are the product of physical transformations/modifications and chemical reactions that take place between the components of atmosphere and polluting substances. This group comprises also dusts that were deposited by atmosphere and then released.

Smog is the accumulation of various pollutions. It is formed in certain atmosphere conditions, mainly when over the area of high emission of pollutions there is the cold mass of humid air and above there is warm air reducing the possibility of conversion. Smog most frequently appears above city agglomerations or industrial regions. It constitutes great hazard for people and the environment.

Sources of pollution of the atmospheric air are divided into natural and anthropogenic ones. The natural sources include: volcanoes, fires in forests, savannahs and steppes, marshes emitting such compounds as methane, dioxide, hydrogen sulfide and nitrogen hydride, these are also soils and rocks prone to the erosion and plant pollens, mushroom spores and microorganisms. Anthropogenic sources comprise combustion of fuels in power plants, heat and power plants and heating plants, industrial and construction technological processes, municipal heating plants, hearths near households, combustion engines, stock-raising farms, fertilizers, sewage plants and landfills.

Protection of air implies ensuring its possibly best quality by maintaining concentration of substances in the air at least at the permitted level for each of them or below this level and it implies also striving for achievement of target levels or levels of long-term aims.

Acid rains are caused by the presence of acidifier compounds in the atmosphere – sulfur dioxide and nitrogen oxide. These gases cause reaction with water included in the atmosphere (vapor, raindrops and even snowflakes), forming thus intense acids – sulfuric and nitric. In water environment the acids emit hydrogen ions which are the direct reason of acidification. Thus acidification means that in the environment occurs increased amount of nitric ions. The concentration of nitric ions – pH indicator – serves the measurement of liquid acidification. Neutral water, i.e. water that is neither acid nor alkaline has pH 7. A lower indicator proves that the concentration of nitric ions is high and that water is acid. In fact, rain is naturally acid – pH is 5-6. Acid rains have pH that is lower than 5. The direct consequence of acid rains is acidification of the environment (of soils, surface and subsoil waters), whereas the indirect consequence is the negative influence on the life of people and animals (increase in the number of diseases of respiratory and circulatory system, impoverishment of biological diversity and withering of trees. It is easier for plants to absorb heavy metals and other toxins when they are in acid soils.

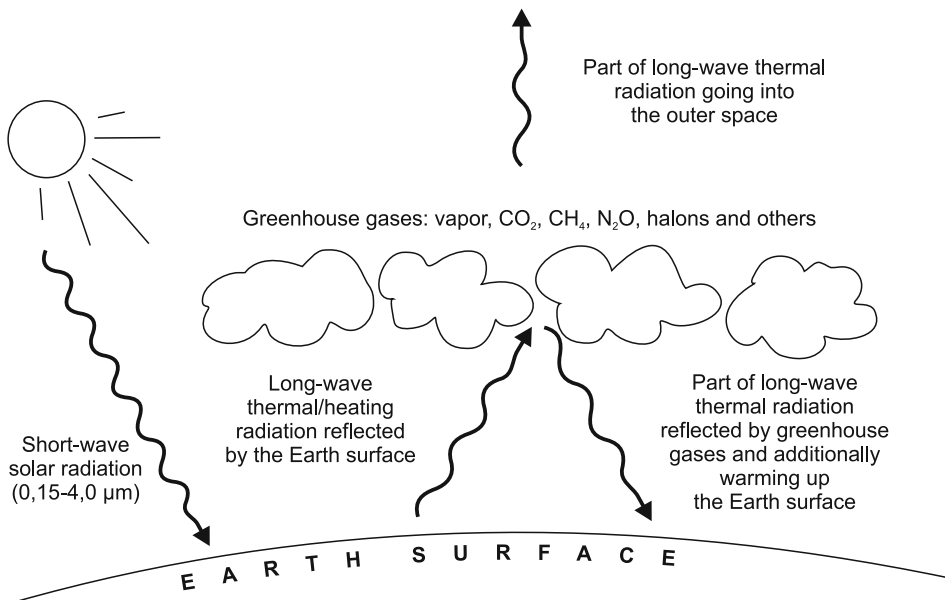
Destruction of the ozone layer (ozone sphere) means reducing the level of ozone in it². The ozone layer constitutes the maximum concentration of ozone in stratosphere which stretches from tropopause seat the latitude of 8 km-17 km (depending on the geographic latitude) to approx. 50 km. The highest concentration of this gas is in the middle part of the ozone sphere. Despite more than a dozen kilometer thickness of this layer the amount of ozone accumulated in it is not great/substantial. If it was collected and placed in the conditions that exist near the Earth surface the layer with depth/thickness of less than 4 mm would be formed. The ozone sphere is the layer that is particularly sensitive to anthropogenic influence. The hazard to the ozone sphere is formed by the substances formed and produced by man (anthropogenic), especially by chlorinated fluorohydrocarbons having the trade terms: freons and halons. The ozone sphere constitutes the filter for ultraviolet solar radiation from UV-B range having the wavelength of 280-320 nanometers. This radiation is indispensable for life. However, the excessive amount of it near the Earth surface leads to skin cancers, eye ailments and to the weakening of immunological system of people and animals. In relation to plants the excessive ultraviolet radiation may lead to the weakening of photosynthesis.

The greenhouse effect is the natural process that preserves the atmosphere of the Earth with the temperature higher than 15°C in comparison with the tem-

² **Ozone** is the particle composed of three atoms of oxygen. It is formed thanks to the influence of ultraviolet radiation on the particles of ozone (O₂) which are subject to dissolution into highly active atoms of oxygen (O). In vestigial amounts of other compounds in this latitude, these atoms combine with oxygen into ozone particles. If there enter into the ozone sphere the atoms of chlorine or fluorine which in the atmosphere were released from chlorinated fluorohydrocarbons they combine active oxygen and ozone is not formed.

perature that would occur if there was no atmosphere. These regulations are due to the existence of natural vestigial gases such as: vapor, carbon dioxide, methane, nitrogen protoxide and anthropogenic freons and halons. These gases fully let through short-wave solar radiation ($0.15-4.0 \mu\text{m}$) which heats the Earth. At the same time, the globe surface emits long-wave thermal radiation which is retained by these gases and in the major part directed at the surface of the Earth. The remaining part of the radiation goes into the outer space. The more thermal gases in the atmosphere, to the greater degree does it retain the thermal radiation. The temperature of the Earth surface is increasing, which causes changes or rather modification of the climate (figure 7.1.). Large emission of greenhouse gases as the result of man's activity (mainly combustion of fossil fuels and cutting of trees) leads to acceleration of climate changes. Global amount of heating depends on the concentration and duration period of greenhouse gases and on their causative effect which is usually calculated per the amount of absorbed radiation by one molecule of CO_2 .

Figure 7.1. Greenhouse effect



Source: [Kassenberg, Karaczun, 2009, p. 14].

Atmosphere protection management object can be considered from various points of view, for example, in accordance with: the type of pollutions, ways in which the emitted pollutions exert their influence on people and the environment and the place where pollutions are formed (sources of emission)

and also the specific character of emission regulations. As regards the type, pollutions are divided into:

1. gases and vapors of chemical compounds: oxides of carbon, sulfur and nitrogen; non-methane organic compounds: aldehydes and alcohols (aliphatic, annular and aromatic) and their derivatives/coefficients: amines, ethers and ketons; enduring/permanent organic pollutions: from the group of dioxans and furans and from the group of multi-annular organic compounds (benzo-a-pyrene, benzo(b)fluoranthene, indeno[1,2,3-cd]pyrene;
2. solid compounds: non-organic, for example: volatile cinder, soot, compounds or elements: of lead, copper, chromium, cadmium and other heavy metals; organic, mainly plant pollens and spores of fungi;
3. microorganisms, mainly viruses, bacteria and microfungi, the type or amount of which differs from the natural composition of air microflora;
4. drops of liquid, mainly acid, alkali and solvents.

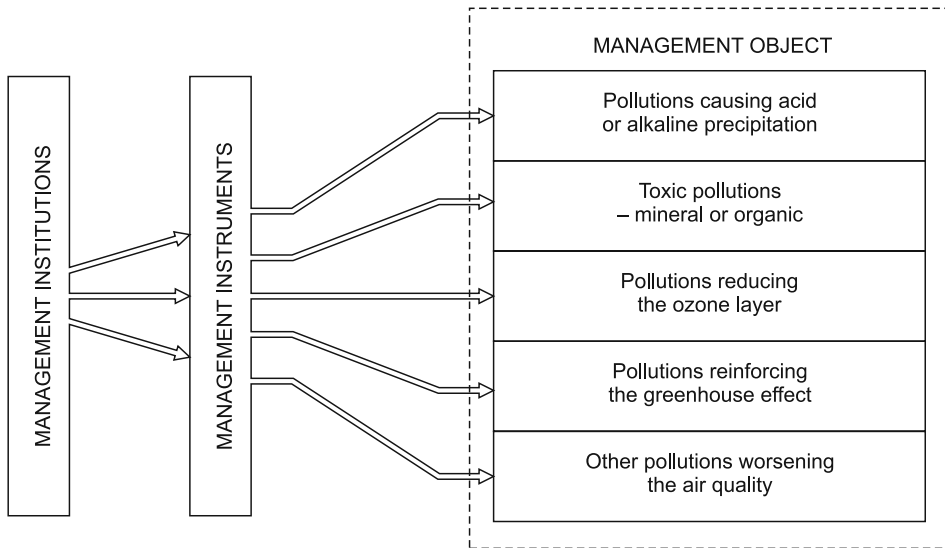
This classification has no larger importance in the management system of atmosphere protection. What matters more is the division of pollutions in accordance with the way they affect people and the environment.

1. Pollutions causing acid rains (sulfur and nitrogen oxides) or increasing alkalinity of precipitation (mainly calcareous dust).
2. Pollutions that are toxic for people and the environment – mainly heavy metals, dioxins, furans and multi-annular organic compounds.
3. Pollutions reducing the ozone layer – chlorofluorohydrocarbons (CFC) and hydrochlorofluorohydrocarbons (HCFC).
4. Pollutions reinforcing (causing) the greenhouse effect – carbon oxides, methane, nitrogen protoxide (N_2O) and chlorine hydrocarbons (HCFC).
5. Other pollutions worsening the quality of atmospheric air – dust and soot, microorganisms (figure 7.2.).

An important object of atmosphere protection management are the emitters of pollutions. The simplest division of the emitters of atmosphere pollutions comprises:

- professional power industry – power plants, heat and power plants and professional heat-producing plants using devices of large capacity;
- municipal power industry, mainly heating plants using devices of medium or small capacity;
- households having their own heat-producing system (most frequently household furnaces);
- industrial plants emitting pollutions as the result of technological and energy processes – e.g. chemical, metallurgic, cement, construction and furniture ones;
- stock-raising farms;
- farms using fertilizers, mainly nitric ones;
- mobile units: cars, locomotives, planes, ships and construction machines.

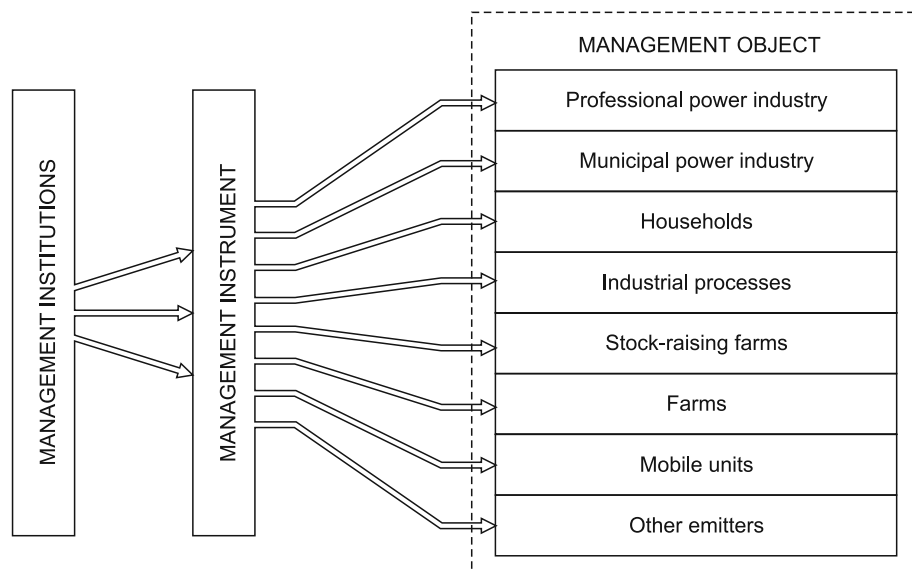
Figure 7.2. Pollutions as management object in accordance with the way they have influence on people and the environment



Source: own elaboration.

The position of these entities in air protection management system is illustrated on figure 7.3.

Atmospheric air protection management system ought to inspire emitters to activities aiming at the elimination, reduction or compensation of emission of non-organic and non-organic solid, liquid and gas pollutions into the atmospheric air. Among the most frequent activities it is possible to enumerate: change in the technology of producing energy and products into less emissive one; enrichment of fuels or change of fuels into less emissive ones (e.g. exchange of coal with gas); usage of technologies having a closed circle of using raw materials, including containment of technological processes along with purification or binding of the produced wastes which constitute the direct pollution of air; purification of combustion gases, mainly removal of dust and sulfur; utilization of industrial and municipal wastes; usage of non-conventional sources of energy. Specific character of pollutions, the type of an emitter and aims of atmosphere protection decide upon the spectrum of management instruments that are used in the system.

Figure 7.3. Emitters of air pollution as management object

Source: *ibid.* figure 7.2.

7.3. Atmosphere protection management instruments

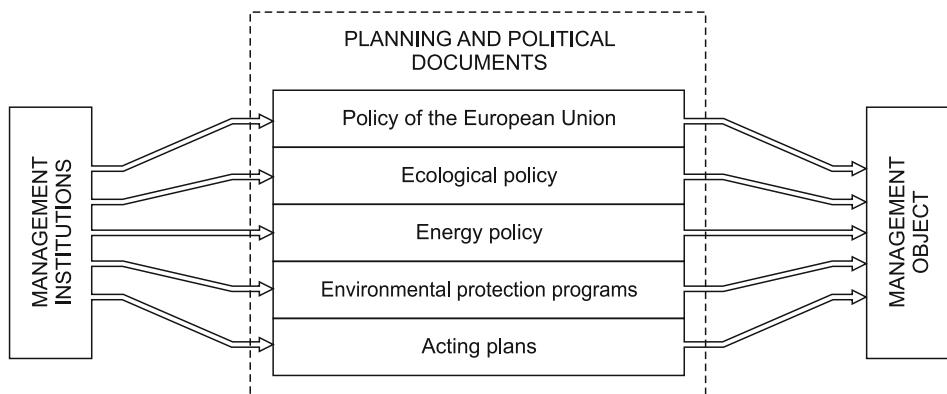
Protection of atmospheric air was ranked third sphere of implementing management instruments, following the protection of nature and the protection of waters. The first normative act regulating protection of air was the act on protection of atmospheric air from pollution approved of in 1966³. Presently in atmosphere protection management system there are used more than a dozen legislative acts (acts and decrees) and the entire spectrum of management instruments. They may be qualified depending on the type and subject of influence (regulation). In accordance with the type, the instruments of atmosphere protection management are divided into: political and planning recommendations and management instruments. The classification in accordance with the subject of influence comprises the following instruments: protection of air, protection of ozone layer and protection of climate. Political and planning recommendations are mutual for all three areas of influence, whereas instruments are largely diversified depending on the subject of influence.

³ The Act on 21 April 1966 on the protection of atmospheric air from pollution (Journal of Acta No. 14, item 87).

7.3.1. Political and planning recommendations

The concept “political and planning” recommendations⁴ comprises aims and tasks of protective actions that are included in planning documents. The aims and tasks of protection of air and climate (along with protection of the ozone layer) are formulated in program documents of the European Union, long-term country’s development programs, country’s ecological and energy policy as well as in district, province and municipal programs of environment protection, in district plans of spatial economy and in other planning documents. The main political and planning documents including recommendations concerning protection of air and climate were presented in figure 7.4.

Figure 7.4. Political and planning recommendations in the protection of air and climate in accordance with the type of documents



Source: *ibid.* figure 7.2.

In the European Union political and planning recommendations in the sphere of protection of air and climate are included in many documents of program character, e.g. in the “Environment Action Program”, “Program for research of technological development for the years 2007-2013”, “Competitiveness and innovation Framework Program for the years 2007-2013”, “Program of Cohesion” and in decisions of the European Council and the European Parliament. These documents imply that in the second decade of the 21st century in the European Union the priority actions that directly serve protection of air and climate will include:

⁴ Act of 21 April 1966 on protection of the atmospheric air from pollution (Dz.U. of 1966, No. 14, par. 87).

- reduction or complete elimination of emission of toxic pollutions into the air;
- reduction or elimination of exposing people to the influence of dusts with granulation smaller than 10 micrometers (PM 10) and especially below 2.5 micrometer (PM 2.5), the particles of which directly from lungs reach the circulatory system of people and animals;
- reduction by 20% in the emission of carbon dioxide in the European Union till 2020, when compared with the year 1990, as well as increase in the participation of renewable sources of energy production to 20% and increase in the energy effectiveness at least by 20%;
- elaboration and implementation of new technologies, instruments and services serving integral way of solving the problems concerning the anticipated climate and ecological changes on the Earth.

Realization of these tasks in Poland is particularly difficult owing to backwardness of Polish energy system, which in more than 90% is based on the combustion of coal and owing to limited investment possibilities.

In Poland the political and planning recommendations concerning the protection of atmosphere are found mainly in state ecological policy and state energy policy.

In the document *State Ecological Policy for the period 2007-2013* with the perspective of 2016 there are assumptions concerning:

- the achievement of the limits in the emission of sulfur dioxide, nitric oxides and dusts PM10 and PM2.5 defined in the Accession Treaty and in the relevant directives of the European Union;
- elimination till 2016 of the emission of substances destroying the ozone layer by removing them from circulation and ban on usage in Poland;
- reduction in the emission of carbon dioxide till 202 by 15% in comparison with 1990, ensuring 14% participation of renewable sources of energy in the production of energy in 2020 and conducting information and modernization actions/activities aiming at the improvement of energy effectiveness;
- elaboration and implementation of air protection programs (the so-called corrective programs) in 161 city zones where the standards of contents of dusts PM10 and PM2.5 in the air are exceeded, mainly through activities serving the reduction in low emission and emission of dust by the means of transport [*Polityka...*, 2008].

The document *Energy Policy of Poland till 2030* implies:

- striving for the maintenance of non-energy growth of economy;
- changing the structure of producing energy towards low-emission technologies;
- reducing the emission of CO₂ till 2020 while maintaining high level of energy safety;

- reducing the emission of SO₂ and NO_x and dusts, including PM10 and PM2.5, to the levels in force in the existing and projected union regulations;
- creating a management system for the national limits in the emission of greenhouse gases and other substances;
- increasing the usage of the side effects of combustion products;
- diagnosing the possibilities of occurrence in energy sector of unintended production of solid organic pollutions (dioxans and furans) [*Polityka...*, 2009].

It needs to be stated that the energy policy and environmental policy of Poland are correlated with one another, which may ensure success in their implementation. The indications included in these documents in the domain of protection of atmospheric air and climate constitute the basis for environmental protection programs and other planning documents on the level of a district, province and municipality.

7.3.2. Management instruments in the protection of the atmospheric air and climate

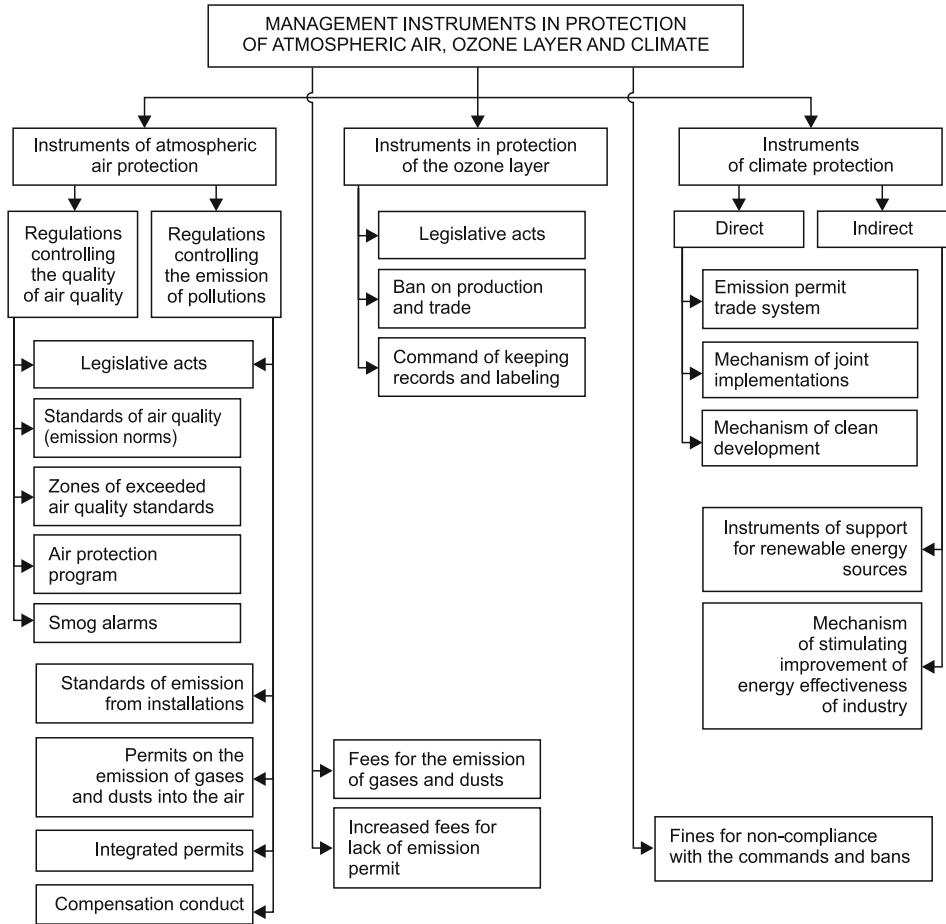
Depending on the subject of protection, the management instruments can be divided into those concerning the protection of air, ozone layer and climate (figure 7.5.). These are, to a large degree, legislative and administrative instruments supported by economic instruments. The widest range of instruments concerns protection of air, whereas the smallest – protection of the ozone layer. At the same time the most complex instruments are those concerning the protection of climate. These instruments are of new generation and were designed and implemented in the first decade of this century.

7.3.2.1. Instruments serving protection of the atmospheric air

Instruments of atmospheric air protection can be divided into two subgroups – the ones regulating air quality and those regulating the emissions of pollutions. Legislative acts introducing these instruments are usually common for these two subgroups. Instruments to a large degree ensue from international conventions and EU directives. They have legal fixation in the state law, mainly in the Act of 27 April 2001 – Environmental Protection Law⁵ and in the related decrees of the Minister of Environment.

⁵ Uniform text, Dz.U. of 2008, No. 25, par. 150.

Figure 7.5. Classification of management instruments of protection of the atmospheric air, ozone layer and climate



Source: *ibid.* figure 7.2.

Legislative acts regulating protection of atmospheric air are of two types: problem and detailed ones. The problem acts include: Convention on long-distance cross-border air pollution of 13 November 1979, approved of in Geneva⁶; Protocol for the Convention from 1979 on long-distance cross-border air pollution, concerning long-term financing of joint monitoring program and assessment of long-distance transfer of air pollutions in Europe (EMEP) of 28

⁶ Dz.U. of 1985, No. 60, par. 311.

September 1984, prepared in Geneva⁷; EC Directive 96/22/EC of 27 September 1996 on the assessment and management of air quality⁸; Directive 08/50/EC of 21 May 2008 on the quality of air and clean air for Europe⁹; Directive 08/1/EC of 15 January 2008 on the integrated prevention of pollutions and on control of them¹⁰.

Detailed legislative acts of the European Union include: Directive 99/30/EC of 22 April 1999 on the admissible values of sulfur dioxide, nitrogen dioxide and nitrogen oxides and also dusts and lead in the circumfluent air¹¹; Directive 00/69/EC of the European Parliament and Council of 16 November 2000 on the admissible values of benzene and carbon dioxide in the circumfluent air¹²; Directive 02/3/EC of the European Parliament and Council of 12 February 2002 on ozone in the circumfluent air¹³ (it concerns earth-bound ozone from anthropogenic sources, mainly from internal combustion engines); Directive 04/107/EC of the European Parliament and Council of 15 December 2004 on arsenic, cadmium, mercury, nickel and multi-annular aromatic hydrocarbons in the surrounding environment¹⁴; Directive 01/81/EC of the European Parliament and Council of 23 October 2001 on the state emission levels for some types of air pollution¹⁵; Directive 01/80/EC of the European Parliament and Council of 23 October 2001 on reduction in the emission into the air of some pollutions from large objects of energetic combustion¹⁶; Directive 94/63/EC of the European Parliament and Council on the control of volatile organic compounds in the process of storing fuels and their distribution from terminals to petrol stations¹⁷; Directive 99/13/EC of 11 March 1999 on reduction in the emission of volatile organic compounds caused by the usage of organic solvents during certain activities and in certain devices¹⁸; Directive 98/69/EC of the European Parliament and Council of 13 October 1998 on prevention of pollutions by emission from engine vehicles which changes the EC Directive 70/220/OECD¹⁹; Directive 00/76/EC of the European Parliament and Council of 4 December 2000 on combustion of wastes²⁰.

⁷ Dz.U. of 1988, No. 40, par. 313; EMEP – *European Monitoring Environmental Program*.

⁸ Dz.U. L. 296 of 21 November 1996.

⁹ Dz.U.L. 152 of 11 June 2008.

¹⁰ Dz.U.L. 24 of 29 January 2008.

¹¹ Dz.U. L. 163 of 29 June 1999.

¹² Dz.U.L. 313 of 13 December 2000.

¹³ Dz.U.L. 67 of 9 March 2002.

¹⁴ Dz.U.L. 23 of 26 January 2005.

¹⁵ Dz.U.L. 309 of 27 November 2001.

¹⁶ *Ibidem*.

¹⁷ Dz.U.L. 365 of 31 December 1994.

¹⁸ Dz.U.L. 85 of 29 March 1999.

¹⁹ Dz.U.L. 350 of 28 December 1998.

²⁰ Dz.U.L. 332/91 of 13 December 2000.

The indications included in the European Union directives were transferred into the state law. In Poland the basic legal acts regulating the problems related to the protection of air is the act of 27 of April 2001: Environment protection law with further alterations, especially the ones introduced in 2007 and 2008²¹. It defines the principles of protection of air and the instruments for realization of these principles. The act, among other things, imposes the responsibility on the minister of environment to define and measure the levels of substances in the air and to mark out zones of air protection assessment, procedure of preparing and implementing environmental protection programs for the zones with exceeded levels of pollutions. This ban has framework character and it entitles the Cabinet or the Minister of Environment to make detailed regulations in the form of decrees. The act was enclosed with more than a dozen decrees.

The legal acts regulating protection of atmospheric air often include also the regulations concerning protection from noise and electromagnetic radiation. In Poland these regulations are included in the Environmental Protection Law and related decrees by the Minister for the Environment.

Instruments regulating the quality of atmospheric air

Air quality standards (imission norms) define the highest permitted level of air pollutions in a certain area within a certain time period. There are isolated four levels of pollutions:

1. admissible level, which is the air quality standard; this is the level of substances which needs to be achieved in a certain time period and ought not to be exceeded;
2. target level – this is the level of substances that must be achieved within a certain time period using economically justified technical and technological actions; this level is determined with the aim of preventing or reducing the harmful impact of a certain substance on human health or on the environment in its entirety;
3. the level of long-term aim – this is the level of substances below which, in accordance with the state of the present knowledge, direct harmful impact on human health or on the environment is very unlikely; this level needs to be achieved over longer period, except for the situations when it is not possible to elaborate and implement economically justified technical and technological actions which are indispensable for achievement of this aim;
4. alarm level – it was determined only for those substances in the air, only slight exceeding of which can cause harm for human health. So far such levels have been determined for carbon dioxide, ozone and suspended dust (PM10).

Admissible levels of substances were determined for the country's area with exclusion of health resorts. They concern benzene, nitrogen dioxide, carbon

²¹ Uniform text, Dz.U. of 2008, No. 25, par. 150.

oxide, nitrogen oxide, ozone and suspended dust (PM10). Alarm levels are identical in the entire country (table 7.3.). The target levels of substances in the air was determined for four substances: arsen, benzoapiren, cadmium and nickel, taking into consideration the necessity of protection of human health and protection of plants. The target level ought to be achieved in 2013 (table 7.4.).

Table 7.3. Admissible and alarm levels of substances in the atmospheric air

Name of the substance	Period of making measurement results average	Admissible level of the substance in the air (in $\mu\text{g}/\text{m}^3$)		Alarm level of the substance in the air (in $\mu\text{g}/\text{m}^3$)
		In the country	In the area of health resort	
Benzene	Calendar year	5	4	-
Nitrogen dioxide	One hour	200 ^a	200	400
Nitrogen oxides	Calendar year	30	30	-
Lead	Calendar year	0.5	0.5	-
Carbon monoxide	8 hours	10 000	5 000	-
	One hour	350 ^b	350	-
	24 hours	125 ^c	125	-
Sulfur dioxide	Calendar year and winter period (1.10-31.03)	20	20	-
Suspended dust	24 hours	50 ^d	50 ^d	200
PM10	Calendar year	40	40	-
	8 hours	120 ^e	120 ^e	240 ^f
Ozone	Vegetation period (1.05-31.07)/hour	18 000	18 000	-

Note: Admissible possibility of exceeding the level within a year: ^a – 18 times; ^b – 24 times; ^c – 3 times; ^d – 35 times; ^e – 25 days; ^f – one hour.

Source: own elaboration on the basis of the decree by the Minister for the Environment of 3 March 2008 on the levels of some substances in the air (Dz.U. of 2008, No 47, par. 281).

Table 7.4. Target level of substances in the air in 2013

Name of the substance	Period of making measurement results average	Target level of the substance [$\mu\text{g}/\text{m}^3$]
Arsen	Calendar year	6
Benzoapyrene	Calendar year	1
Cadmium	Calendar year	5
Nickel	Calendar year	20

Source: *ibid.* table 7.3.

The level of long-term aim was determined only for ozone. It was assumed that in 2020 the average measurement result of this gas at ground level within the period of 8 hours in non-vegetation period (from 1 August to 30 April) ought not to exceed $120 \mu\text{g}/\text{m}^3$, whereas in the vegetation period (from 1 May to 30 April) – $6000 \mu\text{g}/\text{m}^3/\text{h}$. The level of gas substances in the air is determined in the temperature of 293 K and pressure of 101,3 hP, whereas in relation to suspended dust and substances marked in suspended dust in real conditions.

The imission levels were determined also for noise. The admissible level of noise in built-up area during the day (from 6 a.m. till 10 p.m.) is 60 dB, whereas during the night (from 10 p.m. till 6 a.m.) – 50 dB. These are average values. The admissible and short-term boundary levels of noise were diversified depending on the destination of the area and on the source of noise (table 7.5.). There were defined also admissible levels of magnetic fields in the environment for the areas earmarked for construction and places available for population²².

