

Irena KOCISZEWSKA and Karol KOCISZEWSKI,  
Wrocław University of Economics, Poland

## SEWAGE SLUDGE MANAGEMENT IN AGRICULTURE IN THE PERSPECTIVE OF EU AND POLISH LEGISLATION

### 1. Introduction

In professional literature, up to 2001, a lot of the solutions so far accepted in Polish regulation in the field of waste management were perceived as unsuccessful. In June 1997 there was still an absence, to a large degree, of both terminology and legislation. The process of conveying European solutions into Polish law was carried out inconsistently and some of the solutions were simply omitted. The newly accepted system of resolutions meaning the Waste Law [Dziennik Ustaw, No. 62, Item 628, 2001], from 1<sup>st</sup> October 2001, includes the element of Polish legal conformity to EU requirements and attempts to eliminate the visible problems of coupling economic practice with waste management.

Many waste management questions in the field of environmental protection are still in the process of development. Consequently, some regulations of the former systems are still in force. In the area of sewage sludge management in agriculture the new waste act<sup>1</sup> anticipates the adaptation of Polish regulations to Council Directive 86/278/EEC from June 1986 regarding environmental protection, especially of soil and the use of sewage sludge in agriculture. It concerns the regulations of sewage use in agriculture in order to reduce their negative influence on the environment, animals and people. It is achieved through the legislation

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<sup>1</sup>According to Article 2 of Directive 86/278/EEC sludge originates in sewage works, which purify domestic sewage or municipal sewage and other treatment works and digestive chambers.

of the maximum permitted concentration of heavy metal in soil assigned for agriculture production and in sludge, as well as the maximum concentration of heavy metals which may be added to soil. It also stimulates the use of sewage sludge in agriculture, which is strongly linked to the extension of the sewage purification system. For that reason and because of preventing pollution at source, sludge input into soil in the field of so called „good agriculture practice” has great importance in the politics of water purity protection in the EU.

In Poland, regulations concerning the conditions which have to be fulfilled in the use of sewage sludge in agriculture (taking into account the EU directives) are being gradually introduced. A considerable part of its requirements are contained in the Minister of Environment's ordinance from 11<sup>th</sup> August 1999 about the conditions necessary in sewage sludge use for non-industrial aims. The next regulations were introduced in the new waste law, which is consistent with the act “The Law on Environment Protection” from 2001 and according to the decisions from section II, „it determines the rules of waste emissions in a manner assuring life and health protection and environmental protection according to sustainable development, especially the waste prevention principle or waste growth limitations and also waste disposal and its recovery.”

If the newly introduced law is supplemented with executive regulations, it will be consistent with Directive 86/278/EEC. It suggests that the implementation of Directive 86/278/W EEC is almost complete. An accommodating action will be the introduction of the Minister of Environment's ordinance defining the conditions required in municipal sewage sludge use (doses, range, frequency, research methods). Other legal measures will not be performed. The utilization of sewage sludge is not widespread and the existing rules and institutions can function properly without introducing important changes (some rules are much more strict than in the EU) [The implementation plan..., 2001; Kociszewski, 2000].

## **2. The conditions of sewage sludge use in Council Directive 86/278/EEC regulations**

Council Directive 86/278/EEC from 12<sup>th</sup> June 1986 concerning environmental protection, especially of soil, and the use of sewage sludge in agriculture refers to the regulation of sewage sludge utilization in agriculture by limiting its negative influence upon the environment, animals and people. It is achieved through the institution of maximum permitted concentrations of heavy metals in soil assigned for agricultural production (annex A of the Directive), in sewage sludge assigned for agricul-

tural use (annex B), and the maximum amount of heavy metals (cadmium, copper, nickel, lead, zinc and mercury) which can be added to the soil. The permitted concentration of heavy metals in soil can be – in relation to cadmium 1-3 mg/kg of dry mass, copper 50–140 mg/kg, nickel 30–75, lead 50–300 mg/kg, zinc 150–300 mg/kg, mercury 1–1.5 mg/kg. The Directive also requires taking plants alimentary needs into account, protection of soil condition, as well as ground and surface water [Roman, 1999, 45]. There are also regulations concerning the ground water level (minimum depth 1.2 m.), the angle of the slope of a field (not greater than 10%) and the prohibition of sewage fertilization on crop plants to be consumed raw [Code of good agricultural practice, 1999, 47].

