



ORIGINAL PAPER

Environmental Protection: Soil Pollution and Waste Management

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Abstract:

By virtue of the desire to satisfy his growing needs, man appeals to nature, extracting from the environment renewable and non-renewable resources. Over time, the amount of resources available in their natural environment to cope with the increased demand for economic goods is growing faster than the possibilities offered by the environment. At the same time, by expanding production and consumption, the amounts of residues and waste resulting from these economic processes, including cosmic ones, increase, which affects the degree of tolerance of their assimilation by the environment, the ecological balance. In general, the ecological balance expresses the state of normality between the biotic community and its physical environment of existence, between the biocenosis and the biotope, between the biotic and abiotic factors, as well as inside them. This is achieved by self-regulation of the ecosphere and its components by respecting by people the requirements of the law of nature, not disturbing the stability of ecological balance, its inclusion in certain tolerant limits being basically the expression of peaceful coexistence of man with nature.

Keywords: *land pollution; environment protection; climate change; waste management; soil erosion.*

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Introduction

In all developed countries, important actions have been initiated to protect the natural environment at the national level and which concern: defending and conserving the forest fund and combating soil erosion; ban on polluting chemicals; establishing permissible pollution limit norms in various environments; stimulating the takeover of residues, waste, agricultural biomass; creating clean industries and technologies; encouraging the elaboration of specialized publications; actions of ecological education of the population, etc.

The intensification of international concerns about environmental protection is explained by the fact that, the outbreak of the ecological crisis seems to have highlighted, more than other global problems of humanity, the interdependencies between the states of the contemporary world, manifested against the globalization of the national economy: pollution, degradation of the quality of the natural environment in a certain area of the globe can affect, to a greater or lesser extent, the global balance of the ecosphere (Avram, 2007). As a result, solving problems related to ecological imbalances and the protection of the natural environment have become priority objectives of international cooperation (Pirvu, Gruescu, 2009: 109-113). Accelerated degradation of renewable natural resources and severe depletion of non-renewable ones, the danger of overheating the atmosphere by increasing carbon dioxide emissions into the air, the danger of melting the polar cap with rising ocean and sea water levels to the detriment of land, major floods lately in various areas of the Earth, soil erosion and desertification of large areas of land, etc., require increasing global and national concerns about the management of the natural dowry of the planet Earth (Bran, 2001).

Sustainability of Development and Sustainability of Agriculture

Considering these specificities of approaching sustainability, there are a series of formulations of the concept of sustainable development, but which are the basis for the achievement of development policies in different areas of human activity. In the opinion of Allen Robert (1980), sustainability expresses a use of "species and ecosystems at levels and in ways that allow them to renew themselves for any practical purpose... development that meets long-term human needs and improves quality of life."

Goodland R. and Ledec G. (1987) consider that "sustainable development is a model of the structural and social economic transformations available today, without jeopardizing the likely potential to obtain similar benefits in the future... sustainable development involves the use of renewable natural resources in so that they are not depleted or degraded or their usefulness for future generations is not diminished... ..also involves the depletion of non-renewable energy resources at a rate that ensures a high probability of the transition to renewable energy resources... ".

After Lynam J.K. and Herdt R.W. (1989), sustainability is the ability of a system to maintain its output at a level approximately equal to or higher than its historical average. In David Pearce's (1993) view, "the criterion of sustainability requires the necessary conditions for equal access to basic resources that are valid for each generation", which implies a series of constraints by which the consumption rates of resources should not be higher than the rates, their regeneration, and the use of the environment to be a space for waste storage, so that "waste production rates do not exceed the rates of assimilation (natural) by the corresponding ecosystems" (Pearce, Atkinson, 1995).

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Regarding the agricultural sector (Pirvu, 2011: 43), we consider that sustainable development can be identified with a process of long-term agricultural growth supported by rational processes of formation, respectively allocation, resources, conservation and improvement over time the defining characteristics and effectiveness of the determinants of agricultural growth: land (land capital); capital, physical and type of production inputs; labor resources (human capital); the state and dynamics of the environment; technical and technological progress; organizational progress: economic and social organization, in this case the competitiveness of economic agents, governmental management (agricultural strategies and policies, governmental actions); management of agricultural units.