Table 7.5. Admissible and border boundary level of noise expressed by equivalent level of sound A (in dB)

Source, time of the day and type of noise/ Purpose of area	Roads or railway lines				Other objects			
	day ^a		night ^b		day		night	
	D	G	D	G	D	G	D	G
Areas with health-resort protection	50	60	40	50	40	50	35	45
Areas of hospitals outside the town	50	65	40	60	40	60	35	50
Holiday and recreational areas outside the town	55	60	45	50	-	-	-	-
Building areas of detached houses	55	75	45	67	45	67	40	57
Areas of permanent or temporary stay of children and teenagers and areas of nursing homes and hospitals in towns	55	65	45	60	45	60	40	50

²² Decree by the Minister for the Environment of 30 October 2003 on accessible levels of electromagnetic fields in the environment and on the types of checking maintenance of these levels (Dz.U. of 2003, No. 192, par. 1883)

Source, time of the day and type of noise/ Purpose of area	Roads or railway lines				Other objects			
	day ^a		night ^b		day		night	
	D	G	D	G	D	G	D	G
Building areas of single and multi-family houses with craft's services and farmstead buildings	60	75	50	67	50	67	40	67
Areas in central zone of towns having more than 100 000 inhabitants and with compact residential area as well as concentration of administrative, commercial and service buildings	65	75	55	67	55	67	45	57

Note: ^a – range of time of reference having 16 hours; ^b range of time of reference having 8 hours; ^c admissible noise level ^d boundary short-term noise level

Source: Decree by the Minister for the Environment of 9 January 2002 on the boundary values of noise levels (Dz.U. of 2002, No. 8, par. 81).

The zones of exceeded standards of air quality are the places of imission measurement, i.e. the levels of pollutions included in the air. The zone embraces agglomeration of more than 250 000 inhabitants and the area of one or more districts situated in the area of the same district not included in the agglomeration. The Minister for the Environment marked out 153 zones – from 4 (in Opolskie district) to 16 (in Mazowieckie and Western Pomeranian district). The measurement of air quality in each zone is made at least every five years. The assessments of levels of substances in a certain zone are made every year by isolating zones in which the level:

- of at least one substance exceeds the admissible level increased by tolerance margin;
- of at least one substance is between the admissible level and tolerance level;
- of substance does not exceed admissible level;
- of substance exceeds the target level;
- of substance does not exceed the target level;
- of substance exceeds the level of long-term target;
- of substance does not exceed the level of long-term target.

In case of ascertaining exceeding of even one substance there emerges the obligation to elaborate air protection program. The measurement and assessment are made by district inspector of environmental protection whereas the results are given to the district marshal.

Air protection program, which is also known as the corrective program, is elaborated by the district marshal for each zone where the target level is exceeded in case of even one substance. The procedure of making the document implies obtainment of opinion of the proper prefect and participation of the society (by means of the adopted type of social consultation). The plan is approved by the district self-government. Each air protection program must characterize the given area, exceeded admissible levels of substance in the air, the activities necessary for obtainment of admissible level, entities obliged to undertake certain actions, obligations of certain administration organs and entities using the environment in the given area. Air protection program determines emission standards defined in new permits on introduction of gases and dusts into the air or in new integrated permits. The organ responsible for issuing the permit, being aware of the tasks adopted in the plan, can change the admissible emission levels in permits that are already in force (issued earlier).

Plans of short-term actions (smog alarms) are made when there is risk that short-term exceeding of alarming levels of substances in the air can cause hazard to human health. The organ that is obliged to elaborate the plan of short-term actions is the district marshal after obtaining opinion of a proper prefect and informing the society of the occurrence of exceeding of alarming levels or of the risk of occurrence of such exceeding. The plan is adopted by the district self-government by means of an act.

Plans of short-term actions ought to define at least: the list of entities using the environment that are obliged to reduce or stop releasing gases or dusts into the air from the installations; type of organizations and reductions or ban on operation of vehicles and other devices with combustion engines; type of conduct of organs, institutions and entities using the environment and behavior of citizens in case hazards occur; determination of the mode and way of informing about the existence of exceeding.

It needs to be mentioned that earlier (in the 1990s) permits in this aspect were held by the governor as a one-man organ.

Instruments regulating the emission of pollutions

Emission standards from installations are the general norms (introduced by the decree of the Minister for the Environment) which define the admissible emission of gases and dusts for some installations. Emission standards in Poland were determined for five types of installations:

1. of fuel combustion, perceived as stationary technical devices serving production of energy;
2. of combustion and co-combustion of wastes;
3. for production or processing of goods containing asbestos;
4. for production of titan dioxide;
5. in which organic solvents are used.

Emission standards for installations are diversified depending on the term of letting the installation for exploitation and further period of its functioning. For these installations there were determined also: conditions under which standards are considered to be met; requirements regarding the usage of certain technical solutions that ensure reduction in emission; modes of conduct in case of disturbances in technological processes and technical operations of the used installation; types of disturbances causing discontinuation of using the installation; preventive measure that ought to be taken by the entity responsible for the installation; measures and time frameworks under which the entity responsible for the installation ought to inform the district inspector of environmental protection about disturbances in the installation functioning.

Permits for the emission of gases and dusts into the air are the individual norms set by an appropriate organ for a certain installation. The permit for ordinary installations is issued by a prefect, whereas in case of the installation that may have considerable influence on the environment – district marshal, while in case of installations in closed areas – regional director of environmental protection. The permit is issued by request of the entity having the installation. The motion ought to include, among other things:

- information on the type of installation used technical devices and technical characteristic of the sources of origin and places of emission;
- assessment of the technical state of the installation;
- block (general) technological scheme;
- amount and sources of origin or places of emission of gases and dusts introduced into the air in kg/h and Mg/year;
- information on the planned periods of the installation functioning;
- way of measuring and monitoring the emission;
- information about the influence of the emission of gases and dusts on the environment.

The permit is issued for a certain period of time. In law there were defined 19 cases of installations in which its functioning does not require permit for the emission of gases and dusts into the air²³.

²³ Decree by the Minister for the Environment of 22 December 2004 on situations in which introduction of gases or dusts into the air does not require a permit (DZ.U. of 2004, No. 283, par. 2840).

Integrated permit is an administrative decision which regulates the principles of introducing substance or energy causing pollution in all components of the environment from the installation that may cause considerable pollution of particular natural elements or the environment as the entirety²⁴. Also the entity responsible for such installations is obliged to obtain an integrated permit which would comprise all the significant aspects of influence on the environment (consumption of water, sewage disposal, emission of gases and dusts into the air, emission of noise, formation of wastes and reduction in the consequences of industrial breakdown). Furthermore, installations need to meet the requirements of the best available technology (BAT) and their exploitation cannot worsen environment quality and exceed boundary emission values²⁵ or values of reference²⁶. In the permit ought to be defined the tolerance borders²⁷.

All installations that require an integrated permit and are situated within one plant must be comprised by one permit. The permit specifies the admissible total level of emission of gases and dusts introduced into the air, the admissible noise level, characteristic of disposed sewage and conditions of formation as well as the mode of conduct with wastes. The organ that is responsible for issuing the integrated permit for installations qualified as likely to affect the environment is starost, whereas for the installations that may considerably affect the environment and are subject to the obligation of preparing a report on the enterprise's influence on the environment is the district marshal.

Compensatory proceedings mean a special procedure enabling exception to the rule of not exceeding quality standards in the given area while issuing a permit on introducing into air gases and dusts from installations. Exceeding of emission from some installations is possible under the condition that the total amount of released gases and dusts in a certain area will be reduced by reducing or ceasing of emission from other installations. Compensation conduct is initiated by request of the entity interested in the obtainment of emission permit for newly constructed or significantly modernized installation. The entity must obtain agreement of other entities that are situated in a certain area on reduction in emission from their installations. Expressing of agreement means that a proper administration organ limits or withdraws their emission permits in the scope the agreement was expressed. The permit on introducing of gases and dusts from a new installation into the air must not exceed 70% of the value obtained

²⁴ Decree by the Minister of Environment for the 26 July 2002 on types of installations that may cause considerable pollution of particular natural elements or the entire environment (DZ.U. of 2002, No. 122, par. 1055).

²⁵ **The boundary emission values** mean special emission standards that must not be exceeded by installations that require an integrated permit.

²⁶ **Tolerance borders** mean such value by which limits of emission values can be exceeded.

²⁷ Value of reference is estimated in such situations when there is no certain emission standard and admissible levels of substances in the air.

from reduction in the emission in other installations and cannot cause hazard to human health [*Prawo...*, 2009].

7.3.2.2. Instruments serving protection of the ozone layer

Instruments serving protection of the ozone layer refer to production, transportation and exportation, introduction into circulation, usage, retrieval, recycling, regeneration and destruction of substances depleting the ozone layer. The basis of these regulations constitute introductory acts: Convention on protection of the ozone layer of 22 March 1985 that was prepared in Vienne²⁸, Protocol on substances depleting the ozone layer of 16 September 1987²⁹, Decree (EC) 2037/2000 of the European Parliament and Council of 29 June 2000 on substances depleting the ozone layer³⁰, Act of 20 April 2004 on substances depleting the ozone layer³¹.

There were introduced two types of instruments: bans on production and circulation; making records and labeling. **Ban on production and circulation** regards production of substances controlled in the European Union and on introduction of them into circulation. This ban concerns devices containing controlled substances or dependent on such substances as well as plastics and goods containing such materials produced using controlled substances. There is a ban on reconstruction of devices and installations using controlled substances and on storing them on waste heaps of conditioning, cooling and extinguishing devices containing such substances. Controlled substances comprised by the ban include mainly chlorofluorohydrocarbons (CFC) and hydrochlorofluorohydrocarbons (HCFC).

The command to make records and label controlled substances applies to the entities using them. Recording comprises mostly: type of the controlled substance and its chemical and trade name; the amount of used substance in particular months; source of origin of the substance; the way of using it. Each device (installation) must include information placed directly on it with data on the type of controlled substance it includes. Each user of devices or installations must hold the so called "device card" including the controlled substance, make periodical controls of tightness and submit reports: every 12 months in case the substance weighs from 3 to 30 kg; every 6 months – from 30 to 300 kg; every 3 months – more than 300 kg.

The devices can be operated and especially measured in terms of their tightness by an employee with qualifications documented by a certificate issued by

²⁸ DZ.U. of 1992, No. 98, par. 488.

²⁹ Dz.U. of 1992, No. 98, par. 490 with further alterations.

³⁰ Dz.U.L. 244/1 of 29 September 2000 with further alterations.

³¹ Dz., of 2004, No.121, par. 1263 with further alterations.

the certification unit appointed by authorities. Once a year the report must be submitted by the entities introducing controlled “old” substances with the purpose of their utilization (only till 31.12.2014) and “new” ones with the aim of using them. The “new” substances include dibromodifluoromethane (halon 1202), 1-bromopropane (n-propyl-bromide), bromethane (ethyl bromide), trifluoroiodomethane (trifluoromethyle iodide) and chloromethane (methyl chloride).

It is anticipated that Central Register of Operators of Devices and Systems of Anti-fire Protection will be established and it will keep data bases (on the basis of reports) and conduct analyses and assessments of management of controlled substances.

7.3.2.3. Instruments serving protection of climate

Complex system of instruments serving protection of climate was introduced on the basis of two groups of documents: that directly concern the protection of climate and that directly, by means of increase in energy security and effectiveness as well as by increase in the participation of renewable sources of energy.

Protection of climate is regulated by such **legal acts** as:

- Framework UN Convention on climate changes, adopted on 9 May 1992 in New York and signed in June 1992 at the United Nations Conference “Environment and development” in Rio de Janeiro³²;
- Kyoto Protocol for Framework Convention of the United Nations on climate changes, of 11 December 1997, prepared in Kyoto³³;
- Directive 03/87/EC of the European Parliament and Council of 13 October 2003 that established the system of trade in distribution of emission of greenhouse gases in the Union and changed the Council directive 96/61/EC³⁴ together with the Directive 04/01/EC of the European Parliament and Council of 27 October 2004 which changed the directive 03/87/EC which established the system of trade in distributions of emission of greenhouse gases in the European Union while taking into consideration the mechanisms included in the Kyoto Protocol³⁵; the following executive acts refer to this directive: Decree of the Commission (EC) 2216/2004 from 21 December 2004 on standardized and secured system of registers, in accordance with the Directive 03/87/EC of the European Parliament and Council and decision 280/2004/EC of the European Parliament and Council, changed on

³² Dz.U. of 1996, No. 53, par. 238.

³³ Dz.U. of 2005, No. 203, par. 1684.

³⁴ Dz.U. L. 275/32 of 25 October 2003, with further alterations.

³⁵ Dz.U.L. 338 of 13 November 2004.

31 July 2007³⁶; Decision of the Commission 07/589/EC of 18 July 2007 providing recommendations concerning monitoring and reports in relation to the emission of greenhouse gases in accordance with the directive 03/87/EC of the European Parliament and Council³⁷; Decree (EC) 166/2006 of the European Parliament and Council of 18 January 2006 on the establishment of the European register of release and transfer of pollutions which changed the Council directives 91/689/OECD and 96/61/EC³⁸.

Protection of climate is supported also by the instruments related to increasing energy safety indicated in such documents as: Directive 01/77/EC of 27 September 2001 on increase in production on the internal/domestic market of electrical energy produced from renewable sources³⁹; Directive 03/30/EC of the European Parliament and Council of 8 May 2003 on support for the use of bio-fuels and other renewable fuels in transport⁴⁰; Directive 04/8/EC of the European Parliament and Council of 11 February 2004 on support for cogeneration on the basis of demand for usable heat on the internal energy market which changed the directive 92/42/EEC⁴¹; Directive 06/32/EC of the European Parliament and Council of 5 April 2006 on the effectiveness of the final usage of energy and energy services which annulled the Council Directive 93/76/EEC⁴².

The European Union introduced also a number of other regulations which in an indirect way contribute to reduction in the emission of greenhouse gases, for example the EU specified the requirements in terms of effectiveness for new boilers heating water and heated by liquid fuels or gas fuels, determined levels of reducing the emission and absorbency of energy in transport and also recommended energy-related eco-labeling of goods.

All these regulations were transmitted into the internal law.

Both in the European Union and in Poland there are run works on the regulation of actions aiming at reduction in the emission of greenhouse gases. They concern such problems as: adaptation of economy to climate changes, absorption of greenhouse gases, inclusion of aviation and sea ships to the system of trade in emission permits, inclusion of protective actions into tax system, proper usage of lands reducing the emission of greenhouse gases.

In Poland the instruments of climate protection were introduced by the virtue of the following legal acts: act of 22 December 2004 on the trade in permits for the emission of greenhouse gases and other substances into the air⁴³, act of 17 July

³⁶ Dz.U.L. of 29 October 2004, with further alterations.

³⁷ Dz.U.L. 229 of 31 August 2007.

³⁸ Dz.U.L. 33 of 4 February 2006.

³⁹ Dz.U.L. 283 of 27 October 2001.

⁴⁰ Dz.U.L. 123 of 17 May 2003.

⁴¹ Dz.U.L. 52 of 21 February 2004.

⁴² Dz.U.L. 114/64 of 27 April 2006.

⁴³ Dz.U. of 2004, No. 281, par. 2784.

2009 on management of the emissions of greenhouse gases and other substances⁴⁴; Act of 4 March 2011 on Energy Efficiency⁴⁵. On the basis of these acts there were issued several decrees regulating particular detailed issues: on the appointment of the National Administrator of Emission Permits Trade System⁴⁶; on the way of monitoring the value of emissions of substances that are comprised by the union system of emission permits trade⁴⁷; Decree of the Minister of the Environment of 25 February 2011 on the information required for elaborating the national plan of distributing emission permits⁴⁸; Decree of the Minister of Environment of 27 July 2009 on the type of installations comprised by the union system of trade in emission permits⁴⁹.

Management of the emission of greenhouse gases comprises:

- system of trade of permits for emission of pollutions in the European Union (compare with subchapter 5.4.5.);
- mechanism of joint implementations;
- mechanism of clean development;
- instruments of support for the development of renewable sources of energy.

System of trade in permits for emission of pollutions was established in the European Union. It concerns main greenhouse gases: carbon dioxide (CO₂), methane (CH₄), nitrous protoxide (N₂O), fluoro derivatives of hydrocarbons (HFC_s), perfluoro derivatives of carbon compounds (PFC_s) and sulfur hexafluoride (SF₆). The subject of trade is emission permit, i.e. the right to introduce into the air in a certain time period 1 Mg (one tone) of carbon dioxide or its equivalent in other greenhouse gases⁵⁰. Installation operator can use this permit or reduce emission below the granted amount and to sell the surplus on the special market. The obligation to possess emission permits applies to operators of installations producing energy, producing or processing iron metals, producing cement, glass, ceramic goods, cellulose, paper and cardboard. Permits are allocated for a certain period. So far this has been made for two settlement periods: the first one during the period 2005-2007 and the second between 2008 and 2012. There are still works on preparing allocations of permits in the perspective of the period 2013-2020.

⁴⁴ Dz.U. of 2009, No. 130, par. 1070.

⁴⁵ Dz.U. of 2011, No 94, par. 551.

⁴⁶ Dz.U. of 2005, No. 186, par. 1562.

⁴⁷ Dz.U. of 2006, No. 16, par. 124.

⁴⁸ Dz.U. of 2006, No. 43, par. 308.

⁴⁹ Dz.U. of 2009, No. 136, par. 1120.

⁵⁰ Equivalent is the counterpart of 1 Mg of carbon dioxide, calculated on the basis of the coefficient of heating certain gas comprised by the permit.

At the level of the European Union the allocation of permits for the emission of greenhouse gases takes place on the basis of national plans of their distribution into particular sectors of economy and particular enterprises (operators of installations) taking into consideration the EU criteria. The first criterion was ensuring the limit of emissions that was negotiated in Kyoto. The other criteria concerned: ensuring the possibility of emission from new installations, taking into consideration the effects of reduction activities undertaken by companies and the effects of using clean technologies, forming no discrimination of enterprises, complying with free competition and the principles of offering public aid that are obligatory in the European Union.

Enterprises that do not have the appropriate number of permits which would overlap with the value of emissions in a certain year are obliged to pay the fine for the emission exceeding the value of possessed permits and purchase the lacking number of permits on permit trade. During the settlement period 2008-2012 the fine for “unauthorized” emission amounts to 100 Euro per Mg. The possessed permits can be transferred by the operator between the possessed installations or particular years.

The secondary allocation of permits takes place on both the stock and non-stock exchange. The entities making transactions on the stock exchange must be its members or be represented by brokerage houses which on behalf of them transfer orders and make transactions. Trade on non-exchange market may take place by means of brokers with the aid of stock exchange chamber of settlements or directly within the bilateral agreement between interested parties⁵¹. Trade in permits for the emission of greenhouse gases takes place on cash and term exchange. On cash exchange there are spot transactions that are concluded and executed immediately, whereas on term exchange it is possible to make *forward* and *futures* contracts and options. On the stock exchange of permits there can be noticed considerable activity of large investment banks, investment funds and other financial institutions which frequently make speculative transaction [Dyduch, 2010].

In 2009 there were adopted settlements of the EU system of trade in permits for the emission of greenhouse gases during the period 2013-2020⁵². The system will be expanded with additional greenhouse gases – nitrous protoxide and perfluorohydrocarbons and as such it will comprise new types of activity. It allows for excluding from the system small installations which over the last three years have not exceeded 35 MW of power and 25 000 Mg CO₂ of emission. The sys-

⁵¹ The most important European Stock Exchanges where the transactions of purchase-sale of permits takes place include, among others: The European Climate Exchange with the abode in London, Nordic Power Exchange, The European Energy Exchange with abode in Leipzig.

⁵² The directive 09/29/EC of the European Parliament and European Council of 23 April 2009 which changes the directive 03/87/EC aiming at improvement and expansion of the EU system of trade in permits for the emission of greenhouse gases (Dz.U.L. 140 of 5 June 2009)..

tem began to include also the sector of civil aviation. The aim of the system in the third settlement term is to reduce the emission of greenhouse gases by 21% in relation to the value of emissions in 2005, along with the reserve allocated for new installations and innovative technological projects.

Distribution of permits will take place centrally in accordance with sector plans settled at the level of the Union and not, as it has been so far, within the national allocation plans. Allocation of permits will be mixed, thus it will include permits that are free of charge and that are acquired with payment on the exchange. The permits free of charge in the entire third term of settlements will be granted in 100% for those sectors of industry that are exposed to “escape of emission” to third countries⁵³. The other sectors of industry are subject to the principle of gradual stage of acquiring all permits on auction in 2007. In 2013 they will obtain free of charge 80% of the permits, whereas in the next years this number will be reduced in a linear way to 30% in 2020. For the sector of civil aviation – 82% of permits will be granted free of charge in the entire period, 15% on auction and 3% will constitute reserve. The incomes from the sale of permits on auctions (in the EU or inside the country) at least in 50% ought to be earmarked for financing undertakings serving reduction in the emission of energy from renewable sources.

The system requires appropriate national regulations. There was established National Center of Balancing and Managing Emissions (KOBiZE) which, among others:

- ensures functioning of the national system of balancing and forecasting emissions;
- holds a national data base concerning the emissions of greenhouse gases and other substances;
- makes a list of projects of joint implementations that are realized in the Polish territory;
- forms a register of entities entitled to verification of reports concerning the effects of reductions in greenhouse gases within the frameworks of the national system of green investments or projects of joint implementations;
- prepares reports and forecasts of the values of emissions;
- elaborates methods of determining the values of emissions⁵⁴.

National System of Balancing and Forecasting Emissions comprises information on the values of emissions of greenhouse gases and other substanc-

⁵³ The list of these sectors is visible in the Commission Decision 10/2/EC of 24 December 2009 which, in accordance with the directive 03/87/EC of the European Parliament and Council, establishes the list of sectors and subsectors considered as exposed to considerable risk of escape of emission (Dz.U.L.1/10 of 5 January 2010).

⁵⁴ Act of 17 July 2009 on the management system of emission of greenhouse gases and other substances (Dz.U. of 2009, No. 130, par. 1070, with further alterations).

es introduced into the air by the entities using the environment, values of production and characteristic of raw materials and fuels causing the emission, technical devices aiming at prevention or reduction in emission, values of reduced emissions, new planned undertakings causing or reducing emission, prepares forecasts of changes for particular sectors of the economy.

Reports of operators of installations that concern discontinuation of permits for a certain balance year are submitted to the National Center of Balancing and Managing Emissions. This institution makes analysis of information included in it. When the emission of any substance differs by more than 10% and it does not result from reduction in production, KOBiZE submits the report to the district inspector of environmental protection with the purpose to make the assessment of information. The report on the values of emissions of greenhouse gases and other substances is submitted by the center to the Minister of Environment.

The management system of the emissions of greenhouse gases and other substances aims at ensuring stable non-exceeding of the limits of emissions which result from international agreements and management of unused parts of national limits of emissions. In case of ascertaining the possibility of exceeding the national limit of emissions the center elaborates the national plan of emission reduction which is implemented by the virtue of the decree of the Cabinet. The execution of the decree takes place on the basis of sector plans of reduction in the emission of greenhouse gases elaborated by particular departments.

National System of Green Investments was formed with the aim of managing the funds obtained from alienation of permits for emission by entities during the period 2009-2011. The incomes from the sale of permits are granted for the separate "climate" account in the National Fund of Environmental Protection and Water Management. The funds accumulated on this account are earmarked for programs or projects serving reduction or avoidance of emission or absorption of carbon dioxide, adaptation to climate changes and other activities connected with air protection. Decisions concerning spending of funds ought to be consulted with Consultation Council handling the issues related to the functioning of the national system of green investments. The role of the national operator of the system of green investments (KOSZI) is played by the National Fund which handles collection and analysis of applications for financing and financing of undertakings qualified for realization.

Projects of the **mechanism of joint implementations (JI)** in Poland may be realized within the frameworks of either national or international procedure (compare with subchapter 5.4.5.). In both cases the realization of the project requires obtainment of a letter of support and afterwards also the letter of approval by the Minister of Environment. The letter of support can be issued when the project of joint implementations concerns a new investment, does not comprise installations embraced by the union system of trade in emission permits and does not constitute execution of the obligations ensuing from the regula-

tions of the law of the European Union or of the national law. The letter of approval in the form of a decree by the Minister of Environment may be issued when the project has the letter of support, ensures additional reduction (avoidance, absorption) of emission of greenhouse gases in relation to other actions, ensures usage of solutions fulfilling the criterion of best available (BAT) techniques and its realization will not worsen the state of the environment.

The entity realizing the project of joint implementations makes a report on reduction, avoidance or absorption of the emission of carbon dioxide. The number of units of reduction is subject to verification by certified or entitled unit. The report is submitted by verifier to the National Center of Balancing Emissions or to the committee supervising the mechanism. The obtained units of reduction can be at disposal of investor as long as the procedures of trade in emission permits are complied with.

Participation in reduction of projects of joint implementations and in **Clean Development Mechanism** (CDM; compare with subchapter 5.4.5.) outside the territory of Poland requires obtainment of approval of the Minister of Environment which is issued in the form of administrative decision. In the application for obtainment of approval there is estimation of the anticipated value of emission or avoidance of the emission of greenhouse gases or absorption of the emission of carbon dioxide, indication of the anticipated period of formation of reduction units. Reduction units that were obtained thanks to realization of projects of joint implementation and clean development outside Poland can be freely managed.

Usage of renewable sources of energy does not contribute to growth of presence of greenhouse gases, especially carbon dioxide, in the atmosphere. The aim of **instruments stimulating the growth of power in renewable sources of energy** (OZE) is lowering of the costs of production of renewable energy.

In Poland the following instruments of OZE are used:

- the obligation to purchase certificates of origin of electrical energy produced from RSE and cogeneration by energy companies that was imposed on those selling energy for end users;
- obligation to purchase electrical energy produced from OZE;
- obligation to make network accessible for energy from OZE as the priority, which was imposed on operators of electrical energy networks;
- reduction by 50% of the payment for connection to network (established on the basis of real costs incurred on the realization of connection) for renewable sources of energy having the installed power not greater than 5 MW and cogeneration units with power up to 1 MW;
- exemption from making stamp duty for issuing concession and issuing certificates of origin for inscription into the register of certificates of origin in Trade Energy Market, for making changes in the register of certificates as

the result of property rights (up to 5 MW) and from excise duty for energy produced in renewable sources within sale of it to the end users.

Energy-related enterprises which produce electrical energy or deal with energy transactions and sell this energy to end users have the obligation to obtain and submit the **certificates of origin of green energy** (and to obtain **“green” certificate**) for discontinuation to the president of Energy Regulatory Office (URE) or to make replacement payment. Those who sell energy have the obligation to purchase the energy produced from RSE for a fixed price, which is the average price of sale of electrical energy on competitive market from the previous year. In 2009 the replacement payment amounted to 258.89 PLN/MW. This payment is annually amended using the indicator of inflation from the previous year. Participation of energy from renewable sources in 2008 amounted to 10.4% and every year it ought to increase to 12.9% in 2017⁵⁵. The registered certificate of origin becomes property law and thus also transferable market good. Validity of the certificate of origin (property rights) is without any limits. They will remain on market till the owner decides for their discontinuation.

The precedence for purchase of energy from renewable sources is the obligation of operators of energy system. The obligation comprises the entire are of acting of the operator and concerns transfer or distribution of electrical energy produced from RSE (“green”) and from highly efficient cogeneration (“red”) while preserving reliability and safety of the national system of electrical energy system.

Advance payment in advance of connection was introduced in 2009 in order to prevent contesting for the conditions of connection with the purpose of their speculative resale or of blocking connection of new OZE installations. The advance payment amounts to PLN 30 for every anticipated KW of connection capacity [Graczyk, 2010].

Additional payment to the costs of purchase and assembly of solar collectors for physical persons and housing communities in already existing and newly built buildings. The instrument was introduced in 2010. The subsidies are granted by banks on behalf of the National Fund of Environmental Protection and Water Management which offer loans for this enterprise.

Mechanism of stimulating improvement of energy effectiveness of industry concerns production and usage of energy. This is the relation between the obtained value of operational effect and the amount of energy used for its

⁵⁵ Decree of the Minister of Economy of 14 September 2008 on detailed range of duties concerning obtainment and presentation for discontinuation of certificates of origin, making replacement payment, purchase of electrical energy and heat produced from renewable sources of energy and the obligation to confirm data concerning the amount of energy produced in renewable source of energy (DZ.U. of 2008, No. 969, with further alterations).

obtainment. This may apply to the usage or exploitation of an object, technical device or installation. Effectiveness may be related to primary or final energy.⁵⁶

The national aim regarding economical management of energy was specified by the virtue of an act⁵⁷ for the year 2011 in the amount not lower than 9% of the average use of final energy during the period 2001-2005. The Minister of Economy prepares and presents for approval of the Cabinet the three-year plan of actions concerning energy effectiveness. The plan ought to include description of programs and enterprises serving improvement of energy effectiveness in particular sectors of economy as well as the analysis and assessment of executing the undertaken actions. The measure of improvement of energy effectiveness can be realization of specially planned undertaking within the framework of the existing production property, acquisition of a new device, installation or vehicle characterized by lower usage of energy, exchange of exploited devices, installations or vehicles, acquisition or renting of energetically effective buildings or reconstruction or renovation of the already existing ones as well as preparation of energy audit and execution of thermal isolation.

Energy enterprise selling electrical energy, heat or natural gas to end users (or a brokerage house) has the responsibility to obtain and present for discontinuation to the President of Energy Regulatory Office (URE) a **certificate of energy effectiveness** (known as **“white” certificate**). This is the confirmation of declared saving of energy that is announced together with the audit charter of energy effectiveness. The selection of enterprises serving improvement of energy effectiveness is made by the president of URE who declares the value of certificate as well as organizes and conducts tender. The enterprise obliged to be economical with energy and not having the certificate makes replacement payment. The property right ensuing from the certificate of energy effectiveness are the exchange good. Audit of energy effectiveness which is necessary for discontinuation of the certificate may be made by a person with higher education after one-year post-graduate studies for auditors of energy effectiveness.

Fines for non-compliance with commands and bans are imposed by the president of URE and they amount to 10% of the income achieved in the previous year. The financial fine of 2 m Euro is imposed for giving out untrue data, for not realizing the undertaking serving the improvement of energy effectiveness contrary to the commitment, for not informing the president of URE about completion of the undertaking and for receiving savings lower than stated in the tender declaration. The payments and fines constitute the income of the National Fund of Environmental Protection and Water Management.

⁵⁶ **Primary energy** is the energy included in primary energy carriers obtained directly from the environment, e.g. hard coal, natural gas, biomass, energy of wind, water, solar energy and geothermal energy. Final energy – energy of fuel used by the end user.

⁵⁷ Act of 4 March 2011 on energy effectiveness (Dz.U. of 2011, No. 94, par. 551).

7.3.2.4. Ecological charges and fines

Ecological charges and fines are made for the emission of gases and dust into the atmosphere in relation to legal commands (obligations) and bans. Activity of other instruments, e.g. air protection programs, command of recording and labeling products including gases that are harmful for the ozone layer or the system of trade in permits for the emission of greenhouse gases, does not collide with the functioning of the system of ecological payments and fines. The concept “ecological” makes this system different from the payments and fines used within the frameworks of some detailed instruments, e.g. in the mechanism of stimulating the improvement of energy effectiveness of industry.

