

Sanitation: A continuous challenge for the European Region

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Sanitation: A continuous challenge for the European Region



While the majority of Europeans have access to sanitation and properly functioning wastewater treatment, there are still many who remain unserved by improved systems, particularly in Eastern Europe, the Caucasus and South Eastern Europe. Within the EU, more than 20 million citizens do not have access to proper sanitation systems – most of them living in rural areas and small communities.

To address this situation European legislation needs to encourage innovation, not prescribe fixed solutions. Sustainability (economic and environmental) and resource efficiency, in particular the reuse of water and nutrients, are the future of sanitation in Europe.

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Several events within the European Regional Process contributed to the content of this chapter: the Workshop “EU Sanitation Policies and Practices” on 29 January in Brussels, the Wageningen Brainstorming and Coordination meeting on 20 May, the Zaragoza Workshop on 8 and 9 July, the Seminar during World Water Week on 19 August in Stockholm, and the workshop in Budapest on 8 and 9 October.

Status of sanitation in Europe

The European region has for many years been a frontrunner in improving sanitation and wastewater systems. A key factor was the introduction of water-borne centralized systems for waste water collection and treatment as a standard. The great majority of the citizens in the European Union have access to safe sanitation. The coverage of improved sanitation is higher than 94% and public hygiene is no longer a concern for almost all EU member countries. Since the nineteenth century, surface water quality has been greatly improved in most EU countries due to the achievements of advanced wastewater management.

However, this does not mean that sanitation is no longer a challenge for Europe. Many Europeans still do not have access to improved sanitation, and, in spite of the existing wastewater treatment systems, the quality of many surface waters is negatively affected by nutrients and microorganisms from discharged wastewater.

Parts of Europe have had public sanitation systems for over one hundred years, particularly in the cities. These have been improved progressively with time as the demands for public health and environmental protection grew. However, population growth and changing demographics have put additional pressures on these aging systems, and many are now in need of replacement.

In parts of South-Eastern and Eastern Europe and the Caucasus, including the Russian Federation, sanitation systems in many rural areas, and in some urban areas, have not been improved and in some cases have actually deteriorated during the last 20 years.

Changes in regulations, population growth, energy costs and climate mean uncertainties in how to invest for the future. And risk management, which is becoming an increasingly important factor in planning, is affecting sanitation decisions as well.

What is sustainable sanitation?

The main objective of a sanitation system is to protect and promote human health by providing a clean environment and breaking the cycle of disease. In order to be sustainable, a sanitation system has to be not only economically viable, socially acceptable, and technically and institutionally appropriate, it should also protect the environment and the natural resources.

There is no one-for-all sanitation solution that fulfils the sustainability criteria in different circumstances to the same extent. The best solution depends on the local framework and the existing environmental, technical, socio-cultural and economic conditions. Taking into consideration the entire range of sustainability criteria, it is important to observe some basic principles when planning and implementing a sanitation system. These principles were developed some years ago by a group of experts and were endorsed by the members of the Water Supply and Sanitation Collaborative Council as the "Bellagio Principles for Sustainable Sanitation" during its 5th Global Forum in November 2000:

1. Human dignity, quality of life and environmental security at household level should be at the centre of any sanitation approach.
2. In line with good governance principles, decision making should involve participation of all stakeholders, especially the consumers and providers of services.
3. Waste should be considered a resource, and its management should be holistic and form part of integrated water resources, nutrient flow and waste management processes.
4. The domain in which environmental sanitation problems are resolved should be kept to the minimum practicable size (household, neighbourhood, community, town, district, catchment, city).