The potential of agriculture is largely determined by existing natural resources, namely soil, water, and biodiversity resources. There is a major interdependence between these resources and human resources. Historically, agriculture has only responded to food requirements for a long time. At present, the concept of sustainable development is aimed at simultaneously achieving the following objectives: poverty reduction, food security and environmental conservation. In this context, knowledge of how farms are prepared to meet the requirements of promoting practices that contribute to the integrated approach to these issues - social, economic and environmental - is one of the main issues related to the principles of sustainable rural development. (Pirvu, 2009).

Most of the land suitable for agricultural activities is already in operation. As such, in order to meet current and future food requirements, it is necessary to adopt measures to increase the productivity of land in operation; otherwise, we can witness an unwanted expansion of agricultural land, by attracting marginal, poorly productive land into production. There are numerous warning signs that deforestation and land degradation are severely diminishing the potential of agroecosystems. Although agriculture is not the only one responsible when we encounter such situations, it still plays a major role, which can lead to compromising sustainable development when agricultural policies are inadequate and unsustainable agricultural practices (Gavrilescu, et al. 2006: 13- 24).

Decoupling economic growth from the negative effects on the environment requires a new model of sustainable consumption and production (Avram,2007:63-75). Sustainable development proposes the solution of a more efficient production, a sustainable waste management and activities in accordance with the principles of environmental protection. In terms of consumption, recycling is imperative, this requiring the transition to a circular economy and the citizen's awareness of the limits of the planet (Romania's National Strategy for Sustainable Development - 2030: 77-93).

Soil Situation, Agricultural Pollution and Waste Crisis

Soil is one of the most important components of the biosphere. As a support and living environment for higher plants, the soil, especially its humus horizon, is one of the main repositories of living matter of land and potential biotic energy captured by photosynthesis, as well as the most important vital elements (carbon, nitrogen, calcium, phosphorus, potassium, sulfur, etc.). Soil is the main means of production in agriculture. Unlike other natural resources, the soil is limited in extent and has a fixative character; once destroyed, it will not be able to recover as it was. Experimental data show that the formation of a soil layer, 3 cm thick, takes 300-1000 years, and the genesis of a 20 cm

thick layer takes 2000-7000 years. Instead, soil degradation under the influence of various harmful factors can occur very quickly for several years.

Soil pollution is the result of the action of disturbing the normal functioning of the soil, as a living environment, through physical, chemical, or biological degradation. Soil pollution can be achieved by dumping waste on urban or rural land, or by fertilizers and pesticides dumped on agricultural land, or by depositing pollutants initially ejected into the atmosphere in the form of rain contaminated with pollutants "washed" from the contaminated atmosphere, and the transport of pollutants by air currents and winds from one place to another, as well as by the infiltration of contaminated water into the soil. The main direct changes due to human intervention are accelerating soil erosion by using inappropriate agricultural techniques, while indirect changes refer to changes in toponymy and natural properties of the soil.

The general legislative framework in the field is generated by the Law on environmental protection no. 137/1995 which introduces the obligation for all owners to protect the soil, subsoil, and terrestrial ecosystem through measures of management, conservation, organization and spatial planning. Although several industrial units have been closed in recent years and others have been reduced, soil pollution remains high in many areas. Thus, according to the existing data in the records of the regional and county agencies for environmental protection, at national level there are 1,052 contaminated regions, totaling an area of 98,381.94 hectares (984 square kilometers). According to the information provided by the Research Institute for Pedology and Agrochemistry, the fertility status of the soil given by the humus content, "black gold of the earth", is low and very low on 4,943,695 ha (50.6% of the agrochemically mapped area), while on 3,967,027 ha (40.6%) the soil fertility is medium and high.

Soil degradation, through loss of fertility, occurs either: by exporting nutrients from the soil with the harvest, by sanitizing swamps, by erosion caused by massive deforestation or excessive grazing, or by acidification or salinization. The economic and energy crisis, how to carry out reforms in agriculture with the emergence of many owners lacking the necessary equipment and expertise, maintaining old technological schemes with drastic reduction of fertilizers (organic and mineral), the use of irrigation systems, led not only to a dramatic decrease in production, but also at the intensification of the soil depreciation process (Socolov, 2013: 80-88).