7.4. Management and controlling organs and supportive institutions

The management subsystem is the first chain of management system of air and climate protection but due to methodological reasons it is analyzed as the last subsystem. There may be isolated four subsystem of the second degree: management organs, controlling organs, institutions supporting managing process and ecological social organizations.

The organs responsible for the management of air and climate protection in Poland are:

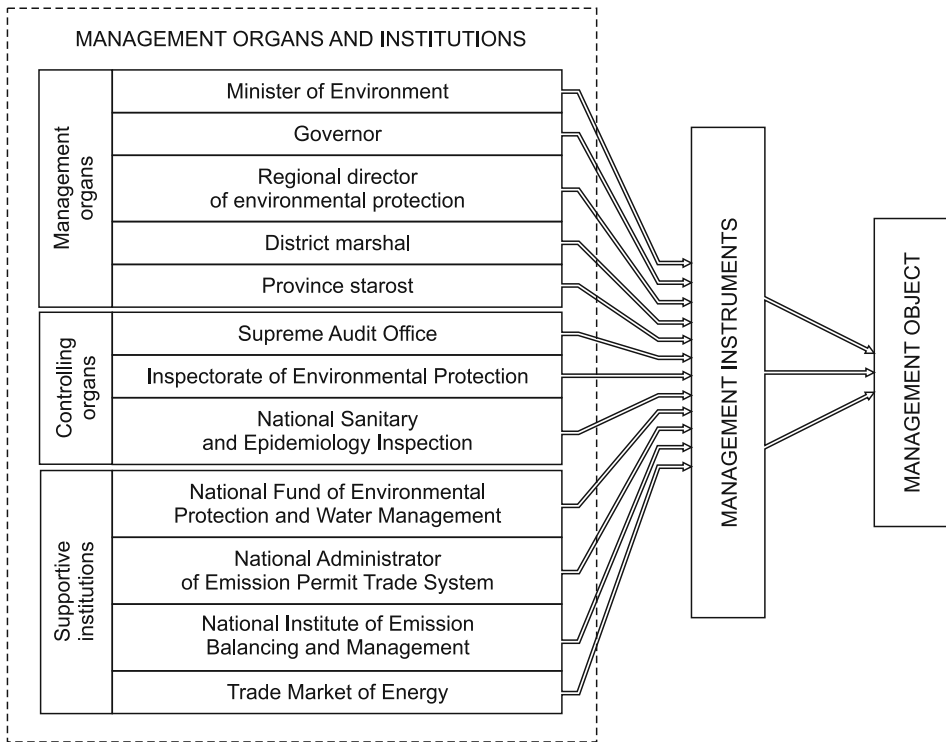
- Minister of Environment;
- governor;
- regional director of environment protection;
- district marshal;
- province starost.

The Minister for the Environment is the organizer of the system, ensures legal, organizational, institutional and financial bases of its functioning. The minister's direct detailed competences include among others the problem of cross-border influence of pollutions emitted into the atmospheric air. The regional director of environmental protection, among others, issues decisions concerning admissible emission of pollutions by the emitters located in special zones, e.g. in the areas of military units. The director analyzes the effects of the emission of air pollution ensuing from the assessment of the influence of development programs and investments on the environment.

The district marshal issues permits for the emission of pollutions and greenhouse gases into the atmosphere from the installations that can largely affect the environment, elaborates and realizes the program of air protection in the zones of exceeded standards as well as plans of short-term actions in case of exceeded

levels of substances in the air that may cause hazard to the health of people (smog alarms). The province starost issues permits for the emission of air pollutions, participates in elaboration and realization of air protection program. The position of organs and institutions in management system of air and climate protection is illustrated in figure 7.6.

Figure 7.6. Organs, institutions and organizations responsible for management of atmospheric air and climate protection



Source: *ibid.* figure 7.3.

Controlling organs include mainly the Supreme Audit Office which makes control of the functioning of managing organs and its offices (from the Minister of Environment to a municipality prefect); Inspectorate of Environmental Protection and National Sanitary and Epidemiology Inspection that makes, above all, controls of economic activity related to usage of the environment, especially control of the functioning of installations that can cause considerable pollution of the air or of the environment as the entirety as well as control of devices protecting the environment from pollution; National Sanitary and Epidemiology

Inspection that mostly controls and assesses emitters in terms of the influence that pollutions emitted into the air – in the form of gas, dust, noise and electromagnetic field – have on people.

The role of particular supportive institutions was shown during description of instruments.

Ecological social organizations play informative and controlling role. The area of their effective activity is the assessment of projects of administrative decisions and informing about non-compliance with legal norms of air and climate protection.

Chapter 8

WATER MANAGEMENT

Water management is an integrated subject of management activities that comprises usage of water resources and protection of them. The aim of water management is to ensure that the entire population will have access to clean and healthy water, to satisfy the well-grounded water needs of economy while maintaining appropriate state of waters and interrelated ecosystems and while reducing the hazards caused by floods and droughts [*Projekt polityki wodnej...*, 2010]. Realization of the aim requires establishment of an efficient system that would manage the maintenance, usage and protection of waters. In Poland, since 1991 this system has been gradually reorganized. In water management system there overlap new and old solutions which are not always compatible with one another.

8.1. Characterization of management object

Water is the source of life. Organisms living on the Earth use water as the structural component and as the internal carrier of other elements that are indispensable for existence or as the environment for living and development. Mineral salts from the soil can be consumed by plants only in the form of water solutions. Transport of any substances, both in the plants and animals, takes place only in the water solution. Depending on the source of origin, waters can be divided into fall (atmospheric), surface and underground waters.

Fall waters are the product of air vapor condensation contained in the atmosphere. The intensity of atmospheric falls depends on geographical location. The amount of water in the air, measured in weight units, is called the relative

air humidity¹. The amount of air vapor in the air depends on the temperature and pressure, therefore, there was introduced a meter called relative humidity. Water evaporation depends on the temperature and humidity of the environment. Humidity in the environment of moderate climate changes regularly in twenty-four hour cycle and irregularly depending on atmospheric falls.

Surface inland (sweet) waters are divided into those in rivers, streams and watercourses and the waters in lakes, ponds and artificial reservoirs. Standing waters differ from running waters by much larger temperature fluctuations, lower amount of dioxide (O₂) and much faster course of processes of eutrophisation² and pollution.

Watercourses include: rives, canals, streams and well-heads. Rivers occur in these earth areas where the total of annual falls comes to 250 mm. In general, rivers originate from the source, i.e. outlet of underground water on earth surface, then pass into the stream of water that is getting more and more abundant in water thanks to tributaries. The area of supplying river is called a basin. The speed of water flow is dependent on the reduction in land, water mass, banks of riverbed and on the type of bottom. Water transports mineral material and shapes the riverbed by corrosion and accumulation processes. The level of water in river is dependent on supplying it with atmospheric falls, on the type of basin, the extent of basin's supply and ground permeability.

Lakes are natural land depressions that are fully or partly filled with water. With time, they get flatter owing to sedimentation of products brought or created by decomposition of dead organisms. With regards to contents of nutritive substances lakes may be divided into: eutrophic (rich), oligotrophic (meager) and dystrophic (meager, acid). Ponds are artificial water reservoirs, which generally have the depth of less than 2 meters.

Underground waters, depending on the place of their retention, are divided into: near-surface (subcutaneous) waters; underground shallow waters; deep waters separated from surface by even a few impermeable layers, in general insensitive to climatic changes; abyssal waters, deep underground, completely not or only hardly renewable, usually strongly mineralized (extracted as mineral waters).

Sea (ocean) waters have significantly smaller economic importance since owing to their salinity they are not suitable for consumption and industrial purposes (considerable aggressiveness in relation to most materials, especially met-

¹ **Relative humidity** is the percentage relation between the amount of water vapor which is truly included in the air and the amount of it that is necessary for full saturation of air in certain conditions of temperature and pressure.

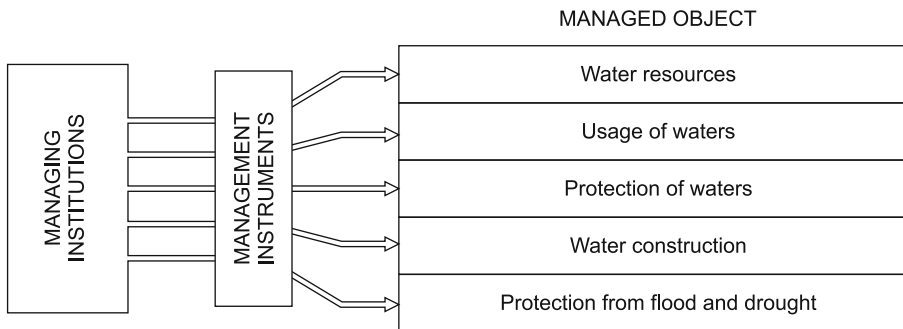
² **Eutrophisation** means enriching water in miogens, especially in nitrogen or phosphorus compounds which cause accelerated growth of algae and higher forms of plant existence. Its effects include undesirable disturbances of biological relations in biological environment and worsening of these waters' quality.

als). They are the basic source of enriching water vapor in the atmospheric air and of the existence of sea organisms.

Water has been a free good for a long period in the development of human-kind. People could use it without any limits or costs. However, as human population and economic activity of society increased, it became compulsory to use water resources in a rational way. In the Polish territory since the 19th century the ruling groups have become interested in water management issues. The task of water management includes shaping of water resources in terms of quantity and quality in concord with the needs of users and consumers of these resources and protection of the natural environment.

In Poland managed object in water management includes: water resources, usage of waters, protection of waters, water constructions and protection from flood and drought (figure 8.1.). **Water resources** may be divided into potential and available ones. Available resources in a major extent refer to surface waters and shallow underground waters that they are supplied by. The total resources of flowing waters in Poland amount to 61.9 bn m³/year, where own resources from falls in the country amount to 54.3 bn m³/year and the resources originating from water tributaries from outside Poland 7.6 bn m³/year. In the country there are 2856 lakes having the area of more than 10 ha, the total capacity of which is 18.2 bn m³/year and 99 retention reservoirs is approx. 3.5 bn m³/year. The sum of falls within a year is on average more than 600 mm and oscillates from 450 mm in the central part of Poland to approx. 1100 mm in mountainous and piedmont regions.

Figure 8.1. Water management as a managed object



Source: own elaboration.

The capacity of stored sweet underground waters in the country oscillates around 6000 bn m³. The resources of underground waters that can be used are termed as available or, when they are not sufficiently recognized, as perspec-

tive. Available resources were set for 44.1% of the country (2009) in the amount of 5.6 bn m³/year, whereas the perspective resources are estimated as 8.2 bn m³/year. Altogether the available and perspective resources of underground waters amount to approx. 360 m³/capita/year. There were identified 162 reservoirs of underground waters (having the capacity of 10 000 m³/day). Underground waters are supplied by surface waters and vice versa, surface waters are supplied by underground waters. It is estimated that approx. 15 bn m³/year of underground waters supply surface flow.

The value of river outflow in Poland oscillates from 30 to 90 bn m³/year. It is characterized by seasonal and uniform (changeable) form in terms of the space, which causes hazard of flood or water deficit (low levels of water in rivers). From the perspective of the maintenance of biological diversity the changeability of flows within a year is a positive phenomenon. The rising and falling levels of water condition the biological diversity of water and water-related ecosystems and also decide upon their proper functioning. The condition of the existence of water systems in rivers is ensuring an appropriate minimum level of waters. The inviolable flow of flowing waters in accordance with the hydro-biological criterion amounts to at least 15 bn m³/year.

Available resources of surface waters in Poland (with the 95% security) is estimated at approx. 10 bn m³/year, i.e. 260 m³/inhabitant/year. Storing water in reservoirs is one of methods of increasing possibilities of using resources of surface waters. However, both amount and volume of water reservoirs in Poland is small. It is possible to contain only 3.6 bn m³ water, which constitutes approximately 6% of annual outlet, with the usable capacity of approx. 1%. Physical and geographic conditions of Poland create the possibility of storing 15% of average annual outlet.

Usage of waters means using water by people for social and economic needs. It must not cause deterioration of the state of water and ecosystems dependant on them, wasting energy of water nor cause damages. Usage of waters may be general, ordinary and detailed. General usage of waters serves satisfying the needs of individuals, household or farm, without using special technical devices. It also serves relaxation, tourism, water sports and amateur fishing. Ordinary usage of waters serves satisfying needs of household or farm, excluding irrigation of lands and needs of business activity. Consumption of surface or underground water in terms of ordinary usage must not exceed 5 m³ per day. Detailed usage of waters comprises:

- consumption and outlet of surface and underground waters;
- introduction of sewage into waters or ground;
- water transfers or artificial supply of underground waters, towering and retention of surface waters;
- usage of waters for energetic purposes, and for sailing and rafting;

- excavation of stones, gravel, sand and other materials from waters, as well as cutting plants from waters or bank;
- fishing usage of inland surface waters.

The responsibility of water management is to ensure the rational needs of populations and economy and to ensure safety in special situations while taking into consideration the needs of water ecosystems and ecosystems dependent on water. For economic use in 2009 were taken 10.8 hm³ of water, out of which more than 83% of surface waters, approx. 16% of surface waters and 0.8% from removing water from mining objects and constructions sites. For production needs there was earmarked 70% of consumed water (in the proportion of 96% and 4% of underground waters), 11% for irrigation in farming and forestry and 19% for the exploitation of water supply network (in the proportion: 31% of surface waters and 69% of underground waters).

Quality and protection of waters. The classification which is presently in force comprises 5 quality classes of surface waters, taking into consideration three categories of quality of water used for supplying population with water earmarked for consumption. The category A1 includes the cleanest waters that require simple physical treatment, above all filtration and disinfection. Category A2 includes waters of worse category that require multi-stage physical and economic treatment. Waters of A3 category are most polluted and require highly efficient physical and chemical treatment.

The division of waters into classes is dependent on the usefulness of water for the needs of supplying population and on the value of biological indicator of water quality (BWJW):

- Class I – water of good quality (Category A1): BWJW indicators indicate insignificant impact of anthropogenic influences;
- Class II – water of good quality (Category A2): BWJW indicators indicate insignificant impact of anthropogenic influences;
- Class III – waters of satisfactory quality (Category A2): BWJW indicators moderate impact of anthropogenic influences;
- Class IV – waters of non-satisfactory quality (Category A3): BWJW indicators indicate disappearance of considerable part of biological populations;
- Class V – waters of bad quality – do not fulfill the quality requirements for surface waters for the needs of supplying population: BWJW indicators indicate disappearance of considerable part of biological populations.

The analyses of the quality of surface waters are made for their uniform parts, i.e. for separate and significant elements of surface waters, such as: lake, stream, canal, part of a river, water reservoir.³ In the area of the Vistula basin there were isolated 2806 parts of river waters, whereas in case of Odra there

³ Decree of the Minister for the Environment of 20 August 2008 on the way of classifying the state of uniform parts of surface waters (Dz.U. of 2008, No. 162, par. 1008).

were 1702. The state of uniform parts of rivers is assessed as good (class I-III) or bad (classes IV and V). In 2008 the good state was characteristic of 5% of separated uniform parts of rivers, whereas the other waters (95%) were in a bad state.

Surface waters used for supplying population in 2009 had the following quality: Category A1 – 10,6% of measurement points, A2 – 33,3%, A3 – 27,3%, water not meeting the requirements – 28,3% [*Ochrona...*, 2010]. Underground waters were divided also into five so called classes and for each class there were set border values of physical-chemical parameters. The classes were divided into groups: underground waters having good chemical state (Classes I, II and III) and underground waters having bad chemical state (Classes IV and V).⁴ The results of monitoring the quality of underground waters in 2009 indicate that there were no waters of class I, in class II – 13,7% of the analyzed samples, in class III – 57.5% (altogether good state – 71.2%), in class IV – 19.4% and in class V – 9.4% (altogether good state – 28.8% of the analyzed samples) [*Ibidem*].

Protection of waters means maintenance or improvement of their quality and biological proportions in water environment and in marshy lands. Protection of waters lies in avoiding, eliminating or reducing water pollution and also in preventing unfavorable changes of natural water flows or levels of water mirror and natural shape of watercourse beds. In 2009 8.9 bn m³ of industrial and municipal sewage was introduced into waters or into soils. In the total value, the industrial sewage without cooling waters constituted approx. 10.9%, cooling waters 75.5% and municipal sewage 13.6%. In relation to the year 2000 there was increase in the discharge of cooling waters and also decrease (by 11%) of the treated municipal sewage. There was observed considerable (by 55%) decrease in the amount of untreated sewage that are introduced into surface waters or into soil. Untreated sewage constituted only 6.2% of the total amount of drained sewage (excluding cooling waters) [*Ibidem*].

Water construction comprises activities related to making and maintaining (exploiting, renovating and repairing) water devices. While designing, making and maintaining water devices, the principle of sustainable development should be used; especially it is advised to maintain the good state of waters and characteristic biocoenosis, existing land surface and biological proportions in water environment and marshy areas. An important sphere of water construction is the regulation of water drops beds and water meliorations. The regulation of beds serves the improvement of conditions of using water and protection against flood. It means shaping longitudinal section and cross-section as well as horizontal arrangement of natural watercourse bed.

⁴ Decree of the Minister for the Environment of 23 July 2008 on the criteria and way of assessing underground waters (Dz.U. of 2008, No. 143, par. 896).

Water meliorations lie in regulating water proportions with the purpose to improve the production capacity of soil, enhance its improvement and protect arable lands from flood. Devices used in water meliorations are of two types: general and detailed. Basic devices include: towering and extraction constructions and objects for collecting waters, water steps and tanks, canals, pump stations, regulating and anti-flood constructions. Detailed devices include: ditches, drainages, dikes, on irrigated lands, fish ponds, irrigation systems and pump stations.

In 2009 the outlays on fixed assets serving water management amounted to PLN 2 823 m. In this amount was estimated the following division of outlays depending on the directions of investing:

- intake and drainage of water – 59.2%;
- construction and modernization of pump stations – 23.0%;
- reservoirs and water grades – 9.2%;
- regulation and development of rivers and mountain streams – 4.7%;
- anti-flood dykes – 3.4%;
- pump stations in heaps and depression areas – 0.4% [Ibidem].

The construction of water reservoirs and regulation of rivers in Poland are the unattended and at the same time controversial problem. Controversy is raised mainly as regards the protection of the existing ecosystems of river valleys owing to the inability of planners to describe the natural wealth before and after realization of water investments.

Protection against flood and drought⁵. Flood means the rising level of water in natural watercourses, reservoirs, canals or at sea, during which occurs threat for population or properties. As regards the reason of origin, floods are divided into floods of the following types: storm, obstruction, thaw, thaw and fall type and floods caused by break-ups of water devices. During the period 1950-2009 there were more than 600 floods in Poland. Threat of flood concerns mainly the areas of Southern Poland and the Vistula basin.

Floods cause considerable losses in Poland. Within the last 15 years there were three floods with catastrophic results: in 1997, 2001 and 2010. In the first among such floods, which was the greatest since a hundred years, 54 people died and approx. 72 000 buildings, 14 000 km of roads and 4 000 bridges were destroyed or damaged and 3 m ha of arable lands were covered in water. In the flood in 2010 there was flood of smaller or larger areas in approx. 600 municipalities, including almost the entire area of Wilków municipality. Most losses caused by floods amount to approx. 1% of GDP.

The increase in flood hazard and the amount of losses, apart from natural causes, results from the rising investment in areas subject to hazard; sealing the

⁵ Floods and droughts are discussed also in chapter 10.

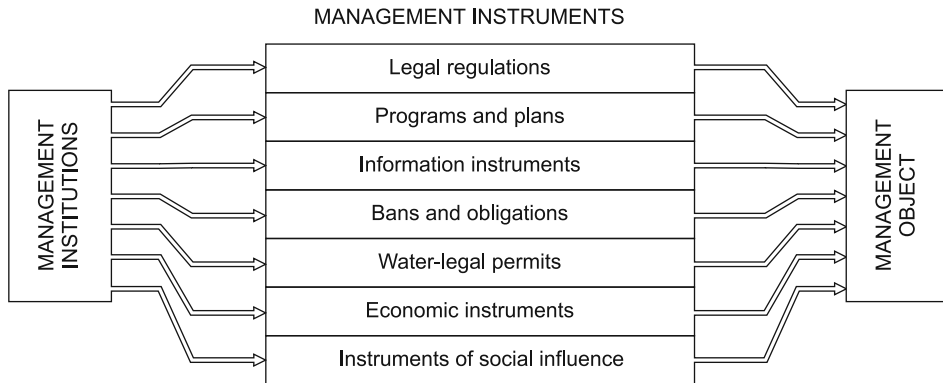
area of river catchments by development and changes in the usage of the area and also from intensive socio-economic development of the coastal sea lane exposed to the effects of storms. The predicted climate changes indicate the possibility of more frequent occurrences of floods.

Protection from flood lies in: the maintenance and formation of systems of water retention; the construction and extension of retention reservoirs, dry reservoirs and anti-flood polders; the rational retention of waters and usage of anti-flood constructions, as well as steering water flows; ensuring good functioning of the system of alarming about dangerous phenomena taking place in the atmosphere or in the hydrosphere; shaping of spatial management of river valleys or inundation areas, construction and maintenance of anti-flood dykes as well as canals reductions.

Drought means shortage of water. There are isolated three hierarchical forms of drought: atmospheric drought, soil drought and hydrological drought. In Poland droughts occur periodically. They cause significant economic losses, mainly in agriculture and forestry as well as in ecosystems dependent on water. Between 1980 and 2009 there were 13 cases of drought that affected the area of 75% of the country. In the local arrangement droughts most frequently occur east from Poznań and south from the Śniardwy lake. The forecasted climate changes indicate the possibility of double increase in the frequency and range of droughts. Droughts can be counteracted by the increasing retention of water as the result of technical activities and by reconstructing ecosystems and urbanized areas. A very essential element is reduction in the absorbency of water by economy by means of rationalizing the water needs in industry and municipal administration as well as by changing the structure of farming.

8.2. Water management instruments

Management instruments of water administration include: legal regulations, programs and plans, information instruments, bans and commands, water-legal permits, economic instruments and instruments of social influence. The position of these instruments in the water management system is presented in figure 8.2.

Figure 8.2. Instruments of water management in Poland

Source: *ibid.* figure 8.1.

8.2.1. Legislative regulations

8.2.1.1. International responsibilities of Poland

International responsibilities ensue from conventions and directives of the European Union and from the concluded international agreements. The conventions that are essential for water management include:

- United Nations Framework Convention on Climate Change of 9 May 1992, signed in New York⁶ – with reference to water management in particular applies to investments in the sphere of water retention;
- United Nations Convention on combating desertification in countries affected by substantial droughts and/or desertification, especially in Africa of 17 June 1994, prepared in Paris⁷ – in relation to Poland, it concerns especially protection of soils from degradation as the consequence of deficiency of humidity;
- Convention on wetland areas of international importance, especially as the living environment for water birds, of 2 February 1971, prepared in Ramsar⁸ – as regards management of water resources for preservation of ecological functions of swamps, and especially and mainly with reference to the analysis of the impact of drought on swamp ecosystems;

⁶ Dz.U. of 1996, No. 53, par. 238.

⁷ In Poland it came into force on 12 February 2002 (Dz.U. of 2002, No. 185, par. 1538).

⁸ Dz.U. of 1978, No. 7, par. 24 and 25. It is the so called Ramsar convention.

- Convention on biological diversity of 5 June 1992, prepared in Rio de Janeiro⁹ – it concerns an integrated ecosystem approach in management of all natural resources and biological diversity of water and water-related ecosystems;
- Convention on protection of migratory species of wild animals of 23 June 1979, prepared in Bonn¹⁰ – it concerns especially protection of two-environmental migratory fish and birds dependent on wetland habitats.

A number of conventions were concluded only by interested European countries. Water management is the subject of among others: Convention on protection and usage of transboundary watercourses and international lakes of 17 March 1992, signed in Helsinki¹¹; Convention on protection of marine environment of the Baltic Sea of 9 April 1992, prepared in Helsinki¹².

In water management of particular importance are directives of the European Parliament and Council: Directive 00/60/EC of the European Parliament of 23 October 2000 establishing the frameworks of joint action in the sphere of water policy¹³ (also named framework water directive); Directive 06/118/EC of the European Parliament and Council of 12 December 2006 on protection of underground waters from pollutions and worsening of their state¹⁴ (also known as directive-daughter); Directive 07/60/EC of the European Parliament and Council of 23 October 2007 on the assessment of flood risk and its management¹⁵ (also named flood directive); Directive 08/56/EC of the European Parliament and Council of 17 June 2008 establishing the frameworks of actions for the Union as regards the policy of marine environment¹⁶ (framework directive concerning the sea strategy).

In water management system into consideration need to be taken the recommendations of many other directives, for example the Council Directive 91/676/EEC of 19 December 1991 concerning protection of waters from pollutions caused by nitrates from agricultural sources¹⁷; Directive 06/7/EC of the European Parliament and European Council of 15 February 2006 concerning the management of bathing water quality¹⁸ (named bathing directive). It is also necessary to comply with the agreements on cooperation in the sphere of water

⁹ Dz.U. of 2002, No. 184, par. 1532.

¹⁰ Dz.U. of 2003, No. 2, par. 17.

¹¹ Dz.U. of 2003, No. 78, par. 702.

¹² Dz.U. of 2000, No. 28, par. 346.

¹³ Dz.U.L.327/1 of 22 December 2000.

¹⁴ Dz.U..L.372 of 27 December 2006.

¹⁵ Dz.U.L.288 of 6 November 2007.

¹⁶ Dz.U.L.164 of 25 June 2008.

¹⁷ Dz.U.L. 375 of 31 December 1991.

¹⁸ Dz.U.L.64/37 of 4 March 2006.

management on boundary waters that were concluded with all the countries neighboring with Poland.

The following needs ensue from the aforementioned documents:

- of integrated approach to all categories of waters and their management, which requires combination of water resources with widely perceived water and sewage management;
- of integrating the assessments of quantity and physical-chemical state with the biological assessment of ecosystems supported by the analysis an morphological assessment of river beds (so far in Poland they have been treated separately);
- of introducing the requirement of complete cause-and-effect analysis of sources, reasons and effects of degradation of ecological quality of water ecosystems in catchment perspective, which will allow for initiating proper and efficient protective actions;
- of integrating water management with forest management and with development of forest areas as well as with nature protection;
- of ensuring a holistic approach to integration of the protection of water ecosystems with the aims of socio-economic development in accordance with the idea of sustainable development;
- of introducing a new approach to protection from flood which is based on complex management of flood risk;
- of introducing problems related to water management into spatial management plans at both regional and local level and into environmental protection plans at the regional level;
- of implementing integrated management of fall waters in urbanized areas and their safe transfer into hydrological system of the region [*Projekt polityki wodnej...*, 2010].

8.2.1.2. National legislative regulations

The recommendations included in the international documents which are in force in Poland ought to be in national legislative regulations. In considerable degree they were introduced on the principle of supplementations. As the consequence, the binding legislative solutions do not have the character of complex regulation and they require amendment. The basic regulations of water management are included in the Act of 18 July 2001 – Water Law¹⁹ and Act of 6 June 2001 on collective supply in water and collective sewage treatment²⁰.

¹⁹ Dz.U. of 2001, No. 115, par. 1229 with further alterations.

²⁰ Dz.U. of 2001, No.72, par. 747.

Particular regulations are included in the decree to these acts. In Polish law there were specified three principles of water protection:

1. of universal character of protection, in accordance with which waters are subject to protection irrespective of who is their owner;
2. of prevention which means avoidance, elimination or reduction in water pollution as well as prevention of unfavorable changes of natural water flows or the natural level of waters;
3. of intensified protection of waters from pollution by substances that are particularly harmful for water environment.

On business entities and citizens were imposed obligations to:

- construct, maintain and exploit appropriate devices protecting water;
- comply with the standards of contents of pollutions in sewage drained into surface water and into soil;
- obtain permit for consumption of water for economic needs and for draining sewage into waters or into soil;
- form and preserve protective zone around reservoirs of inland waters and around water intakes;
- make a payment for consumption of waters and draining of sewage, increased payment or administrative fine for not complying with the aforementioned obligations.

There is interrelationship between the system of legislative regulations and both programming and planning actions in water management. Legislative regulations specify the range and way of programming and short-term planning whereas long-term programs indicate the directions and range of changes in legislative regulations.

8.2.2. Programs and plans

The basic program document is the adopted in 2010 *National water policy till 2030*. This document has strategic character and is superior in relation to other program and planning documents created in Poland as regards water management. Water policy creates the general frameworks and establishes the directions of water management by all users: industry, farming, forestry, municipal management as well as navigation and fishing.

The document specifies the principles of having water management such as:

- treatment of catchment as the basic area of all planning and decision-making actions;
- making decision-making more social;
- integrated approach to surface and underground waters;
- treatment of water as the fundamental factor shaping the functioning of ecosystems;

- implementation of economic mechanisms in water management, in accordance with the “polluter pays” principle of ecological policy and with the principle of compensating the costs of water services.

State Water Policy till 2030 sets the strategic aims of water management till 2030:

1. Achievement and maintenance of a good state and potential of waters and ecosystems related to them.
2. Satisfaction of needs of population as regards the supply of water.
3. Social and economic satisfaction of well-grounded needs of economy.
4. Reduction in the occurrence of negative effects of flood and drought and also prevention of the increased risk of special situations and reduction in their negative effects.
5. Reform of management system and financing of water management.

The document includes the assumption of separating the competences concerning the management of water resources from the maintenance of waters and management of the property of the State Treasury as regards water management. Management of water resources ought to be realized in catchment arrangement by government water administration and must be based on the plans of water management in the areas of river basins, on the plans of flood risk management and of conditions of using waters with simultaneous consideration of principles and criteria of protecting water ecosystems and ecosystems dependent on water as well as on the conditionings in shaping spatial management, including exploitation of the area and development of infrastructure. Maintenance of waters and management of the possessions of the State Treasury may be the responsibility of the state or can be transferred to district self-governments.

The document indicates the need to use such economic instruments as: payments and taxes on usage of waters, insurance mechanisms, financial incentives and sanctions. It points at the possibility of using instruments based on market transactions. In *State Water Policy till 2030* there were presented also such priority investment actions that ought to be rapidly implemented till 2016 as well as realization of other actions serving the achievement and maintenance of good state and potential of surface and underground waters, including: reduction in surface flow of pollutions into water; reduction in outflow of pollutions into the Baltic Sea; elaboration of the principles of water management in Natura 2000 areas; continuation of realization of the program of sewage treatment; support for undertaken renaturization actions; improvement of education system as regards water management. The document specifies the effects that ought to be achieved thanks to the realization of the adopted aims.

The system of programming and planning in water management which is binding in 2011 comprises: “Water-environmental program of the country”, “Plan of water management in the basin area”, “Plan of anti-flood protection of

water region and counteracting the effects of drought effects in the country area”, “National program of municipal sewage treatment”.

