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COMMISSION STAFF WORKING DOCUMENT

IMPACT ASSESSMENT

Accompanying the document

Proposal for a Regulation of the European Parliament and of the Council on minimum requirements for water reuse

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INTRODUCTION

Water is already a limited resource, with one third of Europe experiencing water stress. The growing needs of populations and climate change will make the availability of water in sufficient quantity and quality even more of a challenge in Europe in the future. Water scarcity is no longer confined to a few corners of Europe, and is already a concern across the EU with significant environmental and economic consequences; projections suggest that the situation will become much more pronounced in the coming years.

To respond to this problem, Europe's water resources should be managed more efficiently. In addition to water savings, securing the supply of good quality water can help address water scarcity in the context of an integrated approach to water management. Reusing water after treatment constitutes an effective and sustainable alternative water supply, and so can be a useful tool for managing water resources. For example, this can involve a treatment plant receiving waste water from domestic uses and then treating it separately and providing it by pipe to farmers, instead of returning it directly to a river. It extends its life cycle, thereby helping to preserve water resources as part of an integrated approach to water management and in full compliance with the circular economy objectives. Today, whilst water reuse in the EU could obviously never by itself solve water scarcity problems, it falls far below its full potential.

The Commission has been considering the issue of water reuse for a number of years and has documented its findings to date in several steps. In the 2012 Communication "A Blueprint to Safeguard Europe's Water Resources" (COM(2012) 673) water reuse for irrigation or industrial purposes was found to have a lower environmental impact and potentially lower costs than other alternative water supplies, whereas it is only used to a limited extent in the EU. A Fitness check of EU Freshwater policy (SWD(2012) 393) published in November 2012, as a building block of the Blueprint, assessed the performance of the measures taken, both in environment and in other policy areas, in achieving the objectives already agreed in the context of water policy. It also identified the major gaps to be closed in order to deliver environmental objectives more efficiently. In relation to waste water reuse, the Fitness Check concluded that "alternative water supply options with low environmental impact need to be further relied upon" in order to address water scarcity. A particular issue emphasised by stakeholders in the public consultation of the Fitness Check was the lack of EU common quality requirements for reuse of waste water in irrigation. Several policy options to promote water reuse were considered in the impact assessment of the Blueprint (SWD(2012) 382)¹ A number of actions to promote water reuse were included in the Communication "Closing the loop – An EU action plan for the circular economy" (COM(2015) 614), and in particular a legislative proposal on minimum requirements for reused water for irrigation and groundwater recharge. This proposal has also been included in the European Commission's 2017 Work Programme as it contributes to the political priorities set by the Commission to promote a more circular economy. In addition, it may complement the planned future modernisation of the Common Agricultural Policy.² Finally, the initiative could contribute to the EU's implementation of the Sustainable Development Goals (SDGs) and in particular

¹ It concluded: "*Regarding water re-use there is a need to ensure the effective operation of the Internal Market to support investment and use of re-used water. The assessment, including stakeholder consultation, found that this can only be achieved through the development of new regulatory standards at EU level. Therefore, the preferred option is for the Commission to pursue appropriate health/environment protection standards for re-use of water and, subsequently, to propose a new Regulation containing these subject to a specific impact assessment.*"

² To note in this context that reference to water reuse is made in a Commission Staff Working Document on Agriculture and Sustainable Water Management in the EU (SWD(2017) 153final) as one of a number of measures that has the potential to reduce negative impacts associated with over-abstraction.

SDG 6 on Clean Water and Sanitation, which sets a target of substantially increasing recycling and safe reuse globally by 2030.

The intention to address water reuse with a new legislative proposal was noted with interest by the Council, in its conclusions on the Commission's Communications on the Blueprint and on Circular Economy and in its conclusions on Sustainable Water Management (11902/16). Furthermore, the European Parliament, in its Resolution on the follow-up to the European Citizens' Initiative Right2Water in September 2015, encouraged the Commission to draw up a legislative framework on water reuse, as well as the Committee of the Regions, in its opinion on "Effective water management system: an approach to innovative solutions" in December 2016.

The present document addresses the problem of a too limited application of water reuse in order to contribute to alleviating water scarcity and analyses the modalities of creating an enabling framework for increasing the uptake of water reuse, in particular for agricultural irrigation and aquifer recharge. Setting appropriate minimum requirements together with a risk assessment approach would ensure a level playing field for those engaged in water reuse and those affected, ensure health and the environment are protected and thereby also increase confidence in the practice of water reuse. Acting now by putting in place an enabling framework would contribute to alleviating water stress where it is already a reality today in the EU and also prepare operators and farmers to be ready to act also in those parts of the EU which will experience increasing water stress in the coming years and decades.

1. PROBLEM DEFINITION

1.1. Policy context

This impact assessment analyses the potential of an EU initiative on water reuse **in the context of water scarcity being a serious problem today** and a great concern amongst EU Member States. Europe's freshwater resources are under increasing stress, with a mismatch between the continuously increasing demand for, and the limited availability of, water resources across the whole EU (EEA, 2012³). Water over-abstraction, for irrigation purposes but also for industrial use and urban development, is one of the main threats to the EU water environment, while availability of water of appropriate quality is a **critical condition to growth** in water-dependent economic sectors and society in general. Empirical studies find significant macroeconomic affects which vary with the assumed duration and severity of the drought or water scarcity⁴.

Water stress already affects one third of the EU territory all year round (EC, 2012⁵). This is no longer only an issue for arid, densely populated regions that are prone to increasing water stress; temperate areas with intense agricultural, tourism and industrial activities also suffer from frequent water shortages and/or expensive supply solutions. While during summer

³ <https://www.eea.europa.eu/themes/water/water-assessments-2012>

⁴ The overall impacts on the economy due to the 2003 drought have been estimated at a minimum of EUR 8.7 billion (mainly concerning Mediterranean countries, France and the UK), measured as the estimated losses directly resulting from the drought (EC, 2007). Immediate effects of droughts, such as damage to agriculture and infrastructure, as well as more indirect effects, such as a reluctance to invest in an area at risk, can also have a serious economic impact. A 1% increase in the area affected by drought can slow a country's gross domestic product (GDP) growth by 2.7% per year (Brown et al., 2013). In Catalonia, Spain, a simulation of the macroeconomic impact of water restrictions to the Catalan economy for the year 2001 showed that restrictions on non-priority water uses following a drought warning would have led to a loss of gross added-value of about EUR 1.196bn (0.97% of Catalonia's GDP), while extended restrictions in the case of an extreme drought would have caused a loss of EUR 8.079bn, representing 6.52% of the GDP (Gonzalez et al., 2009).

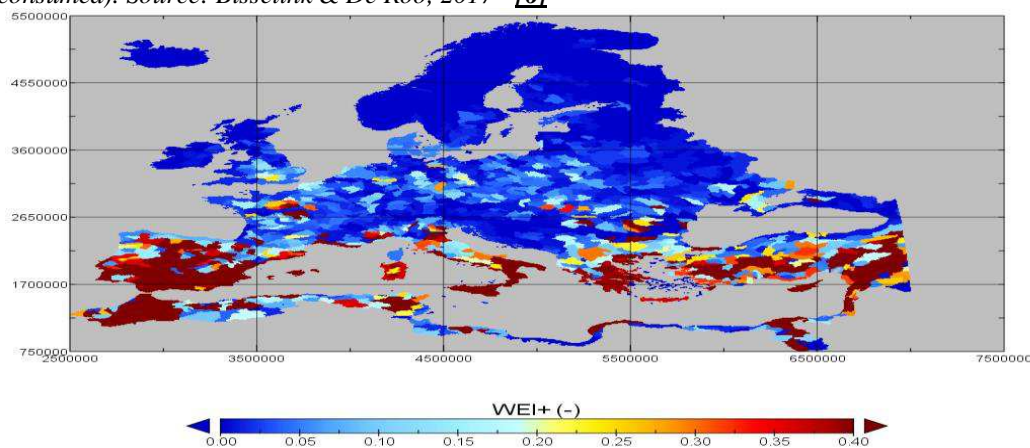
⁵ <http://ec.europa.eu/environment/water/quantity/pdf/COM-2012-672final-EN.pdf>

months this is more pronounced in Southern European basins, water scarcity and droughts are no longer issues confined to southern Europe. Regions in northern European countries, including the United Kingdom and Germany, also face seasonal water stress.

As an effect of climate change, the frequency and intensity of droughts and their environmental and economic damages have drastically increased over the past thirty years: between 1976 and 2006 the number of areas and people affected by droughts went up by almost 20% and the total costs of droughts amounted to EUR 100 billion (EC, 2012). A concrete example related to the droughts of the summer of 2017 may further illustrate the dimensions of economic loss; the Italian farming sector alone was predicting losses of EUR 2 billion⁶. This trend is expected to continue, i.e. the average volume of water annually available as streamflow is expected to decrease significantly in the South of Europe, to slightly increase in the North, with a transition zone in between, where it is expected to remain approximately stable (see Annex 4 for details on the assessment). However, the temporal variability of available water is generally expected to increase, consistent with the general increase in drought and flood hazards projected for Europe (Forzieri et al., 2014; Forzieri et al., 2016)⁷. So, even in the North of Europe there will be a need to better manage water resources and to enable more tools.

As shown in Figure 1, even conservative climate scenarios would subject large parts of the EU territory to significantly reduced quantities of water in rivers.

Figure 1: Water scarcity under a 2 degree climate scenario (Water Exploitation Index, WEI+ is the ratio of consumed water versus availability; in the red areas more than 40% of all annual renewable freshwater is consumed). Source: Bisselink & De Roo, 2017⁸ [6]



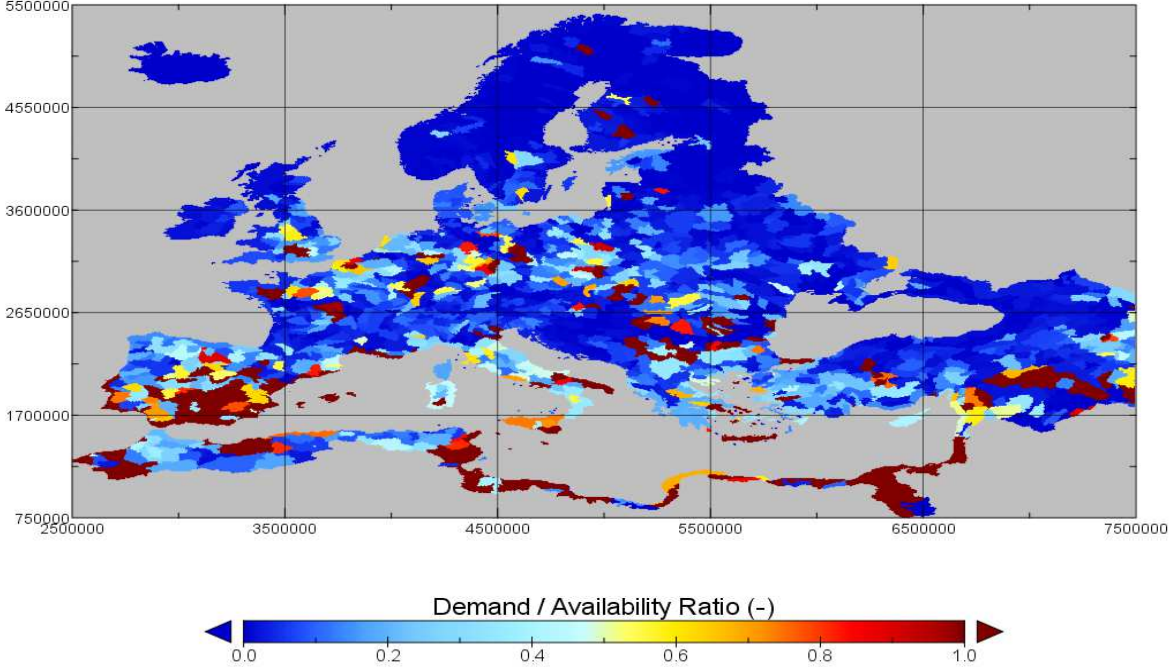
⁶ <http://www.bbc.com/news/world-europe-40803619>

⁷ Forzieri, G., Feyen, L., Russo, S., Voudoukas, M., Alfieri, L., Outten, S., Migliavacca, M., Bianchi, A., Rojas, R., Cid, A. Multi-hazard assessment in Europe under climate change (2016) *Climatic Change*, 137 (1-2), pp. 105-119. DOI: 10.1007/s10584-016-1661-x; Forzieri, G., Feyen, L., Rojas, R., Flörke, M., Wimmer, F., Bianchi, A.; Ensemble projections of future streamflow droughts in Europe (2014) *Hydrology and Earth System Sciences*, 18 (1), pp. 85-108. DOI: 10.5194/hess-18-85-2014

⁸ Figure 1 and 2 are produced using JRC's LISFLOOD water resources model (De Roo et al, 2000). The 2 degree global temperature increase maps are an average of 5 climate models and simulate the consequences when global temperature increase equals 2 degrees. Within an high emission scenario, without signification climate mitigation (RCP8.5 world) this situation is already reached around 2040. In a milder emission world (~RCP 4.5) this may be reached around 2055. When we would stay within the Paris agreement, we may be getting close to this situation, but without ever reaching it, at least not in this century. The 2 degree assessment includes projections of land use change (using JRC's LUISA system) until 2050, GDP projections, population projections and water demand projections until 2100 (Bisselink, De Roo, Bernhard, 2017). A comparison is made between the ensemble means of the 2oC warming period and the baseline period (1981-2010).

Today's situation can be illustrated using an indicator of water stress due to possible over-abstraction; the ratio of water demand to water availability. Using this indicator, Figure 2 shows how Europe's rivers are already subject to significant pressure from abstractions (see Annex 4 for details on the assessment). The indicator highlights that the challenge is not limited to Southern Europe, but is also an issue in more central parts of Europe.

Figure 2: Water demand divided by water availability. Source: Bisselink & De Roo, 2017.



Farmers needing water for irrigation are obviously affected by this water pressure. Farmers seeking reliable sources of water all year round may have several options for alternative water supplies. These can, for example, include investment in water storage devices, using groundwater reserves, desalination or transferring water from other river basins. In theory alternative water supply options, especially desalination, can deliver unlimited amounts of water. In practice, all the options have a lot of limitations in terms of costs and negative economic, environmental and social impacts. These alternatives have been assessed within the impact assessment of the Blueprint (see Annex 1a for details).

In some countries, farmers may also receive treated waste water from urban waste water treatment plants, which can provide a reliable source of water, less dependent on precipitation and in a quality adapted for this water to be reused for various purposes, e.g. for agricultural irrigation. Water reuse generally has a lower environmental impact than other alternative water supplies and offers a range of environmental, economic and social benefits (Annex 6).

While the evidence demonstrates the seriousness of water stress and its expected evolution, the policy context for water reuse as a contribution to its alleviation has only started to be developed. Another important angle is the impact of water scarcity in one Member State on other Member States via the Internal Market. The differences in concepts, principles and procedures between the water reuse laws of different Member States may impede the free movement of agricultural products irrigated with treated waste water, create unequal conditions of competition, and may thereby directly affect the functioning of the Internal Market.

Water reuse has already been identified and encouraged in provisions of two existing EU instruments, however, these instruments do not specify conditions for the reuse of treated waste water:

- the Water Framework Directive (2000/60/EC, WFD); its Annex VI, part B mentions water reuse as one of the possible supplementary measures;
- the Urban Waste Water Treatment Directive (91/271/EEC, UWWTD): its Article 12 stipulates, as part of the condition on wastewater discharges that "*treated waste water shall be reused whenever appropriate. Disposal routes shall minimize the adverse effects on the environment.*".

In the WFD, water scarcity is a key aspect of water management. This legislation sets inter alia a central goal of attaining good status for Europe's waters by 2015. It requires Member States to characterise the situation of their water in terms of pressures from human activities and set 'programmes of measures' to achieve the good status objective. Those are part of River Basins Management Plans, to be reviewed every 6 years. In 2007, the EU policy on water scarcity and droughts (COM(2007) 414) (WS&D) elaborated on the integration of water scarcity planning into River Basins Management Plans, including the use of appropriate water pricing and ecological requirements for river flows. It spelled out the hierarchy of measures Member States should consider in managing water scarcity and droughts, with priority for water saving and efficiency measures, and with additional water supply infrastructures only to be considered as an option when other options have been exhausted, including effective water pricing policy and cost-effective alternatives. Water reuse is to be considered within such an integrated water management approach. The Circular Economy Action Plan included a number of actions on water reuse (one of which is subject of this impact assessment), including also Guidelines on integrating water reuse into water planning and management in the context of the WFD which were completed in 2016 and are expected to positively contribute.

In 2012, the Commission conducted a series of assessments to check the adequacy of the water legislation and its implementation. A 'Fitness Check' of freshwater policy looked into the relevance, coherence, effectiveness and efficiency of water policy. A major evaluation of the implementation of the WFD was carried out, assessing Member States' River Basin Management Plans (RBMPs). A gap analysis of the Commission's 2007 policy on Water Scarcity and Drought⁹ was also carried out, together with an assessment of how vulnerable water resources are to climate change and other man-made pressures such as urbanisation and land use. This included also an assessment of measures introduced by Member States in different River Basins to address water scarcity and droughts. Such measures were, for example, the development of drought management plans, considering additional water supply infrastructure (including water reuse projects) and fostering water efficient technologies and practices. The results showed that the legislative framework was largely complete and fit for purpose. However, the overall objective of the WFD – good status for Europe's waters by 2015 – has not yet been fully achieved, neither the WS&D overall policy objective – to revert the WS&D trends. Furthermore, better implementation and closer integration with other related policies were clearly required, as well as the development of additional tools related to water demand management and water availability.

The few identified gaps were discussed in the Communication "A Blueprint to Safeguard Europe's Water Resources" (COM/2012/0673). As regards the alleviation of water scarcity and reduction of vulnerability, the Impact Assessment of the Blueprint (SWD(2012) 382) assessed a number of measures improving water efficiency and availability (e.g. desalination, water transfers, rainwater harvesting, etc.). Beyond water efficiency measures, water reuse was identified for its cost-effectiveness and its lower environmental impacts compared to other supply options; the need for an EU action to address the barriers to its further development was supported in public consultations (see Annex 2). As a result, the

⁹ <http://ec.europa.eu/environment/water/quantity/pdf/COM-2012-672final-EN.pdf>

Commission announced in the Blueprint it would consider developing a regulatory instrument setting EU-wide minimum requirements for water reuse to improve the uptake of this alternative water supply while maintaining health and environment safety.

A Fitness Check of EU environmental monitoring, which was carried out and presented by the Commission in June 2017, includes an action plan to streamline environmental reporting to be implemented in the coming years¹⁰. Monitoring needs for the present initiative have been elaborated according to the principles highlighted in this Fitness Check (see more details in Section 7).

The Commission has been discussing water reuse with Member States and stakeholders on an ongoing basis for the last number of years, both on the policy aspects and the development of minimum requirements, taking account of existing national requirements and international practice. The need to address the issue at EU level in the context of alleviating water scarcity is broadly recognised and supported, including by the agricultural sector (see Annex 2).¹¹

1.2. Problem definition

The problem this initiative seeks to address is that **although** the practice of **water reuse**, in particular for agricultural irrigation and aquifer recharge, **could contribute to alleviating water stress** in the EU (see projections in Section 1.1), **the uptake of water reuse solutions remains limited in comparison with their potential**, which remains largely untapped. The problem is **relevant for the EU now** due to the **important consequences** of the growing scarcity affecting EU waters **for the environment, the economy and society in general**. There is an **important dimension** related to the **proper functioning of the Internal Market for agricultural products** irrigated with treated waste water.