Source: Sustainable Sanitation Alliance
www.susana.org/index.php/lang-en/vision/42-vision/53-what-is-sustainable-sanitation

European support for the International Year of Sanitation

Motivated by the UN's decision to declare 2008 as International Year of Sanitation (IYS), a group of European organisations active in the field of sanitation took the initiative to form the Sustainable Sanitation Alliance (SuSanA), an international task force to support the IYS. The overall goal of the SuSanA is to contribute to the achievement of the MDGs by promoting sanitation systems that consider all aspects of sustainability. In addition, two high level meetings focusing on the sanitation problem in the EU were organized by a group of NGOs in Brussels and Stockholm.
www.susana.org/

Urban sanitation in Europe

The challenge of sustainability

In the last century, the basic concept of collecting domestic liquid waste in waterborne sewer systems, treating the wastewater in centralised treatment plants and discharging the effluent to surface water bodies became the accepted approach to urban sanitation in industrialised countries. The catastrophic epidemics of cholera, typhus and other diseases that struck many European capitals in the 19th century triggered vast sanitation work intended to drive the "miasmas" outside city limits. The Seine became the sewer of Parisians, the Thames that of Londoners, the Danube that of Budapest and the list goes on. Once major drainage of cities was started, it took a century and a half to repair the damage caused to rivers and coastal waters. Budapest's wastewater is still discharged untreated into the Danube. The city is currently building a high-tech station that will treat most of the Hungarian capital's wastewater. Given the accelerated rate of global urbanisation and the expense and time it takes to undo damage to aquatic ecosystems, urban sanitation deserves a high place on the political agenda.

Density is the key to sustainable urbanism. This does not mean ipso facto "vertical" urbanism composed of skyscrapers and apartment high-rises. Paris is the densest city in the world with more than 20,000 inhabitants per km²; Athens is not far behind. In spite of this, there are relatively few buildings with more than six stories in these two capitals. This is a little known fact and breaks down presuppositions on dense urbanism.

Density saves space, all types of infrastructure systems, e.g., mass transport, energy, water and sanitation. It must be remembered that the city dweller has a need for open natural and aquatic spaces in his daily urban existence. The French Water Agency, Seine Normandy, proposes "blue and green cuts" in the urban tissue that can serve as recreational spaces, rich in fauna and flora, and as buffer zones for sanitation and management of rainwater runoff. Especially for newly developed areas, we can adopt a logic in which it is no longer water that adapts to the city, but the city that adapts to water

Why centralised treatment is not the only answer

Centralised collection and treatment systems have long been the preferred operational model, and the EU Urban Waste Water Treatment Directive (UWWTD) requires such systems for agglomerations with more than 2000 inhabitants. Although these conventional sewer and treatment systems have significantly improved the public health situation in those countries that can afford to install and operate them properly, it is not the only available solution and often not the most appropriate one. The high initial capital investment and the long-term fixed costs can negatively impact the sustainability of these systems. For many semi urban (and rural) areas in lower income countries in the South-Eastern and Eastern part of Europe and in the Caucasus, the conventional sewer and treatment systems are unaffordable. Finding low-cost and sustainable sanitation systems is a key challenge for reaching the Millennium Development Goals on sanitation in Europe.

It is a fact that in developing areas centralised infrastructure networks cannot be constructed quickly enough to keep up with growing populations. It is also a fact that present urban solutions are usually disposal oriented and cannot exploit the reuse potential of different “waste” streams. However, in some areas, point-of-production reuse schemes are being implemented and some treated effluents are being reused. To support and encourage such initiatives, Europe needs innovative solutions with a focus on ecological, economical and socio-cultural sustainability.

Sewerage-based sanitation may not be viable in all areas suffering from water scarcity, unreliable water supply services, lack of skilled labour for operation and management, and lack of financial resources. Instead, other systems more suited to the local environment need to be implemented. Regardless of the technology used, it must address the need to reduce environmental and ecological degradation that the discharge of untreated wastes causes to surface and ground water, and the immediate health risks to households and communities from faecal contamination.