“**Water-environmental program of the country**” defines both basic and complementary actions aiming at the improvement or maintenance of a good state of waters in certain basin areas. Basic actions include, among others: ensuring the reimbursement of costs of water services, meeting the present and future water needs as well as preventive and controlling actions. Complementary actions are the enterprises serving the effective usage of waters as well as technical, research, development and educational undertakings. The program is elaborated by the president of The National Board of Water Management in consultation with the Minister of Environment. The first plan was adopted in 2008. The plan is updated every six years.

“**The plan of water administration in the basin area**” is elaborated by the director of the regional board of water management. The first plan was supposed to be elaborated till the end of 2009. An update is made every six years. The plan ought to include:

- general description of the basin area with isolation of uniform parts of surface waters with specification of their types and referential conditions as well as the list of uniform elements of underground waters;
- list of protected areas, register of waters earmarked for water consumption, for providing population with drinkable water, for the needs of protecting species of water animals that have economic importance, earmarked for recreational purposes as well register of areas sensitive to eutrophy, areas exposed to pollutions with nitrogen compounds and those earmarked for protection of habitats or species of the Natura 2000 network;
- map of monitoring network along with monitoring programs;
- definition of environmental objectives;
- register of proper organs concerning water administration in the basin area.

Integral part of plans regarding water administration is economic analysis which enables definition of water values.

“**The plan of anti-flood protection and counteracting drought effects in the country area**” is prepared by the chairman of the National Board of Water Management with division into areas of basins. This plan takes into consideration, among others: reserves of flood capacity, shaping river valleys and using natural retention, building and reconstructing of water devices, indicating areas that require protection. This document also has essential significance in management of country’s ecological safety.

“**The national program of municipal sewage treatment**” It was prepared by the Minister of Environment and approved of by the Cabinet in December 2003 and updated in 2005. This program specifies the priority aims of water environment protection from the unfavorable effects of insufficiently treated sewage drained either into surface waters or into soil. The Program includes

a list of towns having less than 2000 RLM along with the specification of indispensable undertakings in terms of construction, reconstruction or modernization of sewage system (altogether 37 thousand km) and sewage plants (1378) and management of sediments. Realization of the program was divided into four periods: the years 2004-2005, 2006-2010, 2011-2013 and 2014-2015. The supplementation of the “National program of sewage treatment” is the program of providing agglomerations having more than 2000 RLM with sewage plants and sanitary sewage systems till the end of 2015 as well as the “Program of supplying farming and food industry plants having not more than 4000 RLM and draining sewage directly into waters with devices that comply with the standards of water protection required in Polish law”. The information provided by the Minister of Environment implies that the aforementioned programs are successfully realized.

8.2.3. Informative instruments

In water management are used specific information instruments enabling proper planning and water management. These are: hydrologic documentation, water cadastres, and finally the system of current hydrologic and meteorological information.

Hydrologic documentation constitutes the basis for planning and designing in terms of water construction, protection from flood and drought effects as well as the management of the resources of inland surface waters. These documents ought to be prepared by people having appropriate qualifications certified by the Minister of the Environment in the process of special procedure.

Water cadastre is information system concerning water management. Water cadastre is held with consideration of country's division into basin areas and water regions. It is held for the country's area by the president of the National Board of Water Management, whereas for the region it is run by the director of regional board of water management. Cadastre is composed of two sections in which water management there is collected appropriate data concerning: hydro-graphic network, state of water resources, sources and characteristics of pollutions, biological state of water environment, protective areas and zones, water facilities and usage of waters; plans of water management in basin areas, plans of anti-flood protection and of counteracting drought effects in the country area, plans of anti-flood protection of water region; lists of priority programs of the National Fund of Environmental Protection and Water Administration and lists of priority undertakings of district funds of environmental protection and water management. Water cadastre is made accessible for free, however, the organs of public administration, research-development units as well as plants and owners of water facilities are obliged to transfer data that is indispensable for running it without any charge.

The current information about the level of waters in rivers, hazard of storm falls, flood and drought and water reservoirs is provided by the National Hydro-logic-Meteorological Service and National Hydro-Geological Service, whereas hygienic state of public beaches is provided by the National Sanitary-Epidemiological Inspection.

The conditions of using waters. This instrument is on the border of information instruments and both bans and commands. The conditions are settled by decree of the director of a regional board of water management, after consultation with the President of the National Board of Water Management in case of using waters of the water region or catchment. This document specifies detailed requirements concerning the state of waters and priorities in meeting water needs in the water region or catchment.

8.2.4. Bans and commands

Bans and commands (responsibilities) of using and protecting waters were specified in the act – water law. In Poland the following commands and bans are in force:

- commands (responsibilities) of water owners and owners of other estates to keep in a proper state the beds of watercourses, ensure that surface waters and ice drain away in natural way, ensure usage of observations and measurements and hydrologic and meteorological as well as hydro-geological measurements;
- ban on fencing estates adjoining surface public waters in the distance smaller than 1,5 m from the bank and fencing protective zones;
- commands of estate owners to provide access to waters to be used by the general public;
- bans on changing the state of water on ground and letting in waters and sewage on neighboring grounds;
- bans on letting sewage directly into underground waters, certain surface waters and into ground;
- bans on letting waste into waters, as well as on washing cars and farming sprinklers into surface waters;
- bans on agricultural usage of sewage in any place;
- bans on destroying or damaging water facilities.

Non-compliance with commands and bans incurs penal responsibility.

8.2.5. Water-legal permits

Water-legal permit is a legal-administrative instrument which aims at the regulation and rationing of using waters and protection of waters. This permit is

required, among others, for: consumption of surface and underground waters for economic purposes and for irrigations; letting in sewage into waters and ground (soils); producing water facilities; agricultural usage of sewage; taking sand or gravel from riverbed; removing plants from river banks; long-term lowering of the level of underground water; dehydration of objects or building excavations.

Water-legal law is issued through decision for a certain period – for example, for 20 years on water consumption, for up to 10 years on letting in sewage into waters or ground, for up to 5 years on removing plants from water banks. The permit includes a specified purpose and the range of using waters, conditions of making permits and the obligations concerning protection of waters.

The basis for issuing water law permit is putting forward a motion along with a water law report and decision about investment's localization or a decision about the conditions of development as well as a description of the planned activity. The report is prepared in a descriptive and graphic form. The descriptive part ought to include characteristics of the investor and the undertaking, the purpose and degree of planned usage of surface and underground waters, information on the forms of nature protection that appear within the range of planned usage of waters. The graphic part needs to include: plans of water facilities, fundamental sections of facilities and beds of running water, scheme of arrangement of measuring devices as well as the functional or technological scheme of water facilities.

Water law permit is issued by a starost or marshal of district if the usage of waters or installations is particularly arduous to the environment.

8.2.6. Economic instruments and instruments of social influence

In water management system are used the following economic instruments:

1. ordinary and increased ecological payments for intake of water for economic needs and for letting in sewage;
2. service payments for the supply of water from municipal or plant waterworks as well as for letting sewage into sewage system and for treatment of sewage;
3. fees for usage of water and water facilities such as: receivables for using inland water roads and water facilities that belong to the State Treasury; annual charges for using fishing districts and grounds covered by waters (dependent on the type of activity and the lowest remuneration for work – maximum 10%) and for making accessible data from water cadastre exceeding the range defined in regulations regarding access to information about the environment and its protection;
4. administrative financial fines for exceeding or violating the conditions of using waters specified in the permit;
5. insurance on water facilities against flood or drought;

6. investment payments collected with the aim of covering part of the costs of performing the devices of water melioration.

Ecological payments do not apply to low sums of half-year amounts due (in 2010 up to 400 PLN) and also to letting in sewage and intake of water for the following needs:

- transfers of water into another watercourse;
- for the needs of water energy system, under the condition of return of the same amount of water of at least not worse quality;
- surface water for the needs related to production of heat or electrical energy in the part synonymous with the amount of this water transferred into a reservoir;
- functioning of heat pumps and geothermy;
- breeding of fish and other water organisms;
- watering farming lands and forest lands with surface waters;
- originating from dehydration of lands, objects or building excavations.

The aforementioned exemptions do not refer to increased payments which ensue either from lack or non-compliance with the settlements included in water-legal permit.

Instruments of social influence imply above all education of society in terms of good habits of universal and ordinary usage of waters.

8.3. Description of management system

Organs and institutions that are responsible for water management in Poland do not create a uniform system. Organization of management organs and institutions is complex and the competences are dispersed. Three factors decide upon it: ownership rights of public waters, division of country into river basins and water regions and manner of managing water.

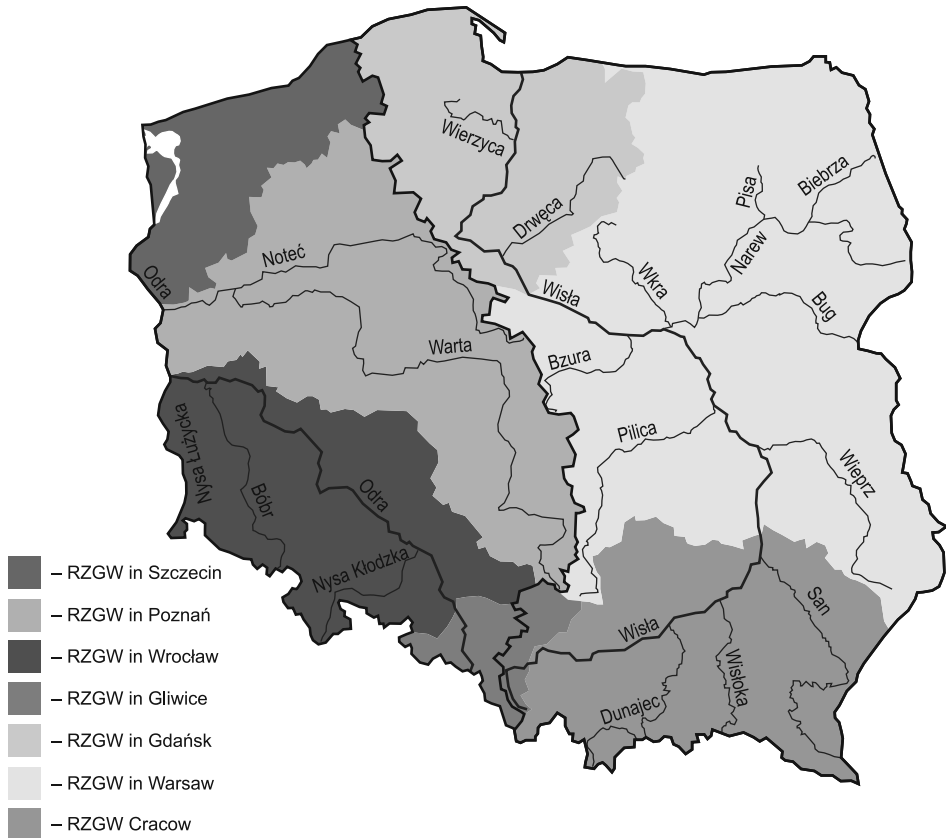
In Poland waters are both public when they are the property of the State Treasury, and private. Private ownership concerns standing waters and waters in ditches within the borders of land estate belonging to a private and physical person. Public waters are the underground waters, surface running and waters of territorial sea as well as inland sea waters together with the waters of the Gdańsk Bay. The organs taking care of the property rights to public waters are:

- minister responsible for marine economy executes ownership rights in relation to waters of territorial sea and inland sea waters together with waters of the Gdańsk Bay;
- president of the National Board of Water Management in relation to underground waters and inland surface waters which are essential for shaping of water resources and anti-flood protection;

- director of a national park – in relation to waters in watercourses located in the park (except for water paths and border waters);
- district marshal in relation to other waters, especially those significant for regulations of water relations for the needs of agriculture.

In Poland seven regional boards of water management were isolated. They comprise water regions from one to several estuaries (figure 8.3.).

Figure 8.3. Area of functioning of regional boards of water management



Source: [*Projekt polityki wodnej...*, 2010].

Regional boards of water management have their headquarters in the following cities:

- Gdańsk – water region with basin of the Upper Vistula;
- Gliwice – water region with basins of: the Small Vistula, the Upper Odra and the Czadeczka;

- Cracow – water region with basins of: Upper Vistula, Czarna Orawa and Dniestr;
- Poznań – water region with basin of the Warta;
- Szczecin – water region with basins of: Lower Odra, Western Przymorze District and Ucker;
- Warsaw – water region with basins of: Central Vistula, Jarfta, Niemen, Łyna and Węgorapa and Świeża;
- Wrocław – water region with basins of: Central Odra, Morawa, Izera, Łaba and Ostroźnica (Upu), Metuje and Orlica.

The organs responsible for water management in Poland are: minister responsible for water management problems; President of the National Board of Water Management; director of a regional board of water management; district marshal; starost; ministers responsible for infrastructure, agriculture, domestic and administrative issues as well as a governor.

Minister responsible for the environment, as the central organ of governmental administration, is the general supervisor of the state of water resources in the country and of the degree of using them. The Minister also supervises the realization of the plan of administrating waters in the basin areas, protection of waters and maintenance of water devices. He also realizes the tasks related to planning, management and protection from flood. Minister is also responsible for international cooperation on borderline waters and for the realization of agreements in this domain. Minister's competences include also supervision of fishing management on public waters supervised by the president of the National Board of Water Management.

President of the National Board of Water Administration is the central organ of government administration, the main task of which is to plan water management in the whole country, to supervise activities of directors of regional boards of water management and National Hydrological-Meteorological and Hydro-Geological Service. The president represents the State Treasury. The chairman performs the function of organ of higher rank in relation to governors and directors of regional boards of water management.

Director of the regional board of water administration is the organ of non-joint governmental administration proper for the issues of water administration in a water region. Director's tasks include, among other things:

- identifying significant anthropogenic influences on surface and underground waters;
- elaborating conditions for using waters;
- elaborating economic analyses linked with using waters in the region;
- running register of protected areas;
- elaborating studies and plans of anti-flood protection.

District marshal administers rivers and canals having smaller flows, including the waters that are significant for the regulation of water relations for the needs of farming. He is also responsible for administering majority of anti-flood dykes together with such devices as pump stations or culverts. This entity also: sets the border line for natural watercourses, lakes and other natural water reservoirs, makes decisions concerning localization of investments of public aim, issues water-legal permits for using waters that can largely affect the environment. The office performing the tasks of the organ is the District Board of Melioration and Water Appliances.

Starost issues water-legal permits for using waters, supervises and controls the functioning of water companies.

Minister responsible for infrastructure administers waters of internal sea, sea waters and supervises the functioning of sea ports and inland navigation ports. The competences of the organ are performed by sea offices and inland navigation offices.

Minister of agriculture and rural development as the central organ of governmental administration coordinates the actions of district marshals in terms of water management and also supervises fishing management on waters managed by these entities.

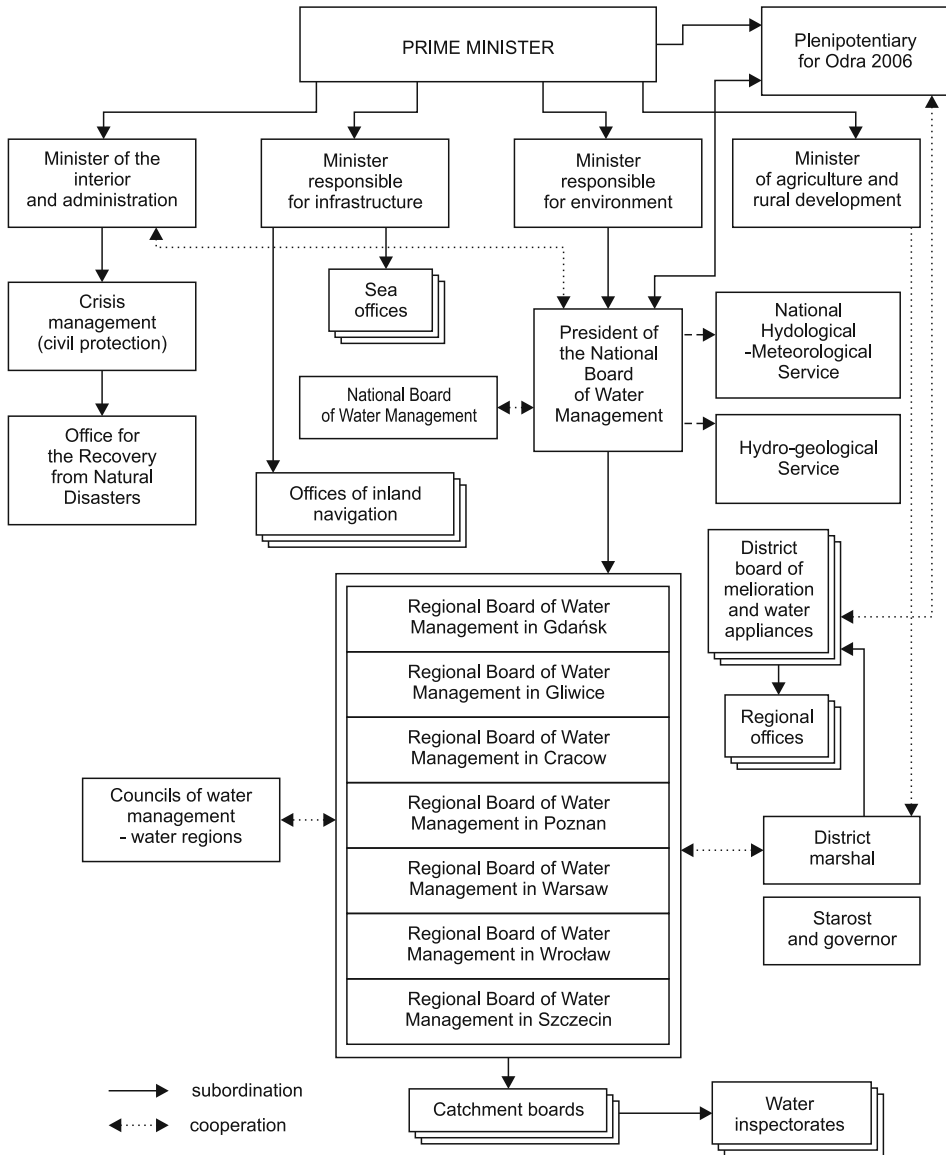
Minister of the Interior and Administration supervises the entirety of issues related to operational anti-flood protection using departments of crisis management of district offices and Office for the Recovery from Natural Disasters.

Governor performs the role of instance of second resort with reference to decisions made by starosts or marshals of districts in the sphere of water management and also supervises the work of Department of Crisis Management. The organizational structure of water management in Poland was presented in figure 8.4.

Important elements of water resources management system include: National Council of Water Administration and councils of water administration in water regions. National Council of Water Administration is an opinion-consulting organ of the President of the National Board of Water Management. Its members are appointed by the minister responsible for the environment for four-year term of office. In turn, the councils of water regions are opinion-consulting organs of directors of regional boards of water administration that are appointed for four years by the president of the National Board of Water Management in response to the motion of the director of a regional board.

In water management system crucial information role is played by: National Hydrological-Meteorological Service and National Hydro-Geological Service. The task of the former is to provide hydrological and meteorological shield for society and economy as well as the analysis of the state and protection of country water resources.

Figure 8.4. Structure of water management system in Poland



Source: *ibid.* figure 8.3.

The service makes measurements and observations in the network of synoptic, climatologic, meteorological, fall and water-gauge stations, network of aerologic stations, meteorological radars, stations of localization of atmospheric

discharge and station of collecting data from meteorological satellites. Important task of Hydrological-Meteorological Service is to elaborate and provide access of short- and medium-term as well as general and detailed hydrological-meteorological forecasts. The service is performed by the Institute of Meteorology and Water Administration. National Hydrological Service is obliged to make measurements, observations, analyses and assessments of hydrological situation and to make forecasts of changing values of resources, state and hazard of underground waters. The service is performed by the National Geological Institute.

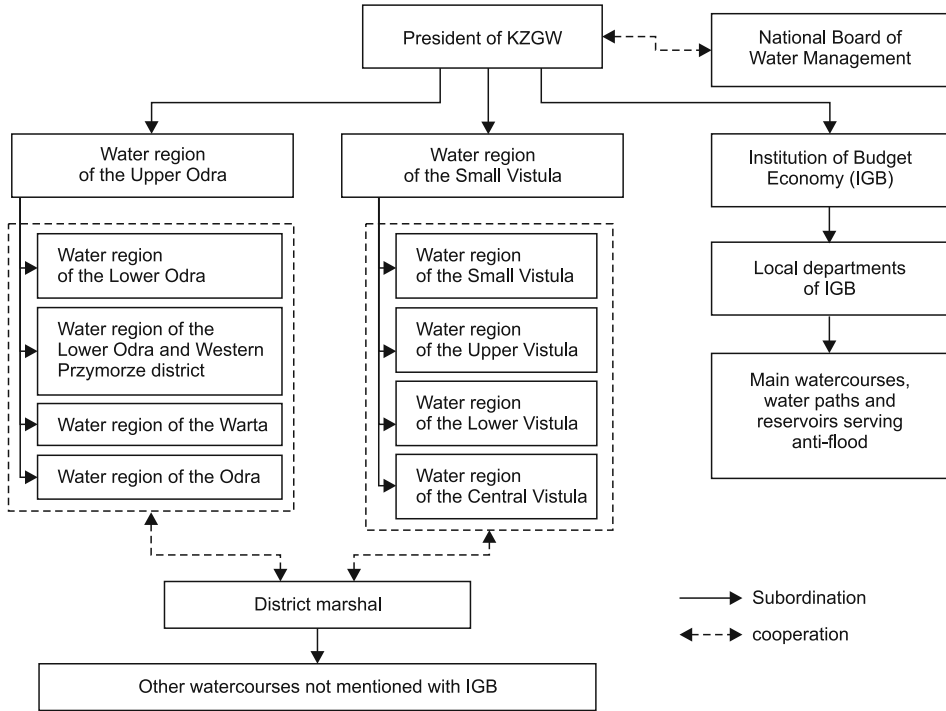
Water management in Poland still does not have a uniform coherent information system. The effect is lack of compatibility and lack of applications that enable uniform collection and analysis of data and also uniform reporting.

8.4. Assumptions of the reform of water management system

In *State Water Policy till 2030* there were presented assumptions of the reform of the water management system. There were presented three variants of solutions:

1. Self-governmental variant – the dominating tasks of directors of regional boards of water management in this domain would be transferred to district self-governments. They would be combined with the tasks realized so far as regards administrative division of the country by the district board of melioration and water appliances. Districts self-governments would realize these tasks on the basis of water management plans in the areas of basins and the conditions of using waters of water region and catchment.
2. Governmental variant – i.e. the entirety of State Treasury treasure concerning water management and the tasks of preserving waters which are now the responsibility of regional boards of water management and district boards of melioration and water appliances would be given to new organizational units subject to the president of the National Board of Water Management functioning in the arrangement of division into water regions and catchments. New units would realize their tasks on the basis of water management plans in the areas of basins, plans of risk management and the conditions of using waters of water region and catchment.

Figure 8.5. The system of organization of water management in the mixed variant



Source: Ibid. figure 8.3.

3. Mixed variant – on the basis of the dominating regional departments of water management there would be created two boards of a basin: the Odra and the Vistula. The territorial units of basin boards would be water regions. The boards of basins would be responsible for the management of water resources in the catchment arrangement. This variant requires raising the rank of KZGW President as the organ responsible for water management by giving him the function of undersecretary in the Ministry of Environment or by excluding KZGW from being subjected to the ministry and by subjecting this institution directly to the Prime Minister. The property of the State Treasury would be governed by the newly created institution of budget economy which is directly subordinate to the president of KZGW with its territorial units. Simultaneously what is not excluded is the creation of two units, for the basin of Vistula and basin of Odra respectively. They would be responsible for two main rivers, water paths, border rivers and water reservoirs serving anti-flood protection and belonging to the State Treasury. Other smaller rivers and hydro-technical constructions would be transferred to district self-governments.

The system of organization of water management in the mixed variant was presented in figure 8.5. In all variants the possession located in the area of surface waters, marine internal waters and technical line of sea waters as regards the maintenance of waters and management of property will belong to governmental administration, to marine offices. In the schedule of implementing the reform the year 2011 was indicated as the time of specification of the concept, the year 2012 as preparation of the reform whereas the period 2013-2014 as the period of its implementation.

Chapter 9

WASTE MANAGEMENT

9.1. Characterization of management object

Waste means substances or things that an entity (company, person) disposes of, wants to dispose of, is going to dispose of or the disposal of which is required. Formation of waste is the inseparable feature of man's economic activity, whereas the management of it is the problem of all societies and economies. There is requirement that in this process no harm may be done to the environment. The necessity of waste management ensues from the necessity to save resources, reduce the space that is necessary for storing waste and burdens caused by the release of waste into the environment (especially dangerous substances).

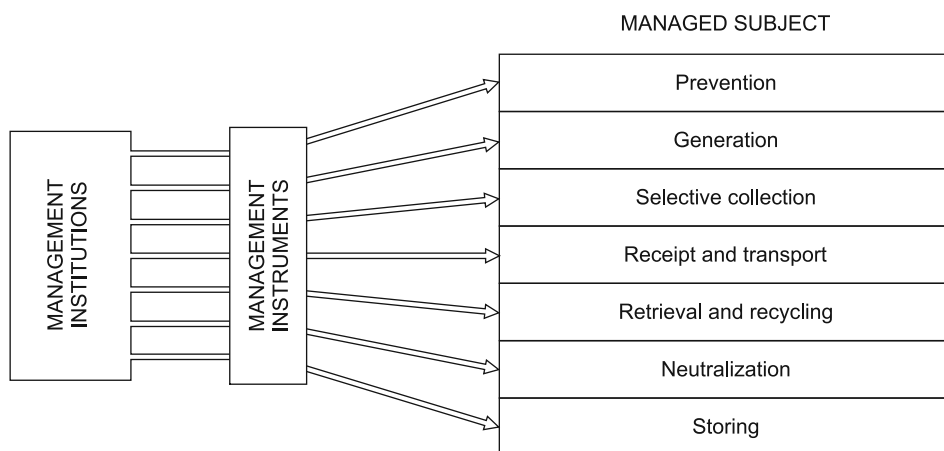
Waste management may be considered in process and type perspective. The objects of steering in the process perspective are:

- preventing the creation of waste, among other things, by means of dematerialization and rationalization of consumption;
- generating waste, i.a. by designing products while taking into consideration the requirements of the recycling of mass remaining after their usage (exploitation);
- selective collection, mainly by segregation of waste at the source of their creation;
- retrieval of matter and energy contained in the whole or in part which means using waste as a whole or part of them, or retrieving from waste substances, materials or energy and using them;
- recycling as a form of retrieval which lies in the repeated processing of substances or materials included in waste in production process with the purpose to obtain substances or material of primary purpose or of another purpose;

- waste neutralization which lies in subjecting them to the processes of biological, physical or chemical conversions with the aim of reaching the state that does not pose threat to human life and health or to the environment;
- storing of hazardous waste on landfills, and storing of secure waste in isolated safe places, e.g. in special magazines (bunkers).

Managed object in the waste management system is illustrated in figure 9.1.

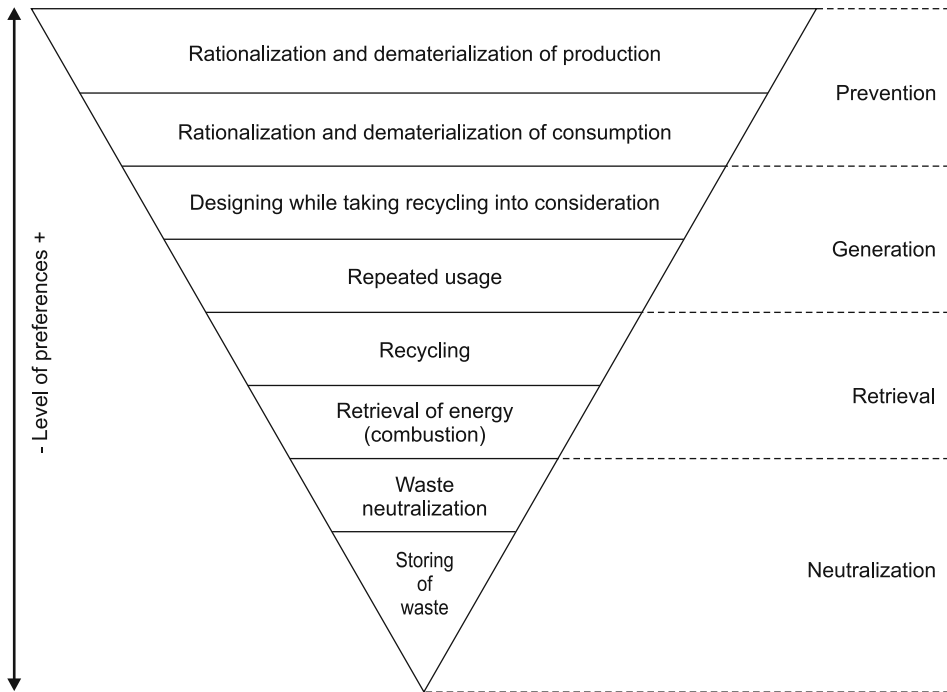
Figure 9.1. Management system of waste management in the process structure



Source: own elaboration.

In process perspective preference is given to the prevention of waste creation, including dematerialization of production and also rationalization and dematerialization of consumption, whereas the least desired one is storing of waste (figure 9.2.). In type structure there is an official classification of waste. In the existing catalogue of waste¹ there were isolated 20 groups, 116 subgroups and 870 types of waste. This division is useful for the purposes of recording and reporting. For management aims are used simplified divisions in accordance with the place of their origin and in accordance with hazard to man and the environment.

¹ Decree by the Minister for the Environment of 27 September 2011 on the catalogue of wastes (Dz.U. of 2001, No. 112, par. 1206).

Figure 9.2. Level of preferences for actions in waste management

Source: Ibid. figure 9.1.

9.1.1. Division of waste in accordance with the place of its origin

In accordance with the place of their origin waste is divided into waste from production plants and service objects (non-municipal waste, 19 groups) and municipal waste (group nr 20) which mainly comes from households.

Specification of groups of **non-municipal waste** is illustrated by the range and complexity of management object. There is isolated waste:

- formed while searching for, excavating, physical and chemical processing of ores and other minerals (group code – 01, there were isolated 5 sub-groups);
- from farming, fruit-growing, hydroponic cultivations, fishing, forestry, hunting and food processing (group code – 02, there were isolated 7 sub-groups);
- from wood processing and from production of boards and furniture, cellulose mass, paper and cardboard (group code – 03, there were isolated 3 sub-groups);

- from leather, fur and textile industry (group code – 04, there were isolated 2 subgroups);
- from processing of petroleum, purification of natural gas and from pisolitic treatment of coal (group code – 05, there were isolated 3 subgroups);
- from production, preparation, circulation and usage of products of non-organic chemistry (group code – 06, there were isolated 12 subgroups);
- from production, preparation, circulation and usage of products of organic chemistry (group code – 07, there were isolated 7 subgroups);
- from production, preparation and usage of protective layers (paints, varnishes, ceramic glaze), putty, glues, crevices and printing inks (group code – 08, there were isolated 5 subgroups);
- from photography industry and photographic services (group code – 09, there was isolated 1 subgroup);
- from thermal processes (group code – 10, there were isolated 15 subgroup);
- from chemical processing and coating of metal surfaces and also other materials and processes of hydrometallurgy of non-iron metals (group code – 11, there were isolated 4 subgroups);
- from shaping and physical processing of the surface of metals and plastics (group code – 12, there were isolated 2 subgroups);
- waste oils and waste of liquid fuels (group code – 13, there were isolated 7 subgroups);
- from organic solvents, coolants and propellants (group code – 14, there was isolated only 1 subgroup);
- package waste, absorbents, wiping fabrics, filtration materials and protection clothes not included in other groups (group code – 15, there were isolated 2 subgroups);
- waste not included in other groups (group code – 16, there were isolated 13 subgroups);
- from construction sites, renovations and disassemblies of construction sites and road infrastructure, together with soil and ground from polluted areas (group code – 17, there were isolated 9 subgroups);
- medical and veterinary waste (group code – 18, there were isolated 2 subgroups);
- waste from installations and devices serving waste management, from sewage plants and treatment of drinkable water and water for industrial purposes (group code – 19, there were isolated 13 subgroups);
- municipal waste together with fractions collected in selective manner (group code – 20, there were isolated 3 subgroups).