Several factors contribute to the situation concerning water reuse today and any proposed solution to the problem should be seen against this background. Firstly, existing water resources in Europe are not always managed efficiently. There are many situations where access to conventional water resources is insufficiently controlled by public authorities resulting in both over allocation (abstraction permits going beyond available resources, incl. situations where no maximum amount is set in permits) and illegal abstraction (when permits are not enforced in particular because of no monitoring of actual abstractions). The same conventional resources are generally under-priced, as fees imposed on self-abstractions generally do not reflect the environmental and resource cost; the water price in collective systems hardly covers infrastructure costs (cf. below Figure 3). Both issues can be considered as an implementation failure as they contradict WFD provisions regarding the setting of controls on permits, abstractions and water pricing. They can be addressed with e.g. compliance and enforcement actions as appropriate, ensuring a proper implementation of the WFD in Member States¹². These failures frequently result in a market failure: subsidised uses of water are being practiced, even more detrimentally in situations of water scarcity, which does not reflect their actual cost, leading to a reduction of the economic attractiveness of water reuse projects (if only the latter are considered at their full cost, or if all available

¹⁰ Report "Actions to Streamline Environmental Reporting" (COM(2017)312) and Fitness Check evaluation (SWD(2017)230)

¹¹ Most recently, Member States expressed support at a meeting of Directors-General for Environment in Tallinn on 23 October 2017. The latest meeting of the Member States' Common Implementation Strategy Ad-hoc Task Group on Water Reuse was held on 6-7 November 2017 a number of Member States and stakeholders expressed strong support for regulation of water reuse at the EU level, pledging for recognising the severity of water stress that they are facing with all accompanying consequences.

¹² In particular the Commission is assessing the updated River Basin Management Plans that Member States were to adopt by December 2015 and will publish an implementation report by December 2018.

options are not compared on equal terms). As a consequence, improper investment decisions made by water users and decision makers in terms of actual costs incurred and environmental impacts, despite water reuse being more advantageous than other measures (e.g. use of drinking water, desalination, lengthy water transfers, on stream storage facilities) in terms of costs incurred and environmental impacts.

Figure 3: Cost-recovery levels in reviewed countries where irrigation water tariffs are in place, and in other southern EU Member States (EEA, 2013)

Country	Cost-recovery levels	Year
Netherlands	99 % (figure including all sectors, i.e. domestic and business users including farmers)	2010
France	O&M costs: 100 % Investment costs: 15–95 % (Average: 55 %)	Arcadis, 2012
Spain (Guadalquivir RBD)	49.78 %	2005
Cyprus	51 %	Arcadis, 2012
Greece	54 %	Arcadis, 2012
Italy	20–30 % (south) 50–80 % (north) Average: 50 %	Arcadis, 2012

Secondly, despite the existing provisions in both the WFD and UWWTD, water reuse has not been systematically and sufficiently considered in integrated water management planning¹³: a) either as a practical solution in the broader water management or in the elaboration and implementation of River Basin Management Plans or b) in the design and location of waste water treatment plants. Cost of adaptation of existing plants and conveying water to places of reuse is generally higher than if taken into consideration at the initial stage of building waste water treatment plants and conveyance networks. The second public consultation identified the distance between treatment plant and irrigation fields and the insufficient consideration for water reuse in integrated management amongst the highest barriers (see Annex 2).

The Regulation on the Hygiene of Foodstuffs (EC) No 852/2004 refers to the concept of clean water but does not include water quality requirements. An accompanying Guidance¹⁴ specifies, amongst others, the use of treated waste water for irrigation; it includes examples of parametric values to ensure the protection of health but their application is voluntary. Potential environmental risks associated with the use of treated waste water for irrigation are not addressed.

Current water reuse practices diverge widely across Member States. In some, water reuse is considered an integral and effective component of long-term water resources management due to severe water scarcity (e.g. Cyprus, Greece, Italy, Malta, Portugal and Spain), while in other Member States water reuse is not practised or water reuse projects are rather limited. An overview of the current situation of water reuse in the EU Member States is provided in Annex 6.

In 2015, the total volume of reused treated waste water in the EU was estimated at 1,100 million m³/year (BIO, 2015¹⁵), accounting for 2.4% of the total volume of treated effluents produced or 0.4% of annual EU freshwater withdrawals (237,660 million m³/year in 2011). The European countries with the highest reuse rates are presented in Figure 4a. However, as presented in Figure 4b, rates even for water scarce Italy, Greece and Spain are much lower than in a number of third countries which have invested a lot in this technology over the last decades. The highest rate is Israel where 87% of treated waste water is presently reused, with a target by 2022 of 90%. This confirms that overall in Europe and even in most European

¹³ mainly due to fragmentation of responsibilities for and authorities over different parts of the water cycle; and a lack of communication and cooperation among stakeholders from different sectors involved in the whole water cycle, in particular between water supply (incl. for irrigation) and sanitation stakeholders.

¹⁴ 2017/C 163/01 of 23 May 2017

¹⁵ http://ec.europa.eu/environment/water/blueprint/pdf/BIO_IA%20on%20water%20reuse_Final%20Part%20I.pdf

countries with water reuse being an integral and effective component of long-term water resources management, the potential of water reuse is far from being exploited.

Figure 4a: Effluent reclamation in Europe (Mekorot, 2017)

Country	Cyprus	Malta	Italy	Greece	Spain	Overall in EU
Effluent reclamation rate	89%	60%	5%	5%	12%	2,4%

Figure 4b: Effluent reclamation in third countries (Mekorot, 2017)

Country	China	USA	Australia	Singapore	Israel
Effluent reclamation rate	14%	14%	15%	35%	87%

Compared to the current practice as summarised above, the potential for water reuse in the EU is estimated to be much larger: a volume in the order of 6,000 million m³/year by 2025 might be achieved in the presence of a better enabling framework and suitable financial incentives at the EU level (BIO, 2015). Reusing the total volume of treated wastewater in Europe could cover nearly 44% of the agricultural irrigation demand and avoid 13% of abstraction from natural sources (Defra, 2011) and could significantly contribute to alleviating water scarcity

The problem as set out above is resulting in an opportunity lost for EU citizens on the whole and economic sectors such as agriculture, tourism, industry, energy and transport (see footnote 2). This may in turn affect economic growth (in the case of reduced production due to water scarcity) or competitiveness (in case of disadvantaged farmers due to differences in input costs or due to unsafe products reaching the markets). The effects of water scarcity in one Member State are also felt in others via the Internal Market and the tightly interconnected European economies through impacts on trade in goods and services as well as investments.

This concerns in particular trade in agricultural products irrigated with treated waste water. The important differences in relation to concepts, principles and procedures between the water reuse laws of different Member States, these differences may in particular impede the free movement of agricultural products irrigated with treated waste water, create unequal conditions of competition, and may thereby directly affect the functioning of the Internal Market. As the intra-EU share of trade in agricultural products by far exceeds the extra-EU share, this aspect is significant. For fruits and vegetables, this amounted to EUR 33.4 billion in intra-EU trade as compared to EUR 4.7 billion in extra-EU trade in 2015.¹⁶

Furthermore, technology providers in this sector are EU-scale companies¹⁷. However, differences in standards among Member States can prevent companies benefitting from economies of scale and standardisation, which would support innovation and the development of systemic solutions at lower costs. This was confirmed by the specific consultation of experts in research and innovation (see Annex 8).

1.2.1. Scope of the present impact assessment

The scope of this impact assessment includes water reuse for agricultural irrigation and aquifer recharge; the source of water for such purposes is limited to treated waste water covered by the UWWTD.

This reflects the priority areas as set out in previous Commission documents. In the 2015 Communication ‘Closing the loop – An EU action plan for the Circular Economy’ (COM/2015/614) and subsequently in the Inception Impact Assessment of the EU water reuse initiative at hand, agricultural irrigation and aquifer recharge were identified as main potential sources of demand for reclaimed water having the greatest potential in terms of its higher uptake, scarcity alleviation and EU relevance: agricultural irrigation as the biggest user of

¹⁶http://ec.europa.eu/eurostat/statistics-explained/index.php/The_fruit_and_vegetable_sector_in_the_EU_-_a_statistical_overview

¹⁷<https://www.ventureradar.com/search/ranked/Water%20AND%20Reuse/>

treated waste water and the links with the Internal Market and aquifer recharge due to the potential cross-border nature of many aquifers.

Beyond the uses analysed in this impact assessment, treated waste water may be used for a wide variety of other purposes. For reference, these are also briefly summarised below and set out in more detail in Annex 6.

Agricultural irrigation is by far the largest application of reclaimed water worldwide and in Europe (Annex 6) and a significant use of water in Europe, overall accounting for around a quarter of total freshwater abstracted. Abstraction for irrigation accounts for about 60% of total freshwater abstraction in Southern and South Eastern Europe, and up to 80% in certain River basin districts (RBDs). Water reuse in agriculture therefore has the highest potential for an increased uptake of water reuse, and thus contributing to the alleviation of water scarcity in Europe.

Artificial aquifer recharge aims at increasing the groundwater potential and it can help prevent saline intrusion in depleted coastal aquifers. The lack of scientific and technical knowledge (including lack of clarity of ownership and liability), coupled with low perception of this kind of technique being an important water management instrument, contribute to the low uptake at present (Escalante, 2014). The risks to health and the environment from pollutants such as bacteria, viruses and emerging pollutants and priority substances such as those already detected occasionally in discharges from water treatment plants (and in high concentrations) are also perceived as an obstacle (Estévez et al., 2016; Estévez et al., 2012). In the first public consultation, aquifer recharge was one of the uses for water reuse most frequently mentioned that stakeholder found appropriate, in particular in order to prevent saline intrusion (see Annex 2). Therefore water reuse for aquifer recharge has been analysed for potential regulation at the EU level but the case for an EU intervention is not deemed proportionate, as set out further in subsequent sections.

Whilst agricultural irrigation and aquifer recharge are in scope, a number of other areas are outside the scope and so not considered further because of various reasons (e.g. they are already covered by other legislation; the risks are being managed effectively and/or are not linked to the internal market).

In terms of investment opportunities, water reuse projects currently suffer from a limited economic attractiveness which is exacerbated by the unclear regulatory framework applying to them and today, the level of investment into water reuse in the EU is limited and far below its potential. This issue is being addressed in the Circular Economy Action Plan which commits to maintain and increase the visibility of existing financial support to investments in water reuse, e.g. with European Structural and Investment Funds. Therefore this topic will not be pursued further in this IA.

A number of actions on improving implementation and enforcement of existing water legislation will be taken independently of this initiative as they are not specific to water reuse. Additionally, in the Circular Economy Action Plan, the Commission committed to develop a series of non-regulatory actions to promote safe and cost-effective water reuse in 2016-2017 (see above).

Water reuse for municipal/landscape uses (e.g. irrigation of public parks, recreational and sporting facilities, street cleaning, fire protection systems etc.) is outside the scope of this Impact Assessment. Local conditions determine both the opportunities and risks, and no significant health or environmental risk has been identified with current practices in the Member States. The risks to the environment are generally very local and they are regulated to a large extent by the existing EU legislative framework (e.g. WFD and UWWTD). Given the visibility of this use to the public, often associated with access restrictions in urban areas where water reuse is practised, the public perception of these risks needs to be adequately

managed (see the supporting studies of BIO and AMEC), taking into account the local specificities of these uses. Therefore, authorities in the Member States need some flexibility within the existing framework and no need for further legislative action has been identified.

Direct reuse of waste water from industrial sources for agricultural irrigation is outside the scope of this impact assessment. The quality of industrial waste water is in general very different from domestic waste water in terms of nature and magnitude of pollutants, in particular chemicals. Because of the diversity of pollutants and of the potential harmful effects to both health and the environment of some of these pollutants, these effluents pose specific challenges in terms of safety and treatment technology. As regards the discharge of industrial waste water into the environment, the Industrial Emission Directive only imposes detailed quality requirements (emission limits) on large-size firms in a number of selected sectors. Reuse and recycling of waste water from industrial sources are generally limited to those for industrial purposes in the same or another industry; the conditions for such reuse or recycling are very sector-specific. Best Available Techniques Reference Documents (BREFs) developed under the Industrial Emissions Directive (2010/75/EU) address water use and reuse for most sectors where this is relevant (29 out of 31; e.g. Food, drink and milk industries, Industrial cooling systems, Rearing of poultry and pigs). The drafting of the EU Action Plan on Circular Economy already considered that further promotion of water reuse in the manufacturing industry will be more effectively addressed in the context of the development and review of these BREFs for the relevant sectors.

Reuse of treated urban waste water for industrial purposes is not addressed by the present initiative as its potential for a higher uptake is relatively modest (Annex 6) and rather a local issue that requires a sufficient degree of flexibility at Member State level; therefore, at this moment, any EU level action would not be proportionate.

The reuse of rainwater and grey water is also not included in the scope of this impact assessment. The issue has been addressed in the impact assessment for the Blueprint (see Annex 1a), which pointed out that environmental impacts related to the need of construction and maintenance of the necessary infrastructure for rainwater harvesting may lead to negative energy/treatment/GHG impacts. For water harvesting in agriculture the same negative effects should be taken as those identified for water storage (dams and reservoirs). Furthermore, a previous study¹⁸ conducted in preparation of the Blueprint Communication concluded that EU policy on certification to promote rainwater harvesting and reuse in buildings could lead to significant water savings but would be applicable only for major renovations or new buildings. Therefore, it was found more appropriate to include such promotion in an integrated manner in the development of Best Environmental Management Practices (BEMPs)¹⁹ and in the context of the sustainable buildings policy²⁰.

As a result the source of water to be reused considered in this impact assessment is only the waste water covered by the UWWTD, that is to say urban waste water defined as "domestic waste water or the mixture of domestic waste water with industrial waste water, subject to the relevant pre-treatment and/or run-off water".

¹⁸ Bio Intelligence and Cranfield University, 2012: Water Performance of Buildings, Study for the European Commission, DG Environment.

http://ec.europa.eu/environment/water/quantity/pdf/BIO_WaterPerformanceBuildings.pdf

¹⁹<https://ec.europa.eu/jrc/en/research-topic/best-environmental-management-practice>

In particular rainwater harvesting and greywater recycling are included as BEMP in the sectoral reference document for Tourism (2013) and in the best practice report by JRC for Building and Construction (2012) and Public Administration (2015)

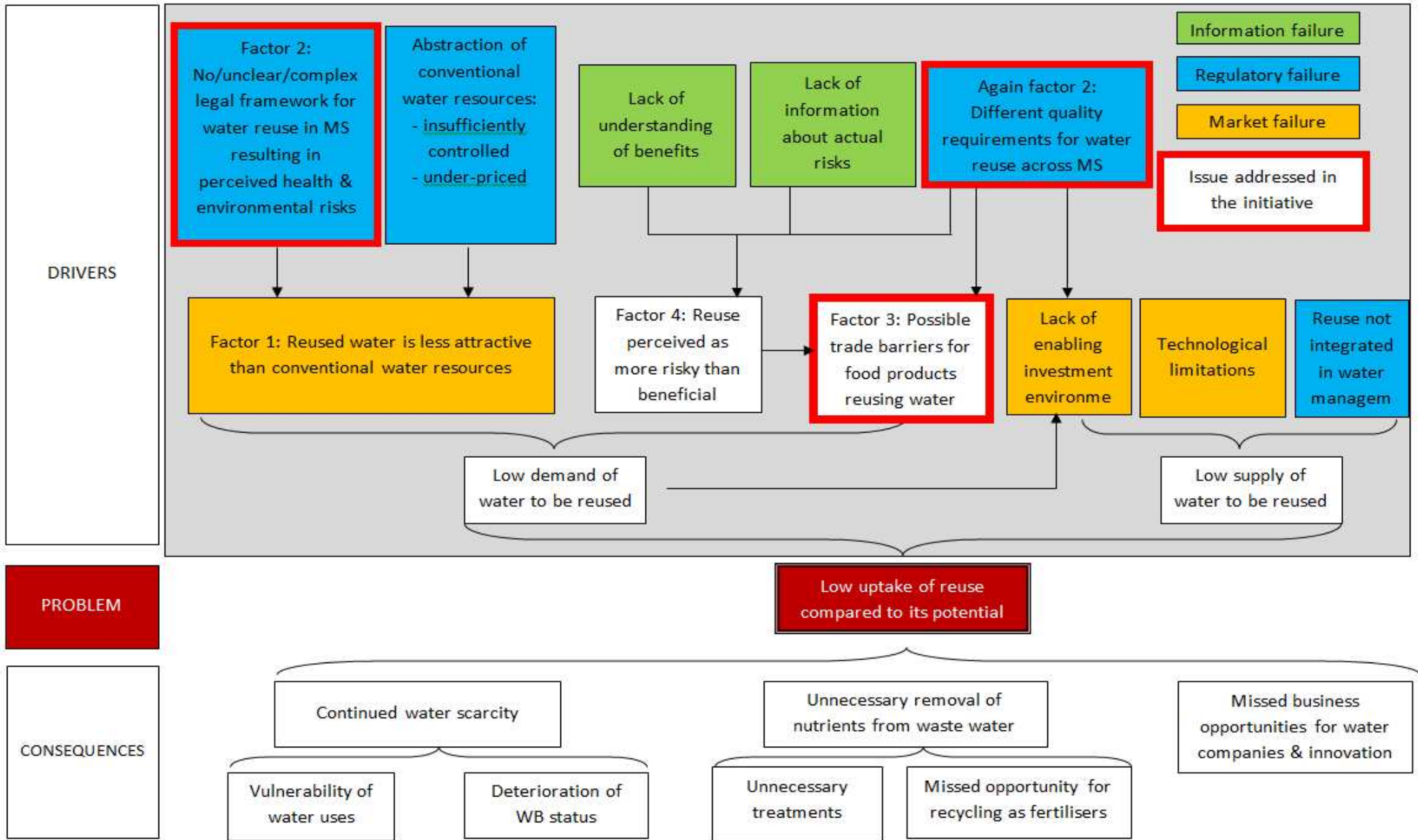
²⁰ http://susproc.jrc.ec.europa.eu/Efficient_Buildings/documents.html

1.3. What are the underlying causes of the problem?

The overall problem of "low uptake of water reuse compared to its potential resulting in a suboptimal contribution to alleviate water scarcity" is the result of four factors discussed below: (1) limited attractiveness, (2) environmental risks and perceived health risks due to varying existing quality requirements or the lack thereof, (3) possible trade barriers and (4) the resulting general view of risks outweighing benefits. However, this initiative is going to address only factors 2 and 3, while factors 1 and 4 are not directly addressed by this initiative.

The problem's underlying drivers and consequences as described in the present section are displayed in a problem tree below. Both this section and the problem tree take as a point of departure the problem definition in the impact assessment of the 2012 Blueprint (see Annex 1a) which already found that: *"The main barrier to expansion of water re-use is the lack of common standards at EU level, in particular in agriculture. While guidelines for agricultural water re-use have been defined by the World Health Organisation, and by different countries, such as the USA and Australia, a uniform solution for Europe is lacking. Establishing standards for the functional operation of the single market is an appropriate EU level response, taking into account EU Health, Agriculture and Energy policies. [...] The lack of common health/environmental standards threatens farmers using re-used water to irrigate crops for export within the single market and prevents industry from making long-term investment decisions. It also constitutes a barrier for innovation."*

The second public consultation identified as the main barriers associated with legislation the insufficient clarity in the regulatory framework, administrative burden for water operators, users and public authorities, stringent national quality requirements, and, to a lesser extent, the absence of national requirements for water reuse. The low price of freshwater compared to the price of reclaimed water and the high cost of treatment were also identified among the highest barriers (see Annex 2).



1.3.1. Factor 1 – Reused water is less attractive than freshwater

The WFD, in its Article 9, provides the legal definition of pricing water services and stipulates the principle of cost recovery (including environmental and resource costs) as well as the polluter-pays principle. The available evidence suggests that, at best, tariffs only take account of the financial costs of water treatment and distribution and that few Member States apply direct charges to polluters for the purification of their waste water as well as other activities that impact on water quality, while charging for the resource costs of water abstraction is rare (EEA, 2013). Furthermore, in agriculture, the rather low levels of cost recovery (up to 80% but sometimes as low as 20%) point to heavy subsidisation of freshwater use, even in water-scarce Mediterranean countries (EEA, 2013). Prices are frequently too low to provide an adequate incentive to the efficient use of both freshwater and reused water.²¹ There are measures being undertaken to improve the implementation of Article 9 of the Water Framework Directive so as to achieve better cost recovery²². Therefore, the underlying drivers of illegal abstraction and subsidised water prices for freshwater are outside of the scope of the initiative and are not addressed in this impact assessment.

As demonstrated in the Impact assessment of the Blueprint, in areas where water is scarce, reclaimed water can be a cost-effective solution compared to other supply options, especially when all economic and environmental costs are considered. However, even in these cases, reclaimed water is generally found less attractive than conventional water resources.

