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Briefing note

Individual and other Appropriate Systems (IAS) for waste water treatment

IAS are individual or other appropriate systems that can treat waste water for households in agglomerations without collecting systems

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Summary

Individual and other Appropriate Systems (IAS) are waste water treatment systems for one or a few households. They are authorised in certain circumstances under the Urban Waste Water Treatment Directive (UWWTD) and especially when it would be disproportionally expensive to build a sewer network to connect the waste water to a WWTP in a rural area. As the evaluation of the UWWTD revealed, IAS is one of the remaining sources of pollution in urban waters and often because of the lack of control and maintenance over them. However, with a variety of technical solutions, they offer an interesting alternative to municipal collection systems, especially with the European climate neutrality objective for 2050. In this briefing note, we explore how water-related legislation can be improved to ensure that IAS can continue to be part of the available solutions for sustainable waste water management.

1. Introduction

This briefing note aims to clarify: What are IAS and individual waste water treatment systems, where are they used (within or outside agglomerations), what are the compliance criteria and whether can they be considered as effective solutions. This briefing note also explores the possible policy options available to policy makers, based on evidence from EU Member States, and makes some suggestions for the future.

An IAS takes the waste water from a single home or business, separates out solids, and purifies it, typically using the soil in a drain field on the property. It's also known as a septic system and can be an environmentally friendly way to get rid of waste water if the system is well designed and properly maintained.

The Urban Waste Water Treatment Directive (91/271/EEC, UWWTD) is currently being revised by the European Commission. From the start of the evaluation process in 2019, IAS (individual systems or other appropriate systems) were indicated as a source of pollution and an area for improvement of the directive. The chart in Figure 1 indicates that the load from IAS is one of the remaining sources organic and nutrient pollution load from urban waste water after compliance of agglomerations, urban runoff, small agglomerations less than 2,000 PE (SD) and CSOs[1]. We understand that that this is based on high level modelling at the European level and reflects the aggregate remaining pollution load from IAS; this pollution load will not be evenly distributed across Europe and will require targeted measures in each Member State, taking account of diverse local conditions if it is to be effectively addressed.

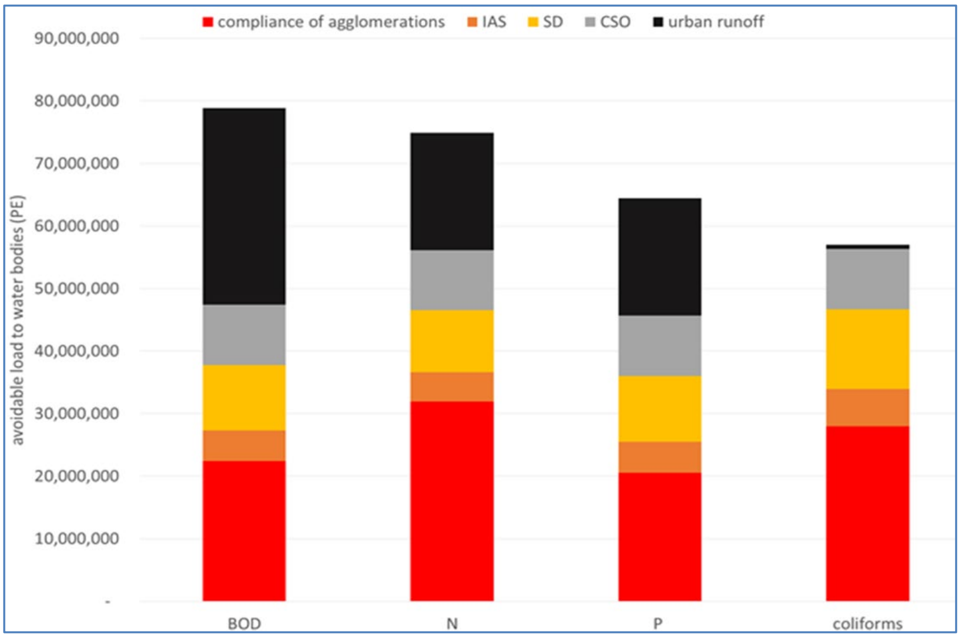

Figure 1: Remaining Pollution Load. Source: JRC Science for Policy, 2019, Effects of the UWWTD.

'IAS', individual systems or other appropriate systems, are introduced in Article 3(1) of

[1] SWD(2019) 700 final: Commission Staff Working Document Evaluation of the Council Directive 91/271/EEC of 21 May 1991, concerning urban waste-water treatment.