In 2009 there were formed 120.3 m tones of non-municipal waste. Division of this waste into particular groups and subgroups in the weight aspect was very diversified. More than 60% of the total amount of non-municipal waste was

formed in the following subgroups: waste formed during rinsing and cleaning of minerals (24.6%); waste from floatation enrichment of ores of non-iron metals (26.6%); mixtures of ashes and slag from wet disposal of furnace waste (11.2%). In the other 16 groups there was formed 37.6% of the total amount of non-municipal waste although their quality size expressed by toxicity has different importance. Non-municipal waste in 2009 was produced by 1746 plants. Among them 1197 plants had the vast majority in terms of the retrieved waste (more than 90%), whereas 314 plants including 93 plants stored more than 90% of formed waste. Micro and small companies include their non-municipal waste into the stream of municipal waste. In the last decade there has been observed considerable decrease in the amount of formed municipal waste (table 9.1.).

Table 9.1. Waste formed within a certain year

Specification	2000	2005	2009	2009/2000 (in %)
	(in mln t)			
Waste (total)	137.7	134.0	120.3	87.4
Non-municipal waste, including:	125.5	124.6	111.1	88.5
subject to retrieval:	96.5	98.7	81.5	84.5
◦ neutralized by not storing	2.8	5.2	5.2	185.7
◦ stored	22.3	16.7	21.3	95.5
◦ stored only temporarily	3.8	4.0	3.0	78.9
Municipal waste, including:	12.2	12.1	12.1	99.2
stored:		9.1	10.1	
◦ neutralized		0.4	0.6	
◦ deposited on dumping grounds		8.6	7.9	

Source: own elaboration on the basis [Ochrona..., 2006; Ochrona..., 2010].

Production plants and service companies must have the permit for formation and storing of waste if the general (summary) amount of formed waste exceeds 1 000 tons annually or if they possess 1 m tons or even more waste accumulated in the area regardless of the amount of waste formed within a year.

Municipal waste (group code 20, there were isolated 3 subgroups) comprises products or their elements that are disposed of by households, with the exception of vehicles withdrawn from exploitation and also safe waste (not having dangerous products or substances), coming from other producers (trade units, service companies, schools, offices and also “social” waste from industrial plants) which, due to their character or composition, are similar to the waste formed in households. Municipal waste constitutes approx. 10% of the total amount of waste formed in the country but they create much more difficult problems with collecting, sorting, using or sorting them than non-municipal

waste. In 2009 there were formed approx. 320-330 kg of municipal waste per one inhabitant living in the country. This is almost half less when compared with highly developed countries however, their value is growing very fast. In the year 2004 there were 260 kg per inhabitant.

In 2009 there was collected 83.5% of all the formed waste. The system of collection comprised 79.1% of inhabitants. Approx. 2 m tons of municipal waste was not collected. Part of the waste was subject to biodegradation (mainly composting) directly in households, major part, however, was combusted in house stoves or was dispersed in the environment, which in both cases caused its pollution.

Retrieval of waste still remains an unsolved problem. In 2009 as much as 78% of collected municipal waste was deposited on dumping grounds. In the country there were 803 active dumping grounds (having the total area of 2870 ha) and 94 closed ones (226.4 ha) [*Ochrona...*, 2010]. When waste is deposited on dumping grounds, precious raw materials are wasted. In 2008 in the total mass of formed municipal waste there was 12.6% of paper and cardboard, 12.7% of plastics, 10.0% of glass, 32.1% of municipal and garden waste, 4.5% of waste from green lands, 12.4% of mineral waste. In smaller amounts (1-3%) were the textiles, wood, large and dangerous waste [*Krajowy plan...*, 2010].

The existing system of municipal waste management does not ensure solution of the problem of selective collection, retrieval and recycling of municipal waste. So far recycling concerns those products or waste materials disposed of in households that have high price (e.g. aluminium cans). The price of secondary raw material depends on their amount and cleanliness. The most expensive waste material is selected to such degree that it is uniform (without pollutions) and is in the amount that is worth being transported. In Poland there was introduced system of selecting secondary raw materials from mixed waste, which limits the functioning of market law in this sphere. The costs of disposal of dirty or improperly selected secondary raw material to make it usable again frequently cause unprofitability of using it. For example, in order to produce covers of packages or foil film as much as 400 000 tons of aluminium is used nowadays in Poland, however in the existing system of collection of this precious raw material only small per cent is retrieved. The outlays made on management of municipal waste do not yield proper effects, whereas the costs of transportation of waste are increasing systematically.

In Poland in 2008 functioned 238 installations serving management of municipal waste, including: 85 composting plants of green waste, 74 waste sorting stations, 74 sorting stations of selectively collected waste, 65 sorting plants of mixed and selectively collected waste, 4 fermentation plants, 9 plants of mechanical and biological processing and 1 combustion plant of municipal waste. The processing capacity of these plants amounted to 3.3 m tons, i.e. more than one third of the total amount of municipal waste.

9.1.2. Division of waste depending on the hazard to man and the environment

In division of waste as regards hazard for man and the environment there is distinguished dangerous waste and other waste. **Dangerous waste** is waste that owing to their origin, chemical or biological composition or other properties or circumstances constitute hazard for life or health of people or to the natural environment. There is an entire catalogue of properties that decide upon whether waste is qualified as dangerous. This waste is: explosive, oxidative, highly flammable and flammable, irritant, harmful, toxic, carcinogen, caustic, septic and eco-toxic.

The following categories or types of dangerous waste have been isolated:

- waste containing polychlorinated biphenyls (PCB);
- waste oils;
- medical and veterinary waste;
- used batteries and accumulators;
- used electrical and electronic devices;
- vehicles withdrawn from exploitation;
- waste containing asbestos;
- overdue plant protection products;
- waste from explosive materials.

Each group of dangerous waste was given detailed regulations of their management.

Waste containing PCB. Polychlorinated biphenyls due to their properties were used in the past decades as additives to oils in transformers and condensers, additives to paints and varnishes and also as preserving and impregnating substances. There was introduced the constitutional obligation to eliminate from usage those substances till 30 June 2010. At the end of 2009 there were still used 1 000 tones of PCB in transformers and condensers.

Waste oils are formed as the result of the exchange of used engine and gear oils, break-downs of installations and devices and also as the effect of removing them from used vehicles and devices. Everyone introducing oils on the market are obliged to achieve the levels of retrieval and recycling (table 9.2.). They can use this obligation on their own or by means of organizations of retrieval. Specialized entities having appropriate permits handle the collection, transportation and management of waste oils. The Main Inspector of Environmental Protection holds a widely available list of entities having installations for regeneration of oils. In 2009 on the market there were introduced 8.4 thousand tons of oils which were in entirety subject to retrieval and recycling. 48.9% of retrieval was achieved (there was required 50% retrieval) and 39.1% of recycling (the required level was 35%).

Medical and veterinary waste is considered as dangerous for sanitary and epidemiologic reasons. In 2009 there were produced 25 thousand tons of medical waste, out of which 83% was the waste perceived as dangerous, and 420 tons of veterinary waste. In most medical and veterinary institutions there is selective collection of waste into special bins and bags. This waste together with overdue medicines is subjected to thermal processing in one of 45 combustion plants functioning in the country.

Used batteries and accumulators. There were isolated three groups of this waste: low-volume and high-volume nickel and cadmium accumulators as well as galvanic batteries and cells. The entity introducing batteries or accumulators on the market is obliged to organize and finance the system of collection, processing, recycling and neutralization after usage of them. Every wholesale salesman, service provider and retail salesman in a shop larger than 25 m² has the obligation to accept this type of waste free of charge. In 2009 there were collected 5.8 m of low-volume accumulators (less than 2 kg), 26 000 high-volume accumulators and 307,1 mln batteries and galvanic cells. In Poland in 2010 there were two installations serving processing of used acid and lead accumulators having the capacity exceeding the supply of domestic waste. They also utilized imported waste.

Used electrical and electronic devices. In households there has been accumulated a lot of electrical and electronic devices. There are very few households (approx. 2%) where there is no washing machine. The number of TV sets that are used by private users largely exceeds the number of households, there are also lots of used refrigerators and freezers (some households have even several units of such equipment). As many as 60% of households possess computers. Simultaneously fast technological development contributes to the fact that this equipment conforms with considerably higher technical parameters. Users are buying more and more advanced equipment. There arises the problem of management of used devices. Electrical and electronic devices may cause considerable environment pollution owing to the contents of dangerous substances – heavy metals, chlorine derivative substances and bromine compounds, and also asbestos and arsenic. In Poland entrepreneurs introducing equipment on the market were imposed the obligation of reaching till 2009 minimum degrees of retrieval and recycling of used equipment (table 9.2.).

The entities introducing equipment must inform consumers about the obligation of selective collection of used equipment, about the potential effects of improper conduct of them and also about the weight of the equipment. Also municipalities have the obligation to make available for inhabitants the information concerning companies and units located in the area which collect used electrical and electronic equipment from households. In 2009 there were collected 108.8 000 tons of equipment, the vast majority of which was from households. Per 1 average inhabitant there was 2.70 kg (per 1 inhabitant living in the

country there was even more – approx. 2.80 kg). It was impossible to meet the requirements of the directive concerning the achievement of the level of 4 kg/inhabitant. Recycling process was used in relation to 80,8% of the collected electrical and electronic equipment.

Table 9.2. Required degrees of retrieval and recycling of used electric and electronic equipment in 2009

Specification	Retrieval degree	Recycling degree
	(in %)	
High-volume household devices	80	75
Low-volume household devices	70	50
Tele-information and telecommunication equipment	75	65
Audio-visual equipment	75	65
Lighting equipment	70	50
Discharge lamps	-	80
Electric and electronic instruments excluding high-volume stationary industrial instruments	70	50
Toys, electric recreational and sports equipment	70	50
Medical facilities, excluding all implanted and infected products	-	-
Facilities for supervision and control	70	50
Vending machines	80	75

Source: Act of 29 July 2005 on used electric and electronic equipment (Dz.U. of 2005, No. 180, par. 1495).

Vehicles withdrawn from exploitation. Car vehicles withdrawn from exploitation are also subjected to organized collection. Formation of waste ought to be prevented by the expanded responsibility of the producer for the vehicles introduced on the market. In 2008 in Poland there were registered 1,6 mln vehicles, including 1.1 m used ones that were imported from abroad. The total number of vehicles in the country in 2008 amounted to 21.3 m. Assuming that the average existence duration period of a vehicle is 15-17 years, annually there ought to be 1.3 m vehicles subjected to disassembly. The entities introducing vehicles on the market are obliged to guarantee the network of collecting vehicles in such way that the owner of a vehicle does not have more than 50 km to get to a collection unit. Furthermore, producers of vehicles are obliged to reduce the usage of dangerous substances, take into consideration the requirements of disassembly and usage once more of disassembled parts. Every owner of a vehicle after completion of exploitation must return it to the entrepreneur having disassembly station or the unit for the vehicles withdrawn from exploitation. In 2009 188 788 vehicles having the total weight of 173 000 tones were official-

ly withdrawn from exploitation and subjected to disassembly. 68.4% of the mass was subjected to retrieval and recycling whereas 10.9% of the retrieved elements of vehicles were transferred to be used again [*Ochrona...*, 2010].

Waste containing asbestos. These are mainly products containing asbestos and cement, including asbestic tile. The most available and universally used method of neutralizing waste containing asbestos is storing of them on dumping grounds that are specially designed for this purpose (in 2010 there were 32 such dumping grounds). It is allowed to process waste containing asbestos in special mobile devices. In “The Program of cleaning the country from asbestos for the years 2009-2032” it was assumed to eliminate from usage till 2032 products containing asbestos, and during the period 2003-2012 – 5413 thousand tons, during the period 2013-2022 – 6187 thousand tons and between 2023 and 2032 – 3867 thousand tons. The total amount of waste to be removed during this period is 14.5 m tons.

Overdue plant protection products. These are mostly the remaining elements of substances used in households and partly also in countryside selling units. They are stored in pesticide burial sites which were built in the 1970s and 1980s. Presently, pesticide burial sites are being removed. Till 30 June 2009 there have been removed 160 pesticide burial sites containing 13,2 000 tones of overdue plant protection products and also 95 storehouses where other 500 tones of these products were stored. There remain 87 pesticide burial sites containing approx. 4 000 tones and 3 storehouses with 3,7 000 tons of overdue plant protection products that need to be removed. For neutralization of this waste are used methods of their thermal processing in proper installations.

Presently, owing to high prices of specimen there are insignificant amounts of plant protection products that are subject to becoming overdue. The problem is with package waste from these products. There were introduced fines for packages and the entities introducing plant protection products on the market have the obligation to manage them properly. It is allowed to store this waste for 3 years.

Waste of explosive materials are formed in connection with activity of armed forces – redundant combat resources” or with activity of companies using explosive materials and also unexploded shells and duds removed from the country’s territory. They are destroyed by means of explosions on military training grounds. The entity producing dangerous waste in the amount of more than 100 kg annually must have the program of managing dangerous waste but when it produces annually more than 1 Mg (tone) of dangerous waste, the entity needs to obtain the permit for producing waste.

Monitoring of production and management of dangerous waste in industry is conducted by the Inspection of Environmental Protection. This institution obtains data by making survey among the producers of waste. The collected data is submitted to district databases of Information System of Industrial Waste

Management (SIGOP-W) and national base (SIGOP-K). According to data from GUS, in Poland in 2009 the amount of produced dangerous waste came to 2 million tons. The amounts of produced dangerous waste indicate considerable spatial differentiation. The biggest amounts of dangerous waste are in: iron industry, chemical industry, copper, lead and zinc metallurgy and in oil industry. Dangerous waste is formed also in households. It is estimated that in 2009 two thirds of dangerous waste from households got into the stream of mixed municipal waste.

Other waste includes:

- used tires;
- waste from construction, renovation or demolitions of construction objects and road infrastructure;
- municipal sewage waste;
- waste subject to biodegradation;
- package waste;
- waste from selected branches of industry the management of which forms problems.

Used tires remain after the exchange into the new ones in used vehicles or during disassembly of vehicles withdrawn from exploitation. In 2009 165.8 000 tons of this type of products were introduced on the market. A producer of tires or the entity importing tires into the country, also as parts of vehicles, is obliged to reach certain levels of retrieval and recycling of waste from tires. In case the required levels are not achieved this entity is entitled to make product payment. In this respect, the entrepreneur can realize these obligations by themselves or with the aid of an organization dealing with retrieval. Used vehicles must be subject to regeneration, recycling or need to be combusted in cement plants as alternative fuel. It is prohibited to store used tires, except for bike tires having the diameter larger than 1400 mm.

Waste from construction, renovations and disassembly of construction objects and road infrastructure are formed during construction works, renovations and demolitions of old objects. In 2008 the main types of waste were: scrap metals – 40%, soil and ground – 30.7%, waste from construction materials 26.9%. There were produced altogether 3.5 m tons of such waste, out of which 80.7% was subjected to recycling. The collection and transportation of these waste is the task of their producers or specialized entities.

Municipal sewage waste is formed in sewage plants. In 2008 there were formed 567 000 tones of dry mass of these waste, out of which 19.7% was used in farming, 18.6% for recultivation, 4.8% for cultivation of plants, 16.1% was stored whereas the other waste was subjected to composting, used in bio-gas works or combusted (1%).

Waste subject to biodegradation, other than municipal waste, include waste:

- from farming, fruit-growing, hydroponic cultivation, fishing, forestry, hunting and food processing;
- from wood processing and from production of boards and furniture, cellulose mass, paper and cardboard;
- from leather, fur and textile industry;
- from installations and devices serving waste management, from sewage plants and from the treatment of drinkable water and water for industrial purposes.

In 2008 there were produced altogether 11.3 million tons of waste of this type, out of which 74% was subject to retrieval.

Package waste is formed on all levels of the supply chain, but above all, by consumers as end users. Every entrepreneur that introduces on the market packed products is given the obligation to ensure certain levels of retrieval and recycling of package waste. When the valid level of retrieval and recycling was not achieved, an entrepreneur is obliged to make a product charge. The charge has the character of sanction for not complying with statutory obligations. The obligation of retrieval and recycling may be realized only by an entrepreneur or be entrusted with an organization of retrieval making certain charges. In 2009 on the market there were introduced 3.8 m tons of packages, including 677 000 from plastics, 77.7 000 tons from aluminium, 144.8 000 tons from steel, 1196 000 tons from paper and cardboard, 842 000 from glass and 888 000 tons from natural materials.

Waste from selected branches of industry the management of which creates problems include waste: formed during search, extraction, physical and chemical processing of ores and other minerals; from production, preparation, trade and circulation of products of non-organic chemistry; from thermal processes. In all these three groups in 2008 there were formed 91.8 m tons of waste, where 69.8 m tons were subject to retrieval, 13.5 m tons were stored, whereas 593 000 tons were neutralized by thermal or other methods.

9.1.3. System of retrieval and recycling of package and post-usage waste

In Poland in 2001 there was introduced legal obligation of organized management of package waste and some post-usage materials². During the period 2002-2005 those entrepreneurs that were introducing on the market products in packages on their own or via organizations were obliged to achieve the mini-

² Act of 11 May 2011 on obligations of entrepreneurs as regards management of some waste and product payment and deposit payment (Dz.U. of 2001, No. 63, par. 639, with further alterations).

imum level of recycling. Since 2006 they have also been obliged to achieve the minimum level of retrieval. The minimum levels of retrieval and recycling are constantly increased. In Poland – due to the transitory period negotiated with the European Union – the basic levels oscillating at 60% ought to be achieved till 2014 (for tires: 75%). From 2014 the minimum levels of retrieval and recycling of package and post-usage waste in Poland will be the same as in other countries of the EU.

Realization of the obligation of material and organic recycling at the level anticipated from 2014 requires:

- 1) development of the processing potential of recyclers in the degree that enables realization of the current recycling needs;
- 2) giving recyclers free of charge rights to the emission of CO₂, the purchase of such rights on the market may cause unprofitability (perhaps only temporary) of the undertaking;
- 3) development of the system of selective collection of municipal waste because package waste from economic units (mainly related to trade) is already managed.

Increase in the required level of retrieval during the period 2007-2014 requires usage of not only material and organic recycling, but also retrieval of energy by thermal processing with retrieval of energy in waste combustion plants, re-combustion³, chemical retrieval or export of waste.

During the period 2010-2020 of considerable importance will be organic recycling. In accordance with the EU regulations which were adopted for realization in Poland, the mass of bio-degradable waste ought to be decreased in 2010 by 25%, in 2013 – by 50% and in 2020 – by 65%, in relation to the mass of waste deposited on dumping grounds in 1995. After 2020 the possibility of storing may be limited only to the waste that was subject to processing or the processing of which is technically impossible or unjustified in another way.

The required levels of retrieval and recycling of waste in the years 2002, 2009 and 2014 and the level realized in 2009 is shown in table 9.3.

³ **Co-combustion** is the thermal processing of waste along with fuels with the aim of retrieving energy included in it or with the purpose of neutralizing them. This process takes place in plants the main purpose of which is formation of energy or certain products, e.g. of cement.

Table 9.3. Required levels of retrieval and recycling of package and post-usage waste in the years: 2004, 2009 and 2014 and the level achieved in 2009

Specification	Rt – retrieval, Rc – recycling	Required level			Level achieved in 2009 (in %)	Deviation from the level required in 2009 (in pt.)
		2004	2009	2014		
Package waste:						
from plastics	Rc	14.0	18.0	22.5	21.5	+3.5
from aluminium	Rc	25.0	45.0	50.0	64.2	+19.2
from metal plates	Rc	11.0	30.0	50.0	33.6	+3.6
from paper and cardboard	Rc	39.0	50.0	60.0	50.9	+0.9
from economic glass	Rc	22.0	45.0	60.0	41.9	-3.1
from natural materials	Rc	9.0	15.0	15.0	23.1	+8.1
Package waste	Rt	-	50.0	60.0	50.2	+0.2
total	Rc	-	-	-	36.9	-
Post-usage waste	Rt	40.0	50.0	50.0	48.9	-1.1
Lubricating oils	Rc	22.0	35.0	35.0	39.1	+4.1
Tires	Rt	75.0	75.0	75.0	74.0	-1.0
	Rc	15.0	15.0	15.0	19.8	+4.8
Low-volume nickel and cadmium accumulators	Rt	25.0	40.0	60.0	40.7	+0.7
	Rc	25.0	40.0	60.0	40.7	+0.7
High-volume nickel and cadmium accumulators	Rt	40.0	60.0	60.0	83.1	+23.1
	Rc	40.0	60.0	60.0	83.1	+23.1
Batteries and primary cells	Rt	10.0	15.0	20.0	15.3	+0.3
	Rc	10.0	15.0	20.0	16.4	+1.4

Source: own elaboration on the basis of data from GUS [*Ochrona...*, 2010].

The Main Inspector of Environmental Protection since 1 July 2006 has collected information and has prepared analyses concerning management of used electrical and electronic equipment. The sources of data are quarterly and annual reports submitted by entrepreneurs and organizations of retrieval⁴. The Main Inspector of Environmental Protection prepares reports on the amount of introduced, collected and processed equipment and about the mass of used equipment subject to retrieval and recycling and also about the mass of equipment used again. The adopted levels of retrieval and recycling are realized (table 9.4.). An entrepreneur having a disassembly station is obliged to achieve the level of 95% of retrieval and 85% of recycling of the mass of vehicles withdrawn from exploitation and produced after 1 January 1980 and 75% of retrieval and 70% of recycling of vehicles produced after 31 December 1979. During calculation of these levels for retrieval and recycling are included only a product

⁴ Decree by the Minister for the Environment of 10 August 2009 on database about the used equipment (Dz.U. of 2009, No. 132, par. 1092).

from fraying machine and also equipment and parts of vehicles that are earmarked for re-usage⁵.

Table 9.4. Required and achieved level of retrieval and recycling of used electrical and electronic equipment in 2009 (in per cents)

Specification	Level of retrieval		Level of recycling	
	required	achieved	required	achieved
Household equipment:				
• high-volume	80.0	89.8	75.0	88.6
• low-volume	70.0	84.1	50.0	81.1
Tele-information and telecommunication equipment	75.0	89.0	65.0	86.7
Audio visual equipment	75.0	87.5	65.0	86.3
Lightning equipment	70.0	92.5	50.0	92.5
Electrical and electronic devices	70.0	84.6	50.0	83.0
Toys, recreational and sport equipment	70.0	78.6	50.0	78.6
Measurement and control instruments	70.0	79.1	50.0	75.6
Vending machines	80.0	82.8	75.0	79.0

Source: [Raport..., 2010].

Companies operating on this market are also object of steering in management system of waste management. These include: producers and importers of waste and specialized units such as:

- companies – organizations responsible for retrieval of package waste and retrieval of electrical and electronic equipment;
- companies having units of collecting vehicles withdrawn from exploitation, units tackling with disassembling and shredding of dismantled parts;
- companies of cleaning type;
- companies running dumping grounds and waste combustion plants, and also preparing waste for combustion in professional power industry.

Unlike normal units operating on the basis of act concerning business activity or trade code, these companies are comprised by additional legal regulation.

⁵ Decree by the Minister for the Environment of 14 October 2010 on calculation of the levels of retrieval and recycling of vehicles withdrawn from exploitation (Dz.U. of 2010, No. 202, par. 1340).

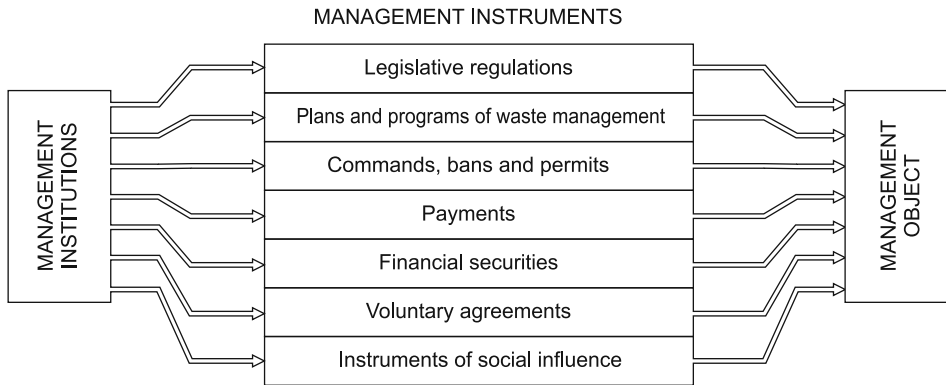
9.2. Management instruments in waste management

In waste management in Poland the following instruments are used:

- national and European legal regulations;
- plans and programs of waste management;
- legal-administrative instruments: bans, commands, permits;
- economic instruments: product charge, deposit charge, register charge;
- financial securities;
- voluntary agreements;
- instruments of social influence, mainly education for the sake of rational waste management, as well as lobbying and complimentary actions.

The main instruments in management system are shown in figure 9.3.

Figure 9.3. Management instruments of waste management in Poland

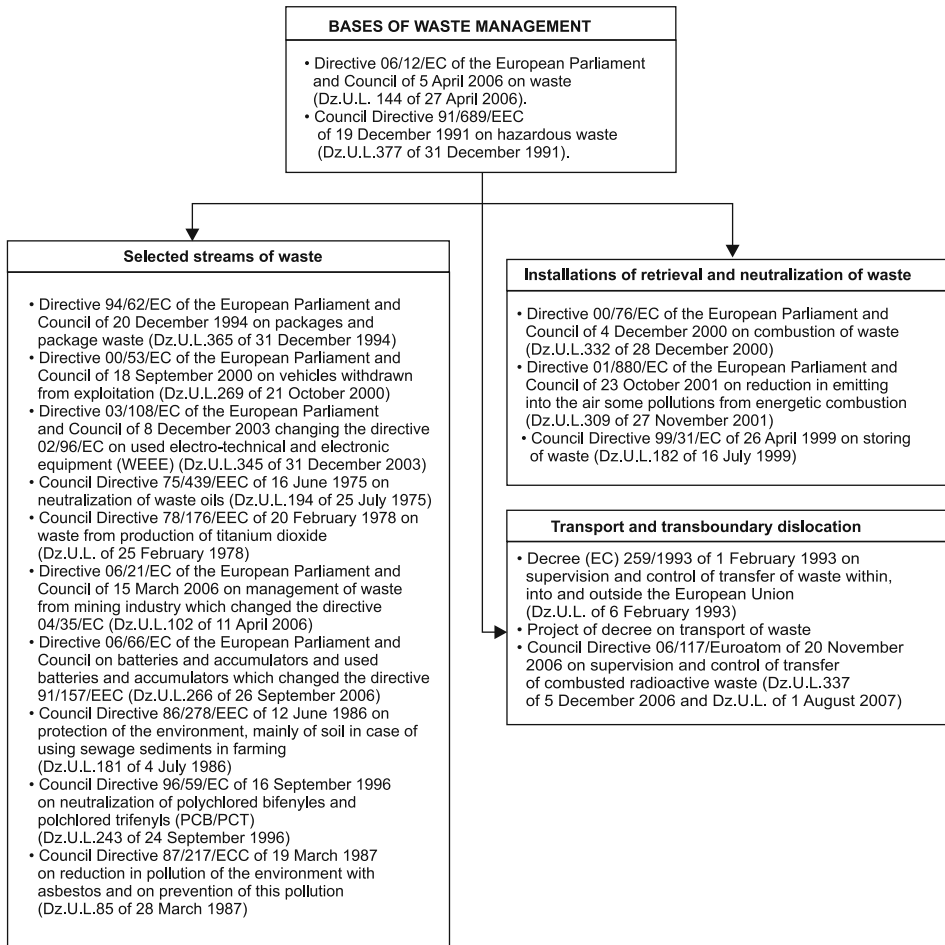


Source: *ibid.* figure 9.1.

9.2.1. Legislative regulations

Legislative regulations in waste management in Poland comprise directives of the European Union introduced into Polish law, decrees of the European Parliament and Council employed in all member states, regardless of the relevant decrees of Polish organs of governmental administration. The system of EU regulations is composed of two framework directives: on waste and related to dangerous waste, as well as the number of detailed directives. The range of EU regulations was presented in figure 9.4.

Figure 9.4. Directives of the European Union in the domain of waste management



Source: ibid figure 9.1.

The aim of the new directive on waste 08/98/EC⁶ is to:

1. explain the key concepts such as: “waste”, “retrieval” and “neutralization”;
2. reinforce the measures necessary for counteracting the formation of waste;
3. introduce the approach taking into consideration the entire life cycle of products and materials, and not only the stage of waste;

⁶ Directive 08/98/EC of the European Parliament and Council of 19 November 2008 on waste and annulling some directives (Dz.U.L.312 of 22 November 2008).

4. reduce the influence on the environment that is exerted by formation of waste and their management;
5. increase the economic value of waste;
6. encourage everyone to subject waste to retrieval and also to use the obtained materials with a view to protecting natural resources [*Prawo...*, 2010].

The basic principles of conduct with waste were not changed in relation to the directive 06/12/EC on waste (compare with figure 9.4.). Directive 08/98/EC of the European Parliament and Council of 19 November 2008 on waste which annulled some directives⁷ when this publication is being printed the bequests of the directive still have not been transferred to the Polish law.

Tasks and recommendations ensuing from these directives were included in the Polish law concerning waste that is composed of directional and detailed acts. Directional acts include:

- Act of 27 April 2001 – Environmental Protection Law⁸, which: defines and regulates actions that are likely to negatively affect the environment; formulates the general requirements concerning the production and introduction of products into circulation; implements limits concerning the use of substances and energy, usage of substances and technical solutions that are likely to negatively affect the environment at the time a product is being used; imposes usage of such construction of devices which enable disassembly and recycling of used parts and whole devices and also introduces charges for storing waste;
- Act of 27 April 2001 on Waste⁹: includes basic definitions concerning waste management, establishes rules of managing waste – i.e. prevention of their formation, reduction in their amount and negative impact on the environment, ensuring retrieval when it was impossible to prevent formation, ensuring neutralization of waste which could not be subjected to retrieval; defines duties of waste owners, detailed principles of managing waste from retrieval of PCB, medical and veterinary waste, waste like batteries; finally regulates the problem of storing waste; The act text was to a large degree supplemented and partly modified by the virtue of the Act of 22 January 2010 on change in the act on waste and some other acts¹⁰; the act specifies: the principles of waste management from accidents; ban on subjecting to retrieval (mostly in incineration plant) or neutralizing (mostly on dumping grounds) of non-segregated municipal waste; the obligations of waste owners and of those transporting waste; set of fines for non-compliance with the law regulations in waste management;

⁷ Ibidem.