1.3.2. Factor 2 – Legal frameworks for water reuse exist only in few Member States resulting in a perceived health risk and environmental risk

A range of potential risks is associated with reused water which is likely to contain pollutants (organic, microbiological, chemical, etc.). These risks differ by type of reuse and entail contamination of the environment (water resources, soil) and people (direct exposure, ingestion of food products irrigated with reclaimed water, etc.). Health risks are partially addressed by existing legislation concerning agricultural product safety, i.e. the Regulation on the Hygiene of Foodstuffs; however, this legislation does not specify the requirements for treated waste water used for irrigation of agricultural products²³. Environmental risks associated with water reuse must be considered as well, e.g. chemical contaminants from inorganic salts, nutrients, heavy metals and detergents can negatively affect the environment. For heavy metals there are concerns that these substances can build-up in the soil over time. Salinity of the water is also a risk to the environment and crops (in case of irrigation). There are also growing concerns over the fate of the wide variety of compounds of emerging contaminants (CECs), e.g. pharmaceuticals, which are present in sewage, often at trace levels, and often unmonitored. Evidence remains limited as to how well treatment processes deal with these pollutants. In general such risks can be addressed by applying suitable barriers, the most important barrier being treatment of waste water and applying a risk based approach.

As displayed in Figure 5, these risks can be split into 2 categories associated with water reuse in agricultural irrigation:

- the health risks to consumers of agricultural products irrigated with reclaimed water and placed on the Internal Market; this category of risk includes those to health of animals consuming crops irrigated with reclaimed water;

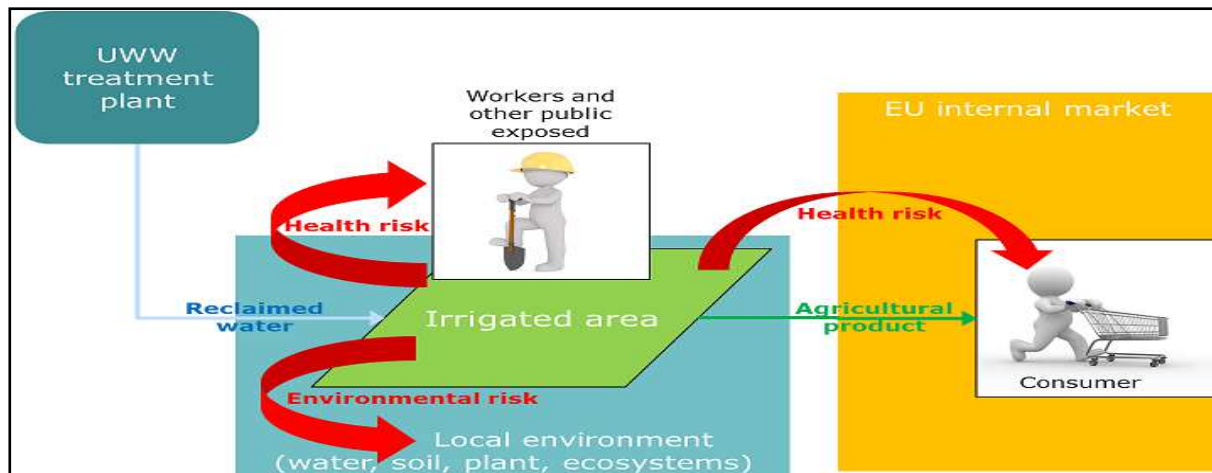
²¹ http://ec.europa.eu/environment/water/blueprint/pdf/EU_level_instruments_on_water-2nd-IA_support-study_AMEC.pdf

²² These measures include enforcement actions launched by the Commission, bilateral meetings with MS on RBMPs, CIS Guidance documents on Art. 9, CIS Peer review process, etc.

²³ Guidance for the implementation of this Regulation introduces some standards for irrigation water, which also covers treated waste water. These voluntary standards do not address all risks, as environmental risks are not covered.

- the health risks to humans exposed to reclaimed water (workers, bystanders and residents in nearby communities) and risks to the local environment (surface waters and groundwaters, soil and depending ecosystems).

Figure 5: Health and environmental risks associated with water reuse in irrigation in the EU



Currently only 5 Member States (Cyprus, Greece, Spain, France and Italy) have developed legislation that sets specific requirements on the reuse of waste water; Portugal has developed non-regulatory standards on water quality. Some other Member States are interested in enabling more reuse of water, but are wary of public perceptions seeing this as a "dirty" technique and so are reluctant to take the initiative on their own to develop a legislative framework. Informally, a number of Member States have indicated an interest in having such a framework, and await to see it developed at European level as announced in the Blueprint as it would be seen as having more standing. Furthermore, whilst 60% of river basins are international, so far, rather countries that do not share river basins as well as those suffering most from water stress have developed their own frameworks.

In the Member States currently with requirements, these vary significantly in their level of stringency as illustrated in Figure 6; none of these national requirements are the same. While there are local specificities, Figure 6 shows that different national approaches and methodologies have been used to arrive at defining requirements to protect consumers' health. In addition to these quality standards to address the potential health risks for consumers, some Member States also apply to some extent a risk assessment approach (see Annex 6 – Overview of MS requirements), however, environmental risks are not addressed adequately and consistently in these existing frameworks. It is to be noted that a risk assessment approach has been introduced on a voluntary basis in the amendment of the Annex of the Drinking Water Directive in 2015 and some Member States (Hungary, the Netherlands and the United Kingdom) have implemented it. The Commission's proposal for a Recast of the Drinking Water Directive introduces the risk assessment approach on a compulsory basis.

This means that the same type of food product (e.g. a tomato), depending on where in Europe it is grown, faces very diverging requirements as to the kind of reclaimed water allowed for irrigation. Nevertheless, these tomatoes are traded across borders in different Member States and are consumed throughout Europe. There is a lack of clarity on how food products are irrigated, resulting in a health risk perception in large parts of the population / consumers / the general public as confirmed by the public consultation outcome (see Annex 2).

Figure 6: Differences in maximum limit values for selected parameters considered in national quality requirements for water reuse

Parameters	Cyprus	France	Greece	Italy	Portugal	Spain
E coli (cfu/100ml)	5-10 ³	250-10 ⁵	5-200	10	-	0-10,000 ²⁴
Faecal coliforms	-	-	-	-	100-10 ⁴	-
TSS	10-30	15	2-35	10	60	5-35
Turbidity (NTU)	-	-	2-no limit	-	-	1-15
Biochemical oxygen demand (BOD 5) (mg/l)	10-70	-	10-25	20	-	-
Chemical oxygen demand (COD) (mg-l)	70	60	-	100	-	-
Total nitrogen (mg/l)	15	-	30	15	-	10

Source: Reproduced from JRC, 2014. '-' indicates that there is no value set for the parameter in the national legislation

Moreover, there is a risk for the health of workers²⁵: those working on farms and workers in the reclaimed water industry. While the workers may be exposed to potential contaminants over longer periods than the public, the risks are not necessarily higher due to better awareness and the implementation of risk control measures (e.g. protective equipment). The literature does not report cases of occupational diseases caused by exposure to treated waste water (BIO, 2015). However, general statistics show that there is an increasing trend occurrence of one or more work-related health problems in the sector of agriculture, hunting and forestry, namely 8% of the workforce in 2007 compared to 5% of the workforce in 1999.

In conclusion, even the few existing national quality requirements only attempt to address the health risks to consumers, the second category of risks depicted in Figure 5 (health risks to humans exposed to reclaimed water and risks to the local environment) are not being addressed in an adequate manner.

Therefore, in the Member States where no quality requirements for water reuse are in place, there is a lack of clarity in the regulatory framework to manage health and environmental risks that need to be taken into account when issuing permits for reuse projects. However, in Member States that have set such requirements, especially in terms of management practice, stakeholders say that in practice the conditions are difficult to implement (e.g. conditions on wind force or access control) or too stringent considering the intended use.

This also means that investors find diverging conditions to invest into water reuse production or technology development across Europe, even as regards its use in growing the same type of product, e.g. a tomato. According to the United Nations World Water Development Report 2017, the absence of suitable legal and regulatory frameworks is a critical barrier, creating

²⁴ Note that this represents the range of different limits for different uses (e.g. crops, irrigation methods). For E. coli, as indicated in RD 1620/2007, the limits are 0 for more stringent values, and 10.000 for less stringent.

²⁵ General statistics from Eurostat show that there is an increasing trend occurrence of one or more work-related health problems in the sector of agriculture, hunting and forestry, namely 8% of the workforce in 2007 compared to 5% of the workforce in 1999. Moreover, the survey carried out by Eurostat in 2005 found that in the EU27, 8% of workers reported exposure to chemicals, dust, fumes, smoke, or gases (8%). The results of the survey in 2007 show that at least for a quarter of their working time, some persons were exposed to chemical products (15%) and infectious materials (9%).

market uncertainties and discouraging investment into water reuse. This is particularly true as regards irrigation in the EU for which:

- some national legislation²⁶ requires water quality similar to drinking water whatever the sensitivity of the crop and associated risks are;
- other sources of water used for irrigation (e.g. rivers, private wells) are not subject to mandatory quality requirements.

1.3.3. Factor 3 – Possible trade barriers, i.e. trade bans for food products irrigated with reclaimed water

As identified in the second public consultation, stakeholders in the agriculture sector and the food industry are concerned about potential trade barriers for agricultural goods irrigated with reclaimed water and put on the Internal Market. The Internal Market issue is already significant. In 2015, the EU internal trade flows for fruits and vegetables was seven times bigger in terms of value than external trade: EUR 33.4 billion vs EUR 4.7 billion²⁷. Farmers thus depend crucially on intra-EU trade and will not use reused waste water as a source for irrigation unless they know they will be able to sell their products on the Internal Market. The current regulatory framework does not provide a way of demonstrating credibly that risks are properly managed across the Internal Market.

The most extreme form of such a trade barrier would be in the form of a trade ban, when a Member State bans the imports from another Member State of a certain agricultural product irrigated with reclaimed water. This situation arises from diverging regulatory frameworks in place in the different Member States, and also from a certain distrust about safety of reclaimed water (see also the section below). The one case that such trade barriers have been formally imposed within Europe for European producers, was the case of accusations in 2011 regarding possibly contaminated cucumbers from Spain as the cause of a deadly E. coli outbreak (see Box 1 for details). This risk of a trade barrier is considered as an actual and critical risk by a vast majority of stakeholders as shown in particular by the results of the second public consultation, see Annex 2.

Furthermore, some studies²⁸ suggest that farmers might face market restrictions due to requirements from certification bodies, e.g. Quality Safety Association (QSGmbH) for fruits, vegetables, and potatoes that are irrigated with treated waste water. In addition, some Member States have on several occasions raised the issue of potential market restrictions of agricultural products irrigated with treated waste water, applied by retailers and/or supermarkets²⁹. In other words, perceptions about water reuse are claimed to lead some retailers to disadvantage agricultural goods irrigated with reused water.

The Internal Market issue is triggered partially by the problem of low public acceptance.

Box 1: E.coli outbreak and accusations regarding cucumbers from Spain in 2011

The case of the *E.coli* outbreaks which affected 16 countries in Europe and North America in 2011, with more than 4000 reported cases and 53 deaths in Germany, is an example of this situation. The outbreak was blamed on cucumbers irrigated with treated wastewater³⁰ imported from Spain and several Member States, including Austria, Belgium, the Czech Republic, Denmark, Germany and the UK blocked or restricted the import of Spanish products over concerns that these would have been contaminated during irrigation. It was subsequently

²⁶ Italy

²⁷ http://ec.europa.eu/eurostat/statistics-explained/index.php/The_fruit_and_vegetable_sector_in_the_EU_-_a_statistical_overview

²⁸ <https://www.umweltbundesamt.de/publikationen/rahmenbedingungen-fuer-die-umweltgerechte-nutzung>

²⁹ http://www.globalgap.org/uk_en/who-we-are/governance/index.html

³⁰ See the notification by the Commission through the Rapid Alert System for Food and Feed (RASFF) http://europa.eu/rapid/press-release_IP-11-653_en.htm?locale=en

proven that the source of the *E.coli* contamination was not the cucumbers but rather sprouted seeds from a German farm, and the fenugreek seeds involved were sourced from Egypt³¹. It was estimated that this event cost Spain EUR 200 million per week as orders were cancelled and contributed to cut agricultural income from the Murcia region by 11.3 percent for the 2010-2011 growing season³². This has been deterring investment in processing food products irrigated with reclaimed water.

1.3.4. Factor 4 – Reuse perceived as more risky than beneficial

There are several risks associated with water reuse as shown in chapter 1.3.2. No evidence so far could be found of significant pollution/contamination at large scale due to present practices of wastewater reuse in the EU. However, as identified in the Impact Assessment of the Blueprint and confirmed in further consultations on water reuse, there is low public acceptance of reuse solutions and even strong opposition to allowing reclaimed water as a source for drinking water. This is due to misconceptions on what ‘reclaimed water’ means and a lack of knowledge about actual health and environmental risks.

The absence of a clear regulatory framework is also seen as a cause for a lack of confidence in the health and environmental safety of water reuse practices. There are existing regulatory standards concerning agricultural product safety, however, they do not explicitly regulate requirements for treated waste water for agricultural irrigation, hence there is still a sense of unease amongst consumers about food that has been irrigated with reused water.

Findings from the literature on the acceptability of water reuse amongst producers and consumers are mixed. There are many factors which play a role in its acceptance, the most important of which are the extent of “disgust” over the concept, the use for which recycled water is intended, perceptions of risk from recycled water, the sources of recycled water, choice between recycled and fresh water, trust of authorities and knowledge, attitudes towards the environment, the cost of recycled water and sociodemographic factors (Po et al., 2004). Furthermore, the degree of public acceptance is affected by many factors including the political context of a country (Marks, 2005), local history, the recycling terminology used with the public, the degree of public involvement in strategy development, the threat of alternatives, such as dams, river development or ocean outfall, the degree to which potable recycling is pushed as the primary option, the “not in my backyard” phenomenon, the degree and nature of education provided (Queensland Government, 1999).

The perceptions of risks from the water reuse related to health, foremost among peoples' worries are the safety of their children (Sydney Water, 1999). Water recycling can be more easily accepted in areas with water shortages (Dishman et al., 1989). The acceptability of recycled water decreases as the use moves from public areas (e.g. irrigation of parks) to house (gardening) or to more personal uses, due to risk perception (ACIL Tasman, 2005; Hurlimann, 2005). Socio-demographic factors appear to provide important information as to which demographic groups are most likely to accept recycled water usage. McKay and Hurlimann (2003) predicted that the greatest opposition to water reuse schemes would be from people aged 50 years and over. Such findings on age are also reported by Tsagarakis and Georgantzis (2003) who also found that educated people were more willing to use recycled water.

At the same time both the general public and regulators appear to be insufficiently aware of the benefits of water reuse. In addition to the most obvious benefits (mitigation of economic risks related to water scarcity, conservation of the aquatic environment, cost savings for utilities), there are a host of indirect benefits that stakeholders seem rather unaware of (e.g.

³¹ See report by EFSA: <http://www.efsa.europa.eu/en/supporting/pub/en-176>

³² See articles: <http://www.reuters.com/article/us-germany-ecoli-idUSTRE74S12V20110531> and <http://www.foodsafetynews.com/2012/07/spanish-produce-paid-a-price-for-europes-o104-outbreak/>

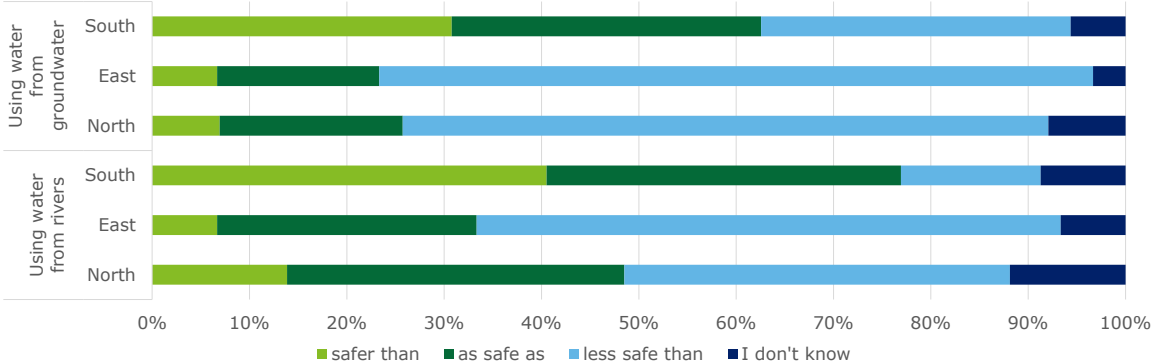
energy and carbon savings, reduced costs and environmental impacts associated with synthetic fertilisers, local economic development).

The second public consultation provided evidence for the lack of consumers' trust in water reuse as it identified this phenomenon as one of the most significant barriers (85% of the respondents perceived this barrier as at least medium and 63% as high). At the same time a large majority of respondents considered that treated wastewater is at least as safe as river water as a source of water for agricultural irrigation or for aquifer recharge (30% even considered it safer; see Annex 2). Furthermore, results of the second open public consultation demonstrate a significantly larger share of respondents from Southern EU Member States consider reused water as at least as safe, independently from the source of water it is compared with.

- In comparison to groundwater: 65% of respondents from Southern EU Member States also consider reused water as at least as safe, while 70% of respondents from Northern and Eastern EU Member States consider reused water as less safe than groundwater,
- In comparison to rivers: 80% of respondents from Southern EU Member States perceive reused water as at least as safe (with half of them considering it even safer), compared to 55% of respondents from Northern EU and only a third of respondents from Eastern EU Member States.

There is larger consensus between respondents from Northern and Eastern EU Member States about the opinion that reused water was less safe than groundwater, in comparison to water sourced from rivers, which remains more controversial within each of these EU regions (see Annex 2).

Figure 7: Safety perception – comparison between Southern EU, Northern EU and Eastern EU Member States in the reuse of water for agricultural irrigation



As a result, this information failure leads to reluctance to consider reuse as an alternative water supply option when relevant and cost-efficient. The Impact Assessment of the Blueprint already identified this issue as well as the opportunity to develop awareness raising campaigns and advisory services. A number of actions committed by the Commission in the Circular Economy Action Plan (e.g. promotion of safe and cost-effective water reuse, including support to research in further characterisation of emerging risks and to innovation with demonstration projects) and a communication campaign are expected to improve the provision of reliable information and rectify misperceptions of benefits and actual risks by stakeholders and citizens. Additionally, studies show that public trust in water reuse is strongly affected by personal experiences and trust in water reuse organisations and regulatory authorities³³; it is in general specific to the local situation of water resources and

³³ FP7 project DEMOWARE report: <http://demoware.eu/en/results/deliverables/deliverable-d5-2-trust-in-reuse.pdf>

management and better addressed at Member State level. Complementary to the above actions, there are ongoing national or local information campaigns that inform about the water reuse practice, e.g. in Spain, when a park is irrigated with treated waste water the relevant information is available to the public at the park entrance.

This information failure will not be addressed in this initiative, apart from providing information to the public on water reuse. However the absence of a clear regulatory framework is addressed, which is an underlying driver and a cause of this lack of confidence in the health and environmental safety of water reuse practices.

1.4. How will the problem evolve, all things being equal?

The current situation and future projections for water availability are set out in section 1.1 above; while water stress is present in many parts of Europe already today, the **past trends in water scarcity are expected to increase in frequency and intensity of droughts and their environmental and economic damages are expected to continue**. This later trend is mainly due to climate change. At the same time, the current state of a mix of absent and un-coordinated national legislation and approaches would continue, resulting in the continuation of related barriers and little incentive to apply water reuse.

An improved implementation of the existing EU water policy framework, especially as regards water pricing and control of abstractions, could positively influence the uptake of water reuse, however, very likely much below its potential for development and benefits to the economy and the environment (BIO 2015). According to the Blueprint, which was based on the 2009 River Basin Management Plans, only 49% of these Plans³⁴ intend to change the water pricing system to foster a more efficient use of water. The barriers to water reuse related to inadequate water pricing are therefore unlikely to change significantly.

It is likely that additional Member States would adopt their own water reuse standards in the near future (e.g. Malta already has plans to develop its own standards). In those Member States, such new standards are expected to provide more clarity to the stakeholders on the required measures to manage health and environmental risks associated with water reuse. However, in the absence of further EU action specific to water reuse, uncertainty on how to apply the existing EU water legislation to manage risks of water reuse projects would persist in the other Member States, while in the countries with the highest stringency of water reuse standards (France and Italy), the situation is likely to remain unchanged in future years, i.e. very few new water reuse projects.