UWWTD, setting the obligations for the implementation of collecting systems in agglomerations larger than 2,000 PE; IAS can be applied as an alternative solution where the establishment of a collecting system is not justified financially and/or environmentally, provided they achieve the same level of environmental protection as imposed for the entire agglomeration.

In the evaluation report of the UWWTD[1], IAS are considered to be a source of pollution as they are an ineffective way of treating waste water and hence are deemed unacceptable as a solution within agglomerations. This is largely based on assumptions, as the UWWTD does not require monitoring of IAS performance. Moreover, based on high level modelling only, moving from IAS to centralised systems is concluded as being more efficient, and also providing cost savings and reducing GHG emissions.

The impact assessment for the revision of the UWWTD, which was launched with the inception impact assessment[2], intends to address policy options for remaining pollution from IAS, indicating that this will be in the scope of the revision of UWWTD.

Individual waste water treatment systems are used widely in rural areas and also to a varying degree within agglomerations. The acronym IAS is used for individual or other appropriate systems located within agglomerations. In considering how best to achieve the objectives of the UWWTD, Water Framework Directive (WFD), Drinking Water Directive (DWD), Bathing Water Directive (BWD), biodiversity and protection of ecosystems, it is useful to look at both individual systems in rural areas and IAS within agglomerations at the same time.

2. Relevant definitions of UWWTD

The following definitions of the terminology used in UWWTD are largely based on the guidance document of DG ENV that was made in the frame of the reporting process under the UWWTD[3].

2.1. Agglomeration

Following Article 2(4) of UWWTD an agglomeration is:

“An area where the population and/or economic activities are sufficiently concentrated for urban waste water to be collected and conducted to an urban waste water treatment plant or to a final discharge point”

The term *agglomeration* refers in the first place to a sufficiently concentrated area for urban waste water to be collected and conducted to an urban waste water treatment plant (WWTP) and is independent of the presence of a collecting system or a WWTP. It does not necessarily coincide with the catchment area of the collecting system or administrative entities. All urban waste water generated in the agglomeration must be collected, conducted and treated. The size of an agglomeration, defined by the total waste water load

[2] https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12405-Water-pollution-EU-rules-on-urban-wastewater-treatment-update-_en (23 July 2020).
[3] Terms and Definitions of the Urban Waste Water Treatment Directive 91/271/EEC, 16 January 2007.

generated, is the main criterion for determining the requirements of collection and treatment. The minimum agglomeration size for monitoring and reporting under UWWTD is 2,000 PE.

As stated in the evaluation report, there is a lack of clarity, thus a need for guidance on how to actually delineate an agglomeration, on what constitutes the 'sufficiently concentrated areas'. This guidance should take account of the variety of national approaches to ensure compliance.

2.2. Collecting system vs. IAS

The requirements concerning the provision of collecting systems are laid down in the first two sub-paragraphs of Article 3(1). An exception to the general requirements for provision of collecting systems within an agglomeration is foreseen under the final sub-paragraph of Article 3(1):

> "Where the establishment of a collecting system is not justified either because it would produce no environmental benefit or because it would involve excessive cost, individual systems or other appropriate systems which achieve the same level of environmental protection shall be used"

Hence, IAS are individual or other appropriate systems that can be used WITHIN agglomerations > 2,000 PE to address urban waste water only in exceptional cases where the establishment of a collecting system is not justified for technical and/or economic reasons. IAS have to achieve the same level of environmental protection as provided for urban waste water discharged into the collecting system, i.e. containing and separating waste water from the surrounding environment, with the intention of further treatment.

The clause gives rise to rights and duties for individuals and this should be correctly transposed into national law. Also, the question of whether to allow an IAS is to be decided on a case-by-case basis and the Member States have to be able to justify the non-provision of a collecting system in accordance with the first two sub-paragraphs of Article 3(1).

The evaluation report notes that it is not explained what 'excessive' costs are, nor is it clearly explained how IAS ensure achieving the same level of environmental protection. For checking IAS compliance, the European Commission launched in 2016-2017 an approach investigating legal frameworks in place in Member States with specific obligations to regulate IAS. This study is still on-going and as mentioned in the evaluation report of the UWWTD[1], yet it is premature to draw definite conclusions.

2.3. Collection and treatment outside agglomerations

In not sufficiently concentrated areas outside the agglomerations, the requirements of other directives than UWWTD apply to address waste water collection and treatment.