To achieve the objectives of halting environmental degradation, protecting water supply sources, and subjecting municipal wastewater to advanced treatment (such as making nutrients available for reuse or eliminating carbon, nitrate and phosphate), may cost more in the short-term, but it will also have greater benefits in the long-term. For example, discharged nutrients that cause eutrophication of surface water and drinking water sources are at the same time a valuable resource if they are used in a proper way.

Discharge or disposal without considering the potential for reuse is a waste of natural resources – and indicates mismanagement and missed opportunities to increase ownership for and economical viability of sanitation systems. For instance, biogas generated by anaerobic digestion of wastewater or sewage sludge can be used to produce electricity. Treated wastewater can be used as irrigation water and treated sewage sludge can be used as soil conditioner on farmland – thus increasing soil fertility and aiding crop production. The WHO 2006 Guidelines for the Safe Use of Wastewater, Excreta and Greywater are promoting these new sustainable sanitation systems.

In an average French city (Paris excluded) one inhabitant “owns” about 100 m² of waterproof area. (This figure is calculated by dividing the waterproof areas of the city – streets, roofs, cement playgrounds and other surfaces – by the number of inhabitants). A rainfall of 10 mm thus causes runoff swallowed by sewers that is 20 times more than the normal flow-rate of ordinary wastewater at a given moment. This is why sustainable city planning must pay very close attention to managing rainwater runoff. Here, it is imperative to set aside “blue and green” open land. This question of excessive local flooding resulting from downpours (that has nothing to do with river levels) is a critical issue in many cities. Most cities no longer collect rainwater in combined sewers but collect and treat it separately at local level, which results in much smaller sewerage systems. Keeping the water in the city also significantly improves the local climate.

Managing and reusing runoff water, Persicetom, Italy

Urban runoff water has become an ever more pressing problem due to the growth of cities. This water can't be discharged directly into rivers because of pollution issues, including raising sediment levels, and the increased risk of floods. Neither can they be treated by the wastewater treatment plants because of problems in the sewerage systems and the biological processes.

The municipality of San Giovanni in Persicetom has solved this problem by constructing a natural urban area for the collection, treatment and management of the runoff water. An extended detention pond has been built for the treatment and management of the runoff water collected from an urbanized area of 8 hectares. The first 5 mm of rain are treated in a forebay, which settles and treats all the suspended solids present in the water. The dissolved pollutant compounds are treated in a filter zone that connects the forebay pond and the detention pond. For limited amounts of rain, these two ponds are able to retain all the runoff water. For heavy rains, the submergible area can be used to retain the excess water for a period of 24 to 48 hours and slowly release it into the river. During the dry periods, typically in the summer, the area can be used as a green area for the inhabitants of the settlement.

Source: Roberto Farina, Luigi Petta, Italy



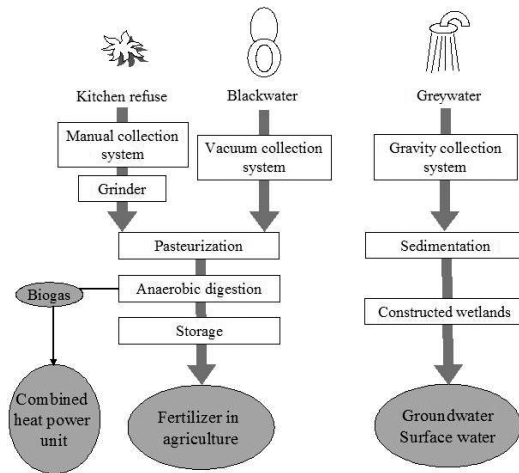
The detention pond

Biogas and organic fertilizer from toilets: Sustainable sanitation in urban areas in Germany and the Netherlands

Flintenbreite, a housing estate of 400 inhabitants in Lübeck, Germany, is separating domestic wastewater (blackwater, greywater, rainwater) at the source, enabling various reuse options. Vacuum toilets produce roughly 5 litres of blackwater per inhabitant per day. Drinking water consumption is less than 80 litres per inhabitant per day. Kitchen refuse is collected at household level in bins and is transported manually to a central feeding unit. Other organic waste can also be added. The anaerobic digestion unit produces energy in the form of biogas and a nitrogen rich liquid fertiliser. Greywater is treated in constructed wetlands and locally infiltrated into the soil as well as the rainwater.