Water reuse technologies are evolving relatively quickly, therefore a number of the technical barriers identified are likely to be solved within the next ten years, either as a result of research and development work conducted by the water industry or of publicly funded research programmes. The evaluation and management of risks associated with emerging pollutants is, however, a very complex issue and may require more significant efforts.

Finally, it is unlikely that national regulators can co-ordinate a harmonisation of their regulatory requirements. A risk of potential trade barriers for food products irrigated with reclaimed water would continue to persist hand in hand with the low public acceptance of water reuse solutions. Consequently, the problem of the low uptake of water reuse would intensify, and in particular in areas of Europe where water scarcity increases (see projections of water scarcity in Section 1.1).

³⁴ An assessment of 2015 RBMPs is ongoing, hence this figure will very likely change, as there are developments in some Member States.

1.5. Who is affected and how?

The currently limited uptake of water reuse affects in particular the environment, economic sectors, national/regional/local authorities, and European citizens and consumers.

Concerning the **environment**, increasing trends in water scarcity exacerbated by climate change together with a low uptake of water reuse affect water resources which are over-exploited by abstractions, in particular for irrigation, and also water-dependant ecosystems which are not left with the necessary amount for them to thrive. In particular, coastal areas of water-scarce regions where treatment plants discharge their effluents to the sea are affected by the wastage of limited freshwater resources. However, it has to be stressed that discharge of treated waste water to rivers can be a major component of river flows in dry seasons, up to 80% in extreme cases (Drewes, 2017³⁵). In these cases reuse can also result in reducing the flow beyond critical limits and have a negative impact on the river and associated ecosystems, despite the fact that unplanned reuse takes already place *de facto*. The quality of water resources is also affected by unnecessary discharge of nutrients into rivers. In addition, the removal of nutrient in treatment plants, even though it is necessary in sensitive areas to prevent eutrophication of water resources, is energy intensive, hence resulting in higher GHG emissions and the same holds true for the production of chemical fertilizers for agriculture. The lack of a consistent methodology to apply the risk assessment approach results in a potential deterioration of the environment due to potential contamination of soils with metals, CECs, etc. These environmental impacts clearly have a local dimension, however, 60% of the EU's rivers run across borders of Member States (and non-Member States). If waters are low in an upstream Member State, less water will reach any downstream Member State. Action taken by a single or few Member States is therefore not sufficient in relation to quantitative aspects of water management and so these environmental problems can be cross border.

A number of **economic sectors** are highly dependent on water supply, in terms of availability and quality, such as agriculture (see also Annex 3a SME test), the food industry, the power generation industry (e.g. for cooling processes and hydropower), tourism and the recreational industry (e.g. golf courses), chemical, textile, pulp and paper industries and mining. A lack of water reuse in the regions affected by water scarcity and related restrictions, e.g. bans to use freshwater for certain types of uses like agricultural irrigation, both negatively affect their production and increase costs. The water industry and their technology providers are affected through foregone business opportunities in the area of treated waste water reuse. These opportunities appear large as the global market for water reuse is expected (Global Water Intelligence, 2015) to be fast-growing in the coming years. Between 2011 and 2018 capital expenditure on advanced water re-use was estimated to have grown at a compound annual rate of 20% as the global installed capacity of high quality water re-use plants grows from 7 km³/year to 26 km³/year. The limited uptake of water reuse technology negatively impacts the potential for further innovation, demonstration and market development for innovative technological and non-technological (organisational, managerial, governance) solutions for water reuse whose market uptake can be negatively affected by the present legislative framework.

From the perspective of **National/regional/local public authorities**, as alternative supply options are generally more costly (considering both capital and operating costs, see Figure 8), the limited development of water reuse tends to render more costly the reduction of water scarcity and implementation of the River Basin Management Plans. It also represents missed

³⁵ http://ec.europa.eu/environment/water/pdf/Report-UnplannedReuse_TUM_FINAL_Oct-2017.pdf

cost saving opportunities, e.g. by reducing drinking water supply production needs and associated costs.

Figure 8: Cost comparison of different water scarcity solutions

Solution	Typical capital cost/ m ³ /d of capacity	Typical operating cost/m ³ produced	Notes
Shallow freshwater aquifer	\$3	<\$0.01	10m depth 10,000 m ³ /d
Deep freshwater aquifer	\$7	\$0.07	200m depth 10,000 m ³ /d
Brackish water desalination	\$480	\$0.29	10,000 m ³ /d
Long distance transfer	\$3,000	\$0.15	500 km long; 100 m elevation; 2 million m ³ /d capacity
New reservoir & conveyance	\$1,700	<\$0.01	250,000 m ³ /d output with 20 km conveyance
Indirect potable reuse	\$800	\$0.45	50,000 m ³ /d facility with UF, RO and UV – water returned to aquifer
Membrane seawater desalination	\$1,200	\$0.47	100,000 m ³ /d capacity
Thermal seawater desalination	\$1,500	\$0.57	300,000 m ³ /d capacity
Shipping water by bladder	\$60	\$1.50	10000 m ³ bladder to port unloading facility 50 km away
Shipping water by tanker	\$120	\$1	100,000 m ³ tanker travelling 500 km with bulk water loading and unloading facilities

For European citizens and society at large, the inefficient management of water resources results in reduced water availability which, in areas of water scarcity and drought, has a direct negative impact upon the EU economy and citizens. The free movement of safe and wholesome food is an essential aspect of the Internal Market and contributes significantly to the health and well-being of citizens, and to their social and economic interests. When there are important differences in relation to concepts, principles and procedures between the water reuse laws of the Member States, these differences may impede the free movement of agricultural products irrigated with reused treated wastewater (see above Box 1 on the E. Coli outbreak), create unequal conditions of competition, and may thereby directly affect the functioning of the Internal Market. Furthermore, a 1% increase in the area affected by drought can slow a country's gross domestic product (GDP) growth by 2.7% per year (Brown et al., 2013). For **consumers**, the lack of European minimum requirements for water reuse leads to mistrust and misunderstanding about how agricultural products are irrigated and whether they are safe if irrigated with reclaimed water.

2. WHY SHOULD THE EU ACT?

The problem this initiative sets out to address is relevant at EU-level, as concluded in the analysis in section 1 above. With this initiative, EU action would aim at enabling a cost-effective waste water reuse for agriculture, while ensuring a high level of protection of health and the environment and contributing to the well-functioning of the Internal Market. Thereby, the main problem drivers (diverging requirements in Member States, resulting in potential trade barriers for agricultural products irrigated with reclaimed water, as set out in the problem definition, section 1.3) would be addressed.

Acting now by putting in place an EU-level enabling framework would allow contributing to alleviating water stress where it is already an important reality today in the EU and preparing operators and farmers to be ready to act also in those parts of the EU which are expected to experience increasing water stress in the coming years and decades, thereby helping prevent the situation from deteriorating.

2.1. Competence

The EU competence to take action on water management derives from Article 191 of the Treaty on the Functioning of the European Union related to the protection of the environment:

“Union policy on the environment shall contribute to pursuit of the following objectives:

- *preserving, protecting and improving the quality of the environment,*
- *protecting human health,*
- *prudent and rational utilisation of natural resources,*
- *promoting measures at international level to deal with regional or worldwide environmental problems, and in particular combating climate change.”.*

Since in particular environmental risks of water reuse are not addressed by the Member States, and there is a clear EU dimension to these risks, moreover the issues at stake are directly related to the inefficient use of a natural resource and adapting to climate change, the legal basis for a possible new EU legal instrument would therefore be Art. 191.

In addition, the EU competence to take action on safety of agricultural products irrigated with reclaimed water is linked to Article 169 of the Treaty on the Functioning of the European Union related to consumer protection:

"1. In order to promote the interests of consumers and to ensure a high level of consumer protection, the Union shall contribute to protecting the health, safety and economic interests of consumers, as well as to promoting their right to information, education and to organise themselves in order to safeguard their interests.

2. The Union shall contribute to the attainment of the objectives referred to in paragraph 1 through:

(a) measures adopted pursuant to Article 114 in the context of the completion of the internal market; [...]"

This initiative is also expected to contribute to the free movement of goods in the Internal Market.

2.2. Subsidiarity

Any new EU initiative on water reuse needs to comply with the principles of proportionality, taking due account of subsidiarity considerations.

Concerning environmental protection, EU-level action on water management is also justified because 60% of EU river basins are international, shared by between 2 and 19 countries (Danube); action taken by a single or few Member States is therefore not sufficient, for instance in relation to quantitative aspects of water management and cross border water pollution. Moreover, if Member States act alone, the technical barriers to water reuse and associated costs are likely to be unnecessarily high.

EU intervention on water reuse in particular for agricultural irrigation is justified to prevent that different requirements in individual jurisdictions negatively affect the level playing field (e.g. between farmers and growers) and cause obstacles to the Internal Market, especially for primary agricultural products. Additionally, different requirements may also be used as an argument to restrict the import of food products from Member States suspected of having lower requirements, as exemplified in the E. Coli outbreak mentioned above (see Box 1). The current situation does not guarantee a level playing field between food producers of different countries; the current EU regulatory framework does not yet address the specific modalities of agricultural products irrigated with treated waste water. Addressing such barriers is an appropriate EU level response, taking into account EU food safety, health, agriculture and energy policies.

EU action is further justified because different and changing requirements in individual jurisdictions are a barrier to the creation of a level playing field for investments in innovation and for water reuse. It is unlikely that national regulators can coordinate a harmonisation of

their regulatory requirements as the number of Member States involved is too large and increasing.

The present document seeks to address the overall problem of a too limited application of water reuse resulting in a suboptimal contribution to alleviating water scarcity and analyses the modalities of creating an enabling framework for increasing the uptake of water reuse for agricultural irrigation. Therefore as already defined by the Blueprint in 2012 in order to ensure the safety of water reuse practises minimum requirements are developed, which would need to be met if water reuse was practised in a Member State. Given the environmental legal basis of a potential future instrument on water reuse, the instrument would allow those Member States with more stringent national standards than the EU minimum level to keep them in place or those wishing to introduce higher national standards to do so. In this context, at the practical level, it should be noted that the proposed EU minimum criteria have been developed together with Member States, stakeholders and the scientific community over the past years and are broadly supported.

It is worth noting that in addition to the targeted discussions between the Commission, Member States and stakeholders over the past years, also the public consultation activities showed strong support for EU measures. In the first public consultation this was considered by almost all of those who expressed an opinion as a legitimate component of EU action. More than 90% of respondents from Member States with quality requirements for water reuse indicated that legally binding EU level minimum requirements would be effective or very effective for ensuring environmental and health safety of water reuse. The second public consultation confirmed a very strong support to defining minimum requirements for water reuse in agricultural irrigation and aquifer recharge, going much beyond Member States and stakeholders in regions where this is currently a developed practice (see Annex 2).

A proportionality analysis of potential EU action on aquifer recharge demonstrates that there is a clear local relevance of this practice, with a very limited cross-border dimension across the EU territory. In addition, the Internal Market dimension which has been identified as a crucial aspect for agricultural irrigation is lacking in the case of aquifer recharge. Finally, the conclusions of the JRC technical report suggest that no minimum requirements at EU level could be developed (see Annex 7). On this basis, this analysis leads to the conclusion that an EU intervention would not be proportionate. The development of an EU Guidance is proposed, however, legally binding intervention in this area should remain the competence of the Member States. A more detailed analysis is included in Annex 11.

3. OBJECTIVES – WHAT SHOULD BE ACHIEVED?

3.1. General objective

The general objective is to contribute to alleviating water scarcity across the EU, in the context of adaptation to climate change, by increasing the uptake of water reuse for agricultural irrigation wherever this is relevant and cost-effective while ensuring the maintenance of a high level of public health and environmental protection.³⁶

This general objective corresponds to the overall problem which motivates this initiative (see section 1.2). Clearly, water reuse will not by itself solve water scarcity, but the purpose of this initiative is to make sure that it can be more widely used and is safe.

³⁶ This general objective was identified as a priority in the Blueprint in 2012 and the Circular Economy Action Plan in 2015.

This general objective is fully in accordance with the 7th Environmental Action Programme³⁷ and, at the global level, the United Nations' 2030 Agenda for sustainable development and the achievement of the sustainable development goal n°6 "Ensure access to water and sanitation for all", in particular as regards the two following targets:

- *By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally;*
- *By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.*

3.2. Specific objectives

The specific objectives aim at managing water resources more efficiently through creating an enabling framework for and establishing a common approach to water reuse in agricultural irrigation across the EU. They relate to the concrete factors 2 and 3 that together drive the overall problem (see section 1.2). The goal is to promote water reuse as one of a range of measures to alleviate abstraction pressure on vulnerable water resources in the context of adaptation to climate change and integrated water management by setting a common methodology so as:

- To ensure that water reuse practices in the EU are safe both to health and the environment;
- To promote water reuse as a way of providing a secure source of water for irrigation where it is economically advantageous to do so;
- To provide clarity, coherence and predictability to market operators who wish to invest in treated wastewater reuse in the EU under comparable regulatory conditions;
- To stimulate business and innovation in water reuse by EU companies for internal and external markets;
- To provide clarity and confidence to consumers regarding safety of agricultural products irrigated with reclaimed water within the EU;
- To prevent trade barriers for agricultural primary products irrigated with reclaimed water within the EU and thereby facilitating the free flow of agricultural goods.

There are strong inter-linkages between the environmental, trade and public health elements of the objectives. In particular the Internal Market component is a key element of the initiative and a key to its success. Farmers depend crucially on intra-EU trade and will not use reused

³⁷ General Union Environment Action Programme to 2020 (Decision No 1386/2013/EU), and more especially its following objectives:

- *"To protect, conserve and enhance the Union's natural capital", with actions ensuring that by 2020:*
 - (b) the impact of pressures on transitional, coastal and fresh waters (including surface and ground waters) is significantly reduced to achieve, maintain or enhance good status, as defined by the Water Framework Directive;*
 - (f) the nutrient cycle (nitrogen and phosphorus) is managed in a more sustainable and resource-efficient way;*
- *"To turn the Union into a resource-efficient, green and competitive low-carbon economy" with actions ensuring that by 2020:*
 - (b) the overall environmental impact of all major sectors of the Union economy is significantly reduced, resource efficiency has increased, and benchmarking and measurement methodologies are in place. Market and policy incentives that foster business investments in resource efficiency are in place, while green growth is stimulated through measures to foster innovation;*
 - (c) structural changes in production, technology and innovation, as well as consumption patterns and lifestyles have reduced the overall environmental impact of production and consumption, in particular in the food, housing and mobility sectors;*

waste water as a source for irrigation unless they are confident that they will be able to sell their products.

3.3. Operational objectives

The operational objectives are to define common minimum quality requirements for reused water for agricultural irrigation together with a risk assessment framework, complementing existing agricultural product safety standards, which ensure maintenance of a high level of protection and address the risks of water reuse to:

- consumers of agricultural products irrigated with reclaimed water,
- workers and other public exposed to reclaimed water,
- the environment, in particular water resources and dependent ecosystems and soils.

These objectives are strongly supported by the public. Respondents to the second open public consultation considered that specific objectives to be addressed by EU minimum quality requirements for water reuse in agricultural irrigation should be safety of agricultural products placed on the EU market (87% of respondents), protection of water resources and dependent ecosystems (80%), protection of human health of public directly exposed to reclaimed water (75%), protection of wider environment (75%). Other objectives, such as protection of agricultural productivity are by far less supported (see Annex 2).

Such a policy would complement and be coherent (not lowering the applicable levels of environmental protection) with the existing EU legislative framework on:

- water, notably the WFD, the Groundwater Directive, the Nitrates Directive, the Environmental Quality Standards Directive (EQS) and the UWWTD,
- food safety, notably the Regulation on the Hygiene of Foodstuffs.

4. POLICY OPTIONS

4.1. Baseline – “No new EU action”

Under the baseline, the EU would not develop any new regulatory or non-regulatory action specific to water reuse. Consequently, the current state of a mix of absent and un-coordinated national legislation and approaches would persist. The barriers to and lack of proper incentives for water reuse, as described in the problem definition, would largely remain in place, as well as a potential risk of trade barriers to agricultural products irrigated with treated waste water.

This scenario includes, however, a number of actions to improve the implementation and enforcement of existing legislation on water that will be taken independently of the initiative assessed in this Impact Assessment since they are not specific to water reuse (especially as regards water pricing and control of abstractions)³⁸. Furthermore, a series of non-regulatory actions to promote safe and cost-effective water reuse in 2016-2017 are committed by the Commission in the Circular Economy Action Plan³⁹. These actions aim at improving implementation and enforcement of existing legislation with a specific focus on water reuse. They include Guidance on the integration of water reuse in water planning and management⁴⁰ (adopted in June 2016), improved consideration for water reuse in the industry in relevant

³⁸ In this context, it should be noted that in a number of Member States, important progress in particular on water pricing was made through the related ex-ante conditionality, which made the availability of EU funding (regional and agricultural) contingent upon meeting certain legal requirements of the WFD.

³⁹ COM(2015) 614 final, Annex I

⁴⁰ http://ec.europa.eu/environment/water/pdf/Guidelines_on_water_reuse.pdf

Best Available Techniques Reference documents (BREFs⁴¹), and increased visibility for support to innovation (through European Framework Programmes and R&I networks) and investments (e.g. European Structural and Investment Funds). The baseline will serve as benchmark for the other policy options defined in this section.

4.2. Design of policy options

This Impact Assessment assesses policy options for agricultural irrigation (Ir), as set out in section 2 above. All policy options directly translate the set of specific objectives of this initiative, as set out in section 2.2 above, into a concrete operational instrument for their attainment. They are all designed to establish comparable regulatory conditions for water reuse projects across the EU and to ensure the maintenance of a high level of public health and environmental protection (see section 3 above), as well as contributing to the proper functioning of the Internal Market by setting minimum requirements. The policy options considered do not set any mandatory waste water reuse targets; the aim is, therefore, to develop an instrument that would enable uptake of treated waste water reuse across the Member States if and when they decide to adopt such a practice.

All options define a common methodology so as to address the two categories of risks described in the problem definition and Figure 5, in the following way:

- 1) The health risks to consumers of agricultural products irrigated with reclaimed water: These are translated in the options into minimum quality requirements in form of standards and
- 2) The risks to the local environment (surface waters and groundwater, soil and depending ecosystems) and to humans (workers, bystanders and residents in nearby communities) exposed to reclaimed water: these are translated in the options into minimum quality requirement in the form of a Risk Management Framework.

These two categories of risks are different in nature; however, the policy options propose to address them together in setting minimum quality requirements for water reuse for agricultural irrigation. The variation in the policy options considers the level of stringency of the minimum quality requirements for the safety of agricultural products ('one-size-fits-all' or 'fit-for-purpose') and legislative nature of the proposal (mandatory legal instrument versus voluntary guidance (see for details chapter 4.2.2)). All policy options considered include the Risk Management Framework as the only means to address the risks to the local environment and to humans exposed to reclaimed water (see for details chapter 4.2.3).

The options for analysis assume either a new EU legal instrument or an EU-level Guidance. The consideration of the latter non-regulatory approach has been based on thorough consultations with Member-States and stakeholders, and taking into account the recently published Guidance related to the Regulation on the Hygiene of Foodstuffs⁴² and international practice. While the mandatory legal instrument (option Ir1 and Ir2) would include only the Key Risk Management Principles as compulsory and an accompanying Guidance would be elaborated with Member States to provide details on the practical application, option Ir3 would include a full Risk Management Framework. These different combinations are summarised below in Figure 9.