There are four different situations:

- Agglomerations of less than 2,000 PE covered with collecting systems
- Agglomerations of less than 2,000 PE without collecting systems

- Small settlements and sparsely populated areas
- Individual dwellings in rural areas.

In these areas, individual systems are applied to address collection and treatment of waste water, either locally or transported to a centralised treatment plant. However, discharges of waste water should allow the receiving waters to meet the relevant quality objectives and the relevant provisions of amongst others the WFD and Ground Water Directive (GWD)[4]. Hence the appropriateness of applied systems to address the disposal of waste water is crucial.

3. Current Situation across Europe

IAS are used to varying degrees within agglomerations as reported in the 10th Implementation Report on the Urban Waste Water Treatment Directive. While usage of IAS in agglomerations accounts for less than 5% of the waste water load in most Member States, higher proportions are reported for some Member States up to a maximum of 15%. Reasons for high usage of IAS in agglomerations include the very high cost of constructing new collecting systems and the cost of making connections to existing collecting systems which can also be high.

A wide range of solutions/technologies are used for individual waste water management both in rural areas and for IAS in agglomerations. These solutions include the most basic such as cesspools which contain waste water for later collection by tanker and transport to a central waste water treatment plant. On-site treatment solutions range from basic septic tanks to nature-based solutions and sophisticated package treatment plants. A wide range of different treatment processes are used in mechanical and electrical package plants.

The Study supporting the Evaluation of the Urban Waste Water Treatment Directive by Wood[1] noted that the use of IAS has allowed Member States to avoid very expensive construction of collection networks in areas where individual solutions can provide similar environmental benefits, thus increasing the efficiency of implementation of the Directive. However the study also points out that there is a lack of knowledge of how well these IAS are monitored and managed and in many cases installed systems are subject to overflows and/or seepage, thus having a negative effect on the environment including risk of contamination of drinking water sources. This perception is borne out by the results of a 2018 survey of EurEau members on the subject of rural sanitation, which identified a range of challenges for design, installation, operation and maintenance of individual systems including:

- Inappropriate design for the particular local situation
- Inadequate installation
- Systems not simple and easy to manage
- Lack of technical competency to operate sophisticated systems
- Lack of regular maintenance
- Regular de-sludging not carried out

[4] EurEau (2021): Position paper On the consideration of small agglomerations in the revised UWWTD.

- Lack of regulation in many cases.

Individual waste water treatment systems can be a significant source of microbiological pollution of groundwater. This is a particular risk in certain ground conditions such as karst limestone or moraine soils where contaminated water can travel easily through the fractured or highly permeable ground.

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Nevertheless while there are real challenges and deficiencies with the use of individual systems for waste water management, both in rural areas and in agglomerations, **there are also many examples of good practice across Europe both in terms of technical solutions and also regulatory solutions to provide assurance that the required level of environmental protection can be achieved.** The following sections of this paper provides examples of this good practice and makes suggestions in relation to policy which could ensure that sustainable and effective solutions for waste water management are used where collection and central treatment of waste water is not technically or economically feasible.

4. Technical Solutions

4.1. Affordability and Sustainability

There is a need for individual systems for management of waste water which are both affordable to citizens and environmentally sustainable, for situations where it is not technically or economically feasible to connect to collecting systems. This applies generally in rural areas but can also apply around the periphery of urban areas where construction of new collecting systems can sometimes involve very high costs and also high embodied carbon. In the latter case, individual systems can often provide a more affordable and sustainable solution for waste water management.

For individual systems to be sustainable they must provide an appropriate level of protection to the water environment. Systems must be well designed, robust and suitable for the local conditions. Proper maintenance of the individual systems is vital and this must be within the capability of the householder or specialist service provider as the case may be. While in the past we would have only considered sustainability in the context of the water environment, individual systems for the future will also have to be sustainable in terms of climate impact and the circular economy.

Householders using individual systems should:

- be helped to choose certified systems, adapted to local conditions and compliant with requirements (the right system in the right place)
- be correctly informed about system performance and the need for proper

maintenance

~ own a legal permit, to be delivered by competent authority
~ be correctly informed about the consequences (i.e. environmental damage, legal penalties etc.) they will face in case of system malfunction.