⁸ Uniform text, Dz.U. of 2008, No. 25, par. 150.

⁹ Dz.U. of 2001, No. 62, par. 628, with further alterations.

¹⁰ Dz.U. of 2010, No. 28, par. 145.

- Act of 13 September 1996 on Keeping Cleanliness and Order in Municipalities¹¹ includes regulations of managing municipal waste in municipalities; it imposes on a municipality the duties concerning organization of selective collection of waste and participation in organizing management of dangerous waste; the text of this act was supplemented and partly modified by the virtue of the Act of 1 July 2011 on Change in the Act on Keeping Cleanliness and Order in Municipalities and some other acts¹²; it introduces supervision of municipality over municipal waste, obliges these entities among others to organize collection of municipal waste from estate owners, establish places for their selective collection and for construction, maintenance and exploitation of regional installations for processing of waste; waste owners are obliged to make payment for waste to the municipality; municipalities must reach to 31 December 2020 the 50% (in terms of weight) level of recycling and preparation for re-use of the following fractions of municipal waste: paper, metals, plastics and glass; simultaneously these entities need to reduce the mass of municipal waste transferred for storing that is subject to bio-degradation to 50% of the mass of this waste transferred for storing in 1995 to 16 July 2013 and to 35% to 16 July 2020.

Detailed acts include:

- Act of 11 May 2001 on Packages and Package Waste¹³ defines this type of waste, specifies duties of packages' producers and sellers of products in packages;
- Act of 11 May 2001 on Duties of Entrepreneurs Concerning Management of Some Waste and on Product Charge and Deposit Charge¹⁴ regulates specific issues concerning retrieval, but especially concerning waste recycling; determines the ways of meeting obligation; introduces the system of information and register of the process of managing waste; establishes duties of public administration organs, chiefly in terms of collecting product charge and deposit charge and management of sources from these charges;
- Act of 29 July 2005 on Used Electrical and Electronic Equipment¹⁵ defines duties of entity introducing equipment, duties of Inspectorate of Environmental Protection, introduces financial securities, product charge and also penal and financial responsibility in the system of managing these specific types of waste;

¹¹ Dz.U. of 1996, No. 132, par. 622, with further alterations.

¹² Dz.U. of 2011, No. 152, par. 897.

¹³ Dz.U. of 2001, No. 63, par. 638, with further alterations.

¹⁴ Dz.U. of 2001, No. 63, par. 639, with further alterations.

¹⁵ Dz.U. of 2005, No. 180, par. 1495.

- Act of 20 January 2005 on Recycling of Vehicles Withdrawn from Exploitation¹⁶: defines the duties of vehicles' owners that introduce the vehicles on market; of entrepreneurs running disassembly stations, units collecting vehicles, fraying machine; as well as the duties of public administration; and includes penal regulations;
- Act of 29 June 2007 on International Displacement of Waste¹⁷: specifies the mode of conduct and organs proper for executing tasks related to international transfer of waste; proper organs are the Main Inspector of Environmental Protection who issues permits for import, transit and export of waste, and also custom services.

All the mentioned acts provide numerous obligatory and optional commissions for issuing executive decrees. This is further concretization of statutory regulations. The act on waste was attached with only 30 decrees that regulate, among others, such issues as: range of exemptions from the obligation to possess permits in terms of retrieval or neutralization of waste, its register, conduct with particular types of waste, thermal processing and storing of waste, problem of planning waste management.

In other legislative regulations there are many complementary regulations, for example:

- Act of 27 March 2003 on Spatial Planning and Management¹⁸ – specifies the conditions of earmarking lands and localization of objects serving waste management;
- Act of 28 October 2002 on Road Transportation of Dangerous Goods¹⁹ regulates transportation of waste and hazardous waste;
- Act of 11 January 2001 on Chemical Substances and Preparations²⁰ – specifies the properties and type of management of dangerous chemical waste;
- Act of 19 June 1997 on the Ban on Using Products Containing Asbestos²¹ – specifies the principles and type of management of waste containing asbestos;
- Act of 20 November 2000 – Atomic Law²²; specifies the type of management of radioactive waste;
- Act of 12 September 2002 on the port devices serving the collection of waste and the loading remains from ships²³.

¹⁶ Dz.U. of 2005, No. 25, par. 202, with further alterations.

¹⁷ Dz.U. of 2007, No. 124, item 859, with further alterations.

¹⁸ Dz.U. of 2003, No. 80, par. 717, with further alterations.

¹⁹ Dz.U. of 2002, No. 199, par. 1671, with further alterations.

²⁰ Uniform text, Dz.U. of 2009, No. 152, par. 1222.

²¹ Uniform text, Dz.U. of 2004, No. 3, par. 20, with further alterations.

²² Uniform text, Dz.U. of 2007, No. 42, par. 276, with further alterations.

²³ Dz.U. of 2002, No. 166, par. 1361 with further alterations.

As one of the last EU member state Poland initiated rationalization of municipal waste management, adjusting legal solutions to the requirements specified in directives.

9.2.2. Plans of waste management

Plans of waste management ought to ensure realization of the aims of ecological policy and create in the country an integrated network of installations and devices for retrieval and neutralization of waste. Plans are elaborated at the level of the country, district, province and municipality. The *National plan of waste management* is elaborated by the Minister of Environment and passed by the Cabinet. It constitutes sector concretization of the state ecological policy (approved of by the decree of Sejm). Other plans of waste management are integrally connected with programs of environmental protection which are passed every four years by territorial self-governments of all levels. Detailed manner of preparing them is specified by the act on waste. The plans in detail specify among others:

- types, amount and sources of waste which is supposed to be subject to retrieval or neutralization;
- distribution of installations and devices for these processes along with the list of entities running activity in this sphere;
- actions aiming at preventing the formation of waste or reducing its amount as well as activities aiming at proper conduct with waste, e.g. reducing storing of bio-degradable municipal waste on dumping grounds.

The national, district and provincial plans comprise all types of waste, whereas the municipal plans comprise only municipal plans. Inconsistency with the plan of individual intentions of waste owners constitutes the main premise of the possible refusal to issue a decision on the conditions of waste management [Ibidem].

Projects of plans are subject to assessment and approval: national plan is assessed by boards of districts and adopted by the Cabinet; district plans are assessed by the Minister of Environment, boards of provinces and administrators (mayors, presidents) of municipalities, and adopted by district seyms; projects of provincial plans are assessed by district board and municipalities' administrators and approved by province's board; projects of municipal plans are accepted by district board and provincial board, and approved by municipal board respectively.

The national plan of waste management 2014 implies the type of conduct that is consistent with the principle of prevention of ecological policy, i.e. above all prevention of formation of waste and then preparation for re-usage, recycling and other methods of retrieval, whereas the lest desired manner of neutralizing waste is storing. The plan adopts the following main aims:

- separation of the increase in the amount of formed waste from economic growth of the country expressed in GDP (growth of GDP does not need to be accompanied with the increase in the amount of formed waste);
- increase in the participation of retrieval, including especially energy from waste;
- reduction in the amount of all waste placed on dumping grounds;
- elimination of the practice of illegal storing of waste;
- formation and activation of data base on products, packages and waste policy.

In the policy of municipal waste management the following aims were adopted:

1. till 2015 all the inhabitants ought to be comprised by the system of selective collection of waste and reduction in the mass of stored waste to 60% of all the formed waste;
2. till 2020 there ought to be reduction by 35% in the amount of municipal waste subject to biodegradation and there should be preparations for re-use and recycling of at least 50% of the mass of explosive materials such as: paper, metal, plastics and glass from households.

As regards the prevention of minimizing formation of waste chiefly such actions will be undertaken: support for introduction of low-waste production technologies and usage of possibly all components of used raw materials; promotion of clean production and environment management; intensive ecological education promoting prevention of forming waste; increase in the rates of charges for storing waste. With regards to shaping of waste management policy particular attention will be drawn to promotion of proper conduct of waste, support in implementation of economically and ecologically effective technologies of retrieval and neutralization of waste, reinforcement of the control of entities running activity in terms of collection, transportation, retrieval and neutralization of waste. *The National plan of waste management 2014* indicates indispensable directions and range of changes in the Polish law concerning waste management.

Programs of managing dangerous waste must be elaborated by producers prior to initiating the activity that triggers formation of dangerous waste. The program ought to include: specification of types and amount of dangerous waste; information about the ways of preventing its formation; detailed description of the ways of managing waste; specification of place and type of storing waste. The program is approved by a starost after consulting the village administrator (mayor) or by a district marshal in the situation when creation and management of dangerous waste may significantly affect the environment.

9.2.3. System of obligations, commands, bans and permits

The binding legal regulations impose a number of obligations, commands and bans on producers, owners and processors of waste. For example, the following obligations can be mentioned:

1. to obtain permit for formation, retrieval or neutralization of waste;
2. to provide information concerning formed waste and ways of managing it;
3. to collect used electrical and electronic equipment and to subject it to recycling or to another form of retrieval;
4. to obtain registration in the national registry of those companies that intend to introduce electrical or electronic equipment on the market;
5. to collect used equipment, subject it to processing, recycling or another type of retrieval;
6. to organize selective collection of municipal waste by municipalities;
7. to possess appropriate capital by an organization dealing with retrieval.

A company can be registered as an organization responsible for retrieval of package waste if it possesses initial capital amounting to at least one million, whereas as an organization responsible for retrieval of electrical and electronic retrieval – amounting to at least five million.

Among commands and bans there can be listed the command on regeneration of used oils, ban on storing waste in seas, dilution or preparation of mixtures from waste, command of ensuring retrieval and recycling of waste, especially of package and post-usage type.

The obligation to obtain a permit is the basic legislative and administrative instrument in waste management system. Regulation in this sphere concerns the processes of production, retrieval and neutralization of waste and operation of some installations serving waste management. Legislative and administrative permits are required for:

- formation of dangerous waste in the amount of more than 1 ton annually and production of other waste in the amount of 5 tons annually;
- retrieval and neutralization of waste – recycling, combustion, storing;
- collection and transportation of waste;
- management of the unit of collecting vehicles from exploitation and station of disassembly of vehicles and operation of a fraying machine;
- activity of entrepreneurs connected with collection of municipal waste from owners of the properties.

Operation of installations serving waste management is usually subject to general discipline ensuing from construction law and environmental protection law. In particular situation appears the manager of dumping grounds who is also obliged to obtain a decision approving of the instruction on how to make use of the dumping ground and also needs to obtain consent for closure of the entire dumping ground or its part.

The act on waste anticipates the possibility of issuing a ban on running certain activity or the ban on making certain actions in the form of administrative decision. This concerns: discontinuation of an activity by means of withdrawing the previously issued administrative decision; expression of objection that results in the ban on initiating the activity; imposition of the obligation to obtain a proper decision of regulating character; commitment to make additional research or analyses; specification of the required range of actions of corrective character. Non-compliance with the commands, bans and the obligation to obtain a permit is threatened with other sanctions, e.g. with administrative fines.

9.2.4. Waste registration system

Having the registry of waste is one of the most important obligations of their owners. Registry of waste means documentation of its formation, collection, retrieval, neutralization, transmission and transportation in accordance with certain procedures on special forms. Registry of waste embraces the following documents: registration card of waste; registration card of municipal sewage waste; registration card of used electrical and electronic equipment; registration card of a vehicle withdrawn from exploitation; card of waste transmission; report – collective set of data concerning types and amount of waste, ways of managing it and about installations and devices serving retrieval and neutralization of waste; report – collective set of data concerning municipal sewage deposits.

Proforma of registration cards and cards of transmission of waste as well as related reports is specified by the decree of the Minister of the Environment²⁴.

Vast majority of producers and owners of waste must have registry of it. The obligation to keep register is not obligatory for: producers of municipal waste; producers of vehicles withdrawn from exploitation if these vehicles were delivered to an entrepreneur having a station of disassembly or a unit collecting vehicles; physical persons and organizational units that are not entrepreneurs (e.g. schools, offices) that use waste for their own needs; small and medium entrepreneurs in the domain of bio-degradable and mineral waste (rubble, stones, soil).

The ongoing amendment to the act on waste introduces the obligation of extended reporting of entities collecting municipal waste from the owners of estates or unloading non-effluent reservoirs. They will be obliged to make quarterly reports and annual reports:

- on collected municipal waste, in which there needs to be information on: the type and the total mass of collected municipal waste from the territory of

²⁴ Decree of the Minister for the Environment of 8 December 2010 on proforma of documents used for the needs of waste registration (Dz.U. of 2010, No. 249, par. 1673).

municipality as well as the manner of management of it; number of owners of estates from which waste was collected; the list of owners of estates that collect waste in the way that is inconsistent with the municipal statute of collection; the type and mass of collected waste subject to biodegradation, including waste placed on dumping grounds; the level of reduction in the mass of bio-degradable waste that was not placed on dumping grounds; achieved level of retrieval and recycling of municipal waste collected from the municipality; mass of collected waste from construction and demolitions of buildings;

- on emptying of non-effluent reservoirs and transportation of liquid impurities in which there is information on: the type and amount of collected liquid impurities from a municipality; the way of managing collected waste; the number of owners of estates from which liquid impurities were collected²⁵.

A separate way of documenting was introduced for packages and package waste. The act on packages and package waste impose on entrepreneurs the obligation of making reports in the form of OPAK forms. Three forms were introduced:

- OPAK-1, which concerns a producer of packages, information about the mass of produced packages (empty packages);
- OPAK-2 which concerns an importer of packages and companies that acquire packages within their community, information on the mass of packages brought from abroad (empty packages);
- OPAK-3, which concerns an exporter of packages and products in packages, information on the mass of packages transported abroad (empty packages) and also packages with a product²⁶.

Prefects of municipalities as well as mayors and presidents of towns are obliged to submit to the district marshal an annual report on the type and amount of package waste collected and subjected to retrieval and recycling as well as on the expenses made for this purpose. The report comprises only the package waste collected in a municipality and transferred for retrieval and recycling on the basis of the documents confirming retrieval and recycling.

Reporting regarding the scope of municipal waste as well as packages and package waste is coordinated and controlled by district marshals. The summary specification for the entire country is prepared by the Minister of Environment. Reporting on the scope of used electrical and electronic equipment is collected and controlled by the Main Inspectorate of Environmental Protection. Economic entities introducing electrical and electronic equipment and handling collection,

²⁵ Ibidem.

²⁶ Decree of the Minister for the Environment of 31 December 2004 on proforma of forms necessary for keeping annual reports on the mass of packages that were produced, imported from abroad and exported abroad (Dz.U. of 2005, 2005, No. 4, par. 30).

processing, recycling (or another form of retrieval) of used equipment have the obligation to submit the following reports: semi-annual report about the amount and mass of introduced equipment with division into groups and types of equipment with specification of data concerning the type and mass of batteries and accumulators used for the needs of operation of the equipment²⁷; semi-annual report about the mass of collected used equipment subjected to processing and retrieval, including recycling and neutralization²⁸; annual report on the achieved levels of collection, retrieval and recycling of used equipment²⁹.

The annual report on vehicles withdrawn from exploitation is addressed at the district marshal and the National Fund of Environmental Protection and Water Management³⁰. The report includes such data as:

- data regarding an entrepreneur running a station of disassembly;
- information about the number, trademarks, mass and production year of vehicles withdrawn from exploitation taken into a station of disassembly;
- information about the mass of waste subject to retrieval, including recycling, and handed down to retrieval, including recycling, and also about the mass of objects, which were earmarked for re-usage, and were taken out from the equipment and parts of the vehicles withdrawn from exploitation;
- information on entrepreneurs for whom there were handed down waste for retrieval, including recycling, and for neutralization;
- information on the level of retrieval and recycling achieved in a station of disassembly.

Increased charges are used as a sanction for handling waste in the way that is non-compliant with the regulations. Their amount is as follows:

- 0.05 of unit stake of charge for placing waste on a dumping ground for every day of storing, for storing waste without decision approving the instruction of exploitation of dumping ground and for storing waste without the required decision,
- 0.1 of unit stake of charge for storing waste in the place that was not earmarked for this purpose,
- 0.15 of unit stake of rate for disposal of waste near water reservoirs, in national parks and nature reserves, in forest or spa areas or in areas having recreational character,

²⁷ Decree of the Minister for the Environment of 14 May 2009 on proforma of reports on the amount and mass of introduced equipment and the way of transferring it (Dz.U. of 2009, No. 72, par. 627).

²⁸ Decree of the Minister for the Environment of 28 August 2009 on proforma of reports on used equipment (Dz.U. of 2009, No. 153, par. 1226).

²⁹ Ibidem.

³⁰ Decree of the Minister for the Environment of 10 November 2010 on the annual report on vehicles withdrawn from exploitation (Dz.U. of 2010, No. 225, par. 1471).

- 100 times of unit stake of charge in situation when waste was disposed of in inland surface and underground waters or sea waters.

Administrative financial fines are imposed for storing or accumulating waste contrary to the conditions specified in the required decisions. The fine is born regardless of the charge. Administrative financial fines are imposed by the district inspector of environmental protection in the form of twenty-four hour rate in the period in which violation takes place. The twenty-four hour amount of the fine amounts to 0,1 of the stake of charge for placing waste on a dumping ground.

Product charge is paid by obligated subject that has not reached level of recycling or retrieval required in the given year. In Poland it has the character of a penalty for not fulfilling duties; therefore it is not product charge in traditional sense because it encumbers all the products that were introduced on the market. The amounts of stakes of product charge for package and post-usage in 2012 were as follows:

- for packages from plastics, aluminium, tinplates, paper and cardboard and for packages from economic glass and wood – 4.35 PLN/kg;
- for lubricating oils and regenerated tires – 2.91 PLN/kg;
- for new and old non-regenerated tires – 11.62 PLN/kg;
- for electrical and electronic equipment (except for the below listed lamps) – 1.80 PLN/kg;
- for fluorescent, discharge, sodium and metal halogen lamps – 18.00 PLN/kg;
- for used portable batteries and accumulators – 9 PLN/kg.

The charges are made on the account of a marshal office.

9.2.5. Charges and financial security

In waste management the following economic instruments, i.e. charges are used: charges for storing of waste; charges for storing municipal mixed waste; product charges; for lack of network of collecting vehicles withdrawn from exploitation; deposit charges; for owners of stations of disassembly.

Charges for storing waste are one of the types of charges for using the environment. They were introduced by the act – Environmental Protection Law and every year they are updated by an indicator of inflation by the Minister of Environment. In 2011 there were 17 rates of charges – the lowest was 9.99 PLN/Mg, the highest – 210,03 PLN/Mg. The rates of charges were designed separately for each of 928 isolated types of waste. The most frequent rates were 17.54 PLN/Mg (187 items) and 147.85 PLN/Mg (180 items). The highest rates are collected for storing on dumping grounds used electrical and electronic instruments, fluorescent lamps and devices containing freons (210.03 PLN/Mg) as well as for storing batteries and accumulators (200.87 PLN/Mg). The lowest

rates are collected for waste from rinsing and cleaning of minerals, soil, ground, stones, concrete waste, waste from production of gypsum and cement, slag, gravel, aggregate, rocks, defective ceramic products (from 9.99-11.32 PLN/Mg). The upper unit rate is established as 254.27 PLN/Mg³¹.

Charge for storing municipal mixed waste (the so-called marshal charge) is made by an entity responsible for a dumping ground. While fixing price for taking waste on a dumping ground, apart from the mentioned rate, the entity in charge of landfill takes into consideration the costs of construction, exploitation, closing, reclamation, monitoring and supervision of a dumping ground. The Internet data implies that in large towns this charge was set above 160 PLN/Mg, in small towns – around 120 PLN/Mg, whereas in rural municipalities – more than 100 PLN/Mg. Simultaneously with ordering of waste management these rates will be changing.

Rate of **product charge** is fixed as a product of the stake of product charge for a certain type of waste and mass or amount of waste, on which obligation of retrieval or recycling was not imposed. Product charge for packages and products introduced on market is made on the bank account of marshal office, whereas the charge for used equipment is made by obligated entrepreneurs on bank account of the Main Inspector of Environmental Protection.

Charge for lack of network of collecting vehicles withdrawn from exploitation is set by an entrepreneur who does not fulfill the duty of ensuring the network. This charge is fixed as a product of unit rate (PLN 500) and the number of vehicles introduced on the market.

Deposit charge in Poland is used for retail sale of acid-lead batteries as singular products. Deposit charge in the amount of PLN 30 is made by retail salesman if the purchaser did not pass the used battery in return. Reimbursement of the charge takes place after handling the used battery to the seller of these batteries or to the unit collecting used batteries.

There are also used deposits for packages of dangerous products. Entities introducing them on market are obliged to define the amount of the deposit for singular charges of these products in the amount from 10 to 30% of the price of dangerous product contained in this package.

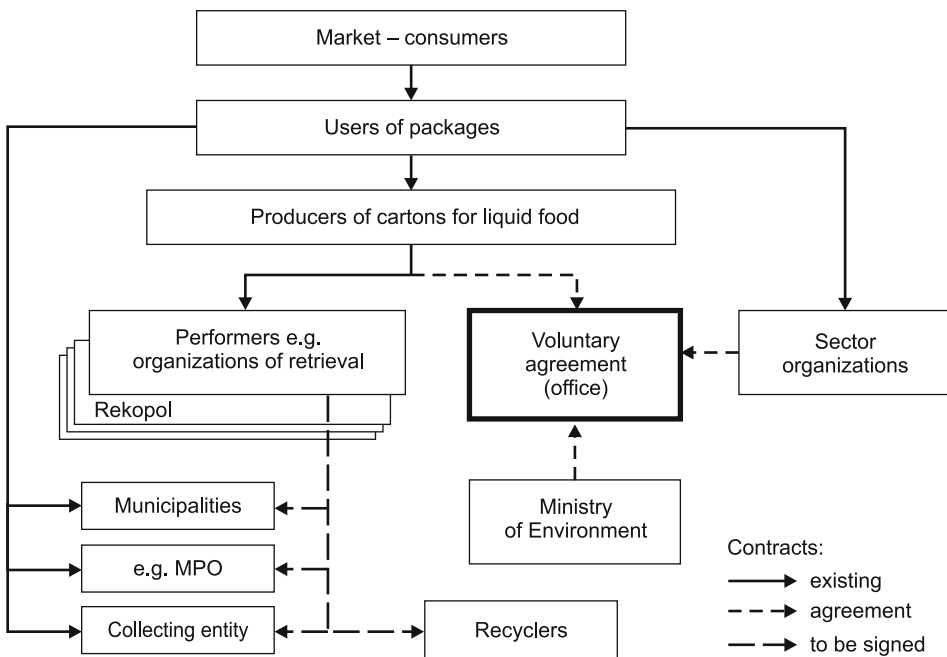
Charge for owners of stations of disassembly. This charge can be collected by an entrepreneur from the owner of incomplete vehicle withdrawn from exploitation. Vehicle is incomplete when it does not contain essential elements and its mass is lower than 90% of the mass of a complete vehicle. This charge cannot be higher than 10 PLN/kg of the lacking mass of vehicle.

³¹ The announcement of the Minister for the Environment of 4 October 2010 on the amount of charges for using the environment in 2011 (M.P. of 2010, No. 74, par. 945).

9.2.6. Voluntary agreements and education of society

The usage of **voluntary agreements** in waste management was stipulated in directives of the European Union with reference to package waste. Such agreements may be made in connection with the realization of directive's objectives provided that minimum levels of retrieval and recycling will be reached. In Poland began actions for the benefit of voluntary agreement concerning collection and recycling of cartons for liquid food. Assumption was made that this agreement does not replace existing duties of obligated objects, but is voluntary additional commitment that realizes responsibility idea of all participants of package chain: entrepreneurs introducing on market products in cartons, carton producers, organization of retrieval (recyclers) and Ministry of Environment. Participants of the system and their contractual conjugations are presented in figure 9.5.

Figure 9.5. System of voluntary agreement of producers and users of cartons for liquid food



Source: Elaboration M.A. Rosa; presentation made available for the authors.

In Polish regulations the functioning of voluntary agreements was anticipated with reference to packages of dangerous products. According to the act on packages and package waste the Minister for Environment may sign an agree-

ment with entrepreneurs introducing dangerous products on the market, which concerns national system of collection, transport, retrieval and neutralization of package waste from dangerous products. Such agreement's operations excludes regulations of deposits for these types of dangerous products for which the agreement was signed.

Education of society is of large significance for shaping efficient and effective waste management. Consumers' awareness of predicting and proper conduct of waste has impact on consumers' decisions and on the decisions concerning selective collection of waste. Regulations apply to entrepreneurs who introduce on the market products in packages to hold educational actions.

Salesmen of packaged products and also electrical and electronic equipment have the obligation to inform consumers (at least once by placing proper information in the place where the product is sold) about the systems of return, collection and retrieval, including recycling, proper conduct of package waste and also on how important is the meaning of symbols used on packages. Salesmen of accumulators, on the other hand, are obliged to inform clients of conditions and procedure of returning used accumulators and of units collecting them. According to regulations, revenues from product charge for packages and post-usage waste ought to be earmarked, among others, on financing ecological education concerning selective collection and also retrieval and recycling of this waste.

9.3. Institutions steering waste management

Waste management is the sphere of influence of many institutions of public administration. These institutions, however, do not have clear conjugations or relations that ensue from management of waste management so that it is possible to isolate them as system of management institutions. Management competences in waste management are assigned to: minister responsible for the environment, minister of economy, district marshal, province starost or voivode, mayor or president of a town. The following institutions participate in information or information-financial processes: Main Inspector of Environmental Protection, National Fund of Environmental Protection and Water Management (NFOŚiGW) and district funds.

Being a central organ of government administration, the minister responsible for the environment is obliged to: initiate, elaborate and implement directions of policy in the sphere of waste management; elaborate, assess realization and updating of the *National plan of waste management*; realize the tasks ensuing from the acts regulating waste management; conduct the cases connected with the realization of international agreements in the sphere of waste management. Minister of Construction has the obligation to: realize the tasks ensuing

from the act on keeping cleanliness and order in municipalities; create a policy concerning waste management in towns; elaborate and assess realization of program of development of communal infrastructure. Furthermore, according to the regulations of the act on waste, the ministers responsible for economy, construction, spatial and housing economy, naval economy, communication, transport, health, agriculture, of domestic issues and the minister of national defence in the frameworks of their competences may define the requirements for substances and subjects, not meeting of which leads to the fact that the owner is obliged to dispose of them and also a detailed manner of treatment of some types of waste.

District marshal is the proper organ of administration at district level in waste management issues. Marshal's competences to large extent concern waste management within the framework of undertakings that may considerably affect the environment. District marshal is obliged to collect data and submit to the minister of environment and to NFOŚiW reports including information on the sizes of packages introduced on market, about retrieval and recycling of package waste and takings from product charges. Starost is the basic organ of administration of first instance. Starost issues permits for running activity in terms of retrieval or neutralization of waste following obtaining opinion of village administrator or mayor. Village administrator or president of town is obliged to keep municipality clean, therefore he is also responsible for organization of management of municipal waste.

The Main Inspector of Environmental Protection keeps register of retrieval of electric and electronic equipment and units introducing equipment on market, collecting used equipment, keeping recycling or any other forms of retrieval.

Controlling functions of waste management, used electrical and electronic equipment and recycling of vehicles withdrawn from exploitation are performed by:

- Inspectorate of Environmental Protection, mainly with regards to management of dangerous waste, functioning of dumping grounds with industrial and municipal waste, plants processing electrical and electronic equipment;
- Trade Inspection with regards to proper functioning of companies on the market of waste management, mainly producers and importers of waste, packages and devices;
- Supreme Control Chamber with regards to proper realization of duties and tasks by organs and offices of public administration;
- National Sanitary-Epidemiological Inspection with reference to those entities whose waste management may generate epidemiological hazard.

The functioning of the system of waste management in those domains where it was possible to introduce detailed EU regulations is not improper. This concerns management of industrial waste, package and post-usage waste as well as used electrical and electronic equipment. The weakest element is manage-

ment of municipal waste. There remains hope that the conducted legal regulations will enable ordering of this important sector of waste management in Poland. Improvement of the management of municipal waste presently decides upon the possibility of executing the adopted levels of retrieval and recycling of waste in Poland, using raw materials and energy placed in waste that are nowadays placed on dumping grounds.

Chapter 10

MANAGEMENT OF ECOLOGICAL SAFETY

10.1. Characterization of management object of ecological safety

The dictionary definitions of safety emphasize such aspects as confidence and protection from something. They also indicate that safety can be identified not only with lack of hazard, but also with protection from hazard. Attention needs to be drawn to the fact that there is no such concept as absolute safety. There always occur unpredictable factors that may pose hazard to people's health or possessions. However, there is a certain acceptable threshold of risk with which one feels secure. From this perspective, the influence on the sense of own safety is exerted by cognitive and emotional processes that make man aware of their situation in the surrounding reality.

From wider (social, national or even global) perspective, safety means actions that are undertaken by the state and its organs and are related to: accumulating, processing and publicizing knowledge of hazards, elaborating methods of preventing those hazards and specifying the procedures of reacting in critical situations when the safety of citizens was posed to hazard. In the subject perspective, safety can be divided into a number of elements. From the perspective of the state's functioning, the most important elements include: political, military, economic, social, cultural and ecological safety. It needs emphasizing that the aforementioned list is still not complete. Development of civilization and social type, as well as changing conditionings of a global policy contribute to the fact that there are still new elements of national safety, whereas other ones are becoming less important. For example, recently more importance is attached

to the problem of energy safety while the military safety of Poland is becoming of secondary importance.

Ecological safety can be defined as prevention and counteracting of the social effects of rapid modifications in the biosphere that have the character of natural disaster. In Polish legislative system, natural disaster is defined as (...) *natural disaster or technical breakdown, the effects of which pose hazard to life or health of a large number of people, possession of large size or to the environment in large areas, whereas aid and protection can be successfully undertaken by using special measures and thanks to cooperation of various organs and institutions as well as specialized services and units acting in accordance with one managing entity*¹.

This definition reveals the double character of the concept “ecological safety”. On the one hand, it can be considered from the point of view of anthroposphere as the exceptional influence of natural forces on man and economy, i.e. on natural disasters. Natural catastrophe means: an event related to the activity of natural forces, including especially a bolt of lightning, earthquakes, strong winds, intensive precipitation, long-term occurrence of extreme temperatures, landslides, fires, droughts, floods, ice phenomena in rivers and sea as well as in lakes and water reservoirs, mass occurrence of pests, plant or animal disorders or of contagious diseases among people or operation of another natural phenomenon².

On the other hand, ecological safety ought to be considered from the point of view of biosphere – as exceptional influence of man and economy on the environment. In such case safety is posed hazard to by technical breakdowns understood as (...) *rapid, unpredictable damage or destruction of a construction site, technical device or system of technical devices causing pause in usage of them or loss of their properties*³.