⁴¹<https://circabc.europa.eu/sd/a/c2f004b6-4c4b-4bbc-8d7d-37938c6c6390/Water%20reuse%20%26%20recycling%20within%20EU%20Reference%20Documents.pdf>

⁴² 2017/C 163/01 of 23 May 2017

Figure 9: Policy options analysed

Options		Description
Baseline		No new EU action
Policy options for agricultural irrigation	Ir1	Legal instrument ensuring safety of agricultural products with a "one-size-fits-all" approach (the most stringent minimum quality requirements set regardless of the food crop category and irrigation technique) and protection of local public health and of the environment (the Key Risk Management Framework Principles) - an accompanying Guidance on the implementation of the Key Risk Management Principles to be elaborated together with MS
	Ir2	Legal instrument ensuring safety of agricultural products with a "fit-for-purpose" approach (minimum quality requirements set depending on the food crop category and irrigation technique) and protection of local public health and of the environment (the Key Risk Management Framework Principles) - an accompanying Guidance on the implementation of the Key Risk Management Principles to be elaborated together with MS
	Ir3	Guidance document on safety of agricultural products with a "fit-for-purpose" approach (minimum quality requirements set depending on the food crop category and irrigation technique) and protection of local public health and of the environment (the Risk Management Framework)

4.2.1. Minimum quality requirements for water reuse to ensure health safety of agricultural products irrigated with treated waste water which are placed on the Internal Market

The current EU regulatory framework does not yet in particular address agricultural products irrigated with treated waste water, apart from the limited voluntary requirements set in the Guidance on the Hygiene of Foodstuffs. Potential trade barriers of agricultural products irrigated with reused water are associated with claims and perceptions of health risks to their consumers. The prevention of undue use of trade bans within the EU calls for common requirements set at EU level on the quality of reclaimed water, designed to ensure the safety of the relevant consumer products throughout Europe. This requires a legal instrument setting:

- Minimum quality parameters for water to be reused;
- Monitoring frequencies for these parameters;
- Limit values for these parameters to be complied with at the outlet of the (advanced) treatment plant.

The definition of quality parameters (and their associated limit values and monitoring frequencies) can follow two approaches resulting in a different stringency level. This can be captured in two alternative approaches which can be included in the policy options, the "one-size-fits-all" and the "fit-for-purpose" approach, further detailed below.

→ Justification of the stringency of the quality criteria

The JRC report included in Annex 7, namely Tables 2, 3, 4 and 5, defines technical parameters on water quality which need to be respected to a certain minimum level in case treated waste water is reused for the purposes of agricultural irrigation. These minimum requirements were developed in a comprehensive and inclusive process involving Member States and stakeholder experts as well as the scientific community. During the development of the proposal, a tiered approach for consultation was applied by the JRC. In the first tier, the JRC invited a group of selected experts from academia, the water sector and WHO to provide input and comments on the drafting work. In a second tier, Member States were formally informed through the CIS Ad-hoc Task Group on Water Reuse and their comments were

taken into account. In the third tier, the specifically requested scientific opinions of the independent Scientific Committee on Health, Environmental and Emerging Risks (SCHEER) and the European Food Safety Authority (EFSA) have been taken into consideration. Wherever the approach diverges from their advice, a justification has been provided. Experts have been consulted to provide comments and input through critical discussion on the JRC document along the process.

The internationally widely accepted approach to develop minimum quality requirements for the safe use of reclaimed water for agricultural irrigation and aquifer recharge is the risk management framework, as recommended by the World Health Organization WHO (2006). These guidelines inter alia establish the level of “tolerable risk” of incurring a disease through water consumption, which has been the basis for standards defined in the Drinking Water Directive (98/83/EC amended by Directive 2015/1787). This risk management framework is already applied in the water *acquis*; it is included in the Drinking Water Directive (Directive 2015/1787 that amends Directive 98/83/EC on the quality of water intended for human consumption). Although the management of health risks is context-specific, the WHO guidelines consider that the overall levels of health protection should be comparable for different water-related exposures. Consequently, this “tolerable risk level” has also been taken into account for JRC’s definition of the technical parameters reflecting the minimum quality requirements on reclaimed water used in agricultural irrigation (detailed information in Annex 7, in section 4.3.1 and the technical background in section 4.4.2). Annex 7 also provides an account of then monitoring requirements as well as of the exclusion of compounds of emerging concern and the sensitivity analysis. It is important to note that no risk assessment has been performed specifically for the establishment of the minimum quality requirements and that the JRC bases its proposal on the validity of the risk assessment conducted by the reference documents taken into consideration, namely the Australian Guidelines for Water Recycling being internationally accepted as a key reference also for the specific EU situation.

4.2.1.1. *"One-size-fits-all" approach*

This approach requires the same quality for any reclaimed water to be used for irrigation of agricultural products. It responds to the perceived health and environmental risks with the most stringent approach without distinguishing between different needs of food crops and irrigation technique. This approach implies that the required water quality has to be the most stringent in order to prevent any risks of contamination even in the worst-case scenario. This approach is the one adopted in the Italian legislation. This option is based on the quality requirements, as detailed in Annex 7 for the most critical situation (quality class A - food crops consumed raw produced with sprinkling irrigation).

4.2.1.2. *"Fit-for-purpose" approach*⁴³

This approach consists in setting reclaimed water quality requirements that will provide the appropriate level of safety for the crop to be irrigated. It considers contamination pathways from irrigation water to the agricultural products, i.e. to which extent contaminants potentially present in the treated effluent are likely to be transferred to the crop and eventually to affect the consumer of the product. These contamination pathways differ according to crop types and to irrigation methods. Indeed, several factors linked to the use of water in agriculture may influence the risk of microbial contamination of the crops, such as: source of water; type of irrigation (drip, sprinkler irrigation, etc.); whether the edible portion of the crops has direct contact with irrigation water; application of a water treatment by the grower; the timing of irrigation in relation to harvesting; possible access of animals to the source; etc. Water of inadequate quality has the potential to be a direct source of contamination and a vehicle for

⁴³ Terminology used in scientific literature and UN context

spreading localised contamination in the field, facility, or during transport. Wherever water comes in contact with fresh produce, its quality impacts the potential for pathogen contamination.

In particular, food crops more or less consumed raw (e.g. tomatoes, strawberries) require a more stringent water quality to avoid microbial contamination (e.g. strawberries) than food crops which will be cooked (e.g. potatoes) or crops which are not intended for human consumption (e.g. pastures or energy crops). Similarly, irrigation methods interfere in this contamination pathway as e.g. drip irrigation in orchards does not entail a direct contact of irrigation water with fruits in contrast to sprinkling irrigation.

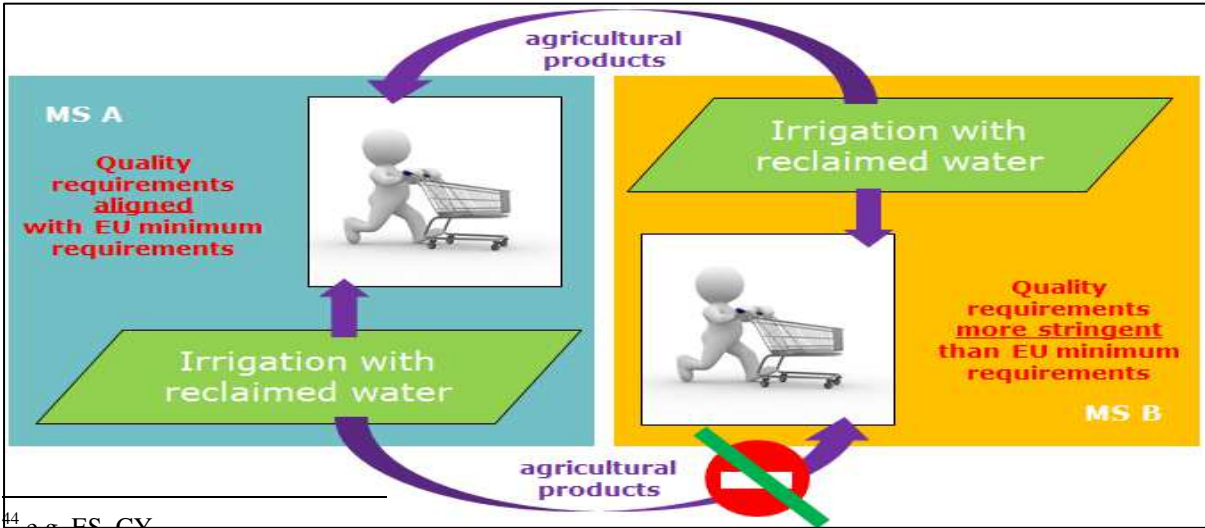
This approach is the one adopted in most of the existing regulations in Member States⁴⁴ and international guidelines. This option, like the other options entailing setting some form of minimum quality requirements, is based on the JRC technical report (Annex 7) that was developed to set minimum quality requirements for water reuse. All options would result in a common methodology with minimum quality requirements differentiated against crop categories and irrigation methods; detailed provisions of the options would be developed on this technical basis.

4.2.1.3. Implementation of the requirements

Under both approaches, quality requirements would complement, but not decrease, the ones laid down by the existing legislation, in particular the UWWTD and relevant European Case-Law⁴⁵ in particular as regards the quality of discharge effluents. Regardless of the approach chosen, also when complying with the proposal (either legal instrument or Guidance), reclaimed water at the outlet of the treatment plant would need to respect the criteria of "clean water" as defined by the Regulation on the Hygiene of Foodstuffs (852/2004). So consistency with other relevant legislation is ensured in either approach. More information is provided in Annex 3.

The proposal would define a common methodology and set minimum requirements, and any Member State (Member State B in Figure 10) could still adopt or retain more stringent legislation for water reuse in its territory. This proposal would contribute to the proper functioning of the Internal Market through the minimum harmonisation of the requirements and the methodology for undertaking the risk management. Consequently, no trade barriers could be feasible for food products irrigated with reclaimed water complying with the minimum requirements set by the proposal (Figure 10).

Figure 10: Trade of agricultural products irrigated with reclaimed water within the EU



⁴⁴ e.g. ES, CY

⁴⁵ ECJ Judgement cases C-119/2002, and C-335/07

4.2.1.4. Minimum requirements: regulated at EU-level or recommended by an EU Guidance document

The EU can introduce the minimum requirements in a legal instrument rendering them compulsory to water reuse projects in the EU, or, alternatively, the Commission can develop a Guidance document recommending these minimum requirements for water reuse for irrigation based on the JRC technical report (Annex 7) and would suggest a "fit-for- purpose" approach on a voluntary basis. The Guidance document would build on the international guidelines and long experience developed in third countries (e.g. California, Australia, Israel, USA), and adapted to the specific context of the EU in terms of environmental and social conditions and legislation; in particular it would take stock of experience and best practices developed in the Member States. Such a Guidance document would be developed directly by the Commission, in consultation with Member States and stakeholders (CIS).

4.2.2. Minimum quality requirements to ensure protection of local public health and of the environment – Risk Management Framework

Risks to humans exposed to reclaimed water (e.g. farmers, workers on the fields) and to the local environment are very specific to the local conditions and the design of the reuse scheme; they vary greatly both in their nature and extent according to:

- Hazard, e.g. the quality of raw effluents discharged to the collecting system and entering the treatment plant, mixing with other irrigation sources of different quality, additional contamination during conveyance and storage;
- Exposure, e.g. distance from crop to waterways (especially if these are sensitive areas) or to public spaces, irrigation method, crop type;
- Vulnerability, e.g. to what extent ecosystems, soil and plants are sensitive to pollutants

Because of their intrinsic site-specific nature, these risks cannot be addressed only with a generic set of minimum quality parameters valid for any reclaimed water to be used for agricultural irrigation in the EU. An effective management of these risks has to include a site-specific assessment of those risks, and this assessment would form the basis for the selection of the most appropriate mitigation measures, e.g. additional requirements necessary to ensure a high level of protection of human health and the environment. Despite potentially diverging additional requirements, the methodology to derive these would be harmonised at EU level, thus ensuring a consistent approach across the EU, hence providing insurance for internal market operators.

The implementation of such a risk management framework is already recommended in some Member States⁴⁶ as well as numerous international guidelines and standards (e.g. by the World Health Organisation, the International Standardisation Organisation, the USA Environment Protection Agency). They have been developed in different socio-economic contexts and without taking into account the existing EU legislative acquis which already sets a number of requirements regarding the protection of the environment and health. Therefore, Annex 7 presents the key principles of such a risk management framework both consistent with these international guidelines and adapted to the European context.

With a view to defining comprehensive policy options in this Impact Assessment, two approaches are considered regarding the implementation of such risk management framework:

⁴⁶ Italian guidelines for site-specific risk assessment for contaminated sites (Decreto legislativo 152/06) <http://www.isprambiente.gov.it/files/temi/siti-contaminati-02marzo08.pdf>

- The key Risk Management Framework principles included in a legal instrument and thus made compulsory for operators and other relevant parties involved in water reuse for agricultural irrigation (e.g. competent authorities in Member States, treatment plant operator, farmers) and an accompanying Guidance that would be elaborated with Member States to provide details on the practical application of the key RMF principles;
- The Risk Management Framework recommended in the form of an EU guidance document, based on the key RMF principles.

4.2.3. Key Risk Management Framework principles included in a legal instrument

The first approach would consist of including the key principles of a risk management framework in a legal instrument, as part of the authorisation procedures and conditions of granting permits to any water reuse project in the EU (as described in Annex 3). The key principles would cover the different steps and operators of the water reuse system (urban waste water collection and treatment, additional treatment if any, distribution, storage if any and irrigation at farm level). In practice, the legal instrument would foresee that, before such a permit can be authorised, the applicant of the permit has to perform a thorough identification and assessment of risks specific to the project and its environment. Key requirements for this risk assessment would be laid down based on description of the risk management framework in Annex 7 (page 29).

The legal instrument would foresee that water reuse projects in the EU are regulated within a risk management framework and would set the key principles to be complied with in the permitting procedure. However, competent authorities in the Member States will retain the responsibility of

- Ensuring and checking that the risk assessment carried out by the applicant is appropriate considering the nature of the project and its environment, and
- Reflecting the outcome of the risk assessment in the permit conditions.

In order to ensure a common understanding on the detailed implications of the risk management framework and a consistent implementation across the EU, the Commission would develop a Guidance to translate the key principles into practise and to assist Member States in sharing experiences and best practices, in the existing framework of the Common Implementation Strategy for the WFD (CIS).

4.2.4. Risk Management Framework recommended by an EU Guidance document

As an alternative to making the key risk management framework principles compulsory to water reuse projects in the EU, the Commission could develop a Guidance document on implementation of the full-fledged risk management framework in the existing framework of the Common Implementation Strategy for the WFD (CIS). The Guidance document would build on best international practice within and outside the EU and would be part of the Guidance document for the minimum quality requirements.

5. ANALYSIS OF IMPACTS

5.1. Baseline

Water reuse is not expected to increase significantly over the next years, if no further EU regulatory action on water reuse is implemented, alongside the non-regulatory actions on water reuse proposed in the context of the Circular Economy Package or improved implementation of EU water legislation. Recently collected data shows, if no further EU policy actions to promote water reuse are implemented, it is estimated (BIO (2015) that under

a Business As Usual scenario, a volume of around 1,700 million m³/year could be reached by 2025⁴⁷. This was based on the assumptions that the nationally set water reuse target for Spain (1,200 million m³/year) is achieved by 2018 and no significant increases in water reuse would take place in other Member States in comparison to the current situation.

Therefore, while water scarcity is expected to affect the EU more strongly and widely in the coming decades, resulting in economic losses particularly for those sectors dependent on the secure supply of water, as well as citizens, no significant increase in water reuse is foreseen under a business-as-usual scenario.

It may be argued that such limited water reuse will be developed under the lowest costs possible. Under the current quality standards for Spain it was estimated that a potential for reuse of more than 6,600 million m³/year could be reached below 50 cents per cubic meter, largely exceeding the baseline reuse volume. Therefore it is realistic to assume that the whole volume reused under the baseline scenario would be available at costs below 50 cents per cubic meter.

Water reuse schemes would remain relatively underdeveloped in the EU due to competing demands for investments in infrastructure and - if left to compete on the basis of real costs against subsidised alternatives - due to perceived low returns on investment. Nevertheless, existing reuse schemes have benefited from subsidies to the water sector, but these subsidies could be at odds with the need for cost recovery (as a means to provide adequate incentives for users to use water resources efficiently) and financial sustainability in the water sector if the necessary funding to provide for water related environmental policies is not secured via alternative means. Clearly, as is the case with any investment, for every water investment that requires an outlay of capital, the associated supplementary costs would have to be borne, or shared, by either the state, the service providers, the water end users or the buyers of the products. Given the existing structure and level of pricing for freshwater, as described in the problem definition section (section 1.2), the policy measures to incentivise and support the case for water reuse schemes will support the uptake of water reuse (i.e. boost the demand by increasing the market security and regulatory security for the farmers) and will therefore help with spreading the costs over a larger base.

Moreover, the heterogeneity of national requirements (including the lack of these) concerning the management of health and environmental risks associated with water reuse would continue to constitute a barrier with a potential to affect the EU-internal trade of agricultural products irrigated with reclaimed water (BIO, 2015). Under a scenario of increasing water scarcity exacerbated by climate change, as well as enforcement of water pricing and cost recovery provisions of the WFD (as explained in the problem definition section), the financial costs of securing freshwater supplies are likely to increase over time for agricultural businesses, although few agricultural SMEs bear the cost of wastewater treatment directly (BIO, 2015).

5.2. Analysis of the impacts of the policy options for water reuse in agricultural irrigation

In line with the Commission's 'Toolbox for Better Regulation', as a first step, all the possible impacts have been screened, and on that basis, several of them have subsequently been subjected to a more detailed analysis⁴⁸. The analysis below discusses the **costs** of irrigation

⁴⁷ A first rough estimate of the total EU water reuse volume in 2025 was developed for the purposes of this study: under a Business As Usual (BAU) scenario, a volume of around 1,700 Mm³/y could be reached (i.e. total volume of reclaimed water that would be reused in 2025 in the absence of further EU policy actions) http://ec.europa.eu/environment/water/blueprint/pdf/BIO_IA%20on%20water%20reuse_Final%20Part%20I.pdf.

⁴⁸ In particular using IA Tools #16-31, see http://ec.europa.eu/smart-regulation/guidelines/toc_tool_en.htm

with reused water and the benefits of it as modelled by the hydro-economic model by the JRC (Annex 4) and some other impacts like administrative burden stemming from the requirement to perform risk assessment under the different options. Environmental and social impacts are also analysed. Wherever relevant, a clear distinction is made between expected impacts for Member States which have national standards in place as compared to those who do not.

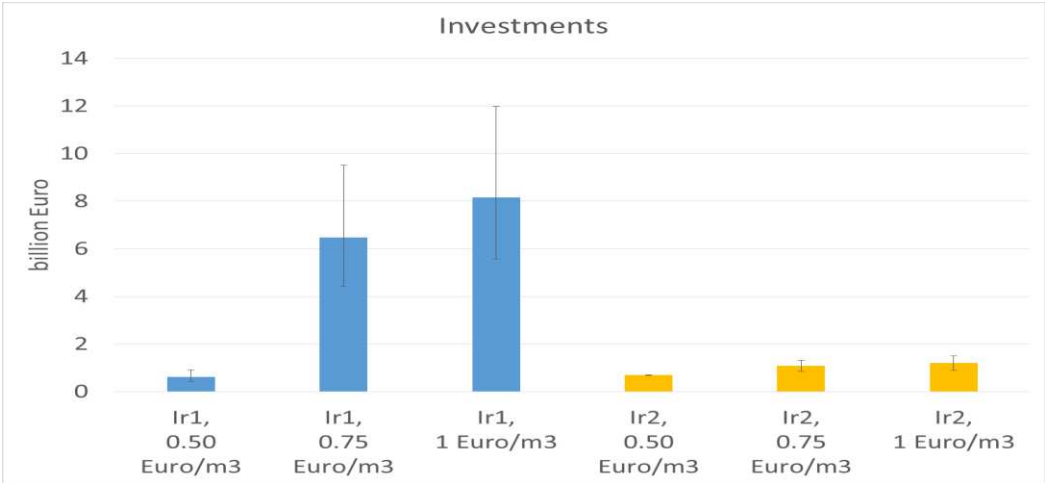
5.2.1. Economic impacts

The cost of waste water reuse is computed as the sum of the cost of: (1) the necessary treatment of waste water for reuse; (2) building infrastructures for water storage and distribution (pipelines and pumps); and (3) energy for reclaimed water pumping from the waste water treatment plant to the neighbouring agricultural areas. The most important cost factor is the transport cost and the underlying model-based assessment has therefore assumed a maximum transport distance of 10 km between UWWTP and the irrigated land, in order to keep costs at reasonable level.