The following sections provide examples of good practice from across Europe in relation to different types of individual systems and solutions. Some innovative solutions are described as well as comments on the need for further research and development. In relation to costs and affordability, it is very difficult to be definitive in comparing the costs between different solutions. This is because the total cost of any particular solution is hugely dependent on the local situation. It is also generally not appropriate to compare costs for different solutions which come from different sources due to a range of factors around costings which will be different, so that one is generally not comparing like with like. Nevertheless, broad indications of cost and affordability are provided in the following sections based on our experience.

4.2. Connection to a collecting system

Where technically feasible and affordable, connection to a collecting system is usually a preferable solution compared to individual or other appropriate systems for management of waste water for single houses. Connection to a collecting system is generally easier to manage for the householder, allows for more efficient management of waste water and enables more effective management of risk to the environment.

However, costs can be prohibitive and these depend on the distance of the house from the existing collecting system and generally on how dispersed properties are within a particular area as well as factors such as ground conditions etc. Studies carried out in Scotland prior to 2015 on expanding the public network in around 20 rural communities showed costs ranging between £20k and £110k per connection. In the past, a maximum of €10k per house was used in Ireland as an affordability threshold for extensions to the public sewer network. This was based on consideration of the cost of sustainable individual treatment systems. However, experience in Ireland has shown that even when the public sewer has been extended it can be very difficult to ensure that existing houses connect to the network as householders' preference is often not to incur the cost of making the connection. In some countries there is an obligation on householders to connect to the existing sewer; e.g. in the Netherlands, households are required to connect if the distance to the existing sewer is less than 40 meters; Austria has the same obligation within 50 meters of the existing public sewer.

> The cost of constructing conventional gravity collecting systems in unsewered villages and around the periphery of existing collecting systems is often high and can be unaffordable. Alternative systems such as small bore pressure can be more cost effective.

While the cost of constructing conventional gravity collecting systems in unsewered villages and around the periphery of existing collecting systems is often high and can be unaffordable, alternative systems have been developed which can be more cost effective. These systems include small bore pressure sewer systems where a grinder pump unit is provided at each house. The pipe diameters are much smaller than for conventional gravity sewer systems and the pipes are laid at shallower depth and so these systems can provide a more cost effective solution to collect waste water from dispersed communities. However, even so, costs can still be high for these systems, particularly in retro-fit situations. In such situations, costs to be factored in include: cost of the small bore pipe network; pump unit at each house; decommissioning of the existing septic tank or treatment system; rearranging drainage pipes at each house; reinstating existing ground surface, paths, gardens etc. Low pressure sewer systems are widely used in Sweden, Finland and Denmark. There are also other alternative collecting system solutions which can be considered such as septic tank effluent pumping (STEP) system. This can be used in locations where infiltration into the ground is problematic for septic tanks. With this system effluent from the septic tanks is pumped for centralized treatment.

4.3. Septic tanks with percolation areas as IAS-solutions

Septic tanks are probably the most basic form of waste water treatment solution for single houses used across Europe. In many countries a septic tank is considered to only provide preliminary treatment, in other countries, such as Ireland, France, Sweden and the UK, the system typically comprises the septic tank itself which acts like a primary settling tank together with a percolation area. A well-designed percolation area in suitable ground conditions can provide the equivalent of secondary/tertiary treatment of waste water. This system is described below. We note that this higher level of treatment from septic tanks and percolation areas is not feasible in all regions due to unsuitable soil/ ground conditions.

The key to successful use of septic tanks with soil percolation is that the local ground conditions (soil permeability, groundwater table level etc.) must be suitable for this treatment option. In suitable ground conditions, well designed septic tanks can provide a very effective and affordable solution for waste water management for single houses. They are very easy to maintain with the only maintenance typically being to desludge the tank every two to three years. The systems include effluent distribution pipes in the percolation area and the main treatment actually occurs in the soil beneath this area through physical and biological processes in the soil and in a biologically active biomass which develops over time. One of the requirements for the effectiveness of this treatment in the soil is that there must be at least one meter of unsaturated soil (with suitable permeability) beneath the percolation area. Research [5] carried out in Ireland has shown excellent attenuation of

Climate impact of septic tanks is an area that will require more research in the future. Research carried out in Ireland indicates that the primary greenhouse gas (GHG) produced in septic tanks is methane generated in the anaerobic zone within the tank.

[5] Dubber, D; Gill, L.W. Application of On-Site Wastewater Treatment in Ireland and Perspectives on Its Sustainability. *Sustainability 2014,* 6, 1623-1642.