The Directive defines the conditions of sewage sludge use, it also determines the minimal time intervals between the application of sludge on some sorts of farmland [Ibid.]. The sludge supplier is obliged to give comprehensive information about its composition, and the sludge itself must be specially examined before its use. Directive 86/278/EEC determines situations in which sludge use is forbidden: on meadows and fodder crop cultivation when grazing or crop cultivation is supposed to take place before some fixed date – defined by one of the member states, on soil where fruits and vegetables are cultivated (except trees) especially those which have direct contact with the soil and are assigned to be consumed raw. Member states have been obliged to create conditions intolerant to the overstepping of allowable values listed in the appropriate annex. It has a special meaning for acid soil (pH lower than 6.0) where there is a danger of plant absorbing heavy metals. Another annex defines the procedures and periods (at least once every half-year) of carrying out research and analysis of soil and sludge. They should not only take into account the content of the heavy metals mentioned above, but also soil pH and organic matter. The directive obliges the keeping of special records [Mering, 1999, 184].

Sewage sludge which is the product of sewage conditioning may be used in irrigation or fertilization of fields or fish-breeding ponds under the condition of fulfilling certain sanitary requirements and standards referring to the amount of heavy metals in the top soil layer. They are used because of their mineral components and in utilization. The risks which may result from this refer to the excessive concentration of heavy metal (which later accumulates in living organisms) and sanitary danger – connected with the presence of disease bacteria, viruses and parasite eggs. Another effect of sludge use is the reduction of soil permeability and oxygen content, which has a negative influence upon root growth.

In 1999 Polish municipal sewage treatment plants produced about 354,400 tons of sewage sludge dry matter. 123,807 dry matter tons were used for non-industrial purposes (including agricultural aims). It is estimated that the amount of sewage sludge used for agriculture purposes in Poland does not exceed 10% of the sewage sludge used for non-industrial aims. Very often sewage sludge composition exceeds the permitted concentrations of heavy metal values for agriculture purposes. Consequently, about 60% of sewage sludge might be used only for non-agricultural purposes, and 80% for ground surface fixation (farmland reclamation) [The Environment Negotiation Area, 2001]. Anyone wishing to use sewage sludge has to have legal permission.

### 3. Implementation of Directive 86/278/EEC in Poland

A large part of the directive requirements is contained in the Enactment of the Minister of Environment from 11<sup>th</sup> August 1999 referring to conditions which have to be fulfilled in the use of sewage sludge for non-industrial purposes. It was based on Art.16, par. 3 of the Waste Law from 27<sup>th</sup> June 1997 [Dziennik Ustaw, No. 96, Item 592, with later changes, 1997]. The ordinance sets the permitted concentrations of heavy metal in sewage sludge, soil on which sludge will be used, the frequency of research and the methods of sample collection examining sewage sludge and soil. The document also determines the areas in which sewage sludge must not be used. However, the act does not include any regulations concerning controlling sewage sludge usage in agriculture. Full conformity of Polish and EU regulations in that respect is supposed to be achieved with the acceptance of the new Waste Law (1st October 2001) and related executive regulations.

The Waste Law from 27<sup>th</sup> April 2001 [Dziennik Ustaw, No. 62, Item 628, 2001] replaces the Waste Law from 27<sup>th</sup> June 1997 which previously a created legal and administrative basis for sewage sludge use in agriculture. The revised law contains the definitions of basic concepts, the rules and plans of waste management, the duties of waste owners and some principles concerning special types of waste management (Art. 43 relates sewage sludge use). Separate articles regulate thermal waste transformation, its disposal and storage and international waste circulation. Penal regulations (custody or fines) provided for non-compliance with act regulations also refer to inadequate use of municipal sewage sludge – for example in agriculture. The act also contains annexes defining: waste categories, dangerous wastes, waste components and properties. One of the tables in the annex includes information about mechanisms which first use and than recover wastes – also spread them on soil

surface – to fertilize or improve soil or land reclamation of soil and ground. The annex also embodies the processes of waste disposal – for example in the soil and ground (biodegradation of liquid wastes or sludge in soil and ground) or surface storage (e.g. putting waste on sludge beds or lagoons).

The law sets new regulations – the ordinance accepted by the Minister of Environment and Minister of Agriculture, which will contain conditions which have to be fulfilled with the use of municipal sewage sludge (dozes, frequency, range and referential methods regarding municipal sewage sludge and soil research). In the new legal regulations there are limits to the concentration of heavy metals in soil and the amount of heavy metals that can be emitted into soil within a year together by sewage sludge – defined earlier in the act of the Minister of Environment, Natural Resources and Forestry from 11<sup>th</sup> August 1999. The regulations are much more strict than the EU Directive values in some respects.