The difference among the options is in the stringency of the water quality requirements, which results in different treatment costs and therefore is a variable cost. The other cost elements are not dependent on which option is chosen. Under Ir1 ("one-size-fits-all") generally higher costs of treatment can be expected than under Ir2 ("fit-for-purpose"), whereby different quality standards apply depending on the use conditions. Ir3 represents an intermediate solution and is expected to end up in a situation where certain countries adopt Ir1 and others Ir2, therefore this option is not examined explicitly in the underlying modelling as costs are falling into the range between the costs of the baseline scenario and the costs of option Ir2. Quantifying the costs of treatment under Ir1 and Ir2 with high certainty is impossible due to the inherent variability of investment and operating costs depending on the initial level of treatment of plants. Moreover, it is impossible to anticipate with high certainty the share of reclaimed water that may need the highest quality standards under Ir1. In order to come to an estimate of the impacts of adopting Ir1 and Ir2 compared to the baseline scenario, it has been assumed for modelling purposes that the treatment would require on an average a depth filtration and disinfection process for Ir2, meaning treatment costs of EUR 0.08/m³ of treated water, while under the Ir1 option, a membrane filtration process would be required to achieve the most stringent standards, meaning treatment costs of EUR 0.23/m³. A more detailed justification of these figures is provided in Annex 4.

The difference in the treatment costs under the two options reflects in a shift of total costs of reclaimed water (including treatment and transport and incorporating investment and operating costs), and consequently in a change in the volumes of reclaimed water that can be distributed at a given cost. In terms of investments, the two policy options Ir1 and Ir2 may be significantly different. Under option Ir2, investment costs of EUR 38/(m³/day) are estimated while under Ir1 these raise to EUR 271/(m³/day). A justification of the underlying assumptions is provided in Annex 4. Under Ir1, an investment of about EUR 600 million in Europe would allow treating about 800 million m³ of waste water yearly with a total cost of reclaimed water below 50 cents per cubic meter, while a slightly higher investment (less than EUR 700 million) would allow treating more than 6,6 billion m³ yearly below the same cost threshold under Ir2. When considering higher cost thresholds, uniformly applying the most stringent water quality criteria (Ir1) in Europe would make investment costs surge in comparison with the fit-for-purpose quality requirements (Ir2).

Figure 11: investments required to treat the available volumes of water at a given threshold total cost, under the Ir1 and Ir2 policy options. Error bars represent the expected range of costs (see Annex 4). Modified from Pistocchi et al., 2018⁴⁹.



The direct costs of water reuse would be in principle borne by farmers, who would try to pass these costs on to consumers. However, also today farmers are not bearing the full costs of irrigation because of subsidies, and therefore a similar assumption could be made under the different options. In such a case the costs would be borne by the society at large. Case studies described in Annex 4 highlight a significant willingness to pay of households for a more sustainable management of water resources. This may support the idea that a part of the costs of water reuse could be borne by society/taxpayers and not only by the farmers alone, since water reuse generates additional benefits to society. Nevertheless, there is an economic case to bear the full costs of water reuse under certain circumstances as shown below.

Water shortages appear to be the main reason why farmers would be willing to use and pay for the reused water; the higher the price farmers currently pay for fresh water supplies is, the more they are willing to pay for the recycled water. It is also notable that freshwater supplies for irrigation are not available in all river basins as demand exceeds available supply and so some farmers are currently unable to source freshwater for irrigation, at least with any security of supply. Furthermore, the pumping costs for groundwater, which are increasing with the groundwater levels going down due to increasing water scarcity/droughts or impacts of climate change, could be another significant driver for farmers to opt for reused water.

Therefore, the main argument for farmers to use reused water for irrigation purposes is the fact that it would allow for a secure water supply, including during times of droughts when other irrigation sources may not be available, however, fully respecting the principles of sustainable management of water resources and adaptation to climate change. Existing valuations of the impact of droughts⁵⁰ on the overall welfare (farmers and consumers) suggest the benefit of a secure water supply, as allowed by reuse, to be in the order of EUR 500-1000

⁴⁹ Pistocchi, A., Aloe, A., Dorati, C., Alcalde Sanz, L., Bouraoui, F., Gawlik, B., Grizzetti, B., Pastori, M., Vigiak, O., The potential of water reuse for agricultural irrigation in the EU. A Hydro-Economic Analysis, EUR 28980 EN, Publications Office of the European Union, Luxembourg, 2018, ISBN 978-92-79-77210-8, doi 10.2760/263713

⁵⁰ The example of a particular Member State may further illustrate this point. The drought of the summer of 2017 resulted in an estimated loss of EUR 2 billion for the Italian farming sector (see above section 1). Italy currently applies water reuse for irrigation to a very limited extent. Water reuse could, however, cover an estimated 47% of all irrigation demand in Italy (see below Figure 10), which would positively contribute to alleviating water stress and avoiding economic loss.

million/year.^{51, 52} While this estimation is very rough, it at least shows that, in areas where droughts are (or are likely to become) common, water reuse is clearly also beneficial from an economic point of view. In other words farmers would be willing to pay the limited extra cost of reused water in order to save their crops from severe water shortages and droughts as the benefits would outweigh these limited extra costs.

Under all options those farmers growing crop which are consumed raw, so mainly fruit and partially vegetable growing businesses, would be affected most. As costs would be in EUR/m³, so proportionate to the amount of water used for irrigation, none of the options would disproportionately affect SMEs. Therefore, no specific mitigation measures would be needed under the different options. More details on how farmers would be affected are included under the SME test (Annex 3a).

A distinction needs to be made between the economic impacts for countries which currently have no national standards for water reuse in place and those who already have some. For the latter, the analysis below takes account of the impacts both for Member States with currently lower standards (ES, EL, CY) and those whose standards are currently more stringent than the proposed EU level (IT, FR). A detailed comparison of the respective impacts is included in Annex 12. The most important economic impacts for Member States aligning with the proposed EU minimum quality requirements could be summarised as follows:

- Unless minimum quality requirements are too stringently set, the legally binding policy options and the Guidance, if followed, will have positive impact on **growth & investments**, as the new regulatory framework, with clearly established minimum quality requirements for water reuse for agricultural irrigation, will boost research and innovation, technological development in the sector, it will incentivise investments and consequently it will be leading to new employment. According to the Territorial Impact Assessment (Annex 9) the development of minimum quality requirements for reused water in agricultural irrigation would have a positive effect of the overall economic growth of all EU regions. Especially the Eastern European regions in the Baltic Sea and the Black Sea and some regions in Greece could potentially benefit with a high positive impact, most other regions would have a moderate impact.
- **Water suppliers.** Operators could face additional investments in waste water treatment, storage and distribution and increased sampling costs in order to comply with the minimum quality requirements while dealing with uncertain demand for the treated waste water from the farmers. It was not possible to estimate to what extent monitoring costs would increase due to the introduction of a risk assessment requirement. It is estimated that the costs for water suppliers would be higher in case of policy options Ir1 due to the necessity to achieve the most stringent (sometimes unnecessary) quality requirements,

⁵¹ A paper on the Po plain in Italy, Musolino et al. (2017) quantifies the impact of droughts on the overall welfare (farmers+consumers) in the order of EUR 500-1000 million/year during drought years. The affected population is more than 16 million persons. This may suggest a cost of about EUR 30-60/person during drought years and is in fact in line with the figures on the willingness to pay provided above. The authors stress that farmers alone benefitted from drought as the price increase was stronger than the production loss in the area. As reuse contributes to water stress reduction in the order of 10%, we may assume an indirect benefit of EUR 50-100 million during drought years, for the Po plain alone. Considering a drought that simultaneously affects an area 10 times as big as the Po plain in Europe, the indirect benefits for the whole of Europe would go back to EUR 500-1000 million during a drought year. Source: Dario Musolino, Alessandro de Carli, Antonio Massarutto, Evaluation of the socioeconomic impacts of the drought events: The case of the po river basin. Europ. Countrys. · 1 · 2017 · p. 163-176 DOI: 10.1515/euco-2017-0010.

⁵² During summer 2017, a drought hit the whole territory of Italy causing losses to agriculture, that farmers estimated at least at € 2bn (<http://www.bbc.com/news/world-europe-40803619>). Notably, also regions traditionally not suffering from water scarcity were hit.

e.g. removal of nutrients that could otherwise be beneficial for the agricultural sector (fertilisation). Furthermore, the operators might face higher costs in relation to the compulsory risk assessment approach that is part of Ir1 and Ir2, and for Ir3 if the Guidance is followed by Member States. The alignment with the EU quality standards, including the risk assessment framework would require existing waste water treatment plants to submit an application to amend their permits. If the Member States with relatively less stringent standards were to adopt the proposed EU minimum quality requirements, then this would place a burden on businesses to update their permits accordingly. Similarly, for Member States with no national legislation, the adoption of the EU minimum quality requirements would lead to some burden on businesses to be permitted / registered as required.

- **Functioning of Internal Market, international trade and competition.** Positive impacts on the Internal Market, international trade with third countries and competition would be expected through reduced differences in the requirements used in different Member States. The European producers would rely on a safe and sustainable water supply option leading to a more sustainable agricultural production. In addition, European products could benefit from a comparatively good reputation as minimum quality requirements would ensure adequate safety of the relevant EU products. A similar approach for all EU Member States would contribute towards a more informed and safer consumer choice, with positive impacts for the Internal Market. The impacts on competition with imports from third countries are expected to be neutral. In addition, developing standards at EU level will reinforce the EU stance in international standard setting discussions on water reuse. Common EU standards could serve as a model for third countries, and in particular our bilateral trade partners. Especially those countries facing water scarcity and considering applying water reuse schemes could benefit from the EU approach in addressing potential risks associated with water reuse. This would reinforce bilateral co-operation and standard approximation with key exporting partners of primary agricultural products. The likelihood that negative impacts could be expected as a result of irrigation with treated waste water that is not subsidised, which would then lead to an increase in the cost of agricultural production and as a consequence an increase in the price of agricultural products (thereby rendering these products uncompetitive on the market) is considered a very remote one, because farmers would simply avoid using the costlier irrigation water option. They would instead continue using the already existing irrigation source.
- **Employment.** As a means of better securing water availability, water reuse provides further economic security to agricultural producers, and will build a water reuse expert community to support water reuse business which translates into social benefits. This enables jobs to be secured, created and providing benefits to local communities (EC, 2012) (BIO, 2015); According to the Territorial Impact Assessment (Annex 9), the development of minimum quality requirements for reused water in agricultural irrigation would definitely cause positive effects in all regions with agriculture depending on irrigated land. In more detail, Spanish regions on the Mediterranean coast, Greek regions on the Northern coast of the Aegean Sea and Italian regions around Torino could benefit from a moderate positive effect. All other regions could gain a minor positive impact. Also according to the Territorial Impact Assessment (Annex 9) the development of minimum quality requirements for reused water in agricultural irrigation could improve the public acceptance of reused water, which could open chances for employment, especially in rural areas. Regions with a greater share of employment in agriculture and forestry are likely to be more affected. This would lead to minor positive impacts on most regions. Regions in the North and the South of Romania and several other regions could gain a moderate positive impact if they took up the new options for reusing waste water.

- **Economic impacts for public authorities.** For those Member States with existing national standards that might align with the EU minimum quality requirements, their current systems (quality categories, quality parameters) would not need to be adapted in terms of conceptual design, and it is estimated that upgrading the limits on some parameters would not require significant administrative adjustments. However, for those Member States with no national legislation, the burden on public authorities could be important, in terms of setting up the administrative system to allow water reuse for agricultural irrigation. For the risk assessment approach, Member States could benefit from the experience with the risk assessment approach introduced by the Drinking Water Directive on a voluntary basis (and is being considered as compulsory in the revision of this Directive). Therefore, only limited additional costs might be expected (around EUR 2,244,176, see Annex 4 for a detailed calculation). However, it is to be noted that the EU will not impose the water reuse practice on those Member States that do not wish to promote it. Reporting under the proposed policy options would most likely entail the use of existing reporting streams such as the reporting under the UWWTD or WFD. If included, separate guidance could be provided in order to define the content and format of information to be reported. There would be modest burden in adding further reporting fields at the European level. At national level, reporting would be parallel to compliance monitoring performed by the competent authorities and would also lead to modest additional burden.
- **Consumers:** The trade of agricultural goods irrigated with reclaimed water would be positively influenced (in terms of levelling the playing field) which could benefit consumers. However, additional costs for water reclamation plants might imply increased costs to water users including farmers, and hence to consumers should the farmers pass on the increased costs. On the other hand a more stable and potentially increased food supply due to reclaimed water and less variation in crop prices might positively affect consumers.
- **Innovation and research.** The introduction of minimum quality requirement and a risk assessment framework under all policy options would promote research on innovative treatment technologies. For example, in the UK Water Industry Research recently concluded a project entitled ‘Establishing a Robust Case for Water Reuse’⁵³ which showed that reuse is a technically viable water source in a range of applications, geographies, and scales. Considering that water reuse is an emerging worldwide market, a greater uptake of reuse at the EU level would provide a showcase for the relevance of these technologies and skills of EU companies towards potential customers in third countries. Impacts on competitiveness and innovation are expected to be positive as removal of current barriers to investment is anticipated. It should be noted, however, that innovation and economically viable changes would also take place without adoption of a new legal instrument. A clear and consistent EU framework would allow economies of scale and standardisation. This in turn would support innovation and development of solutions at lower costs. The potential market for innovations in water reuse and recycling, through implementing technological solutions and adoption of policy and legislative measures, is expected to grow and develop significantly within and outside Europe, particularly in highly water stressed regions. The Territorial Impact Assessment (see Annex 9) points in the same direction.

⁵³ Reports/90179/Water-Resources/90193/Water-Reuse/97338/Establishing-a-Robust-Case-for-Final-Effluent-Reuse---An-Evidence-Base also quoted in http://ec.europa.eu/environment/water/blueprint/pdf/EU_level_instruments_on_water-2nd-IA_support-study_AMEC.pdf

- **Benefits for the industry**, EU competitiveness and innovation potential. There is a rapidly growing world water technology market, which is estimated to be as large as EUR 1 trillion by 2020. By seizing new and significant market opportunities, Europe can increasingly become a global market leader in water-related innovation and technology (EC, 2012). According to Global Water Intelligence the global market for water reuse is one of the top growing markets, and it is on the verge of major expansion and going forward is expected to outpace desalination. The EU water reuse sector is maturing both technologically and commercially, albeit at a slow rate. Given the importance of the water industry sector in the EU, the past and current spread of water reuse technologies in the EU and worldwide has been a driver for the competitiveness of this industry sector, and this situation is expected to continue over the next 10 years. Water supply and management sectors already represent 32% of EU eco-industries' value added and EU companies hold more than 25% of the world market share in water management (EU, 2011) (BIO, 2015). Without any policy measures to incentivise / support the uptake of water reuse schemes, it is unlikely that the EU water reuse sector would be maturing at a faster rate. The absence of incentives for further water reuse would lead to no positive impact on competitiveness and innovation related to water reuse technologies and their application to agriculture. Considering the potential worth of this industry, this could lead to a loss of opportunities for the European market to be a leader on this issue.
- **ICT**. Implementing the policy options would be facilitated by advances in the ICT water sector, relevant to remote monitoring, sensors, automation control and decision support systems.

Summary of economic impacts

The above indicated benefits would only be achieved if the minimum quality criteria set are not too stringent and would not result in too high costs. Therefore while Ir1 has in general positive economic impacts, these do not materialise at the assumed cost level of 50 cents per cubic meter, but only at higher cost levels (see next section where it is shown that uptake of this option is calculated to be lower than under the baseline at the assumed cost of 50 cents per cubic meter). This is the reason why in the summary table Ir1 is assessed to have slightly negative impacts.

Figure 12: Summary of economic impacts

2030 (50)	Option Ir1 Legal instrument " <u>one-size-fits-all</u> " approach + <u>RMF</u>	Option Ir2 Legal instrument " <u>fit-for purpose</u> " approach + <u>RMF</u>	Option Ir3 Guidance " <u>fit-for purpose</u> " approach + <u>RMF</u>
Growth & investments	Slightly negative	Positive	Positive, if Guidance followed Neutral, if Guidance not followed
Public authorities	Slightly negative	Slightly negative	Neutral
Sectorial competitiveness	Slightly negative	Positive	Positive
Facilitating SMEs growth	Slightly negative	Positive	Positive, if Guidance followed Neutral, if Guidance not followed
Achievement of Internal Market	Slightly negative/neutral	Positive	Positive, if Guidance followed Neutral, if Guidance not followed
Increased innovation & research	Positive	Significantly positive	Positive, if Guidance followed Neutral, if Guidance not followed

Increased international trade & investments	Neutral	Positive	Positive, if Guidance followed Neutral, if Guidance not followed
Specific regions (TIA)	Neutral	Positive	Positive, if Guidance followed Neutral, if Guidance not followed
Consumers	Neutral	Significantly positive	Positive, if Guidance followed Neutral, if Guidance not followed

It is worth noting that an economic safeguard exists in terms of use of water reuse being voluntary. A wastewater treatment plant will only develop the practice (separate treatment and piping infrastructure), if it can sell the water to farmers for irrigation. On their side, farmers will only be willing to pay for the water for irrigation if it is competitive in pricing terms (taking into account also that the security of supply may be higher). As such, option Ir2 will have positive financial impacts for farmers by definition and indeed it is this economic attractiveness that will decide the ultimate level of water reuse. This safeguard is weakened in Option Ir1, where the one size fits all may mean some existing supplies need to be treated to a higher level with resulting higher costs, even if future expansion was always financially advantageous.

5.2.2. Environmental impacts

The main environmental impacts of the proposed policy options include: supporting adaptation to climate change and preserving the quality of natural resources (in particular through the reduction of water stress and nutrient pollution), fostering the efficient use of resources, sustainable consumption and production; and minimising environmental risks.

5.2.2.1. Adapting to climate change and preserving the quality of natural resources

All proposed policy options analysed are expected to contribute to the ability to adapt to climate change and reducing pressure on the environment by shifting the demand from main water supplies towards reused water of appropriate quality for irrigation. Annex 4 provides information on the quantitative model-based assessments available. A short summary is provided below.

Reclaimed water can take up a potentially significant share of the water demand for irrigation in the EU. Figure 13 shows that water reuse has the potential to meet for Spain and Portugal about 20% of irrigation demand, for Italy and France to about 45%, for Greece, Malta and Romania to around 10%. In all other countries, due to the lower irrigation requirements, water reuse is able to meet the whole demand unless irrigated agriculture is relatively too far from wastewater treatment plants (Nordic countries, Slovakia, Bulgaria, Poland).

Figure 13: wastewater availability and potential contribution of reclaimed water to irrigation demand, by EU Member State. Potential contribution to irrigation demand is computed as water that can be allocated, regardless of costs, in the neighborhood of wastewater treatment plants within each country, divided by the total irrigation demand estimated for the country. Source: Pistocchi et al., 2018.

Country	Availability at WWTPs	Total that can be allocated near WWTPs, regardless of cost	Potential contribution of reuse to total irrigation demand
EE	80,710,881	0	0%
LU	42,159,474	291,747	>100%
LT	180,393,800	50,601	32%
LV	351,587,408	104,500	52%
IE	1,199,386,263	1,019,289	>100%
FI	320,255,823	304,968	55%
HR	254,634,919	1,716,665	72%
SI	63,329,276	7,864,075	>100%
CZ	830,070,479	28,279,623	>100%

BE	466,779,792	67,571,968	>100%
MT	3,248,802	3,248,802	11%
AT	831,719,537	78,986,625	>100%
SE	764,770,821	43,679,832	57%
GB	5,785,815,226	185,791,041	>100%
PL	2,028,581,131	59,899,677	70%
BG	1,163,546,557	63,463,880	64%
HU	692,694,899	125,040,578	>100%
NL	961,098,462	264,433,029	>100%
SK	191,797,107	54,429,211	41%
DK	609,431,705	199,487,876	66%
DE	6,759,616,101	624,227,536	>100%
RO	743,414,782	99,146,222	11%
PT	1,278,557,567	660,784,949	23%
FR	4,998,793,967	1,845,451,653	44%
EL	1,153,447,397	417,500,899	9%
IT	9,769,661,947	4,962,268,684	47%
ES	7,114,641,769	3,295,147,922	18%
TOTAL	48,640,145,892	13,090,191,851	

However, not all water available at wastewater treatment plants can be deployed at acceptable costs. Figure 14 shows the amounts of water that can be reclaimed and distributed at different costs (total costs including investment and operation of both water treatment and its transport to farmlands), based on the modelling work described in Pistocchi et al., 2018. Among the largest irrigation demand countries, Greece shows the most favourable conditions for total costs, with the majority of potential water reuse volumes available at reuse costs below 50 cents per cubic meter, followed by Portugal. France is the least favoured, while Italy and Spain are facing an intermediate condition.