Nitrogen, Phosphorus and microorganisms through just one meter of unsaturated soil. Nitrogen removal has even been shown to be higher under percolation areas receiving septic tank effluent compared to secondary treated effluent due to the development of a biomat across the percolation areas. On the basis of this treatment which happens in the soil, well designed septic tanks could be considered to be a form of nature based solution.

As mentioned above, a key consideration for the use of septic tanks is the suitability of the local ground conditions. In many areas, use of septic tanks in unsuitable ground conditions has resulted in pollution of the local groundwater[6,7,8] or surface water and this has resulted in the perception that septic tanks are a poor solution in some quarters. However, these issues can be resolved through good design and effective regulation. Studies carried out by the Environmental Protection Agency (EPA) in Ireland have shown that approximately 39% of the land area of Ireland is likely to have inadequate percolation for conventional septic tanks. Conversely approximately 61% of the land area of Ireland is likely to have adequate percolation and well-designed septic tanks in these areas should provide adequate treatment and disposal of domestic waste water. Research has also been carried out in Ireland to find solutions for the low permeability soil areas. This has shown that enhanced percolation systems such as low pressure pipe and drip dispersal systems can sometimes provide effective solutions for these areas.

Climate impact of septic tanks is an area that will require more research in the future. Research[5] carried out in Ireland indicates that the primary greenhouse gas (GHG) produced in septic tanks is methane generated in the anaerobic zone within the tank. In comparison between septic tanks and secondary treatment solutions for single houses, septic tanks have been shown to have marginally higher GHG production in CO2 equivalent terms.

4.4. Mechanical treatment systems

There are a wide range of mechanical waste water treatment systems for single houses and small communities on the market across Europe. These are typically package plants based on aerobic biological processes, including the following categories of process:

- Biological/submerged aerated filters (BAF/SAF)
- Packaged media filter systems
- Rotating biological contactors (RBC)
- Sequencing batch reactor (SBR)
- Membrane bioreactors (MBR)
- Activated Sludge systems.

These products are generally covered by the European Standard EN12566 – Small wastewater treatment systems for up to 50 PT[9]. This is a set of standards which specify requirements for packaged and/or site assembled treatment plants for up to 50 PT (population total). Member States are obliged to adopt the EN standards as national

[6] EurEau (2014): Protection of groundwater resources used or suitable to be used for drinking water abstraction.
[7] EurEau (2019): The holistic approach to addressing micropollutants 2019 update.
[8] EurEau (2018): Position on the Drinking Water Directive.
[9] CEN/TC 165/WG 41 - Small type sewage treatment plants (< 50 inhabitants).

standards and may incorporate additional national requirements in national annexes to the standard. CE marking is generally applied by the manufacturer to products which fully conform to the standards requirements.

One of the key success factors for these systems is ensuring that good operation and maintenance is carried out and this can be a challenge for householders who are ordinary citizens and not trained as waste water operators. One example of good practice in this regard is from Austria, where every owner has to have an official qualification as an operator for treatment plants < 50 PE The national association ÖWAV offers this training/ qualification. In addition to basic operational requirements which the householder must observe, regular servicing (typically once per year) must also be carried out by a specialist service provider. Again, the practice in Austria is that every operator must report to the authority a yearly inspection from a third party, approved company. Because of this requirement, in Austria many companies have become established to service this market need.

4.5. Innovative and nature-based solutions

Nature based solutions (NBS) such as reed beds and constructed wetlands have been used to provide waste water treatment for single houses and small communities for many decades. These systems are growing in popularity due to their simple operation and low maintenance requirements. On the other hand, a drawback of these systems is that larger areas are typically required compared to more conventional waste water treatment options.

Nature based solutions include horizontal flow reed beds, vertical flow reed beds, constructed wetlands and willow bed evapotranspiration systems. These systems are often used in conjunction with septic tanks, to provide the equivalent of secondary treatment. In the case of the willow bed evapotranspiration system, depending on local rainfall and plant growing season, there may be no discharge to the local groundwater or surface water for part or all of the year.

In addition to well established nature-based solutions, research is ongoing in this area to develop new solutions. One such example is the Innoqua project[10] which has been funded under the Horizon 2020 research and innovation programme. This project is aiming to develop modular nature-based systems which can be deployed in urban and rural settings. The system uses earthworms, zooplankton and microalgae with the potential for the treated waste water to be re-used. The system is currently deployed at 2 pilot sites and 11 demonstration sites across 11 countries.