This situation is not to be neglected if we consider the importance that the member countries of the European Union attach to soil decontamination, while in our country all efforts in this field are reduced. Irrational use of chemical fertilizers, pesticides and herbicides pollutes the soil, subsoil and endangers the quality of agricultural products. Pesticides are used to destroy the activity of harmful insects, rodents, fungi; they have provided immense services, destroying insects that transmit microbes or that sometimes consume up to 50% of crops. However, their uncontrolled use has led to water and soil poisoning. Some of these substances degrade slowly, accumulating in some plants or animals consumed by humans. As water is the main vehicle for pesticides, they destroy or threaten the biological balance of aquatic units. A no less important role in the circulation and distribution of some pollutants is played by living organisms, which put into circulation various pollutants taken from water, air, and soil. This is the case, for example, with certain pesticides that pass from the soil into fodder, from here into the body of herbivorous animals, and through the consumption of meat and milk they eventually reach the human body. Pesticide residues can also end up in manure resulting from animals fed fodder treated with such pesticides or from straws

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containing such residues, left over from treatments applied to the respective crop, and from the manure pass to all plants grown on land areas where this type of garbage was administered.

The biggest danger in the circulation and dispersion of certain types of pollutants is their biological concentration, which can sometimes have very serious consequences. Thus, if the active substance of the pollutant used, in our example of the pesticide, is resistant to degradation, from small amounts of pesticides in soil, water or air it can reach increasing concentrations, from one stage of the food chain to another. Although the average concentration of pesticides in the composition of plant organisms does not exceed 0.1ppm (parts per million), in the animal and human body it can increase up to the order of hundreds or thousands of times. Similarly, accumulation processes can be recorded in other elements, such as certain heavy metals in water and soil, or radioactive elements that can be concentrated in certain food chains, reaching a very high concentration at the top of the food pyramid, at the end to which man is also.

In the case of pollutants, it is proven that the effect of some so-called "threshold" occurs by accumulation over time, even in extremely small quantities. These include pesticides, certain hydrocarbons, ionized radiation, and some heavy metals: Pb, Hg, Cd, etc. Attention is drawn to the chronic action that these substances exert not only on intoxicated organisms, but also on their offspring. Regarding pesticides, it is obvious that agriculture cannot dispense with their use. Aromatic cyclic hydrocarbons come from incomplete combustion of fuels in industry or in motor vehicle explosives. Mercury and lead pollution also have serious consequences for humans.

Pollution with oil products and salt water from oil and transport operations is present on about 50,000 ha. Landslides (about 0.7 million ha) due to improper exploitation but also extreme weather events (floods, drought) cause soil losses of over 41 t / ha / year.

Another factor of degradation is erosion. Along with the natural process of erosion, human activity (agriculture and intensive grazing) has become a geological factor that accelerates the flow of fertile soils into the oceans. The volume of sediments transported by rivers to the oceans is estimated at over 24 billion tons.

In addition to agriculture, mass industrialization has led to the release of more and more toxic substances into the atmosphere. From the air, precipitation deposits them in the soil where they accumulate. In addition to inhibiting the growth of useful plants and bacteria in the soil, it is possible that through food, some compounds reach the human body. Some of the pollutants accumulate in the soil, some continue their way and end up being deposited in the oceans, where persistent pesticides and other organic impurities have started to accumulate. Another aspect is given by intensive agriculture, which no longer gives the soil time to recover. The expansion of agricultural land is to the detriment of forests and other natural habitats. In turn, an increasing proportion of agricultural and forestry land are decommissioned for construction, industry, mines, waste storage, roads.

Degradation of productive capacity of soils due to agricultural overexploitation, in recent decades, has been manifested by intensified erosion processes by: landslides, hummus deficit, insufficiency of mobile phosphorus, salinization, periodic excess moisture, clogging depressions with poorly humid soil deposits, discoveries, fertile lands, etc.

Erosion covers 33% of agricultural land. The surface of eroded soils increases on average by 0.5-1.0% per year, which will cause 20-40% of the most fertile layer to be

lost in the next 50 years. The annual damage is equivalent to 2000 ha of full profile chernozems.

Excavations of the ground cover from quarry operations until 1990 were not accompanied by land reclamation works; so that 5,000 ha of agricultural land were destroyed. In the last 20-30 years, irrecoverable soil losses (damaged, destroyed by landslides and excavations) amount to 78.8 thousand ha or 3% of agricultural land.

Pollution of agricultural land is maintained, although the application of chemical fertilizers has decreased 4.3 times. At the same time, the degree of biological soil pollution in the built-up areas of the localities increased 2 times due to the lack of functional systems for the removal and use of household and zootechnical waste (Jităreanu, 2007: 6-15).