Figure 14: Amounts of reclaimed water that can be potentially deployed at different total costs for 27 EU Member States (Cyprus not included due to missing irrigation estimates). “Unmet” represents irrigation demand estimated for the Country, in excess of potentially reclaimed water. Costs shown include treatment costs representative of the Ir2 option. Source: Pistocchi et al., 2018.

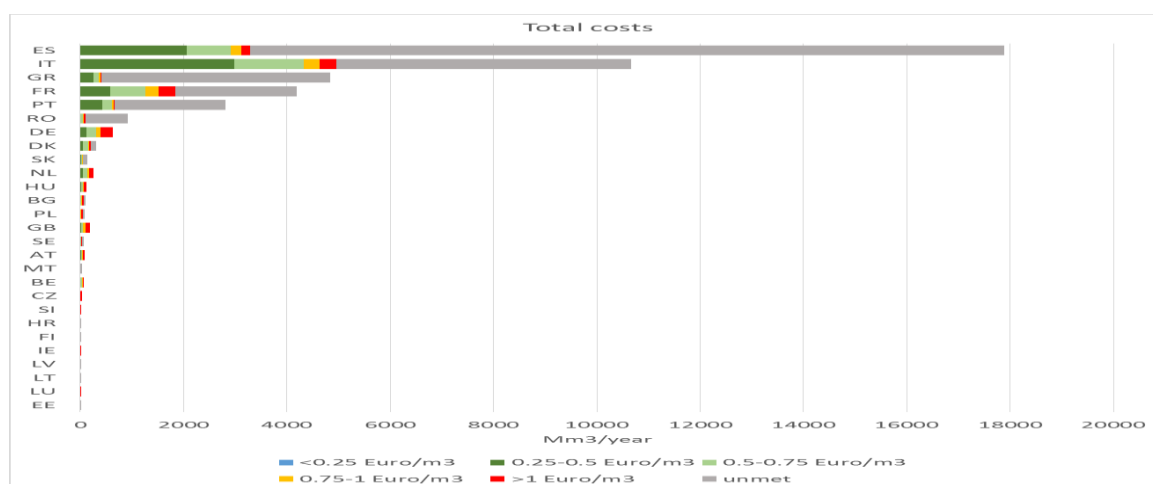


Figure 15 shows the estimated volumes of reclaimed water that can be deployed at costs below 50, 75 and 100 cents per cubic meter with the treatment costs assumed under Ir1 and Ir2. From these figures, it is apparent that under Ir1 less water is available to be reused for

irrigation below the cost of 50 cents per cubic meter than under the baseline option. Under Ir1 the minimum quality requirements are too stringent and are too costly to support water stress reduction at the assumed cost of 50 cents per cubic meter. On the contrary, Ir2 allows maintaining costs below 50 cents per cubic meter for a large part of the water available for reuse.

Figure 15: cumulative volumes (m3/year) that can be allocated below or at a given cost in Europe, under « variable quality » and « higher quality » requirements. We refer to total (investment, operation and maintenance) costs. Source: Pistocchi et al., 2018.

	Below EUR 0.5/m3	Below EUR 0.75/m3	Below EUR 1/m3
Under Ir2	6,633,811,238.00	10,438,686,582.00	11,571,593,978.00
Under Ir1	827,229,354.00	8,747,570,594.00	11,028,173,972.00
Baseline	1,700,000,000.00		

The share of agricultural water abstractions is variable across Europe, averaging about 60% in Southern countries, 11% in Eastern countries and 7% in Western countries⁵⁴. A first approximation indicator of water stress reduction potentially allowed by reuse is the % reduction of total abstractions (Figure 16). This ranges from 3.5% in the East, to more than 15% in the North, averaging around 10%⁵⁵. This indicative percentage summarizes a much nuanced picture with significant variability not just among continental zones, but also within countries and regions.

Figure 16: reduction of water abstraction potentially allowed by reuse in different European zones. Based on EEA data, 2017.

Zone	Total reuse potential, regardless of cost (km3/year) ⁵⁶	Irrigation demand (km3/year)	(C) Agricultural share of total abstraction	(A*C/B) Indicative potential % reduction of water abstraction
East	0.44	1.37	11%	3.5%
South	9.34	36.2	60%	15.4%
West	3.31	5.21	7%	4.2%

From a water quality point of view, water reuse allows diverting flows of nutrients, from direct discharge to rivers to application to agricultural soils with irrigation. Fertigation (simultaneous application of fertilizers and water to plants) may contribute to reduce nutrient pollution if the application is efficient (i.e., nutrient leaching to groundwater is not increased) and the mineral fertilizers used in agriculture are reduced proportionally to the nutrient flows coming with reclaimed water. Figure 17 shows the nitrogen (N) that can be potentially recovered from wastewater in the different EU Member States. This is a significant amount, and water reuse in itself would enable recovering up to the amounts corresponding to N in treated wastewater. However, the potentials shown in Figure 17 do not take account of the

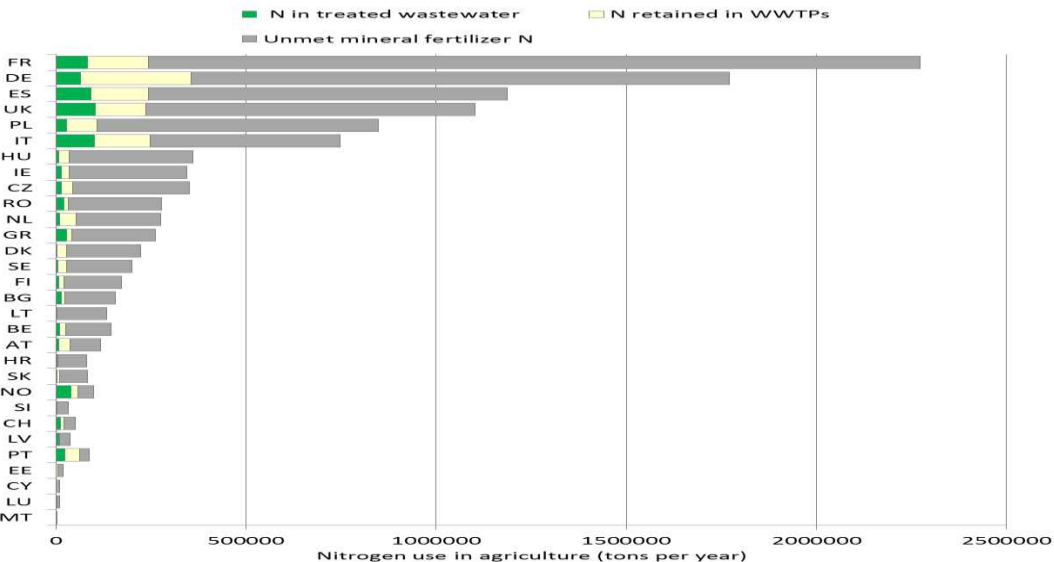
⁵⁴ These percentages are the average of figures for the years 2000s and latest available year collected by EUROSTAT and reported by the European Environment Agency (EEA): <https://www.eea.europa.eu/data-and-maps/indicators/use-of-freshwater-resources-2/assessment-2>. Countries are grouped as follows: East: Bulgaria, Czech Republic, Estonia, Latvia, Lithuania*, Hungary, Poland, Romania, Slovenia, Slovakia; South: Greece, Spain, Italy, Cyprus, Malta, Portugal; West: Belgium, Denmark, Germany, Ireland*, France, Liechtenstein, Luxembourg, the Netherlands, Austria, Finland, Sweden, England and Wales, Iceland, Norway, Switzerland.

⁵⁵ Arithmetic average 7.7%, irrigation volume-weighted average 13.7%, average of the two 10.7%.

⁵⁶ Reuse potential is computed for the three zones by aggregating the volumes shown by country in Figure 13.

costs involved and thus constitute a maximum estimate. The amount of N recovered under the different options would depend on the volumes of m³ of water reuse estimated under the different options. Therefore benefits in fertigation would be highest under option Ir2, but would be practically negligible under Ir1 if we assume a maximum acceptable cost for reclaimed water of 50 cents per cubic meter. Under this assumption, while Ir2 would enable reclaiming about 6.6 billion m³/year of water, Ir1 would enable only 0.8 billion m³/year (Figure 15).

Figure 17: comparison of N from wastewater and mineral N fertilizer. N from water reuse is the load of N in treated wastewater, while the additional N recovery. “Unmet” refers to the amount of mineral N fertilizers in excess of potential N recovery. Source: modified from Pistocchi et al., 2018.



The benefits of reusing water, while clear in principle, depend very much on the local conditions where reuse is to be made. As reuse is meant to reduce irrigation water abstractions from surface and groundwater bodies, in principle it should be implemented only where the benefits from reducing abstractions exceeds the benefits of discharging treated wastewater in the environment. In some cases, especially when treatment standards are high, discharges of treated wastewater may represent a positive input to the receiving water bodies, as they could sustain the flow regime while compensating other possibly existing hydrological alterations. In many cases, however, it is preferable to use treated wastewater in irrigation while reducing irrigation abstractions, because in this way the flow regime of water bodies is least disturbed, and nutrients conveyed by treated wastewater may be taken up by crops⁵⁷ instead of ending up in water bodies.

Valuing the benefits that may stem from water reuse is overwhelmingly complex in general terms. One proxy of benefits is the willingness to pay of farmers for reclaimed water, which is extremely variable (for instance, Birol et al., 2007⁵⁸ estimate a willingness to pay higher than EUR 0.6 /m³ in Cyprus, while Tziakis et al., 2009⁵⁹, indicate less than EUR 0.1/m³ for

⁵⁷ This requires that nutrients in reused water are taken into account in the planning of crop fertilization, and that fertilization is efficient. If these conditions are not met, reuse may simply contribute to transfer pollution from surface water bodies (where wastewater is typically discharged) to soil and aquifers where fertilizers may leach.

⁵⁸ Birol, E., P. Koundouri, and Y. Kountouris (2007), Farmers’ demand for recycled water in Cyprus: A contingent valuation approach, in Wastewater Reuse—Risk Assessment, Decision-Making and Environmental Security, edited by M. K. Zaidi, pp. 267–278, Springer, Dordrecht, Netherlands.

⁵⁹ Tziakis, I., I. Pachidakis, M. Moraitakis, K. Xideas, G. Theologis and K. P. Tsagarakis (2009), Valuing benefits from wastewater treatment and reuse using contingent valuation methodology, Desalination, 237, 117–125.

Crete), see Annex 4 for further details on the range of different studies and estimations for the value of 1 m³ of water. These examples in the Annex highlight the large variability in valuation of water used to reduce water stress, and the uncertainty due to their high case-specificity. In this assessment, based on the above estimations on willingness to pay, the benefit of water reuse can be estimated in the magnitude of EUR 0.5 /m³, which is in the mid-lower end of the cases examined above, and may be argued to represent a first approximation of the combined market and non-market value of water reuse in Europe, provided it contributes to reducing water stress. Therefore it can be argued that there is an economic case for water reuse as in general there would be willingness to pay where water reuse costs do not exceed EUR 0.5 /m³.

According to the above modelling overall a water stress reduction of more than 5% could be achieved in Europe under option Ir2, corresponding to a benefit of about EUR 3 billion/year for the whole EU assuming a willingness to pay about EUR 0.5/m³ for preserving natural flows in rivers and aquifers. This is based on the calculation that Ir2 would enable reusing more than 50% of the total volume theoretically allocated for agricultural irrigation; the total available volume would enable a water stress reduction of approximately 10%. Consequently Ir2 would enable a water stress reduction of more than 5%. Furthermore, most of the alternative water supply options (e.g. desalination, water transfers) are related to the intensive use of energy. Among them the most energy consuming is desalination. If the energy is generated using fossil fuels, this will increase GHG emissions. This is linked to the higher amounts of energy needed to desalinate water (between 3.5 and 24 kWh/m³ according to the technology), especially with thermal processes. On the basis of an average European fuel mix for power generation, it has been estimated that a reverse osmosis plant produces 1.78 kg of CO₂/m³ of water, while thermal multi stage flash leads to 23.41 kg CO₂/m³ and multiple effect distillation to 18.05 kg CO₂/m³ (Ecologic 2008). Consequently, all proposed policy options would contribute to cutting CO₂ emissions in case the water reuse is used instead of desalination plants, with the "fit-for purpose" options Ir2 having the highest benefits due to the lower energy consumption for the treatment of wastewater for the identified purpose compared to Options Ir1 due to possibly too stringent and unnecessary treatment for some purposes, e.g. more stringent water quality that could otherwise be required for food crops which will be cooked.

Box 2 Example from Spain: it was estimated the desalination installation at Carboneras – Europe’s largest reverse osmosis plant - uses one third of the electricity supplied to Almeria province. The more than 700 Spanish desalination plants produce about 1.6 million m³ of water per day. According to the estimates (1.78 kg of CO₂ per m³ of water) on CO₂ production from desalination, this translates into about 2.8 million kg CO₂ per day. It can be argued therefore that desalination is contributing significantly to Spain’s overall GHG emissions of XX per year, which have increased to +19.4% in 2015 compared to 1990 levels⁶⁰. This may be a foretaste of the dilemmas and choices between different adaptation options that Member States will face in future years as the impacts of climate change are felt increasingly widely (Ecologic 2008).

5.2.2.2. *Fostering the efficient use of resources*

Policy options Ir2 and Ir3 (if followed) are expected to contribute to the implementation of SDG 6 which sets a target of substantially increasing recycling and safe reuse globally by 2030 insofar as they would increase water efficiency through the uptake of water reuse. Policy options Ir2 and Ir3 (if followed) are expected to foster a more efficient use of water resources, as a clear framework for the water reuse would promote public and user confidence in reclaimed water and provide the possibility to water managers to prioritise various supply options taking into account the local needs of the society and environment. It is estimated that

⁶⁰ <http://ec.europa.eu/eurostat/web/environment/air-emissions-inventories/main-tables>

these two options would result in an increased demand for treated wastewater for irrigation, as the water managers would have a solid basis to encourage/promote the application of water reuse in the planning of the use of water resources in given river basins, as well as farmers would have a confidence in the quality of treated wastewater for the identified purpose. It is anticipated that a regulatory framework on water reuse would result in a decrease of illegal abstractions of groundwater, thus positively impacting the status of groundwater and associated ecosystems. However, for Ir1 the uptake is estimated to be negative at the assumed cost of EUR 0,5/m³ resulting in a supply of water reuse which is lower than the baseline, therefore this would mean less efficient use of water resources.

The assessment undertaken on territorial impacts (see Annex 9) has confirmed that most benefits from setting minimum quality requirements for the reuse of wastewater would mostly concentrate on regions suffering from water scarcity, which are mainly regions also endangered by droughts. In relation to reducing water scarcity the assessment concludes that about 24% of the regions could gain a moderate positive impact situated in the South of Europe (Portugal, Spain, the Mediterranean coast of France, Italy, Greece, Cyprus), in the East of Europe (Eastern Poland, Southern Hungary, parts of Romania and Bulgaria) and in central France and 1% of the regions located in the South of Portugal, in the very South of Italy and Haute-Corse could gain a high impact. The majority of 75% of the regions would face a minor impact. This assessment, however, was conducted only on this option and on the basis of the current situation on water scarcity and did not take account of the likely aggravation of water scarcity due to climate change and is therefore a conservative approach of the potential from water reuse.

Under policy options Ir1, Ir2 and Ir3, if followed, water reuse may result in a more efficient energy use in the water supply and wastewater treatment sector in those Member States adopting the minimum quality requirements. Several reports and studies have looked into comparing use of energy from water reuse and other alternative sources such as desalination, in particular in Californian literature, where both options are often considered. On average, a water treatment plant uses 2,500 kWh per million gallons of water treated⁶¹. The energy use varies based on the characteristics of the water being treated, the distance and elevation of the treatment plant and the distribution system. In comparison, desalination of sea water (in particular processes based on thermal distillation or membrane filtration technologies which are energy intensive) requires from 9,780-16,500 kWh/ million gallons). Further comparisons are presented in Figure 18 below.

Figure 18: Overview of energy use per water source in California

Type of water source	Average energy use in kWh per MG
Waste water treatment plant	2,500
Seawater desalination	9,786-16,500
Groundwater desalination	3,900-9,750

Source: California’s Water-Energy Relationship

In addition, the use of treated waste water for irrigation would require an equivalent or increased level of waste water treatment depending on the policy option. This would result in equivalent or increased energy consumption and costs associated with water treatment. In particular, different treatment technologies allow different levels of water quality to be achieved, with technologies such as dual membrane tertiary treatment processes that combine micro-filtration and reverse osmosis allowing the highest quality of treated water to be achieved. Such treatment processes are energy intensive. However, whilst there would be

⁶¹ California’s Water-Energy Relationship, 2005
<http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF>

additional energy use, this would to some degree be offset by avoided energy consumption associated with freshwater abstraction, treatment and distribution. In particular, reusing treated wastewater (as opposed to discharging it and abstracting and treating freshwater anew) can result in net energy savings. However, it should be noted that the net energy savings or increases will depend on the current levels of treatment and particularities of water supply, and the extent of increases in wastewater treatment where applicable.

For the sake of modelling, the same energy cost has been assumed for all 3 options and these potential costs savings due to more energy efficient water management could not be quantified. In general it can be concluded that these cost savings would depend on the ability of each option to reduce water stress and proportionate to the reduction the water stress levels. This means that it would be most beneficial under option Ir2, less beneficial but still positive under Ir3, depending on to what extent guidance is followed. Furthermore higher overall energy costs for water management can be estimated for option Ir1 as water stress would even increase under this options in case of the assumed water costs of 0,5 EUR / m³.

5.2.2.3. *Sustainable consumption and production*

Policy options Ir1, Ir2 and Ir3 (if followed) are expected to significantly contribute to sustainable consumption and production⁶² through the recycling of treated wastewater of high quality, which would be otherwise discharged into receiving streams. Considering the effort spent in producing this high quality product, reusing part of this investment for beneficial purposes directly contributes to the sustainable development. While options Ir2 is expected to have positive impacts on the sustainable consumption and production, option Ir1 could represent potential negative impacts due to the removal of nutrients that could otherwise be beneficial for the agricultural sector (fertigation) and it would increase water stress.

5.2.2.4. *Minimising environmental risks*

Options Ir1 and Ir2 would ensure that environmental risks are sufficiently tackled since a risk assessment would be needed to be performed on a binding basis in all cases water reuse is considered for agricultural irrigation. Option Ir3 due to its voluntary character would only ensure to some extent that environmental risks of water reuse are tackled, depending on to what extent Member States would follow the guidance.

Waste water reuse not only reduces the demands of freshwater, but can also reduce the discharge of nutrients to rivers, other surface water bodies and groundwater. On the other hand, increased uptake of treated waste water reuse in agricultural irrigation would need to ensure adequate controls of potential environmental risks including managing chemical contaminants, nutrients, heavy metals and micro pollutants that can negatively affect the environment and or may lead to human health problems (water-borne diseases and skin irritations). For heavy metals there are concerns that these substances can accumulate in the soil over time. Salinity of the water is also a risk to the environment and to crops. While using treated water containing nutrients for irrigation can constitute an environmental benefit whereby the nutrients are used by the crop rather than being discharged into water bodies, careful management is needed to ensure minimised risks of nutrient run-off and increased eutrophication, by ensuring an adequate type of treatment of the reclaimed wastewater according the areas of application (e.g. sensitive areas or their catchments). Finally, there are also growing concerns over the fate of the wide variety of contaminants of emerging concern (e.g. pharmaceuticals), which are present in sewage, often at trace levels, and which are often

⁶² <http://www.thesourcemagazine.org/the-role-of-water-in-the-circular-economy/>

unmonitored. Evidence remains limited as to how well treatment processes deal with these pollutants.