A big area for innovation of individual treatment systems is focusing on integrated water management, looking at the whole water cycle and linking sanitation to energy use/production and/or resource reuse. By using less water, less waste is produced and this can help with the viability of new solutions. One example which is now used in Sweden is where the toilet water is separated from the other waste water (grey water). The toilet water is collected in a storage tank and is transported to an urban waste water treatment

[10] https://innoqua-project.eu/.

plant once or twice per year. The grey water is treated in infiltration beds of various types. Other examples are from the Interreg project I-Qua[11], that is implementing case studies in Flanders and the Netherlands on sustainable individual treatment systems, focusing on the recovery of treated waste water and/or the recovery of resources (nutrients) and energy.

Finally some project are also looking at combinations of constructed wetlands with different technical post- or pre-treatment options (ozone or bioreactor systems). The Horizon 2020 project AquaNES[12] demonstrated this is possible as a wastewater treatment option and gave evidence of reductions in operating costs and energy consumption.

5. Regulation for Better Outcomes

5.1. Regulation of Individual Systems

Many Member States already have regulatory frameworks for individual waste water treatment systems at national or regional level which can include:

- Permitting including design requirements
- Specific effluent criteria
- Norms and/or standards for certified systems put on the market
- Registration including geolocation
- Operation and maintenance obligations
- Monitoring
- Inspections
- Published rules for action in case of non-compliance
- Subsidies for building assets.

These regulations generally apply to all individual systems whether they are located in rural areas or within the boundaries of agglomerations. They ensure that well designed and well maintained individual systems are put in place, which are safe for human health and will not, for example, contaminate drinking water sources. They ensure that the risk of pollution of surface waters due to poor performance is managed and avoided. Examples of good practice are included below.

In Austria, every domestic waste water treatment plant requires a permit and must comply with national standard: ÖNORM B 2502-1:2012 04 15. This standard sets out requirements for application, dimensioning, construction and operation of plants for up to 50 inhabitants.

In Ireland permitting of individual systems is required as part of the development planning approval process. Individual systems must comply with the national code of practice for domestic waste water treatment systems (PE ≤10). The code of practice covers septic tanks, mechanical systems and nature based solutions.

[11] https://www.i-qua.eu/.
[12] https://cordis.europa.eu/project/id/689450.

In Denmark, a licence is required for individual waste water treatment systems. Guidelines and rules are in place for five different treatment facilities depending on the sensitivity of the local water environment. The different classes of treatment relate to removal of organic material only or removal of organics combined with removal of ammonia and/or phosphorus. Home owners can have a choice on the level of treatment they provide and the amount of green tax they will have to pay to the national tax authorities depends on the level of treatment. There are (nine) different tax rates ranging from the most simple treatment with a 0,81 EUR (6,01 DKK) highest tax per m3 wastewater to the best treatment with a 0,11 EUR (0,79 DKK) lowest tax per m3 wastewater.

In Ireland, all individual systems are required to be registered, including systems installed prior to the introduction of the governing regulations. There is an on-line registration system and registration includes recording the geolocation of the property.

In Austria, every owner of an individual system has to report to the authority a yearly inspection from a third party, approved company. This helps to ensure that operation and maintenance of plants is carried out properly.

In Ireland, a national inspection plan for domestic waste water treatment systems is prepared by the environmental authorities. This plan includes both education/awareness raising and a risk-based inspection regime. The plan focusses particularly on where the potential risks to human health and the environment are higher.

In Wallonia (Belgium), since 2018, building and management of individual waste water treatment systems are organized and coordinated by SPGE (a public company for the water management, mandated by Walloon Government)[13]. The new management system sets clear responsibilities:

- Government and regional administration: general regulation of IAS
- Local authorities: permits
- SPGE: coordination, financing (subsidies, operational costs, collection and treatment of sludge), reporting (database, GIS), certification of treatment systems, certification of installers, certification of maintenance service providers, certification of de-sludging service providers
- Waste water service providers (public entities): commissioning at the start to ensure proper performance, periodic inspection, advisory services for municipalities and customers, reception and treatment of sludge in specific public WWTPs
- Private sector: production and retail of IAS, installers, maintenance service providers including desludging and transport to certified treatment centres (public WWTPs)
- Householder: general maintenance of IAS,

> Characterisation work for the preparation of River Basin Management Plans should identify where individual waste water treatment systems are causing a high risk that water bodies will not meet their environmental objectives under the WFD.

[13] www.gpaa.be/.

payment of the water bill.