In Sneek, a city in the Northern part of the Netherlands, a similar blackwater system was constructed in 2006 for a housing estate of 100 people. The blackwater system is similar to the one in Lübeck, but here the blackwater is further treated to produce a dry fertilizer.

Up-scaling of the systems is planned for the coming years in Hamburg as well as in Sneek.



Schematic representation of the sanitation system



Sneek, the Netherlands

Sanitation in small agglomerations

The European Union requires sewerage and wastewater systems for inland communities with more than 2000 inhabitants, and EU funds and grants are available to assist municipalities in setting up such systems. For agglomerations of less than 2000, it requires "appropriate treatment". What qualifies as appropriate is not clearly defined.

But in many rural regions, the major cause of groundwater and surface water pollution is inadequate sanitation with systems such as septic tanks, cess pools and pit latrines. Some EU countries have supplemented the requirements of the UWWTD with additional legislation; for example Finland has implemented legislation targeting small agglomerations without sewerage (see box).

In the countries of Eastern Europe and the Caucasus, up to 50% of the population live in settlements with less than 2000 inhabitants. In general these settlements have insufficient or no wastewater treatment systems and low capacity to implement and maintain a sophisticated system.

Finnish legislation on wastewater treatment outside sewer networks

Sewerage systems are not a solution for sparsely populated areas such as Finland. As much as 20% of Finnish citizens are not connected to sewerage systems. Those 20% pollute six times more than all the rest together and count for the second largest source of phosphorous pollution to Finnish lakes, rivers and the Baltic Sea.

Finland has actively protected its lakes for decades and in 2004 it set up the Government Decree on Treating Domestic Wastewater in Areas Outside Sewer Networks to limit this pollution source. Instead of recommending specific treatment methods, it sets minimum standards for wastewater treatment, planning, construction, use and maintenance as well as purification standards (90% removal of BOD₇, 85% of total phosphorus, 40% of total nitrogen).

By 2014 all onsite systems have to comply with the Decree. As the Decree allows a variety of technologies to be used, it has boosted technological development and enabled the set up of companies offering planning, equipment or construction services. New standards and testing methods have been developed to match the technological development of the private sector. As most of the nutrients in wastewater come from urine, the demand for dry sanitation solutions and water saving options has increased.

Source: Kati Hinkkanen, Finland



Finnish house with a dry toilet indoor



Finnish dry toilet

The countries of Eastern Europe and Caucasus have a quite high overall level of water supply and at the same time a quite low level of municipal wastewater treatment. Functional sewer and treatment systems are mainly found in big cities and towns. The tremendous cost of upgrading municipal wastewater treatment is not in harmony with available economic resources.

These areas need realistic solutions that meet the modern goals of resource, energy and cost efficiency. These could be water-less systems based on urine diversion, onsite or cluster treatment in constructed wetlands or ponds, or irrigation and other natural treatment concepts that are simple, robust, low-cost and sustainable.

In a recent publication, the Global Water Partnership of Central and Eastern Europe recommends involving key stakeholders in "Open Wastewater Planning dialogues" (GWP-CEE 2007) to find solutions for sustainable sanitation in rural areas. This publication also notes the lack of political priority to address the needs of the more than 20 million citizens in the European Union who do not have access to safe sanitation, most of whom live in settlements with less than 2000 inhabitants.