In Romania, soil protection can be achieved by developing an ecological agriculture, which does not affect the components of the environment and at the same time gives quality products. In this sense, the chemical control of pests must be gradually replaced by the biological one, the practice of monocultures must be avoided and all necessary measures must be taken to improve degraded soils, without omitting the need for reforestation and optimizing the storage of various industrial wastes and residues. Consequently, in this period of the structural reform of the Romanian economy, it is important to balance the interventionism / liberalism ratio regarding the protection of the land, as patrimony and economic factor.

Waste Management

Waste is a substance resulting from biological or technological processes, which can no longer be used as such, some of which are reusable. Waste management involves their collection, transport, recovery and disposal, including the monitoring of landfills after their closure. This is achieved through actions of recovery (recycling), storage, final storage, incineration. Recycling is the operation of reprocessing in a process of production of reusable materials for the original purpose or for other purposes. According to Government Ordinance no. 33 of 18 August 1995 reusable waste is substances, materials or products from industrial, agricultural or construction activities, transport, services and other areas of activity, as well as from the consumption of the population, whose characteristics and properties allow their reintroduction as such or as secondary raw materials in the productive circuit without risk to the environment or the health of the population. Recycling is driven by market forces, but there are situations where it has been driven by the implementation of legislation specific to reusable material flows.

Efficient waste management is the key aspect of any environmental policy. In general, due to the lack of facilities and poor operation, landfills are among the objectives recognized as generating risks for the environment and health. Insufficient capacity for the collection and transport of household waste has led to the emergence of urban or pre-urban areas where waste is stored, thus endangering the health of the population and the quality of the environment, and negatively affecting the landscape.

The commitment to the sustainable use of resources, the minimization of environmental damage, the obligation of polluters to pay and solve environmental hazards right at source, all have led the European Union to create a wide range of instruments to promote harmonization of national materials laws which are reusable. Preventing the occurrence of an ecological problem is always preferable to solving it. Minimization and prevention of generation must be one of the pillars of any strategy on

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reusable materials and waste. In 1997, the Council of the European Union promulgated a resolution on the Community strategy on the management of reusable materials. The Council expressed its conviction that the prevention of the generation of reusable materials and waste should be a priority aimed at reducing the quantities and hazards caused by waste. The European Topic Center on Waste will facilitate the collection of data on waste generation and management methods.

The main aspects that characterize the field of recycling of reusable materials, common to many countries in Central and Eastern Europe are:

- these countries cannot afford to make major investments in modernization and pollution control;
- most investments in environmental protection will have to be financed from internal funds and by establishing user fees for energy and urban services, including waste management;
- successful companies are the first to be able to invest in new technologies;
- communities that are able or willing to pay for a new infrastructure will be the first to benefit from improved reusable materials management.

In Europe, the way household waste is distributed among different types of processing or disposal units has changed little in the last ten years. Burial and incineration continue to dominate, to the detriment of recycling and reuse.

In Romania, waste management, elaboration of the national strategy for waste management, organization of training and education programs for the population, monitoring of the impact of waste on the environment are the responsibilities of the Ministry of Environment together with other competent organizations. Also, the legislation regulates the international trade and transit of waste, the obligations of the operators in the field of recovery and disposal of waste, the general conditions of their management.

The quantities of household waste are experiencing a significant increase. There are no appropriate legal regulations in this area and, what is worse, no technical solutions for safe processing and neutralization for the environment. The amount of solid household waste in urban areas is between 0.5 - 0.9 kg / inhabitant / day, which are currently incinerated in proportion of 5%, the rest being deposited in landfills, most of which are not provided with environmental protection. Rural waste differs from urban waste in composition and quantity. Until now, they have not been the subject of statistics in Romania, because they are difficult to follow in the conditions of non-existence in public communes and villages of public sanitation services. The amounts of rural waste can only be approximated. From the Romanian specialized literature and from some conducted studies it results that in our country the index of rural waste production is approximately 0.3 kg / place / day.

At the level of each county, a system of selective collection of packaging from the population must be implemented, on types of waste: paper, glass, plastic, biodegradable materials.