Management subject of ecological safety (figure 10.1.) can be the events related to the activity of natural forces and serious breakdowns of rapid character which:

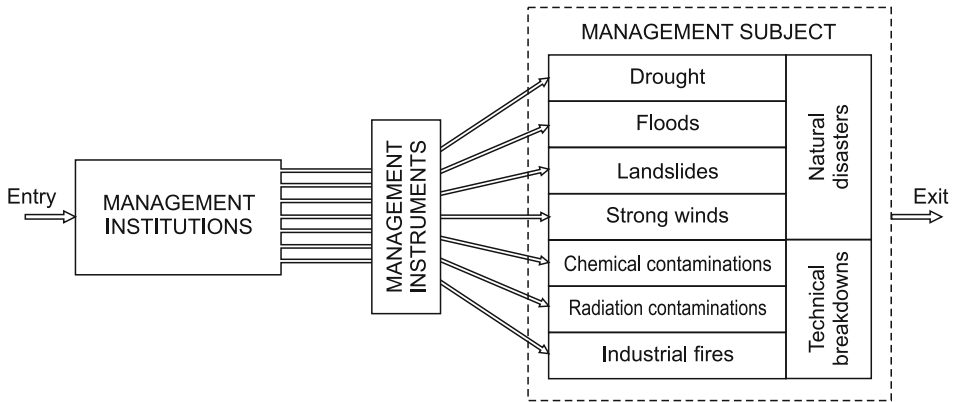
- occur suddenly and frequently also out of a sudden or in considerably larger intensity than it is expected;
- create real hazard for human health and life or possessions of considerable dimensions;
- destabilize the functioning of: economy, society, governmental and self-governmental administration.

¹ Act of 18 April 2002 on the state of natural disaster (Dz.U. of 2002, No. 62, par. 558).

² Ibidem.

³ Ibidem.

Figure 10.1. Management subject of ecological safety



Source: own elaboration.

10.1.1. Floods

In accordance with the Water Law⁴ flood is defined as water rising in water-courses, water reservoirs, canals or in the sea during which, water after exceeding the waterside limits, inundates river valleys or depression areas and poses hazards to people or possessions. It needs emphasizing that water rising which results in flooding of a certain area does not mean flood. For example, every year in Biebrza valley large part of the river area is covered with water. This water rising despite considerable degree does not cause flood which is understood as hazard to people’s lives and either destruction or devastation of: houses, infrastructure, factories, crops, culture monuments.

The reasons of water rising may be both direct and anthropogenic. Direct reasons of it have natural character. These are: intensive snow falls or rain falls, fast melting of snow, glaciations of rivers, short-term and intensive storms with tempestuous rain, whereas on the coast there is strong wind from the sea to land and as the effect water rising (the so called burp). The most important reasons of anthropogenic floods are: destructions of dams in retention reservoirs and breaking of anti-flood dams during water rising.

In Poland floods occur almost every year: e.g. July 2011 – Przeźmierowo, August 2010 – Bogatynia, May-June 2010 – South Western and Central part of Poland, June 2009 – Southern municipalities of Podkarpackie, Śląskie, Opolskie and Dolnośląskie districts, July 2008 – Southern municipalities of Podkarpackie

⁴ Act of 18 July 2001 Water Law (Dz.U. of 2001, No. 115, par. 1229, with further alterations).

and Małopolskie district, July-August 2011 – Vistula basin in the Southern part of Poland.

10.1.2. Landslides

Landslides, i.e. mass movements of land, are defined in the Environmental Protection Law⁵ as the naturally conditioned or caused by man sliding, dropping or dropping out of the surface layers of rocks, residual soils and soils. The effect of movement of land masses can be degradation of areas with their infrastructure (residential buildings, road network, sewage system, telecommunication and electrical lines, gas pipelines etc.) and with crops. Landslides occur most frequently in the areas where the layers of non-permeable and permeable rocks are one under another. The places where landslides occur are: natural hills and slopes of valleys and water reservoirs, source areas of rivers, scarps of ditches and pits.

Figure 10.2. Position of areas posed hazard to by mass movements of land in Poland



Source: [Rączkowski, 2007].

⁵ Uniform text, Dz.U. of 2008, No. 25, par. 150.

The main factors of biosphere origin that cause landslides are above all: increase in humidity of land as the effect of long-lasting precipitation as well as undercut of slopes by river erosion. These factors occur most frequently in the southern part of Poland (figure 10.2.). Landslides can be caused also by factors of anthropogenic origin, such as: excessive loading of a slope by construction or by vibrations related to construction works.

In July 1997 in the Wyspowy Beskid the rain falls caused a number of landslide movements. There were recorded more than 500 cases of hazards posed to construction objects. The area occupied by landslides oscillated from several to more than 100 ha. In April 2000 in the Pogórze Karpackie Highlands there was a small spring flood that occupied areas situated East from Dunajec. Approximately 2500 landslides having varied size were formed or renewed then, causing thus destruction or damage to the infrastructure. The losses were estimated at approx. PLN 120 m. The rain falls in July 2001 caused formation of landslides in the Beskid Makowski, Żywiecki, Sądecki Mountains and in the Pogórze Rożnowskie Highlands. The most disastrous landslide in the Beskid Makowski Mountains was created in the Beskid Makowski Mountains on 27 July 2001. The area of the slumped material came to 15 ha. In 2002 there was renewal of the eastern part of landslide on the slopes of Pierchałówka in Lachowice. 4 buildings were destroyed while 30 others were menaced.[Bajgier-Kowalska, 2005]. In the period from May to June 2010 landslides that posed hazard to buildings took place in the total of 107 municipalities.

Main Construction Supervision Office estimates that in Poland in 2010 as the result of landslides 2269 buildings were destroyed whereas 560 buildings were completely destroyed and 1709 others require reconstruction or renewal. The losses caused by the functioning of the disaster in the period from May to June 2010 – in accordance with the data of the Ministry of the Interior and Administration – cost 2.9 bn Euro.

10.1.3. Droughts

There is no universal definition of drought because unlike flood drought is not a single clear event but frequently it is the result of many complex factors that interact. Generally, droughts are formed when over the areas of high pressure arrangements there are expanded spheres of descending movements that do not allow for formation of clouds [Ziarko, Walas-Trębacz, 2010]. Insolation increases while vaporization and outflow of water from the ground are not counterbalanced by precipitation. Maintenance of such situation causes that the ground runs dry, and as the consequence it leads to drought. However, meteorological conditions are the basic but not decisive factor deciding upon the formation of this phenomenon. Of equal importance are the conditions of soil and

hydrological ones as well as plant cover, i.e. the factors that decide upon water retention in the surrounding.

Additional difficulty with defining what drought is constitutes specification of its beginning and end. Usually it is assessed on the basis of historical materials after the event took place. It is also related to the fact that in non-precipitation period there may take place a short period with precipitation that is unsatisfactory for supplementing the shortages. It needs emphasizing that the phenomenon of drought is related not only to extreme situations but it also comprises conditions of smaller availability of water for a certain region. In the Act on Insurances of the Cultivation of Plants and Livestock⁶ drought is defined as the losses caused by the occurrence in any six-decade period from 1 April to 30 September of climate decrease in water balance below the value specified for particular species of cultivated plants and soils. However, available literature provides considerably more comprehensive definitions. Owing to meteorological and climate conditions the farming problems, hydrological conditions and economic effects there are distinguished the following types of drought [Dębski, 1970]:

- meteorological – period that usually lasts from several months to several years and in which the supply of humidity in a certain area decreases below the state that is ordinary in certain climate conditions of humidity;
- farming – period in which humidity of soil is unsatisfactory for satisfying water needs of plants and having regular economy in agriculture;
- hydrological – period in which flows in rivers fall below the average flow, and in case of prolonged meteorological drought there is observed considerable reduction in the level of occurrence of underground waters;
- in economic terms, which is the effect of the aforementioned physical processes and is related to economic issues in the sphere of activity of man affected by drought. H. Lorenc provides for the classification of intensification of soil drought in Poland [Lorenc et al., 2006]:
 1. Drought occurs when: for the period of at least successive 20 days the deficiencies of precipitation constitute less than 75% of the normal state; within one decade precipitation constitutes only 30% of the normal state while the average daily temperature remains at least 1.0°C above the normal state whereas the number of hours with the sun constitutes >110% of the normal state.
 2. Strong drought occurs when: at least for the period of 4 successive decades the deficiencies of precipitation constitute less than 75% of the normal state in the same areas and for 20 days they constitute only 30% of the normal state; the average daily temperature at this time remains

⁶ Act of 7 July 2005 on Insurances of the Cultivation of Plants and Livestock (Dz.U. of 2005 No. 150, par. 1249), art. 3.

- 1°C above the normal state, and the maximum daily temperature within 10 days is higher than 25°C; the number of hours with the sun during a month constitutes 120% of the normal state.
- Intensive drought occurs when: at least for 6 successive decades the deficiencies of precipitation constitute less than 75% of the normal state in the same areas and among them within 3 decades they constitute only 30% of the normal state; the average daily temperature at this time remains at least 1°C above the normal state and the maximum daily temperature of more than 25°C remains over the period of 15 days, the number of hours with the sun during a month constitutes >120% of the normal state.

Figure 10.3. Extremely dry months in Poland in the years 2000-2008

Pre- cipita- tion sta- tions	Białystok	Chojnice	Elbląg	Gorzów Wlkp.	Jelenia Góra	Kalisz	Katowice	Kętrzyn	Kielce	Kłodzko	Kolo	Kolobrzeg	Koszalin	Łęborg	Legnica	Leszno	Łódź	Lublin	Miawa	Olsztyn	Opole	Plock	Rzeszów	Sandomierz	Siedlce	Ślubice	Sulejów	Suwalki	Szczecin	Terespol	Włodawa	Wrocław	Zakopane	Zielona Góra	Months	
2000																																				17
2001																																				0
2002																																				13
2003																																				21
2004																																				3
2005																																				22
2006																																				23
2007																																				11
2008																																				7

Source: Progностyczno-Operacyjny System Udostępniania Charakterystyk Suszy “POSUCH@”
[\[http://posucha.imgw.pl/\]](http://posucha.imgw.pl/)

Within the project “Influence of climate changes on the environment, economy and society” that is realized by the Institute of Meteorology and Water

Management there was conducted classification of atmospheric and hydrological droughts for selected precipitation stations and partial catchments (figure 10.3.). A dry year or period means the period in which precipitation amounts to less than 90% of the average value of many years – which is adopted as the normal state (90-110%). Here are distinguished the following categories: dry period (from 75 to 89%, very dry – from 50 to 74%, extremely dry – precipitation lower than 50% of the normal state). For monthly periods as the average month is considered the period with precipitation from 75 to 125% of the normal state, dry – from 50 to 74%, very dry – from 25 to 49%, and extremely dry – precipitation below 25% of the normal state.

The years with extremely dry months in major part of the analyzed catchments were as follows: 1969, 1972, 1974-1976, 1982, 1984, 1988, 1994, 1996-97 and 2005-2006. Whereas the very dry months occur much more frequently and almost in all years they occurred in more than 50% of the analyzed catchments, except for the years: 1967, 1970 and 1988.⁷

10.1.4. Strong winds

Wind is a horizontal movement of the air that is formed as the effect of irregular distribution of the atmosphere pressure on the Earth surface. In order to level the pressure the air moves from areas with high atmosphere pressure towards the area with lower pressure. Strong winds with the speed larger than 75 km/h which are usually termed windstorms are most frequently caused by fast moving active low pressures. They adopt the most radical form at the turn of spring and summer as well as at the turn of autumn and winter. In Poland there can be isolated five main types of strong winds: gale-force winds, storm winds, foehn winds, whirlwinds and hurricanes [Żurański, 2005].

Gale-force winds which are caused by extensive and deep low pressure areas in temperate geographic latitudes are from 400 km to 600 km. These areas can extend over the distances of 1000 km or more. In such low pressure area the strong wind of almost unchanged direction but with different intensity can last several days. In Poland this is the most frequently observed type of strong wind, especially at the seaside. The strongest winds of this type occur from autumn to spring.

Storm winds frequently occur together with rapid storms during cold front. They usually comprise rather limited area and last from several to more than a dozen minutes. They are characterized by non-stationary speed, rapid gusts and relatively low average speed [Ibidem].

⁷ Prognostyczno-Operacyjny System Udostępniania Charakterystyk Suszy „POSUCHa [<http://posucha.imgw.pl/>]

Foehn winds in the mountains, which in Poland are named halny wind, are formed as the effect of the influence of the mountain range on the flow of wind in deep low pressure area. Halny wind is in leeward slopes of mountains, is very gusty, the air is dry and warm. In Poland this is the southern wind in the Carpathians and in the Tatra mountains [Ibidem].

Whirlwind is a strong whirl of the air of small diameter – from several to tens of meters and with vertical or diagonal axis of rotation towards the Earth surface. It is usually formed in the front side of the storm cloud. Whirlwinds usually occur in the vast planar areas with continental climate. In Poland they occur locally during warm periods, usually from June to August before noon. They have relatively limited range but they are very rapid – the wind speed in the whirl oscillates from 150 to 360 km/h, whereas the speed with which the wind moves is from 30 to 40 km/h. The frequency with which whirlwinds occur in Poland during a year is from 8 to 15 times. The most serious event with whirlwinds in Poland within the last dozen years took place on 15 and 16 August 2008. There were observed then eight strong whirlwinds in the following districts: Opolskie, Śląskie, Łódzkie, Mazowieckie and Podlaskie. In total, the cataclysm destroyed or made damage to 770 buildings, power lines in Częstochowa district (20 000 people were short of electric current) and the losses are estimated as worth PLN 100 m.

Hurricane is the deep low pressure area moving from the Atlantic towards Russia in the external zones of which the wind speed exceeds 120 km/h. In the past, hurricanes occurred in Poland very seldom, however due to the climate changes in the recent years they have occurred more often, mainly in winter months, and the frequency with which they occur increases. While in 2005 there was no hurricane, in the years 2006 and 2007 there was one hurricane (Britta, 1-2 November 2006; Kyrill, 18-19 January 2007), in 2008 there were as many as 3 hurricanes (Paula, 26-27 January 2008, Zizi, 22-23 February 2008; Emma, 1-2 March 2008).

10.1.5. Technical breakdowns

The consequence of technological advancement, especially in case of dynamic development of industry, is danger of occurrence of a technical breakdown that may pose hazard to ecological safety. This type of situation may appear where radioactive substances, chemical substances, toxic industrial products, caustic, explosive and combustible substances may be processed, stored or transported. Breakdowns occur mostly in: chemical plants, nuclear power stations, research laboratories, on road and railway itineraries.

Technical breakdowns involving dangerous or radioactive substances are very difficult to predict. There are also scarce chances to predict their progress or consequences. Breakdowns may cause hazard to ecological safety resulting

from non-controlled dispersal of dangerous substances. Most frequently this appears during: fires in industrial plants, partial opening of containers with dangerous substances, improper storing of dangerous substances, destruction of industrial pipelines, accidents of tankers and tank trucks, river and sea tankers.

Breakdowns involving these substances may affect large areas, causing many ecological and material damages. Depending on the character of a breakdown substances may be released into the atmosphere either at once (explosion) or after certain passage of time. The amount of toxic substances that may be released and dispersed in a certain time period depends among others on: construction solutions, container capacity, type of dangerous compounds, scale and character of the damage caused, physical parameters of the conditions of storing the substance and also on meteorological conditions during the breakdown [Lidwa, Krzeszowski, Więcek, 2010].

The most serious breakdown in Poland took place on 26 June 1971 in Czechowice-Dziedzice. There was fire in the oil refinery as the effect of lightning striking the top of one of the oil containers. Despite the breakdown work was not stopped in the refinery, also oil from tankers was not poured into another container. The fire caused explosion of oil containers. As the consequence of the catastrophe 37 people died, whereas 100 others were seriously burnt. Another serious catastrophe happened in 1993 in Nitro-Erg company in Krupski Młyn and it was caused by the explosion of “Dynex” dynamite stored in this plant producing plastics. Yet another dangerous even was in 1994 in Płock Refinery (presently known as “Orlen”) and it was caused by the explosion of heating oil. The explosion caused partial opening of pipelines and fire as well as turning down of a chimney being 55 m tall, the fragments of which destroyed a nearby overpass [Gajek, Zatorski, 2011].

10.2. Description of crisis management system

The tasks related to realization of ecological safety depend on the administration level. At [Kopaczewski, 2009, p. 161]:

- municipal level there are realized basic tasks related to the protection of population, and main efforts are concentrated on: warning, alarming and informing population about hazards, conducting evacuations and ensuring the evacuated people medical and social aid, mainly as regards accommodation and alimentation;
- provincial level there are realized the same tasks as at the municipal level. Furthermore, this level coordinates activities of reacting in crisis in the province which are given support of appropriate services and guard as well as aid of non-governmental organizations anticipated in the provincial plan of reacting in crisis;

- district level there are realized tasks connected with offering indispensable aid to district authorities the possibilities of which in the existing critical situation do not ensure conducting efficient activities; in the critical situation that embraces the area larger than one province, the district level takes over coordination of conducted actions;
- central level in the situations when the possessed district forces and measures are unsatisfactory for handling the critical situation a governor asks central authorities for suitable aid from the superior level (including introduction of the state of natural disaster in part or in the entirety of the district area).

Management in the situations of hazard to ecological safety in Poland is realized in the general system of crisis management. Crisis management is (...) *the entirety of systems solutions in the sphere of protection of population performed by public authorities of all levels in cooperation with specialized entities and other situations with the aim of preventing dangerous situations that pose hazard to the existence and health of citizens and to the environment* [Zieliński, 2004, p. 29].

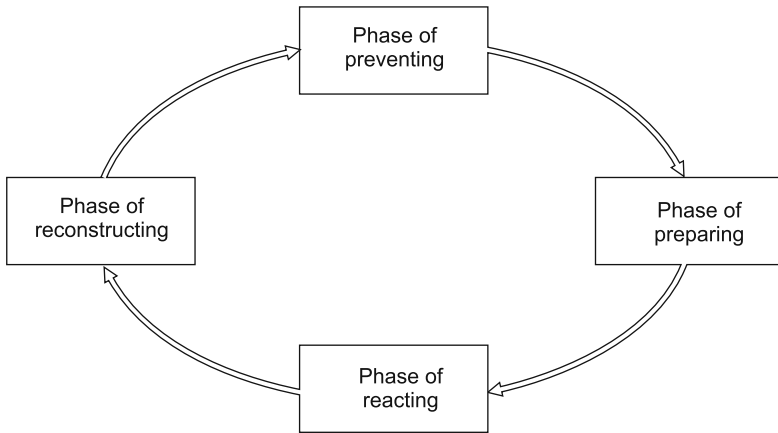
Crisis management is based on [Gryz, Kitler (ed.), 2007, p. 203]:

1. the principle of the primacy of one-person management that means entrusting organs that exercise power in a certain domain with decision-making competences. Such organs are: prefect (mayor), starost (town president), governor and prime minister;
2. the principle of responsibility of public authority organs that specifies responsibility for management in the situations of crisis by the organs of governmental and self-governmental administration functioning in the country;
3. the principle of primacy of territorial arrangement that specifies that the basis for activity of authority organs constitutes the territorial division of the country;
4. the principle of universality that obliges all the entities of state law to participate in anti-crisis activities, everyone accordingly to its legal and organizational status;
5. the principle of functional approach which lies in the specification of actions that are relatively stable, usually repeatable, typical and formalized in terms of procedures and that were isolated due to their type and character and that are directed at the realization of the aims of national safety;
6. the principle of uniting in accordance with which the organs of general administration (prefect, starost and governor) are given, in accordance with the principles specified by acts, control over other forms of administration, both united and non-united;
7. the principle of continuity of state functioning which specifies that regardless of the state and circumstances of functioning of the state there remain

unchanged organizational forms of state authority, and particular organs perform their functions in the times of crisis.

Crisis management system is a complex system the aim of which is to ensure proper level of safety, efficient counteracting of all types of dangers, and in the case of hazard, to undertake actions leading to restoring the former state in possibly shortest period of time, using available forces and measures, with justified costs and in the conditions of the existing legal system [Sienkiewicz-Małyjurek, Krynojewski, 2010, p. 69]. Hence there can be distinguished four basic phases of crisis management: preventing, preparing, reacting and reconstructing which make its cyclical process (figure 10.4.).

Figure 10.4. Phases of crisis management



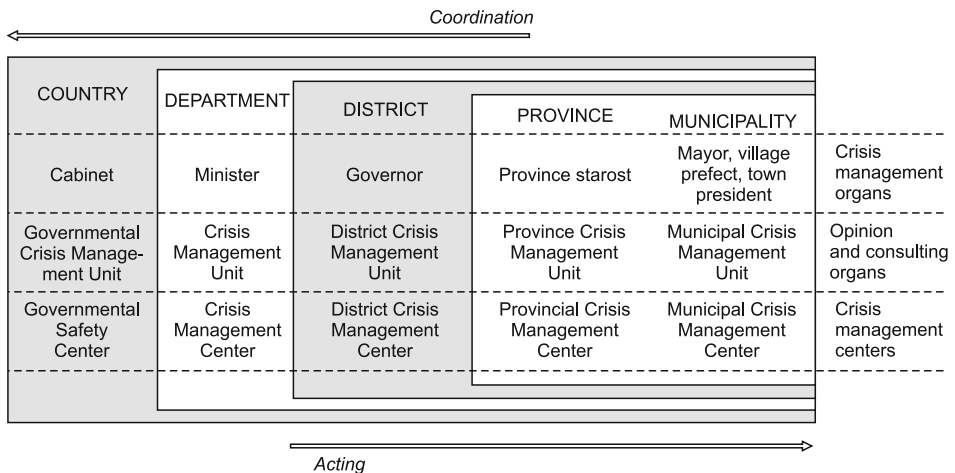
Source: *ibid.* fig. 10.1.

The phase of preventing means realization of actions reducing the probability of crisis occurrence or reducing its effects to minimum when they occur. In the phase of preparing there are undertaken actions of planning character that concern the ways of reacting during crisis situation an enable removal of its effects. The phase of reacting means realization of indispensable activities when a hazard appears so as to provide aid for the injured parties, hamper the progress of hazards and also reduce losses and damages. The phase of reconstructing is related to the realization of tasks concerning: restoring of the ability to react, reconstruct the reserves of supporting services, reconstruction of infrastructure that is crucial for the functioning of both a certain area and the most important public services. Particular phases do not need to occur in the sequence presented in figure 10.4. For example, in the phase of reconstructing one needs to remember about refilling the stocks used in the phase of reacting, whereas unused

stocks in reacting may be used in the phase of reconstructing [Skomra 2010, p. 36]. The sequence presented above is the most effective and enables constant perfection of the management process.

System of crisis management in Poland has multi-level character which is in accordance with administrative division of the country and is composed of three basic components: organs of crisis management, opinion and consulting organs as well as centers of crisis management (Figure 10.5.).

Figure 10.5. Institutions realizing the tasks of ecological safety in Poland



Source: *ibid.* figure 10.1.

10.2.1. Crisis management organs

In the country crisis management is the responsibility of the Cabinet. Whereas in urgent cases crisis management becomes the responsibility of the Minister of the Interior and Administration. However, the decisions made by the minister are analyzed at the successive session of the Cabinet.

The organs responsible for crisis management in the area of a district, province and municipality are: a governor, province starost, village-prefect, mayor or town president. Their tasks include, among other things: taking control of monitoring, planning, reacting and removing the effects of hazards in the given area, realization of the guidelines concerning crisis management in the certain area, making recommendations to authorities of lower level for crisis management plans and approval of these plans. These tasks are performed using the aid of an isolated organizational unit of district, provincial or municipal offices.

10.2.2. Opinion and consulting organs

The Governmental Crisis Management Unit (RZZK) is the opinion and consulting organ responsible for the initiation and coordination of critical actions, the members of which are the Prime Minister, Minister of Defence, Minister of the Interior and Administration, Minister of Foreign Affairs and Special Services Coordinator. Additionally, the sessions of RZZK can be participated by ministers responsible for sensitive and strategic domains of social life. The tasks of RZZK include, among others, consulting as regards coordination of actions of governmental administration organs, state institutions and services in critical situations as well as forming opinions and submitting of the *National Crisis Management Plan*⁸ to the Cabinet.

District, provincial and municipal crisis management units that are appointed by a governor, province starost, village-prefect, mayor and town president – are the ancillary organ of crisis management. The tasks of the units include, among others: assessment of real and potential hazards that may have influence on public safety, preparation of proposals of anti-crisis actions, publicizing information connected with hazards and also forming opinions about crisis management plans.

10.2.3. Crisis management centers

Governmental Safety Center ensures service of the Cabinet, Prime Minister, the Unit and Minister responsible for the interior in issues related to crisis management as well as performs the function of the National Center of Crisis Management. The Center is controlled performs the function of the secretary of the Governmental Crisis Management Unit. The Center's tasks include, among others: presentation of detailed ways and measures of reacting to critical situations, elaboration and updating of the *National Plan of Crisis Management*, monitoring of potential hazards, ensuring coordination of information policy of public administration organs in case of critical situation, cooperation with the entities of NATO and European Union as well of other international organizations responsible for crisis management.

District and provincial centers of crisis management and crisis management centers of central organs of governmental administration are established obligatorily. Municipal (town) Center of Crisis Management can be established by a village-prefect, mayor or town president only when it is considered as compulsory. The centers' tasks include, among others: being on twenty-four hour

⁸ Act of 26 April 2007 on crisis management (Dz.U. of 2007, No. 89, item 590), art. 9.

duty in order to ensure information flow for the needs of crisis management, supervision of the functioning of the system of detecting and alarming as well as of the system of early warning of population. Crisis management centers cooperate with one another and also undertake cooperation with the entities realizing monitoring of the environment and with the entities carrying rescue actions.

10.2.4. Crisis management instruments

The main instruments of planning character in crisis management are: *National Plan of Crisis Management* and also district, provincial and municipal plans of crisis management. The plans aim at ensuring society basic conditions of protection from the effects of natural catastrophes and technical breakdowns. Planning actions ensure:

- directing actions that are necessary to be realized in crisis situations;
- clear information on the forces and measures that can be used in crisis situations;
- information on the possibilities of the situation of crisis management;
- appropriate operational procedures in case of reacting actions.

The plans of reacting in crisis are composed of three basic parts and comprise:

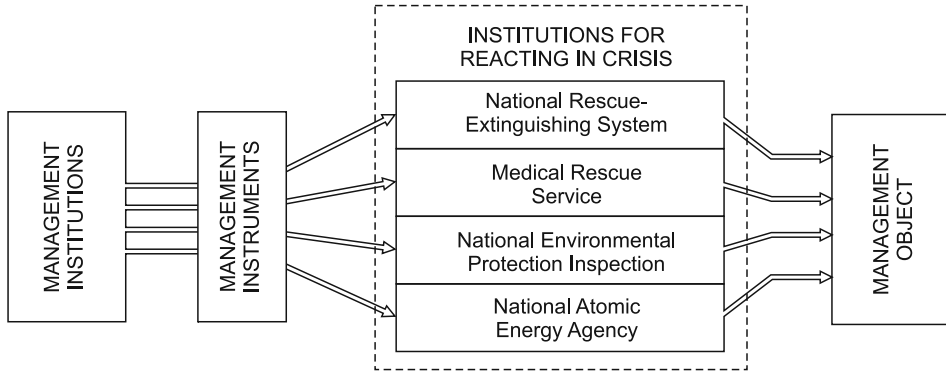
1. the main plan including characteristic of hazards and assessment of the risk of their occurrence along with the tasks and responsibilities of the participants of crisis management;
2. a number of undertakings related to monitoring, activating of indispensable forces and measures, procedures of reacting in crisis in case of critical situations;
3. functional enclosures defining, among others: organization of communication, evacuation, rescue, principles of informing population about hazards, list of concluded contracts and agreements related to the realization of tasks.

Plans of crisis management are created for a certain time period, not longer than two years.

10.2.5. Institutions for reacting in crisis

An important element of ecological safety management, especially when hazards occur, are institutions for reacting in crisis (figure 10.6.).

Figure 10.6. Institutions for reacting in crisis



Source: *ibid.* figure 10.1.

10.2.5.1. National Rescue-Extinguishing System

The most important institution for reacting in crisis in Poland is the National Rescue-Extinguishing System (KSRG) established in 1995. Its main task is to protect life, health and possessions of people by means of predicting, recognizing and combating fires, natural disasters or other hazards and to ensure ecological safety. KSRG functioning is supervised by the Minister of the Interior. The system functioning at the national level is coordinated by the chief commandant of the Fire Service System, at district level – by a governor, at provincial level – by a starost. The system actions include:

1. at central level – support and coordination of rescuing actions in the country, management of the system in extraordinary situations and also setting of standards of the functioning of rescuing-extinguishing system;
2. at district level – management of rescuing actions in extreme situations when there is hazard to human life, health or to the environment in the area of a district, and support for such actions;
3. at provincial level – undertaking of rescuing and extinguishing actions there is hazard to human life, health or to the environment, and coordination of such actions;
4. at municipal level – performing of supplementing tasks supporting the actions at provincial level.

In this system of key importance is the State Fire Service (PSP) the tasks of which during fires, natural disasters and hazards of local character include mostly: conducting basic rescuing actions, performing supportive specialized rescuing activities, preparation and realization of external operational and rescuing plans for the areas posed to the effects of an industrial breakdown. PSP organi-

zational units are: National Headquarters, district headquarters, provincial (town) headquarters, the Main School of Fire Service as well as other schools and research and development units.

State Fire Service is supported also by other rescuing entities such as: Military Fire Service, institutional rescue services, municipal occupational fire services, provincial (town professional fire services, local fire services and voluntary fire services. The system may also include other rescuing units equipped with specialized equipment enabling combat with fires or hazards of technical, chemical or ecological character.

Additionally, depending on the situation, the National Rescuing-Extinguishing System may be supported by many: services, inspections, guards, institutions and entities that voluntarily (by civil and legal agreement) agreed to cooperate in rescuing actions. These are, among others: Maritime Search and Rescue Service, mining rescuing stations, National Environmental Protection Inspection, State Atomic Energy Agency (together with nuclear supervision), Institute of Meteorology and Water Management and also non-governmental organizations like: Polish Aeroclub, Polish Medical Mission, Polish Red Cross and Mountain Rescue Service (GOPR) [Zarzycki, 2009, p. 305]. The units of the National Rescuing-Extinguishing System cooperate with the entities of the State Medical Service when it comes to providing medical aid.

10.2.5.2. State Medical Service

The principles of organization, functioning and financing of the State Medical System (PRM) are regulated by the regulations of the Act of 8 September 2006 on State Medical Service⁹. The main task of PRM is to provide aid for people who found themselves in the state of sudden hazard posed to their health, whereas the executive organs are the minister responsible for health, whose competences imply supervision of the system in the country, and a governor who is responsible for planning, organizing and coordinating the system as well as for supervision of the system in the district.

PRM system is composed of:

- hospital rescue departments;
- ambulance service station which is composed of outgoing groups: specialist – composed of at least 3 people entitled to perform medical rescue activities, including a doctor and a nurse or a life-saver; basic – composed of at least two people entitled to perform medical rescue activities; neonatologist – transporting children younger than 1 year old;

⁹ Dz.U. of 2006, No. 191, par. 1410.