Combining wastewater treatment and bio-energy production using short rotation plantations

The use of pre-treated wastewater in Short Rotation Plantations (SRP) for biomass production offers a resource oriented approach to sustainable sanitation. SRPs are land-use systems combining agricultural and forestry practices (agroforestry) to grow woody biomass. Trees – mostly willows in northern climates and poplars in southern climates – are harvested in 1-5 year coppicing cycles. These non-food/non-fodder crops are suitable for wastewater fertilization due to low hygienic risks and their treatment and phyto-remediation abilities.

SRPs can serve as a secondary or tertiary treatment step and additionally provide multiple benefits to local communities. Municipalities may use this approach as a low cost alternative to upgrade existing sewage treatment plants and sustainably produce bio-energy sources through cooperation with local farmers and water and energy suppliers. The farmers need reliable wastewater quality data and guarantees from sewage treatment plant operators. Groundwater monitoring and other best management practices are available to comply with environmental health standards.

Short Rotation Plantations using wastewater are currently operating in Estonia, Sweden, Ireland, Poland, Spain, Czech Republic and other countries. If provision for SRP is included in the design of new treatment systems, they can also serve as safe nutrient resource providers for biomass production right from the beginning (www.biopros.info).

Source: Anja Brüll, Grit Bürgow, Germany



Willow short rotation plantation, Sweden

Reuse of treated wastewater

In many areas of Europe, water shortage and water scarcity are growing problems, especially in the South (see Water Scarcity chapter). In order to meet water demand, the use of treated wastewater is an option – a fairly reliable option since, outside of seasonal tourist areas, wastewater quantities remain fairly constant throughout the year.

Irrigation for agriculture, urban landscaping, sport and recreation areas is the largest consumer of treated wastewater. Other proven applications of reuse of treated wastewater are the following:

- Water for manufacturing (cooling and process water) and construction industries.
- Dual water supply systems for urban non-potable use (garden irrigation and car washing).
- Fire fighting, street washing, dust suppression and snowmaking.
- Water for creation or restoration of natural or constructed aquatic ecosystems, recreational water bodies and fish ponds.
- Aquifer recharge through infiltration basins and injection wells for water storage and saline intrusion control.
- Redevelopment of old industrial or mining sites into attractive water parks for the community to increase quality of life and land value.

In spite of the variety of possible applications, many people still do not consider water reuse an acceptable option, probably as a result of lack of knowledge.

Although the UWWTD supports the reuse of treated wastewater in broad terms, there are no formal EU definitions or guidelines on reuse. Some local or national standards unnecessarily constrain reuse applications. EU policies are very unclear, when present, and institutional capabilities to manage wastewater reuse are often lacking. However there are clear rules in the European Union governing the use of treated sewage sludge in agriculture. This practice was encouraged by a report published in September 2008 by the UN Habitat programme "Global Atlas of Excreta, Wastewater Sludge, and Biosolids Management, Moving Forward the Sustainable and Welcome Uses of a Global Resource" (UN-Habitat 2008).

A joint initiative towards wastewater reuse at EU level was taken by the MED-EUWI Wastewater Reuse Working Group (WWR-WG). The Group developed and submitted a report to the water directors at end of 2007 (WWR-WG 2007). The report presents a way forward by identifying the main objectives of a treated wastewater reuse policy and the existing barriers and constraints that will have to be overcome if wastewater reuse strategies are to gather more momentum and be adopted on a larger and more effective scale than at present. There is consumer resistance to direct re-use, although many major rivers, such as the Thames,

that are used as a source of drinking water contain significant proportions of treated sewage effluent.

Wastewater reuse at a regional scale in the Algarve, Portugal

The region of Algarve has a limited rainfall that averages about 500 mm per year. Its capital, Faro, has the lowest number of days per year with rain (60 days) of any European city. On top of the limited water availability, tourism increases the pressure on the water resources. In some areas it accounts for a 200% increase in water use, especially in the dry season.