Romania produces 142 of the 237 categories of hazardous waste classified in the European Waste Catalog. Hazardous waste, according to law 136/1995, means "toxic, flammable, explosive, infectious, corrosive, radioactive or other waste that, introduced or maintained in the environment, can harm plants, animals or humans." Although hazardous waste has a relatively small share in the total amount of reusable materials and waste generated in Europe, it can pose a serious threat to human health and the environment if not properly managed. The largest quantities are generated by

industry, mining, and the clearing of contaminated land. Hazardous waste also comes from certain everyday goods: nickel-cadmium batteries, organic cleaning solvents, paints, and lubricating oils for car engines. The European Union is considering the possibility of amending the legal framework on hazardous waste to include those urban wastes that contain harmful substances. Some large industrial landfills have been closed due to the closure of some plants, being strong sources of pollution in the area.

Another problem is radioactive waste. Radioactive pollution is an artificial contamination of the environment beyond the limits of the natural background, which began with dust from atomic explosions and was then amplified by the creation of various laboratories and nuclear power plants that discharge radioactive water. The problem of radiation is not only a consequence of the progress of modern man, radiation being part of nature. From this point of view, the sources of radioactivity can be artificial or natural.

The main artificial sources of radioactive pollution are accidents and waste from nuclear reactors; experiences with nuclear weapons, medical treatments using radiation, various professional activities. And before it caused artificial radioactivity, man and all living things were subjected to natural radiation, coming from the cosmos (from the sun, especially during periods of solar flares), from the earth, from the ocean waters and from the atmosphere, where they have adapted, without harming evolution. Earth's radiation comes from the fact that all the materials in the earth's crust are radioactive. Within certain limits, radiation is harmless to life. The character of radioactivity is related to two aspects: the radioactivity of the elements and the lifetime. While some elements disintegrate instantly, for others the half-life is millions of years (plutonium, for example). Radioactive pollution has a multilateral and universal character, being contaminated simultaneously air, water, soil, and subsoil, and through the elements of the ecosystem, everything that is alive is slowly destroyed.

Another major problem is biodegradable waste, namely that it is not collected selectively given that over 30% is made from recyclable materials that are not recovered but disposed of, thus losing large amounts of secondary raw materials and resources. energetic. The lack of services for household and animal waste management in rural areas, transport to landfills individually and randomly by generators, is manifested against a background of total disinterest shown by local authorities to these issues.

Conclusions

However, specialized studies (Eurostat's Land Use and Cover Area Frame Survey) indicate a progressive degradation of soil quality by doubling, in the last 25 years, the perimeters subject to drought and desertification, erosion, excessive humidity, salinization or acidification as an effect of inappropriate use of irrigation facilities, compaction due to the use of heavy machinery and depletion of organic matter through the application of inadequate technologies. According to Eurostat surveys to assess land use for urban development and infrastructure needs, there is a threat at EU level.

In Romania, waste storage is still done according to standards and methods inferior to the requirements of the European Union. Urban waste, like many other types of waste, is disposed of in landfills that do not meet European standards for design and operation. There is no safe handling and storage system for hazardous waste; They are generally required to be stored by the manufacturer. Recycling must be carried out at an optimal rate, both economically and ecologically, as part of an integrated policy for the management of reusable materials, which includes alternatives such as prevention, reuse,

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and energy recovery. This involves balancing economic and environmental costs, assessing them in the light of technological progress and improving knowledge of the environmental consequences of human activities. Recycled materials should compete with originating raw materials. However, there are raw materials resulting from recycling that can become competitive with the original materials if there are solutions to internalize the costs of environmental protection.

The priorities of this period in Romania should be the following:

- separation of urban waste, imposing better management of burial and raising taxes;
- introduction of local programs to encourage the recycling of hazardous waste;
- making an inventory of reusable materials depending on the potential impact on the environment and health;
- improving the legislation on the procedures for prioritizing contaminated lands, reporting the rules for the transport of hazardous materials and waste;
- the introduction of economic instruments used in many European countries to discourage landfilling or stimulate reuse, recycling, recovery.

Integrated waste management is organically part of the vision of sustainable development and represents the materialization of the concept of the circular economy, based on recycling and conservation. In this way, any product processed by man and made unusable is treated as a raw material for the generation of other products or services (National Waste Management Strategy 2014-2020, Government Decision no. 870 of 06/11/2013).

The circular economy must represent the Romanian contribution to the EU's effort to develop a sustainable economy. The transition to the circular economy involves coordinating economic policies with those related to increasing employment in the sectors of the circular economy, increasing investment in specific sectors, developing social policies and innovation in the economy, combating climate change and its effects.

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