Article 43 of the new Waste Law, allows the possibility of municipal sewage sludge use in arable crops, land re-cultivation, plant crops for compost production and plant crops not for consumption and fodder production. However, their use is subjected to certain conditions. They should be stable and prepared for the means and the purpose of their use, by undergoing biological, chemical, thermal or other treatment that eliminates environmental and health threats. Both municipal sewage sludge and land on which they are supposed to be used should be examined by the producer of municipal sewage sludge (sewage disposal works). Such a manufacturer is obliged to give results, together with information about sludge doses which might be used on particular land to an owner, leaseholder or other person responsible for such real estate. Such information should come from earlier registration of sewage sludge quantity and quality. Registration will be kept according to the waste catalogue, created on the basis of Council Directive regulations 75/442/EEC on waste emission. In the case of contractors who carry on their activities in the field of recovery or disposal of sewage sludge, registration will also consider the methods of waste management (sewage sludge) including their origin and destination [The implementation plan..., 2001]. Sewage sludge registration will be also recorded by a waste owner, who carries out activities in the field of gathering, transport, recovery or disposal of sewage sludge. Sewage disposal works, as waste manufacturers, are obliged (according to the new law) to have an integrated permit (the Environment protection law) and obtaining permission for waste production (more than 1 tonne).

The law forbids the use of sewage sludge: in national park areas, nature reserves and other forms of environmentally protected areas, in ar-

areas of inland water protection, in land that directly adjoins to lake banks and watercourses (50 m wide). Also in lagoon areas, temporarily flooded land and swamps, as well as land frozen and covered with snow, in ground with high permeability if the ground water level is lower than 1.5 m below ground level. In agricultural areas with a slope surpassing 10%, in areas with alimentation of underground water reservoirs, if sewage sludge is produced outside the areas. In areas situated at a distance not less than 100m from a water supply, dwelling house or food production plant, in land used for fruit and vegetable cultivation (or areas destined for cultivation), whose edible parts touch the ground directly and are eaten raw – during 18 months before cultivation and during cultivation on land used for pastures and meadows.

In relation to protection against dangerous waste, the Minister of Environment's act from 3<sup>rd</sup> August 1993 considering the creation of a dangerous waste list [Dziennik Ustaw, No. 76, Item 362, 1993], includes an annex with a list of dangerous wastes, some of which are connected with agriculture: animal excreta, other biologically infected wastes, spoilt or out of date food products and feeding stuff. The list also includes used phytosanitary packaging, wastes coming from biocides and phytopharmaceutics, crop protection chemicals, outdated or withdrawn from use biocides and phytopharmaceutics. Animal excreta are accepted as waste, if they are not used in the field of agricultural production in a manufacturing cycle.

#### **4. Comparison of Polish and EU legislation and measures which have to be performed in practice**

The implementation of Directive 1986/278/EEC concerning environmental protection, especially of soil, and the use of sewage sludge in agriculture, carried out on the basis of the new Waste Law from 27<sup>th</sup> April 2001 and related regulations, includes in the directive the obligation of registering the quantity and quality of sludge. According to the law, a municipal sewage sludge manufacturer (meaning treatment plants, which are obliged to have integrated permits) have to examine municipal and ground sewage sludge in the areas where they will be used and is also responsible for registration keeping. He is supposed to give the results and information about the doses of sludge that might be used to a land owner. The registration mentioned above will be kept according to the waste catalogue created on the basis of Directive 75/442/EEC concerning waste. Polish legislation also fulfils requirements concerning the

elimination of threats to the environment and human health, which may be the result of sewage sludge use and refers to appropriate treatment,<sup>2</sup> and specifies the areas in which sludge cannot be used (areas important to the environmental state or people's supplies). The means of waste management (sewage sludge), regulated by one of the tables in the waste law annex, refer to the use and recovery of waste – including application to the surface to fertilize and improve soil, or ground and land reclamation. Legal regulations presently being introduced (taking into account executive regulations, which will supplement the Ordinance from August 1999 where other directive requirements are included) confirm the Directive (86/278/EEC). This may suggest that its implementation has finished [The implementation plan..., 2001]. A problem may arise while introducing limitations to sludge use on acid-polluted soil (where plants are more prone to heavy metal assimilation), which will probably be settled by the introduction of the above listed by-laws.