The Algarve also has many golf courses, which require huge amounts of water to maintain. The Aguas do Algarve, responsible for drinking water and wastewater treatment in the region, developed a wastewater reuse plan for irrigation of the golf courses. Major conclusions can be summarized as follows:

- Summer wastewater flow is enough for that season's demand. In spring and autumn, water irrigation will not be enough for all golf courses.
- The wastewater treatment level has to insure high disinfection standards and very low solids concentration.
- Wastewater Treatment Plants (WWTP) located closer to existing golf courses were included in a priority group.
- A detailed study conducted with this priority group showed that, with some upgrades, treated wastewater would comply with national water quality standards for irrigation. The plan has already received approval from the necessary regulatory agencies.

Source: Carlos Póvoa, Algarve, Portugal



Financing and governance (see also Financing chapter)

In the EU, the huge investment costs of the centralized sewerage and wastewater treatment required by the UWWTD are usually subsidized by other sectors or by EU budgets.

New Member States, Bulgaria and Romania, have received considerable EU funding to help meet their obligations in terms of

reform and improvement of their institutions and infrastructure. The Environment Operational Plan in Bulgaria is funded with 1,395 million Euro from the EU Cohesion funds. Bulgaria has until 2015 to build 427 wastewater treatment plants (WWTPs) to meet the requirements of the EU Urban Waste Water Directive. With the current levels of funds, priority is given to WWTPs of large municipalities with more than 10,000 inhabitants and smaller municipalities on the Black Sea coast (due to regular faecal pollution of the shore and the adjacent areas).

In Bulgaria, there are 5000 towns and villages with less than 2000 inhabitants and only 2.1% of them have a sewerage system (without treatment). Therefore, almost 2 million people, or 25% of the Bulgarian population, will still lack adequate sanitation, even after this massive investment, since they are not covered by the UWWTD. A similar situation exists in Romania.

For these regions, as well as other Eastern European countries, there are subsidies missing because sanitation, particularly sanitation in rural areas, is a low political priority compared to other sectors. Additionally there is little popular demand for sanitation due to poor education, embarrassment and gender differences.

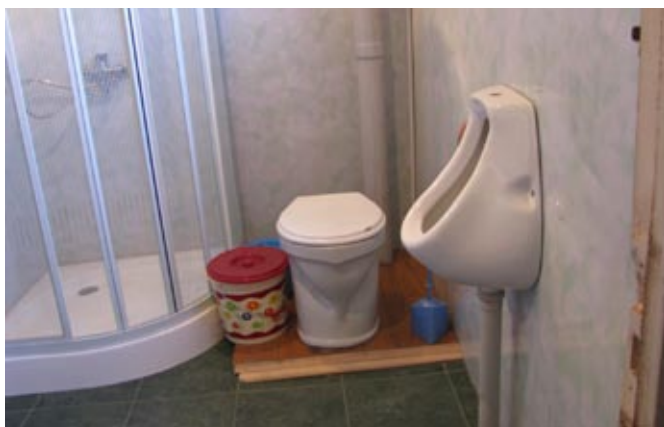
Rural households are usually left on their own to invest in, operate and maintain their own sanitation systems. An enabling framework at regional level is therefore necessary to provide local people with professional support, e.g., through wastewater associations. Sanitation should be an integrated part of regional planning, e.g., a village mayor does not usually have the knowledge required to decide on the most efficient sanitation solution. An open planning process with involvement of all stakeholders is needed to secure the long term success of the concept.

Local production of modern urine diverting dry toilets in Tbilisi, Georgia

The local production of specialised toilets is an important step towards the acceptance and spread of new sanitation concepts. In Georgia, the first sanitation projects based on urine diverting dry toilets have been initiated in the last two years. The separately collected urine can be used as liquid nitrogen fertilizer in agriculture after a defined storage time and the faeces are sanitized according to the 2006 WHO Guidelines for the Use of Wastewater, Excreta and Greywater.