SPGE ensures a financing support to householders in form of subsidies to build new IAS (not for new dwellings, extra funding for nature-based solutions and for IAS in protected areas). SPGE also reimburses part of the maintenance costs (only of maintenance contracted with certified service providers). Desludging, transport and treatment of by-products are also fully financed by SPGE.

In Flanders (Belgium) citizens are responsible for individual treatment systems (as opposed to the common responsibility for centralized waste water treatment infrastructure). However, in practice the environmental authority put the responsibility for implementation, operation, maintenance and control with the local sewer system service providers (communities or delegation to third parties), that have all the competences to deliver high quality services. Moreover, these pay the investment and maintenance of the individual treatment system, while the citizens bear the costs for the electricity and a fee for the system.

While regulatory frameworks are in place for individual systems in many Member States, this is not the case for all and this gap will need to be addressed. Due to the diversity of situations across Europe, we would suggest that the details of these regulatory frameworks should be decided on at national or regional level. Regulatory frameworks should also enable innovation as there is a need for innovation to develop better climate resilient and circular economy solutions for dispersed waste water management. One example covering both of these points would be the potential for digital solutions and Internet-of-Things (IoT) for monitoring and inspection. This could be particularly beneficial in countries with much dispersed rural populations, such as Finland.

5.2. Water Framework Directive and Drinking Water Directive

Regulation of individual waste water treatment systems should apply to all such systems as described in the last section. In addition to this, the Water Framework Directive and the recast Drinking Water Directive act like a second line of defence for environmental and drinking water source protection respectively.

Characterisation work for preparation of River Basin Management Plans should identify where individual waste water treatment systems are causing a high risk that water bodies will not meet their environmental objectives under the WFD. Data obtained from registration and monitoring as described in the last section can be used to inform this characterization work. Measures should then be included in the River Basin Management Plan to address significant pressures on at risk water bodies.

One example of this approach is from Ireland’s current River Basin Management Plan (RBMP). Characterization work for the plan showed that individual waste water treatment systems were a significant pressure for 11% of the water bodies which were at risk of not meeting their environmental objectives. Measures have been included in the RBMP to make financial grants available for upgrading of defective individual systems which are located in High Status objective catchments and in other areas prioritized for action in the RBMP.

Article 7 of the WFD provides for protection of drinking water sources. This is now reinforced by the recast DWD which will require a risk based approach to source protection. Risk assessment will be required to identify hazards in the catchment including individual waste water treatment systems which may not be performing to the required standard. Risk management measures will then need to be put in place. The recast DWD will require a clear and appropriate distribution of responsibilities between stakeholders to ensure that catchment activities for drinking water source protection are effective.

5.3. Urban Waste Water Treatment Directive and Agglomeration Boundary

As set out above, the UWWTD defines an agglomeration as an area where the population and/or economic activities are sufficiently concentrated for urban waste water to be collected and conducted to an urban waste water treatment plant. Individual or other appropriate systems may be used for waste water treatment within the agglomeration boundary but only in exceptional circumstances and with justification on a case-by-case basis.

It seems that the current policy as set out in the UWWTD is based on the assumption that, either:

1. Connection to a collecting system is almost always a better and more sustainable solution than the use of IAS within agglomeration boundaries, as defined, or
2. Regulation of IAS, independent of the UWWTD, cannot provide the same level of environmental protection as that provided by the UWWTD.

Taking these points in turn, individual systems as set out in this briefing note can provide the same level of environmental protection as a centralised treatment infrastructure provided that the right solution is used in the right location and provided that the systems are properly maintained. Extending collecting systems to connect dispersed properties can have a very high cost per connection and this may not be affordable in many cases. In many cases of areas around the periphery of urban areas, individual systems may provide an effective solution which is more affordable and sustainable in terms of climate impact than extending the existing collecting system. A key consideration in these cases would be whether or not there is sufficient area available for the individual treatment system and that the treated waste water can be safely dispersed to the receiving water environment.

In relation to the second point above, effective regulatory frameworks for individual waste water treatment systems do exist in many Member States. These regulations can be reinforced by the Water Framework Directive and recast Drinking Water Directive to ensure that any significant pressures from individual systems are addressed in RBMP programmes of measures and drinking water safety plans.

Taking these points into consideration, it is our view that regulation of individual waste water treatment systems at national or regional level combined with the WFD and DWD would be a more effective and sustainable policy option compared to using the UWWTD. The former option has the benefit of regulation of all individual systems within the territory and not just those around the periphery of larger urban areas. It would also be a targeted and risk-based approach, thus enabling the achievement of best environmental outcomes.