Owing to this, no important new regulations are intended. Though the use of sewage sludge is not widespread and the regulations and institutions already existing are able to fulfil their proper functions, they should adapt to issuing permits and inspections performed by the Environmental Inspectorate. According to the new waste law, a foreman and a voivode (governor of a province) are the organs responsible for regulating sewage sludge use on farmland. A Province Marshal will be responsible for database creation and storage in the field of waste management (including a list of production permits and sewage sludge management), he will be obliged to carry this out on the basis of a general quantity and quality database referring to the use of sewage sludge in agriculture. The information will come from sewage sludge producers, meaning sewage disposal works, which will have to, according to the new waste law, carry research into soil and sludge use in agriculture. The Marshal will have to make a regional report and pass it on to the Minister of Environment, who is responsible for the central database. Regional databases will be also accessible to the voivode, foreman, mayor, city president, the Environmental Inspectorate (it will conduct the required controls) and the Provincial Statistical Office.

The voivode will give permits for the recovery and use of sewage sludge for enterprises dealing with projects highly influential on the environment and who are to treat making an environmental impact report as their lawful duty. This refers to sewage treatment plants with a great

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<sup>2</sup> In Article 2 p.b. of Directive 86/278/EEC there is a definition of "conditioned sludge" – such sludge underwent biological, chemical and thermal or any other treatment that can reduce health threats in the case of its use.

throughput. The foreman will be the suitable organ for giving permits for the recovery and use of sewage sludge to other waste owners, who are entrepreneurs and will keep records of persons, who are not entrepreneurs but want to utilize sewage sludge. The local administration of a community council is supposed to be responsible for the registration system and inspection of fertilization plans. The roles of research institutes and ministries of agriculture and environment are crucial in preparing the section analysis of fertilizers, mineral and organic fertilization and education.

A permanent increase in the number of jobs will take place because of records-keeping (the evidence), issuing permits and the registration of sewage sludge use. A voivodeship (province) will need 10 regular jobs and an administrative district 60 regular jobs (meaning the whole country) to fulfil certain tasks connected with record keeping, registration and issuing permits for sewage sludge use. The 10 regular jobs in a voivodeship are connected with plans concerning the employment of 2 people in an area to realize new waste management tasks (including the expanded registration of wastes other than sewage sludge) and sewage sludge registration will create about one-third of them. Additionally, there will be schooling for government administration connected with the practical introduction of the new waste law, and other issues concerning sewage sludge management.

There is also no need for building additional installations or other sewage sludge disposal units, used up to now in agriculture. Owing to the fact that the application of sludge to fields takes place with the use of standard organic manure scattering, there is no need for extra action regarding to transportation and application of sewage sludge to fields. In 1999 such guidance referring to sewage sludge use in agriculture entitled "Technical Possibilities of Rational Sewage Sludge Management" was published by OBREM (the Research and Development Centre of Urban Ecology). Except for the already existing guide, the Ministry of the Environment is supposed to publish a detailed guide (10 thousand copies) entitled "The Use of Sewage Sludge for Non-industrial Purposes." This new guide will be a supplement to the existing one. The Environmental Institute is responsible for preparing it as the supplement to the act concerning the use of sewage sludge for non-industrial aims (from 1999), in order to convey it to every local and regional administrative unit, to sewage treatment plants and scientific study units.

Despite the fact that so far there has been little use of sewage sludge in agriculture, there is a necessity of its monitoring (it was included in the act from 1999). It will consider sludge and soil examination in areas where sludge will be used and temporary Environmental Inspectorate

controls. The research will include pH, dry matter content, organic matter, total nitrogen, total phosphorus, calcium, magnesium, heavy metals, as well as disease bacteria and parasites. The research will be conducted in laboratories, in sewage works and in the case of more technical research required by the EU directive will be conducted in the laboratories of the Provincial Environmental Inspectorates. In this case there is no need for creating new laboratories [The implementation plan..., 2001].

## 5. Conclusion

The purpose of Council Directive 86/278/EEC is the implementation of regulations controlling sewage sludge use in agriculture in a manner preventing their harmful influence on soil, plants, animals, humans and for defining the conditions of proper sludge usage. Such use should be forbidden if heavy metal concentration in soil, the amounts added in a period of one year, go beyond the set limits specified on the basis of the average from the last ten years. The differences in the regulations of certain member states, referring to the use of sewage sludge, may influence the functioning of the common market. It is important to Poland, as a country which is expected to be a member of the EU soon. Consequently, there is a necessity of harmonising legislation in this field and collecting basic information aimed at conscious use of sewage sludge in agriculture.

The waste amendment act and the introduction of the corresponding regulations have conformed Polish law to EU standards in the field of sewage sludge use. Practical realization of the law can be performed by institutions, which should adjust to their new tasks. It refers particularly to administration organs (especially considering data transmission). This is possible because of the relatively low sludge use in Poland. If the amount of sludge increases, as the result of treatment system development, the practical execution of the law will result in intensified financial and organizational efforts.

## Literature

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