After the joint implementation of the new sanitation systems by local and international NGOs, there has been a growing demand for the specialised toilets. Since it was expensive and difficult to purchase the urine-diverting toilets, in August 2008 a local ceramic factory started producing them. The high quality of the toilets enhances their acceptance and the low price accelerates their spread throughout the country.

Source: Rostom Gamisonia, Georgia and Margriet Samwel, Germany



Urine diverting dry toilet



Dry toilet and urinal, Georgia

Decentralised wastewater technology with centralised operation and maintenance service, Germany

In Europe, decentralized and onsite wastewater treatment in household based plants is a relevant issue. The market in the European Union for these small scale plants is calculated to be at least 10 million plants. In Germany, around 8% of the population is not connected to any sewerage network and therefore relies on onsite wastewater treatment. The households are responsible for operation and maintenance of their plants, resulting often in inadequate effluent results due to the lack of capacity in the households.

The public wastewater company Lippeverband addressed this problem by offering a full contract for construction and operation of 21 onsite plants in a settlement of 100 inhabitants where the connection to a centralized plant was too expensive. As a technical solution, a membrane bioreactor was chosen and a 10-year contract with a monthly fee for operation and maintenance with the Lippeverband was fixed. Operation and maintenance are carried out by the company on a contractual basis using remote monitoring. The purchase of a high number of equal plants and the remote monitoring decreased the costs significantly. Within all steps of decision making, planning and implementation, the households were involved, which led to the success of the project.

www.syswasser.de/german/projects/PlanungBeratungskompetenzen/ISI_Oekonomisch_Dahler_Feld.pdf

Appropriate guidelines and regulations

The investments in and management of sanitation services in countries belonging to the European Union are largely driven by European Directives, such as the Urban Waste Water Treatment Directive (UWWTD 91/271/EEC), the Sewage Sludge Directive (86/278/EEC) and directives on water quality such as that concerning bathing waters (76/160/EEC). To move forward, this legislation must be harmonized with the global principles of sustainable development (see box).

The UWWTD has had considerable success in extending the provision of wastewater collection and treatment systems in urban settlements, but this success has been limited because the legislation predetermines technical solutions – solutions that are not appropriate for all contexts – and thus it actually hinders innovation. To reach all of the citizens currently unserved by improved sanitation, innovative sanitation concepts that are economically feasible, socially acceptable and resource oriented must be included as options. In addition, the UWWTD does not sufficiently define sustainability goals.

While the UWWTD sets emission standards for BOD₅, COD and in case of sensitive areas for N and P, it does not deal with hazardous substances. These are covered by separate Directives now under the umbrella of the Water Framework Directive. The WFD sets good water status as an overall goal. Priority hazardous substances are limited by emission standards. Technical solutions are not specified, in order to support innovation and cost effectiveness.

The Integrated Pollution Prevention and Control Directive (IPPC 96/61/EG) regulates the approval of industrial plants based on an overall approach that prevents the shifting of pollution from one environmental medium to another. Resources and energy efficiency have high priority. The directive requires the application and implementation of the best available technique (BAT) and is thus very dynamic and forward-looking. To define and describe the BAT, an information exchange for all industrial sectors was established between member states and relevant sectors. The BAT reference documents (BREF) are constantly updated.

European legislation currently contains an unequal treatment of the different environmental sectors. The end-of-the-pipe approach used by the UWWTD could be replaced by the IPPC approach that follows the goal of sustainable production. This would lead to a paradigm shift – a move towards a sustainable approach to wastewater management characterized by resources efficiency. Wastewaters from households, industry and agriculture should be considered as resources independent of water content. For municipal wastewater streams, BAT reference documents could be established to detail the variety of new technical solutions and proven concepts that should be considered as options along with the conventional end-of-pipe treatment of all municipal wastewater. The 2006 WHO Guidelines for the Safe Use of Wastewater, Excreta and Greywater and the Finnish legislation provide good guidance in crafting resource and cost efficient legislation for wastewater treatment.