- aerial ambulance station– performing the tasks related to the aerial rescuing and sanitary service;
- centers of rescue alarming (CPR) – taking notifications from the alarm number 112 and sending them to the appropriate unit;
- medical controllers, whose task is to: take notifications about events, sending necessary information facilitating medical rescuing actions on the spot of the accident, informing hospital rescuing groups and the units cooperating with the system about the accident;
- doctors-coordinators of medical rescue service working in district rescue service centers.

The PRM system functions also due to participation of services that are constitutionally entitled to provide aid for people in the sudden health hazard. The most important ones include: organizational units of the State Fire Service, units of fire-fighting protection (included in the State Rescuing-Extinguishing System) and organizational units of hospitals that are specialized in terms of providing medical aid necessary for medical rescue service. Additionally, as regards education and preparation of staff, elaboration of procedure recommendations, assessment of the quality of the system and setting of directions of its development and also initiation and realization of scientific and research tasks related to rescue medicine the PRM system gains cooperation with medical universities, lifelong learning institutions for adults, medical associations at national level that are related to rescue medicine.

10.2.5.3. Other institutions of reacting

The tasks of the **National Environmental Protection Inspection** include, among others: prevention of serious technical breakdowns, transboundary effects of industrial breakdowns and sudden pollutions of transboundary waters and also removal of breakdown effects, restoring of the environment into its proper state and also monitoring of the environment – conducting research on the environment quality, observation and assessment of its state and of the changes taking place there. These activities are controlled by the Main Inspector of Environmental Protection and also governors with the aid of district inspectors of environmental protection.

National Atomic Energy Agency (PAA), being a central organ of governmental administration is proper in the situations of nuclear safety and radioactive protection. In case an alarming situation (radiation event) occurs, the Center for Radiation Events (CEZAR) directed by PAA President, plays the informative and consulting role in terms of: assessing the level of doses and contaminations as well as other expert's reports and actions on the spot, publicizing information among both the communities involved and international organizations and neighboring countries.

10.3. Monitoring and alarming about the hazards to ecological safety

10.3.1. Hydrological and meteorological service

The main organ handling monitoring of hazards of biosphere type in Poland is the National Hydrological and Meteorological Service formed at the virtue of the act – water law¹⁰. Its responsibility is hydrological and meteorological protection of society, environment, cultural heritage and economy as well as recognition of hazards of the dangerous phenomena taking place in the atmosphere or hydrosphere. Institutional hydrological and meteorological service is performed by the Institute of Meteorology and Water Management (IMGW). Its responsibilities comprise, among others:

- making measurements and observations of hydrological and meteorological type;
- collecting, processing, archiving and publicizing hydrological and meteorological information;
- making current analyses and assessments of hydrological and meteorological situation;
- elaborating and submitting hydrological and meteorological forecasts;
- elaborating and submitting to public administration organs the alarming notifications of the dangerous phenomena taking place in the atmosphere and hydrosphere;
- making hydrological and meteorological modeling as regards flood hazards and the phenomenon of drought;
- cooperating with public administration organs as regards reduction in the effects of dangerous phenomena taking place in the atmosphere and hydrosphere.

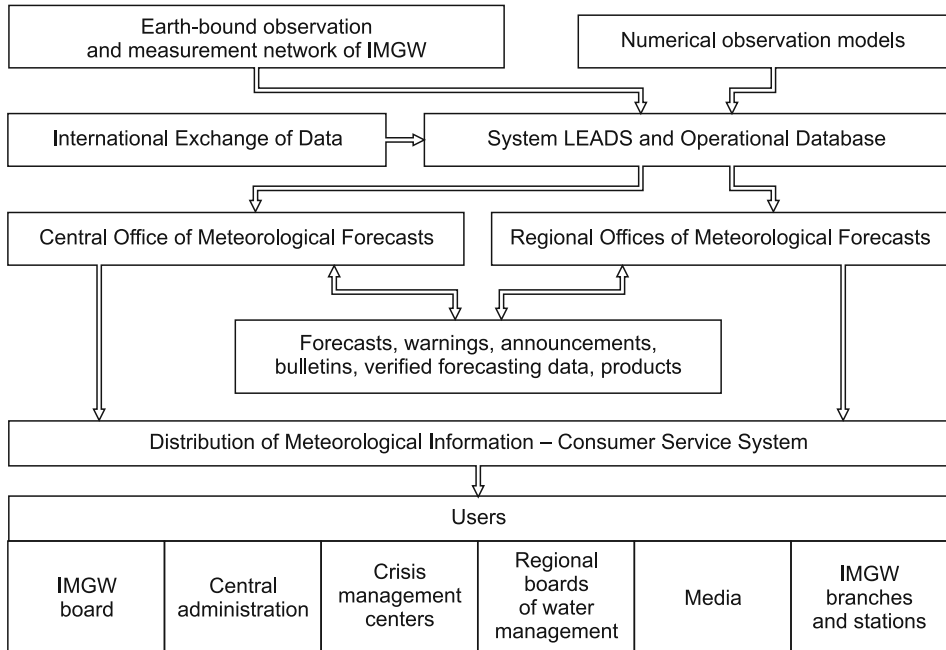
IMGW performs its tasks using appropriate instruments including:

1. measurement and observation networks including: more than 2000 earth-bound measurement units, 8 meteorological radars, 3 aerological stations, 9 detection stations with the system of detecting and localizing storms, station of collecting satellite data, sea research ship “R/V Baltica”;
2. system of collecting, processing and exchanging data as well as of forecasting and warning that includes: the Central Institute and seven regional institutes of hydrological and meteorological forecasts and protection; the system of operational and historical data base, system of numeric, statistical and conceptual forecasting models; system of publicizing data and warnings

¹⁰ Act of 18 July 2001 Prawo Wodne (Dz.U. of 2001, No. 115, par. 1229), art. 102.

- to the central and district decision-making organs as well as other users (Customer Service System – SOK); figure 10.7. presents the outline of elaborating and making forecasts and warnings;
3. Central Office of Meteorological Forecasts (CBPM) and regional offices; the Central Office of Meteorological Forecasts: responsible for coordination of forecasting activity of IMGW as regards short, medium and long-term forecasts; elaborates general and specialist meteorological forecasts and warnings on a general national scale; consults the forecasts and warnings issued by regional forecast offices;
 4. Central Office of Hydrological Forecasts (CBPH) and regional offices of hydrological forecasts; Central Office of Hydrological Forecasts (CBPH) monitors and makes forecasts of physical processes taking place in hydrosphere in Poland and also supervises the functioning of protection in the entire country.

Figure 10.7. The process of elaborating and making forecasts and warnings by the Institute of Meteorology and Water Management



Source: [Klejnowska, Ordak, 2008, p. 22-25].

10.3.2. Coordinating and informative centers of anti-flood protection

The Water Law¹¹ act imposes on the directors of regional boards of water management the obligation to handle a coordinating and informative center of anti-flood protection (OKI). The main aim of OKI functioning is to elaborate scenarios of events and anti-flood hazards as well as to cooperate with the organs of reacting in crisis at the level of governmental and self-governmental administration. OKI realizes its tasks by collecting and analyzing information related to protection against flood and drought, creating digital database for: hydro-technical devices and constructions of anti-flood protection, inundation zones, input data for hydrological models and cooperating with scientific and research institutions tackling with water management.

10.3.2.1. Forecast and operational system of publicizing characteristics of drought “POSUCH@”

The Institute of Meteorology and Water Management also handles the Forecast and Operational System of Publicizing Characteristics of Drought “Posucha”. The system is directed at supplying selected information concerning detection, analysis of intensity and duration as well as assessment of subjectivity and forecast of the hazard of occurrence of meteorological and hydrological drought. The basis of the system constitute operationally determined values of selected hydrological and meteorological indicators. The system is composed of information applications that constitute three functional modules: assimilation of operational data from historical database, analysis of data and processing of information and visualizing of results and generating of end products.

For the assessment of the hazard of drought there were selected partial catchments located in various geographic and climate regions of Poland.

10.3.2.2. System of Monitoring Farming Drought

On the basis of IMGW data in Poland functions the System of Monitoring Farming Drought, the aim of which is to pinpoint areas where occurred losses caused by drought in crops. It takes into consideration the climate water balance and spatial changeability of soil conditions. The values of climate water balance are calculated for successive six-decade periods on the basis of measurements of meteorological IMGW stations. While marking out areas affected by drought into consideration are taken not only the values of climate water balance but also the retention properties of soils which are specified on the basis of soil

¹¹ Ibidem..

categories determined on the basis of soil and farming maps. In this way into consideration is taken the strong diversification as regards subjectivity of Poland's soil cover to the effects of water shortages.

10.3.2.3. System of Anti-Landslide Protection

System of Anti-Landslide Protection (SOPO) is the national research project concerning recognition and documentation of the symptoms of mass movements in Poland on the map in the scale 1:10000. The project is realized in the Polish Geological Institute by order of the Minister of Environment from the funds of the National Fund of Environmental Protection and Water Management. The superior aim of the SOPO project is to supply credible and up-to-date data for proper management of hazards ensuing from the development of mass movements and efficient counteracting of negative effects of their development. Data collected by SOPO can be used by public administration for executing tasks that prevent hazards related to mass movements and are included in the following legislative acts.

10.4. Management of safety in the usage of genetically modified organisms

10.4.1. Description of the management object

A specific object of management of ecological safety are genetically modified organisms (GMO). This concept denotes plant or animal organisms, including microorganisms (MMO) in which genetic material was changed in the way that does not take place in the natural conditions by means of crossbreeding or natural recombination. There are isolated three types of combinations:

- 1) activity of genes that naturally occur in a certain organism changes;
- 2) additional copies of its own genes are introduced into an organism;
- 3) a gene (or genes) from an organism of another species is introduced into an organism, as the consequence of which there are formed transgenic organisms that arise the greatest controversies are particular subject of interest of safety management system.

The main object of genetic manipulations are cultivated plants. Thanks to the techniques of transgenesis they achieve better possibilities of growth and development, and thus better crops and higher quality of crops when compared with traditional specimens.

Green genetic engineering means:

- conferring resistance to herbicides, i.e. chemical plant protection substances; cultivation of plants with this property enables usage of herbicide preparations without fear of destruction of proper cultivation; this property is obtained either by introduction of a proper gene or additional copy of its own gene coding enzymes decomposing herbicides; this is one of the basic genetic changes that were made in such plants as: soya, rape, tomatoes, corn and tobacco;
- inducing resistance to disorders – this property is obtained above all by introducing a transgene coding enzymatic albumens decomposing cell walls of bacteria and fungi attacking the plants; another variant is addition of the gene of albumen which, after becoming linked with the cell membrane of pathogens causes its disorganization; resistance to viruses is obtained by plants in the genome of which there were located genes coding albumen of virus enzymes; this procedure is a certain type of vaccine thanks to which possible infection of a certain virus is much weaker and the effects of disease occur after a considerable delay; as an example can be shown tobacco that is resistant to the tobacco mosaic virus (TMV) or a cucumber that is insensitive to the virus of cucumber mosaic;
- increasing resistance to parasitic insects is obtained by using the gene of soil-dwelling bacteria *Bacillus thuringensis* (Bt) which codes Cry albumen that is toxic for insects; this albumen becomes toxic only after it is linked with appropriate receptors in the surrounding of the digestive system of an insect that consumed cells of a transgenic plant; it is not harmful for other organisms, including a man; the first cultivated Bt plant was potato resistant to potato beetle, and afterwards also cotton, corn, tomatoes and cabbage were modified in this manner;
- conferring resistance to unfavorable conditions of the environment, for example: low and high temperature, lack of water, excessive salinity of soil or pollution of soil with heavy metals, or excessive radiation; plants having such properties can be cultivated in areas which have been so far unavailable or they can be used in order to clean the environment (for example, there was cultivated charlock that is capable of accumulating heavy metals from soil);
- improving quality features – for example, modifications causing delay of ripening (as it takes place with Flavr Savr tomato); they are obtained by introducing additional genes coding the enzyme responsible for decomposition of cell walls of vegetables and fruit; however, this gene is introduced in anti-sense position, i.e. it has inverted sequence of nucleotides. Thus, modification hampers biosynthesis of enzyme.

There is considerable progress in works on new modifications. Presently, there exist the following transgenic plants:

- tomatoes having prolonged durability (decelerated ripening);
- strawberries with higher contents of sugar in fruit, delayed ripening and resistant to frost;
- soya with lowered contents of palmitic acid, resistant to herbicides, viruses and pests;
- rice with gene transplanted from jonquil that conditions production of beta carotene which is indispensable in production of Vitamin A; this procedure was supposed to be helpful in solving the problem of the deficiency of this vitamin, which is frequent among children in eastern part of Asia;
- potatoes with increased contents of starch and lowered amount of glycoalkaloids, which are in raw potatoes and are harmful for people, that are resistant to herbicide, potato beetle and viruses;
- rape resistant to pests;
- sugar-beets resistant to plant protection substances;
- corn capable of producing compounds used for production of medicines or vaccines;
- cotton producing fibres containing additions of polyester that improves its thermal isolation properties.

Worldwide in the year 2010 genetically modified plants were cultivated in 29 countries in the area of 148 million hectares (4.7 times larger than the surface of Poland). The cultivated plants included mainly corn, soya, cotton and rape. During the period 20001-2010 the acreage of these cultivations increased on average by 10% every year. The cultivation of genetically modified plants became the activity of 15 million farmers who work in both large and small farms. In geographic configuration, the largest areas of cultivation of genetically modified plants are mainly on the continent of Americas – in the United States, Argentina and Brazil.

Genetically modified organisms are widely used also in medicine and pharmaceutical industry as well as in biodegradation of specific pollutions of the environment. A typical example is production of insulin by bacteria strain into which human gene was introduced.

The influence of GMO on the environment can be both direct and indirect. Direct influence can be considered as the effect of the presence of plants having new properties in the environment and as the effects of transfer of genes from transgenic plants on wild related species, whereas indirect influence is the result of using new technologies in farming [Hails, 2002].

Theoretically, the main hazard lies in uncontrolled transfer of modified genes. Such theoretical possibility has still not been empirically confirmed. The results of research show that in nature the cases of “gene escape” are rather rare. Most doubts arise as regards the possibility of the escape of genes that condition resistance of plants to herbicides and insects, whereas less doubts are formed as regards transfer of genes responsible for other properties, e.g. delayed ripening

of fruits, increase in the contents of vitamins. Research has shown that some species manifest capability of crossbreeding of transgenic and traditional specimens. It refers mainly to rape and sugar-beet, i.e. plants from which oils and sugar are obtained, i.e. the products not containing albumens with modified genes. So far there has not been observed cross-breeding of modified and wild specimens of potatoes, soya, corn, rice, tomatoes, cornflowers, wheat, cotton and bean.

The hazard is more realistic in case of plants with Bt gene which conditions resistance to harmful insects. They can be harmful for many positive species, and thus they can disturb ecological balance of the environment by breaking trophic chain [Saxena, Flores, Stotzky, 2002].

Red genetic engineering is related to animals and microorganisms. It comprises:

- changes in genotype thanks to which transgenic animals are formed;
- genetically created hormones of growth, antibiotics and vaccinations;
- genetically modified fodder microorganisms (e.g. used in the process of preparing green fodder);
- genetically modified microorganisms that increase the effectiveness of digestion and better usage of fodder;
- genetically modified milk reactors of cows with the aim of creative curative substances in cow's milk;
- genetically modified milk bacteria (e.g. of lactic acid), which improves the quality parameters of milk.

Most controversies arise in relation to transgenic animals that have inbuilt extraneous gene into reproductive cells. Genes can be introduced into cells using three methods:

1. microinjection – gen is introduced directly into the nucleus of fertilized egg cell;
2. infection of early embryo with recombined vector of virus origin – retroviruses;
3. genetic modification of original cells of embryonic node and introduction of them into the embryo of blastocyst stage because the cells of embryonic node are capable of diversifying into all the three types of cells.

The first transgenic animal was a mouse with the gene of growth hormone of a rat. Introduction of research based on mice enables usage of them as the animal models of human diseases, which is of significant value in recognition of the course of diseases and also in planning of treatment methods. Furthermore, there was made considerable research with rabbits, guinea pigs and sheep. Presently, there has been observed intensive progress as regards cloning of embryos or mature cells of mammals, which enables obtainment of many identical specimens.

According to bio-technologists transgenic farm animals are in general safe for the surrounding [Niiler, 2002]. The probability of their getting into the environment is minimal because they are not capable of surviving and fertilizing outside a farm. The largest hazard for the environment is posed by fish (carps and salmons). It is practically impossible to avoid situations where transgenic fish escape from breeding farms into natural water reservoirs. These types of fish can manifest their adaptation advantage and displace natural species from the environment, which, in turn, may lead to the formation of new biological configurations that so far have not been observed in nature. It is difficult to estimate whether these configurations will be more beneficial from biological and economic point of view, when compared with the configurations existing so far. Therefore, in some cases it may prove be beneficial to produce sterile transgenic fish incapable of fertilization or fish with new genes in somatic cells, i.e. the introduced gene will not be transferred to the progeny.

Genetic engineering can bring a genuine revolution when it comes to combating pests. Transgenic insects that by means of genetic manipulations will no longer constitute hazard to crops and health perhaps in the near future will enable complete elimination of chemical procedures or reduction in the number of them. However, introduction of these organisms into the environment yields new not always predictable hazards.

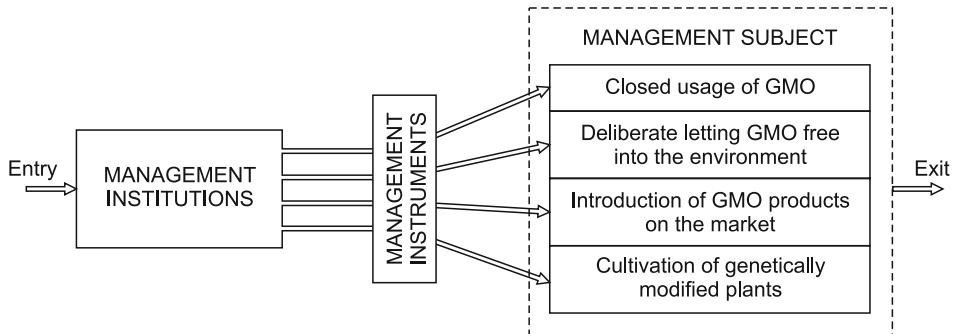
Genetically modified food means that products were created from plants or animals improved using genetic engineering techniques or by using such organisms. This group includes:

- food containing processed organisms that were genetically modified (e.g. concentrates from genetically modified tomatoes or chips from GMO potatoes);
- food produced using genetically modified organisms (e.g. bread and other products of alcohol fermentation that were produced using transgenic yeast);
- food products originating from genetically modified organisms but not containing any components of bio-manipulation (e.g. rape oil obtained from transgenic rape or sugar from transgenic sugar-beets).

Biological safety is considered as actions aiming at reduction or elimination of potential hazard ensuing from usage of biotechnology products as the effects of genetic manipulations. This is safety within one species, the organisms of which were subjected to manipulation or safety related to transgenic manipulations. The subjects of management of genetically modified organisms are: closed usage of GMO; deliberate letting GMO free into the environment; intro-

duction of GMO products on the market; cultivation of genetically modified plants¹² (figure 10.8).

Figure 10.8. Subject of management of safety in creation and usage of genetically modified organisms



Source: *ibid.* figure 10.1.

Closed usage of genetically modified organisms is the usage of security in the form of a closed institution, place or another physical barrier with the purpose to reduce contact between GMO and people and the environment during their modification, storing, transport, destroying, removal or usage. Depending on the degree of hazard to people's health and to the environment there are distinguished four categories of actions of closed usage of GMO:

1. category I – actions not causing hazards;
2. category II – actions causing insignificant hazards;
3. category III – actions causing moderate hazards;
4. category IV – actions causing significant hazards.

The assessment of hazard is based on the identification of all harmful effects of planned genetic combinations, description of the character of activity and scale of action and on the assessment of the probability of the occurrence of harmful causes. Depending on the category of actions there are selected measures ensuring containment and protection while making all the standard and non-standard activities. GMO user is obliged to comply with the principles of good laboratory practice and with the general principles of safety. The condition of initiating closed usage of GMO is elaboration of the plan of acting in case of

¹² Act of 22 June 2001 on genetically modified organisms (Dz.U. of 2001, No. 76, par. 811, with further alterations).

a breakdown causing uncontrolled proliferation of a modified organism which causes direct or indirect hazard to health or to the environment.

Deliberate letting genetically modified organisms into the environment or their combination can be conducted for laboratory purposes, without usage of securities reducing contact between GMO and people and the environment. The aim of field experiences is to test transgenic cultivated plants before registering them in the National Catalogue, assess the influence of GMO on the environment and conduct scientific research. Deliberate letting GMO free into the environment requires approval of the minister that is issued by demand of an interested party. GMO user who conducts this liberation is obliged to submit to the minister a report with a detailed description of the results of letting GMO free. The document ought to include information concerning all the hazards to people's health or to the environment. The information is supplied within the period of three months starting from completion of actions.

Introduction of GMO products on the market which are other than food and fodder is the activity which means supplying or making available to third persons with charge or free or charge the products made from modified organisms or formed with such organisms and that may be processed or used in economic processes. Union¹³ and national regulations specify the way of introducing on the market two types of plants: the first group includes cotton, rice and cut flowers, whereas the second group comprises corn, ripe, beet and starch potatoes. Introduction of these products on the market requires approval of the minister.

Special categories were specified for genetically modified food and fodder which were introduced on the market. It is regulated by the Decree of the European Union Council¹⁴. It specifies the procedure of introducing on the market genetically modified food and fodder and introduces conditions that are the strictest worldwide. The decree isolates approx. 30 types of modifications that were included in the GM food and fodder Register and require special procedure. The approval for introduction on the market is issued by the Main Sanitary Inspector. The supervision of compliance with the existing indications and recommendations is the responsibility of the National Sanitary Inspectorate and the Inspectorate of Trade Quality of Agricultural and Food Products. **The cultivation of genetically modified plants** is regulated by the Directive 02/53/EC¹⁵ of 13 June 2002 on the EU catalogue of species of farming plants. In the European

¹³ Directive 01/18/EC of the European Parliament and Council of 12 March 2001 on deliberate letting genetically modified organisms into the environment and annulling the Council directive 90/220/EEC (Dz.U.L.106 of 17 April 2001).

¹⁴ Decree (EC) 1829/2003 of the European Parliament and Council of 22 September 2003 on genetically modified food and fodder (Dz.U.L.268/1 of 18 October 2003).

¹⁵ Dz.U.L.193 of 20 July 2002.

Union it is allowed to cultivate the following types of genetically modified plants: corn, potatoes, sugar-beet, ripe and soya.

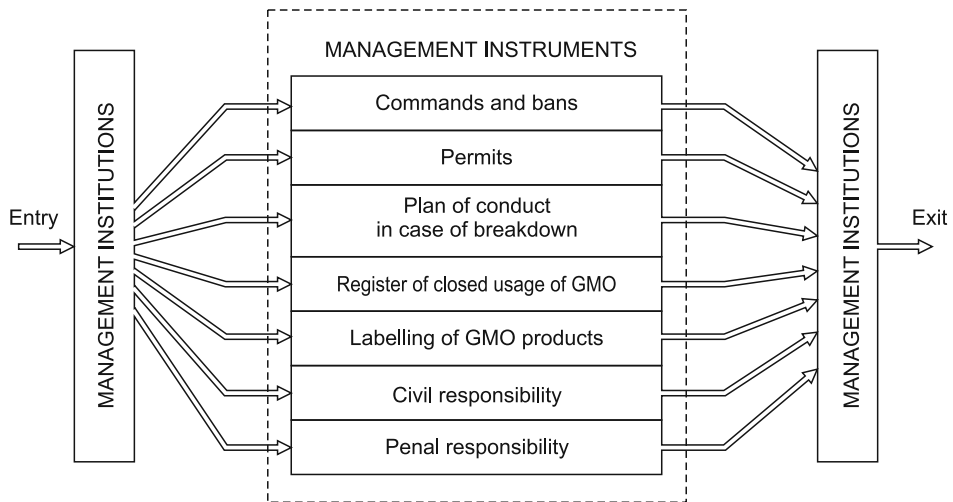
10.4.2. Management instruments

Security of creating, using and popularizing genetically modified organisms is ensured by the following instruments:

- commands and bans;
- permit for closed usage, deliberate letting free, introduction on the market as well as transport and import of GMO from abroad;
- plan of conduct in case of a breakdown;
- Register of Closed Usage of GMO and monitoring of hazards;
- labeling of GMO products;
- civil responsibility;
- penal responsibility.

The position of instruments in safety management system is illustrated on figure 10.9.

Figure 10.9. Instruments ensuring safety of production, circulation and usage of genetically modified organisms



Source: *ibid.* figure 10.1.

Commands and bans are the legally binding duties imposed on producer and users of genetically modified organisms. They regard obtainment of appro-

appropriate permits, registering, monitoring etc. Non-compliance with the commands and bans causes that people responsible for it bear penal responsibility.

Permits are given in response to the interested party request for: closed usage of GMO; having preferential laboratory; deliberate letting GMO free into the environment; introducing GMO products on the market; transport abroad and transit of GMO products. The application for issuing permit for closed usage of GMO ought to include the following substantial information: about the planned action, including the characteristic of GMO or GMO combination; about the planned levels and types of securities; about security measures during work with GMO; about the planned manner of conduct with waste containing GMO.

The application for issuing permit for deliberate letting GMO free into the environment ought to include not only general data and characteristic of the modified organism but also information concerning the conditions of deliberate letting free, including the purpose of letting free and characteristic of the environment; information about the interaction between GMO and the environment and about the manner of monitoring; the plan of reacting to hazards, manner of handling waste. Application concerning the introduction of GMO on the market in its substantial part ought to include information about the recommended precautions, permit for being introduced on the market in other countries as well as documentation of hazard assessment.

Plan of conduct in case of a breakdown ought to include information about precautions that ought to be used by people posed to hazard in case of breakdown as well as information about actions that ought to be taken by rescue services of the National Rescue and Extinguishing System.

Register of Closed Usage of GMO, which is held by the Minister of the Environment, includes: the application, Commission opinions on Genetically Modified Organisms, notices, approvals, information about breakdowns. The register is apparent and no charge is imposed for having insight into it.

Labelling of GMO products introduced on the market is the duty of an entity introducing a product on the market. The label ought to include the number of permit, name of the product and producer, predicted range of usage (e.g. industry, farming, forestry, universal usage by consumers or other specialized usage), usage and concrete conditions of using a product, detailed requirements concerning storing and transport, information about the use difference between GMO and its traditional equivalent.

Civil responsibility for losses made towards a person, possession or the environment is born by a GMO user in accordance with the civil law if the loss was made owing to conducting the activity of closed usage of GMO, deliberate letting GMO free into the environment or due to introduction of GMO on the market. The user bears no responsibility if the loss was made as the consequence of force majeure or is solely the fault of the injured party. If the loss

concerns the environment the State Treasury, territorial self-government unit or an ecological organization can demand responsibility for the loss made to the common good.

Penal responsibility is born by a person that without required permit or without compliance with the conditions indicated in the permit makes the operation of closed usage of GMO, actions of deliberate letting free, introduction on the market or transport of GMO abroad. The hazard caused as the result of these actions is synonymous with the penalty from six months to 8 years. If the effect of the action is someone's death or serious damage of someone's health the perpetrator is subject to the penalty from 2 to 12 years. The penalty of imprisonment from 3 to 5 years is imposed for: destruction of the environment to a large extent, uncontrolled proliferation of GMO, not informing about breakdown or undertaking actions without necessary securities.

10.4.3. Management institutions

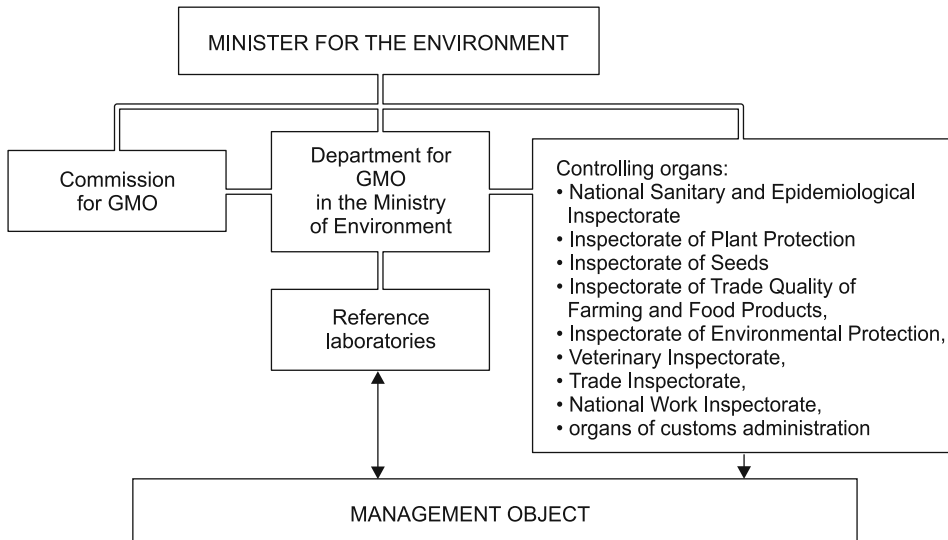
The organ responsible for all the issued connected with genetically modified organisms is the Minister of Environment. The minister's responsibilities in this domain include: issuing permits, coordination of control and monitoring, collection and exchange of information. The Minister forms the strategy of biological safety together with the program of actions, which is later approved of by the Cabinet.

The advisory organ is the Commission Regarding Genetically Modified Organisms that comprises: seven representatives of science, eight representatives of central governmental organs, a representative of entrepreneurs related to biotechnology, two representatives of non-governmental ecological organizations and a representative of consumer organizations.

The control of compliance with safety procedures during creation, liberation and usage of genetically modified organisms is conducted by: the National Sanitary and Epidemiological Inspectorate, Inspectorate of Plant Protection, Inspectorate of Seeds, Inspectorate of Trade Quality of Farming and Food Products, Inspectorate of Environment Protection, Veterinary Inspectorate, Trade Inspectorate, National Work Inspectorate and organs of customs administration. The structure of institutions handling the problems of creation, letting free and usage of GMO is presented in figure 10.10. Between 2009 and 2011 there was made attempt to update the Polish law related to ecological safety, however in the Sejm during the period 2007-2011 no consensus enabling adoption of the new act has been achieved.

In Poland the legislative basis of crisis management is the Act on crisis management¹⁶ in accordance with which this is activity of public administration that is an element of managing national safety which means prevention of crisis situations, preparation for taking control over it via planned actions, reaction in case of occurrence of crisis situation and recreation of infrastructure or restoring of its primary character. Crisis situation is the situation that has negative influence on the level of safety of people, possessions or the environment. As such situation is considered among others occurrence of hazards of biosphere character.

Figure 10.10. Institutions responsible for safety of creation, letting free and usage of genetically modified organisms



Source: own elaboration on the basis: [Struktury organizacyjne..., 2002].

¹⁶ Act of 26 April 2007 on Crisis Management (Dz.U. of 2007, No. 89, item 590).

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