



Guidelines

FOR INSTITUTIONS

for nutrient management
at biogas plants

PURPOSE OF THE DOCUMENT

The benefit of greenhouse gas emission reduction caused by anaerobic fermentation can be significant for achieving Paris agreement objectives, which are - reducing the emissions related to energy production, and the management of agricultural residues and other waste.

Replacement of current fossil fuel by local renewable resources is not possible without observation of CO₂ emission reduction policy.

Biogas production in such conditions opens new perspectives for industry of renewable energy, returning carbon back to its natural life cycle.

Production of environmentally friendly biogas

can ensure sustainability for soil that is very important for nutrient turnover cycles, i.e., nitrogen and phosphorus. Inappropriate legislation, biogas station designing standards and management practice may cause future environmental risks related to intensified eutrophication in both local water bodies and the Baltic Sea.

The aim of these guidelines

is to help environmental authorities to plan and implement biogas production in a more sustainable way from the point of view of nutrient management. The guidelines aim to minimize nutrient emissions from the storage and transport of feedstocks and digestate, the use of digestate, disturbances and accidents, and the treatment of wastewater at a biogas plant or when conveyed to a municipal wastewater treatment plant.

LEGAL REQUIREMENTS FOR SUSTAINABLE NUTRIENT MANAGEMENT

The most important aspect is that biogas plants everywhere should operate in accordance with BAT (Best Available Techniques) for waste management.

Each country sets individual rules when the Environmental Impact Assessment must be done before the construction of a biogas plant and what are the environmental permit requirements.

From the point of view of nutrient management,

the most important parts of the permit application are emissions, load and waste, environmental impacts, risk management methods and an environmental impact monitoring plan.

There are several minimum requirements that should be implemented in every country:



in order to avoid environmental problems due to increased volumes, the permit decision shall specify the maximum permitted capacity of the installation, expressed as the maximum amount of waste to be treated or received;



waste facilities must describe how and where the waste is collected, how it is transported, how it is used and how the process works;



regarding discharged wastewater (e.g., rainwater, condensation water) regulations should contain limit values for certain substances or parameters, such as nutrients. Concentrations or loads and the installation may be required to monitor them. The facility may also be required to monitor the status of water bodies;



the operator should perform the monitoring on biogas plants according to the monitoring regime conditions mentioned in the section of polluting activity permit's regulations, **an annual report on self-monitoring must be submitted to the supervisory authority for approval;**



nutrient management risk related to digestate concentration in nutrient residue zones occurs because very often it is too expensive to transport nutrients to the nutrient deficit zones. Digestate may be stored in warehouses (storages) or may be used in agriculture more than it is required, or may be used for landscape relief formation, exceeding plant needs (over-fertilizing). **Therefore, when new permits are issued, the applicant during the procedure should explain where and in what scope it is intended to spread manure or digestate and how it will be planned;**



requirements for various feedstocks should depend on their type and quality. For example, animal by-products are covered by the EU By-Products Regulation (No 1069/2009). It aims to prevent the spread of diseases. In addition, waste legislation should regulate the treatment of substances defined as waste in anaerobic fermentation process;



in order to enter the EU market, fertilizer preparations must bear the EC label. In order to place fertilizer products on the market, a biogas plant must register with the authority which is responsible for fertilizer control.

In order to prevent nutrient leakages from digestate use

in landscaping authorities should pay attention to regulation in this sector. Usually, landscaping is not a subject to statutory nutrient limits. Large landscaping sites, such as landfills and mines, should require an environmental permit that regulates the quantity and quality of fertilizer products used.

INTERACTION BETWEEN AUTHORITIES AND OPERATORS FOR SUSTAINABLE FUTURE OF BIOGAS INDUSTRY

In general, according to the objective of EU Member States, the reduction of landfilling of organically degradable municipal waste should be promoted through the establishment of a functioning management system for industrial and household biodegradable waste and residues and their centralised recycling, for instance in anaerobic fermentation process.

Execution of such initiative may require implementation of obligations stated in the law for municipalities and industries, including anaerobic fermentation stations as obligatory places for final processing of this waste.

In such model the biogas plant takes important role

and each citizen or company, which creates biodegradable waste or residues usable in anaerobic fermentation would participate in the provision of raw material for the further extension of such station's activity.

In general, the involved parties should set the objective – not to create degradable waste that stays in the environment at all and organize its collecting and processing as optimally as possible.

Creators of
biodegradable
waste and residues:
citizens, companies

Legislator
Institutions
Biodegradable
waste and residue
management
systems and
equipment

Climate objective
State
independence in
energy
Sustainable biogas
production and
nutrient circulation
Circular economy
principles

Interaction principles for the future of sustainable biogas industry

It would be desirable to implement specific environmental policies in each country to increase the recycling of organic waste, including such recycling in biogas plants, as the production of biogas generates added value (electricity, fuel and heat) and meets the long-term objectives of large-scale environmental policies (prevention of greenhouse gas emissions, reduction of chemical fertiliser use and reduction of nutrient leaching from soil to watercourses).

The authorities should establish and implement a legal framework in order to make citizens, businesses and municipalities interested in using organic waste (including waste from households, parks and other green zones) primarily for the production of biogas.

Municipalities should review the possibility of building new biogas plants or cooperating with existing ones, taking into account the available resources of organic waste and agricultural residues in the region.