As discussed above, we do question the assumption that connection to a centralised system will always be a better solution than the use of IAS, where technically and economically feasible. We particularly question this assumption in the context of innovation and the likelihood that dispersed models of service provision and integrated water management are likely to become more sustainable in the future. We also acknowledge that collection to a central system, where feasible, is likely to be the best solution in many cases based on the circumstances of today. If the concept of "sufficiently concentrated" area is to be retained in the revised Directive, it would be useful to provide guidance as to how this should be assessed (and hence how agglomeration boundaries are to be defined) at national or regional level. This guidance could include the variables which should be used in carrying out the assessment; e.g. distance to the public sewer and property density. Different considerations could be made for:

1. Properties within the area of the existing sewer network
2. Properties in an area adjacent to the existing sewer network at a generally uniform density level
3. Clusters of properties outside the existing sewer network at a higher density than the surrounding area.

Some Member States currently have regulations including obligations for property owners to connect to the public sewer where properties are in close proximity to the sewer. It is our view that such obligations should be set at national/regional level rather than at European level for reasons as follows. The requirements for each agglomeration collecting system should be considered in a holistic way. In addition to objectives of connecting existing properties with IAS, existing collecting systems will require capacity to support population growth and in many cases higher population densities in the future. Both of these requirements could potentially lead to the need for major investment to increase the capacity of the existing network. A complimentary policy objective which could avoid this need for network upsizing would be the widespread adoption of blue green infrastructure to remove storm water from entering the collecting system. EurEau advocates the adoption of such a holistic approach through the development of Integrated Waste Water and Storm Water Management Plans[14].

Individual systems, as set out in this briefing note, can provide the same level of environmental protection as a centralised treatment infrastructure provided that the right solution is used in the right location and provided that the systems are properly maintained.

6. Conclusions

While there are many examples of individual waste water treatment systems which are poorly designed or poorly maintained, there are also many examples of good practice with effective regulation in place and individual systems operating as intended to protect human health and the environment.

[14] EurEau (2021): Briefing note public on integrated management plans.

EurEau considers that the most appropriate way to regulate these systems is through national or regional regulation combined with effective implementation of the Water Framework Directive and the Drinking Water Directive. This should allow the most sustainable solutions for waste water management to be adopted in each case, whether this be connection to a collecting system or use of individual systems. It should also allow innovation to develop by keeping both the options of local treatment or collection and centralised treatment available for use.

As stated above, EurEau considers that individual systems should be regulated at regional/national level. However, EurEau also recognises that Europe could act at European level by the definition of minimum standards for mechanical and nature-based systems, in order to give the same level playing field for producers and retailers of individual treatment systems and to enhance innovation and improve compliance with requirements.

Regulatory frameworks should protect customers against bad or inadequate systems and guide them to buy systems they are able to manage by themselves in an easy way.

It is our opinion that individual systems present a large field for innovation towards more easy-to-handle and sustainable autonomous systems and towards possible local reuse of treated waste water and/or sludge. EurEau advocates for a strong European support to innovation in this field.

Finally, in relation to addressing IAS within agglomerations in the revision of the Urban Waste Water Treatment Directive, EurEau suggests:

- that well-regulated IAS should be considered as part of the solution in agglomerations where these can be more affordable and more sustainable in terms of protecting the environment and achieving climate targets (low carbon footprint) compared to extending collecting systems
- to include provisions for a better monitoring and control of individual and appropriate systems (IAS) inside agglomerations
- to base the monitoring and control of individual waste water treatment systems outside agglomerations on the local risks and circumstances, particularly with regards to the protection of drinking water resources. This should be through national legislation, the WFD and recast DWD and not through the UWWTD
- to boost innovation for appropriate systems for small agglomerations and standalone treatment, to develop safe, efficient, sustainable, and easy-to-manage systems with the opportunity to locally recover and reuse resources from IAS. Nature-based solutions should be promoted.

About EurEau

EurEau is the voice of Europe's water sector. We represent drinking water and waste water operators from 29 countries in Europe, from both the private and the public sectors.

Our members are 34 national associations of water services. At EurEau, we bring national water professionals together to agree European water sector positions regarding the management of water quality, resource efficiency and access to water for Europe's citizens and businesses. The EurEau secretariat is based in Brussels.

EurEau

With a direct employment of around 476,000 people, the European water sector makes a significant contribution to the European economy.