The calculation of biomass resources should include municipal organic waste, sewage sludge, organic residues of food, feed or other industries, park, forest waste, plant biomass from non-agricultural areas, agricultural residues and manure from farmers, where their use is not linked to disproportionate transport costs. Planning of such resources would provide appropriate usage of current biomass resources.

In order to disseminate knowledge on the potential risks that may arise from the operations of a biogas plant, permit issuing authorities should ensure that the potential operator consults environmental experts prior the initial environmental impact assessment is started.

Cooperation between authorities can improve nutrient management authorization processes. In Sweden, for example, various authorities systematically consult during the permitting process. In Germany, on the other hand, the building permit authority contacts the fertilizer authority, which is considering the management of nitrogen and phosphorus for a permit decision. The same applies to annual monitoring.

Control and monitoring authorities should promote awareness among biogas operators on the environmental risks associated with the storage and use of feedstocks and digestate, by organizing seminars and making informative materials.

Public authorities could provide information on nutrient recycling, for example through training for those working with biomass.

Increasing nutrient awareness in general could also benefit society and the environment.

Subsidies for renewable energy production can lead to a rapid increase in biogas production.

Without adequate regulation and control of nutrients, this can lead to regional nutrient surplus and increase nutrient loads to water bodies. The aim is not to limit the growth of the biogas sector, but to strive for more sustainable use of nutrients.

In addition to comply with laws and regulations, public authorities and biogas producers can promote the sustainable use of nutrients by implementing existing or new good practice.

Increasing the dialogue between public authorities and biogas producers is a key way to increase the sustainable use of nutrients in accordance with the principles of the circular economy.

This can mean, for example, exchanging information and increasing the transparency of information. It is important to strengthen legislation that supports the use of biogas for heat and power generation, biomethane production and infrastructure for it (biogas treatment plants, filling stations, gas networks with connection points, etc.), especially in those countries that are now starting to produce biomethane.

Managing authorities should give special support to projects, including EU-funded projects, for the technical modernization of biogas plants and the improvement of nutrient management, thus facilitating the transition to biogas plants as nutrient processing centres.

Operators of biogas plants should indicate where the nutrients they produce end up.

The main benefit would be the identification of the regional nutrient situation and more effective control of nutrient flows, e.g., digestate application in soil.

It is advisable that an electronic inventory system is established throughout the country, which lists all biomass (manure, sewage sludge, food residues, etc.) and reflects regional flows of this biomass.

Such a database can be easily used for regional nutrient management,

for the identification of nutrient surplus risk zones and for planning new biogas plants, particularly in areas with high use of digestate. When combining biomass flow data with general soil monitoring data, planning can be carried out at an in-depth level, e.g., by drawing up crop fertilisation plans.

HOW AUTHORITIES CAN ELIMINATE LEAKAGE AND ACCIDENT RISKS

Decision-makers, biogas plants and permitting authorities should be aware that biogas production is not just about energy production, but also involves important nutrient management issues that need to be taken into account in all activities and regulation.

In Germany, for example, decision-makers have an understanding of the need for nutrient management in relation to biogas production, and biogas production is taken into account in the calculation of the national nutrient balance.

To reduce nutrient loss by volatile compounds authorities should support the development of local biogas plants in livestock farms, particularly in farms with a smaller number of livestock.

In the permitting process for small biogas plants, it is recommended to have a discussion between the permitting authority and the operator on the risks and problems of nutrient use.

In order to reduce the risk of nutrient leaching, the use of digestate at field level should be based on crop needs and nutrients available in the soil.

It is recommended to perform direct incorporation of digestate in soil or shallow cultivation immediately after even spreading to minimize ammonia evaporation into the air.

Institutions should help to find digestate users in cases where a biogas operator is unable to incorporate digestate into its fields, including but not limited to development of the market for recycled nutrients.

The growth of the market encourages biogas producers to process digestate into high quality products. It is good practice in nutrient surplus areas to process the digestate so that nutrients can be transported out of the area.

The current EIA and permitting processes do not take into account the regional nutrient balance, i.e., whether a biogas plant is planned for a nutrient deficit or surplus area.

Biogas plants operating in the nutrient surplus area may receive raw materials from areas with nutrient shortages, further distorting the balance of nutrients. Authorities should recommend the location of biogas plants depending on the existing or expected availability of raw materials and areas for digestate use in the municipality.

It is also important to ensure that biogas plant operators understand whether they source their raw materials from surplus or deficit areas and what is the environmental significance of that.

The responsible authorities can provide support for the voluntary implementation of best practice aimed at reducing emissions and leakages,

such as gas-tight storage covers, installation of wetlands or bio-ponds, upgrading of rural drainage systems, etc.

This can be done in the form of financial grants,

reduced environmental taxes and other forms of incentives. In cases, when biogas plant improves its environmental impact of activity, responsible authorities should show supportive approach when making amendments in the permit in a way that they should create internal objective – if the company by its initiative make improvements in relation to environment protection, then after improvement implementation, the modifications to polluting activity permit should be done more easily and faster.

In order to make information on good practice available in one place, it is advisable to establish an international database on examples of good environmental practice in biogas plants in the Baltic Sea region.

Then in each country the responsible institution could decide whether exact example complies with national level good practice requirements so that more knowledge about environmental protection is spread across the region.