Figure 19: Summary of environmental impacts (assuming the costs of EUR 0.50/m³)

2030 (50)	Option Ir1 Legal instrument "one-size-fits-all" approach + RMF	Option Ir2 Legal instrument "fit-for purpose" approach + RMF	Option Ir3 Guidance "fit-for purpose" approach + RMF
1- Fighting climate change and preserving the quality of natural resources	Slightly negative	Significantly positive	In the range of neutral to significantly positive depending on to what extent it is followed
2- Fostering the efficient use of resources	Slightly negative	Positive	Neutral-positive
3- Sustainable consumption & production	Slightly negative	Positive	Neutral-positive
4- Minimising environmental risks	Positive	Significantly Positive	Positive-Significantly positive

5.2.3. Social impacts

The same social impacts are anticipated as under the baseline for the Member States without national standards, if they retain the current status (no water reuse requirements in place). In any instance where Member States with more stringent national requirements choose to align with the minimum EU standards, i.e. lower their national standards, some adverse impacts in terms of compromised public acceptance could be anticipated.

By contrast, adoption of the new EU wide standards (by the Member States without national standards) or alignment of less stringent national standards with more stringent EU wide recommendations would positively impact on promotion of public acceptance.

Social impacts associated with the Member States without national standards adopting the EU wide recommendations and Member States with less stringent standards aligning these with the proposed standards for water reuse in agricultural irrigation would include:

- **Public and occupational health.** In those Member States with national legislation, the proposed policy options are expected to bring little additional benefits with regard to public and occupational health with the exception of Member States with less stringent national standards aligning these with the proposed EU wide requirements. For Member States with no legislation but which adopt the minimum water quality standards, this would provide a framework for protection of human health and safety of individuals/populations. The legally binding policy options and the Guidance if followed would also decrease the likelihood of health risks due to exposure to dangerous substances; Results of the second open public consultation show a large consensus (75% of respondents) about the need for the minimum quality requirements to address the protection of human health of public directly exposed to reused water (e.g. workers; see Annex 2).
- **Employment.** The establishment of an EU framework together with improved communication on actual risks and benefits of water reuse is expected to have a positive impact on confidence of the general public in the quality of the reused water and, therefore, on acceptance of water reuse as a water management tool. More jobs would be created in the water and agri-food industry as well as in innovation and research sectors. Other sectors are expected to be influenced indirectly. For instance, in Greece, data

available suggests that investments in wastewater reuse have a growth and employment multiplier of 3.5⁶³ providing a positive contribution for employment;

- **Governance and good administration.** In Member States where no legal framework currently exists governing wastewater reuse for agricultural irrigation, the opportunity to fill the existing gap in the national legal system by adopting these EU wide standards is present. The Territorial Impact Assessment (Annex 9⁶⁴) shows that setting minimum quality requirements could improve government effectiveness. Eastern European regions in Latvia, Lithuania, Poland, Romania and Bulgaria as well as Italian and Greek regions and some Spanish regions could gain a moderate to high positive impact on government effectiveness. Most of the other regions would gain a highly positive impact. Many developers are aware that stakeholder participation is a key success factor for the development and efficient operation of water reuse schemes. In order to build trust and get support, developers and local authorities therefore need to initiate stakeholder awareness raising actions, consultation and collaboration activities during the development of new water reuse schemes. In most cases, the development of water reuse projects is thus an opportunity to enhance good governance practices and public participation (BIO, 2015). Compared to the baseline, this would be considered as a lost opportunity.
- **Public acceptance.** Adoption of the EU wide minimum quality requirements as well as aligning less stringent national requirements with the proposed EU wide standards would contribute to consumer protection by ensuring an appropriate quality of treated wastewater used for irrigation and hence of agricultural products on the market. An EU action would also bring more confidence to the public on the safety of the practice having a positive impact on the public perception of using recycled water for irrigation. The type of application for which water is reused is an important factor for public acceptance. Public acceptance decreases when public health is at stake or when there is a risk of contact or ingestion of reclaimed water. For instance, public acceptance of reusing water to irrigate crops that are intended to be eaten or to wash clothes can be low while reusing water for bioenergy cropping will not cause serious public concerns (IEEP et al., 2012). Public acceptance is difficult to achieve as long as citizens are not fully aware of the need to reuse treated wastewater to alleviate water scarcity and droughts, associated potential risks and adopted risk management strategies and consider it an efficient solution to address water scarcity and to reserve high quality water supplies for drinking water purposes. The first stage of acceptance of the use of reclaimed water is the acceptance by the community of the need. In this case, the use of reclaimed water becomes a solution to a problem and this, in turn, is an important driver of public perception (UK Water Research Industry, 2003). According to WSSTP (2013), growing confidence in technologies such as ultrafiltration, reverse osmosis, membrane bioreactors, and ultra-violet disinfection, has also reduced public health concerns about reuse (BIO, 2015); therefore currently public acceptance is greater in countries where water reuse is already taking place, for instance in Spain.

The results of the second public consultation show a relative consensus among respondents about reused water in irrigation as being at least as safe as compared to water abstracted from rivers. This perception is more controversial regarding groundwater. There is a large consensus among respondents representing different economic sectors about the safety of reused water compared to water from rivers, as nearly 70% of them (in each sector but

⁶³ Appendix D of AMEC study, Processed data by the authors

⁶⁴ It is to be noted that the TIA has been concluded before the JRC modelling has been completed, hence there is a potential discrepancy regarding the available data.

agriculture, where this figure is closer to 60%) consider reused water as at least as safe. There is also a consensus between different types of stakeholders, as more than 60% of respondents from each group indicate that they perceive reused water as at least as safe as using water from rivers, with private companies having a particularly favourable opinion. The large majority of respondents from Southern EU Member States and others in high water stress also report a positive perception of the safety of reused water in agriculture compared to freshwater. On the other hand, the results of the consultation show a more negative perception from respondents of the safety of reused water compared to groundwater, as nearly 50% of respondents perceive it as not as safe. This is particularly true for respondents from Northern EU Member States and for respondents from the health sector, for which this figure raises to nearly 70%.

Figure 20: Summary of social impacts

2030 (50)	Option Ir1 Legal instrument "one-size-fits-all" approach + RMF	Option Ir2 Legal instrument "fit-for purpose" approach + RMF	Option Ir3 Guidance "fit-for purpose" approach + RMF
Employment	Positive	Positive	Neutral
Public and occupational health	Positive	Positive	Neutral
Governance & good administration	Positive	Positive	Neutral
Public acceptance	Significantly positive	Positive	Neutral

6. COMPARING THE OPTIONS

This section compares the policy options to the baseline in terms of their effectiveness, efficiency and coherence, as well as their environmental, economic and social impacts (see overview in Figure 21 below). The comparison of the policy options is done in the context of their respective abilities to meet the general and specific objectives of the initiative, as set out in section 2.2 above.

Figure 21: Summary of environmental, economic and social impacts

Policy option Category of Impacts, Effectiveness, Efficiency & Coherence	Agricultural irrigation		
	Ir1 Legal instrument "one-size-fits-all" approach + RMF	Ir2 Legal instrument "fit-for-purpose" approach + RMF	Ir3 Guidance "fit-for purpose" approach + RMF
Environmental	Slightly negative	Positive/Significantly positive	In the range of neutral to significantly positive depending on to what extent it is followed
Economic	In the range of slightly negative to neutral	Positive/Significantly positive	Positive, if Guidance is followed Neutral, if Guidance not followed
Social	Positive	Positive	Positive, if Guidance is followed Neutral, if Guidance not followed
Effectiveness	Negative	Positive	Positive, if Guidance is followed Neutral, if Guidance not followed
Efficiency	Negative	Positive	Positive, if Guidance is followed Neutral, if Guidance not followed
Coherence	Neutral/Negative	Positive	Positive, if Guidance is followed Neutral, if Guidance not followed

6.1. Effectiveness of the policy options

In sum, based on modelling results, the different policy options contribute to the objectives of reducing water stress and nutrient pollution in proportion to the additional amount of reused water available at the assumed acceptable costs of of 50 cents per cubic meter. Figure 22 below (also in above section 5.2.2.2 Adapting to climate change) provides a comparison with the baseline, where it is assumed that approximately 600,000 m³/year of additional water will be reused, i.e. from the current 1,100 million m³ to 1,700 million m³ (see Section 1.4.2). Therefore the baseline would not significantly reduce the water stress level, and alleviate water scarcity, so it would not significantly contribute to effectively achieving the objectives set. In comparison with the baseline scenario, option Ir1 would achieve even less water stress reduction than the baseline at a total cost below 50 cents per cubic meter, so would not be effective. Option Ir2 would be very effective as it would lead to a significantly higher uptake of water reuse at acceptable costs. Ir3 would be effective to the degree to which Member States would implement the Guidance.

Figure 22: cumulative volumes (m³/year) that can be allocated below or at a given cost in Europe, under « variable quality » and « higher quality » requirements. We refer to total (investment, operation and maintenance) costs. Source: Pistocchi et al., 2018.

	Below EUR 0.5/m ³	Below EUR 0.75/m ³	Below EUR 1/m ³
Under Ir2	6,633,811,238.00	10,438,686,582.00	11,571,593,978.00
Under Ir1	827,229,354.00	8,747,570,594.00	11,028,173,972.00
Baseline	1,700,000,000.00		

Policy option Ir2 would be effective in relation to the specific objective as it sets a common methodology for defining requirement for reuse of treated wastewater used for agricultural irrigation. It would be effective as it addresses the underlying driver 2 (see chapter 1.3.2) on

the uneven regulatory framework at Member States and the two sets of risks defined in Figure 5. Moreover, it would reduce the risk of potential trade barriers as there would be certainty on how the food products were irrigated and that this practise is safe both for consumers, the workers on the field and the environment. Therefore this policy option does address those drivers of the problem that the initiative intended to address, namely driver 2 and 3 (see chapters 1.3.2 and 1.3.3.).

Given the fact that under Ir1 the quality requirements are too stringent and therefore Ir1 would rather inhibit the uptake of water reuse than supporting it, it is not effective in achieving the overall objective, even if Ir1 would meet the specific objective of setting a common methodology as regards defining minimum quality requirements for reused water.

Option Ir3 would only be partially effective as those Member States who decided to apply the guidance would follow a common methodology for defining minimum quality requirement for water reuse, however overall the approach would continue to be fragmented.

As the overall objective on increasing the uptake of water reuse also depends on other factors, for instance the underlying driver 1 (on reused water being less attractive than conventional water resources) and 4 (on lack of consumer trust) shown in the problem definition, these factors can pose a limitation to achieving the overall objective and to reaching the uptake volumes shown in Figure 23. These factors are not addressed by this initiative and are outside of its scope, as already stated in the problem definition (see chapter 1.3.1 and 1.3.4). However, there are actions being undertaken (i.e. improving the implementation of the Water Framework Directive, organising information campaign to inform the public about water reuse) also on these external factors, but not in the remit of this impact assessment and initiative. Nonetheless, options Ir1, Ir2 and to some extent Ir3 would result in improved consumers' trust in relation to water reuse because there would be more certainty on the safety of water reuse practises due to common minimum quality requirements within Europe.

Moreover, effectiveness of the options also depends on the extent to which farmers would have an incentive to apply water reuse for irrigation purposes. Even if the above factors 1 and 4 pose a limitation to achieving the overall objective, they are not likely to significantly undermine the effectiveness of this initiative, because the analysis of impacts (see chapter 5.2.2.1) has shown that it is reasonable to assume willingness to pay for the availability of reclaimed water for agricultural irrigation at the assessed cost of 50 cents per cubic meter in water stressed areas. In other words farmers would be willing to pay the limited extra cost of reused water in order to save their crops from severe water shortages and droughts as in these cases the benefits would outweigh these limited extra costs.

Furthermore, the degree of effectiveness in reaching the general policy objective will vary depending on the policy option and water reuse practices currently adopted in different Member States in terms of the use of treated wastewater:

No new action – Baseline for treated waste water reuse for agricultural irrigation would not be effective in reaching the overall objective. As highlighted in Section 1.4.2, estimated treated wastewater reuse potential under the baseline (in the absence of further policy developments) is estimated at 1,700 million m³/year by 2025 (compared against 1,100 million m³/ year in 2015).

The effectiveness of policy option Ir3 (if followed) would vary across the Member States due to its non-binding nature:

- Member States with existing national standards for the reuse of treated wastewater (six Member States in total) are likely to retain their own national systems or to introduce marginal changes. At the same time, introduction of EU wide Guidance on the reuse of

treated wastewater might support the progress of existing national standards aiming to increase reuse of treated wastewater, through positively affecting public acceptance and providing further reassurance about the safety of such a use of treated wastewater. On the other hand, if a Member State with currently more stringent national reuse standards were to decide to align (lower) the national system with the proposed EU requirements, this might result in a lower level of treatment required, subsequently, lower costs of treatment, but at the same potential compromised public acceptance;

- A large number of Member States (22) do not currently have national standards on the reuse of treated waste water. Taking into consideration these two factors, this policy option is not expected to significantly increase uptake in treated waste water reuse or to contribute significantly to addressing the key barriers to waste water reuse discussed in Section 1.

The implementation of policy options Ir2 and Ir3 (if followed) is expected to result in higher uptake of treated wastewater reuse across the Member States where water scarcity is identified as a significant pressure and water reuse is deemed an effective measure. As indicated by BIO (2015), a volume in the order of 6,000 million m³/year by 2025 might be achievable in the case of both stronger regulatory and financial incentives at the EU level. The effectiveness of these policy options would vary across the Member States depending on the existence of any national standards and their relative stringency in comparison to the proposed minimum quality requirements and risk assessment approach. In general terms, the effectiveness is anticipated to be higher in those Member States for which the absence of a clear legislative framework is seen as a major obstacle to water reuse and Member States whose national standards are lower in stringency than the proposed minimum requirements (see also Annex 6).

In particular, depending on the relative stringency of the existing national standards for the reuse of treated wastewater in the six Member States with standards in place, in comparison to the proposed EU minimum requirements and a risk assessment approach, and their choice regarding retaining or aligning the national standards, these Member States would see an increased or decreased stringency of requirements (notwithstanding that member states with more stringent existing regimes could retain these, rather than reduce the level of protection). For instance, in Cyprus and Greece, the legally binding option could perform better in terms of improvement of public perception and raising confidence, removing a fragmented framework for agricultural irrigation using treated wastewater across Europe and resulting in lower treatment costs.

Crucially, the Member States that do not currently have national standards on the reuse of treated wastewater and which are not interested in implementing use of treated wastewater would not be affected. The proposed EU minimum requirements and a risk assessment approach considered in this assessment for water reuse in agricultural irrigation does not interfere with the Member States' decision on whether or not to develop water reuse and the extent to which water reuse should be encouraged.

6.2. Efficiency of the policy options

The degree of efficiency in reaching the general policy objective is assessed in terms of the respective costs involved. It will vary depending on the policy option and water reuse practices currently adopted in different Member States regarding the use of treated wastewater:

No new action – the Baseline for agricultural irrigation is not cost-effective as it involves many lost opportunities in terms of cost savings, and in terms of business development for the EU water industry (BIO, 2015).

Figure 22 above clearly shows that option Ir2 provides more volume of treated waste water, hence more benefits, than option Ir1 at any given cost, and is therefore more efficient. The efficiency of option Ir3 depends on the extent to which Member States would follow the Guidance and is therefore considered less efficient than option Ir2.

Policy options Ir3 (if followed) – development and promotion of a non-binding Guidance would involve limited additional treatment, monitoring and administrative costs. In particular, Member States that have national requirements in place already are most likely to retain these, while Member States that do not have such national requirements at present will retain the freedom to decide whether to engage in treated wastewater reuse practices and under what conditions. The policy options, however, would not contribute towards development of consistent quality requirements across the EU Member States.

The implementation of all policy options Ir1, Ir2 and Ir3 (if followed) would involve some administrative costs associated with development and adoption of the EU intervention, as well as its implementation and enforcement in the Member States that would choose to adopt treated wastewater reuse practices:

- Member States which do not currently have national standards would benefit from having a clear regulatory framework for managing health and environmental risks of reuse if they choose to adopt the practice. At the same time, Member States that do not anticipate engaging in treated waste water reuse practices would not incur administrative costs of transposition, in case the proposed instrument is a Regulation. In case a Directive is proposed, additional administrative burden is expected due to the required transposition, in particular in those Member States who do not make use of water reuse and do not intend to engage in such a practice.
- Member States with existing national standards that are relatively more stringent than the minimum quality requirements proposed are either anticipated to incur no additional costs or benefits if they choose to retain their national standards or would incur lower costs of treatment if they choose to align their national standards with relatively less stringent minimum requirements under the EU proposal (while not the intended objective of the proposed EU wide standards, this constitutes an available choice to this group of the Member States). In selected cases where Member States national standards were found to be less stringent, the countries would incur marginal increases in monitoring costs due to the higher number of parameters to be monitored.

6.3. Coherence of the policy options

All policy options have to ensure they are fully coherent with other EU policies, supporting, in particular, the achievement of the objectives set by the WFD and its associated Directives, and by the Marine Strategy Framework Directive.

As options Ir2 and Ir3 (if followed) would reduce water stress levels, these policy options would contribute to the implementation of several other EU policies, in particular the EU climate change adaptation and disaster prevention policies, the EU biodiversity strategy, the resource-efficient Europe initiative, and the EU policy framework on phosphorus (BIO, 2015). Option Ir1 would not be coherent under the assumed cost of 50 cents per cubic meter, because it would lead to higher water stress levels than the baseline, so it would undermine other policies like the EU climate change adaptation strategy.

In addition, options Ir1, Ir2 and Ir3 (if followed) would support the achievement of EU food safety legislation, by addressing upstream safety issues and, in the case of agricultural irrigation, promote addressing the Internal Market and possible trade barriers, and would be fully coherent with the existing Regulation on the Hygiene of Food Stuff.

Further information on the coherence of the preferred option with the existing legislation is included in Annex 3.

6.4. Nature of the instrument

As set out in the above analysis, the purpose of the new instrument on water reuse for agricultural irrigation would be to facilitate the uptake of water reuse wherever it is appropriate and cost-efficient, thereby creating an enabling framework for those Member States who wish to practice water reuse. This impact assessment considers the full array of legal instruments, namely amending one of the existing Directives, a new Directive or Regulation, as well as the non-binding form of a Guidance

Most of the existing EU legislative framework on water is composed of Directives (e.g. WFD and its associated Directives, Drinking Water Directive, UWWTD, Bathing Water Directive, Marine Strategy Framework Directive). This choice of instrument not only reflects the need for EU legislation to accommodate pre-existing national institutional arrangements and legislation in Member States but, among other things, also the intrinsic nature of water management which has to adapt to highly varying situations in terms of natural characteristics of water resources and of the human activities impacting their status.

Also for water reuse practices there is a wide variation across the EU (see Annex 6) but there are much less pre-existing institutional arrangements at national level. When considering new legislation on water reuse, it should be noted that the legal instrument of a Directive would easily be able to accommodate the fact that Member States may wish to either keep existing national standards (in case they are more stringent than the EU minimum requirements) or introduce more stringent national standards if a Member State finds this more appropriate.

One possibility is to amend an existing legal framework where water reuse is already mentioned, in particular the UWWTD. However, an amended or new Directive would require transposition into national legislation by all Member States. While water reuse is certainly a promising option for many Member States, it needs to be considered that at present only 6 Member States (CY, EL, ES, FR, IT, PT) can build on specific coverage in their legislation or in national non-regulatory standards. The transposition obligation applies for all Member States, whether they intend to reuse water or not. This would result in the burden of introducing fully new legislation which may not be proportionate.

The possibility of allowing for an opt-out from a possible new Directive has been considered. Such opt-outs can only occur by way of negotiation after a Directive has been adopted by the co-legislators. The opt-out possibility is generally envisaged for more permanent situations⁶⁵. In the case of water reuse, however, a more flexible possibility for phase-in is appropriate in case certain Member States decide to introduce the practice at a later stage; this possibility would be better provided by the legal form of a Regulation.

Moreover, an amended or new Directive would necessarily leave flexibility in transposition of the requirements. While this would accommodate for differences across the EU, this would pose a limitation in meeting the objectives set, in particular as regards the Internal Market and

⁶⁵ For example, Malta opted out of a Directive on the interoperability of the rail system within the European Union because it has no railway system and no plans to introduce one.

in setting a common level playing field. This limitation was already identified in the impact assessment of the Blueprint in which a Regulation was eventually the only regulatory policy option assessed in detail.

While the two open public consultations demonstrated a broad support by all categories of stakeholders for a binding approach (i.e. a Directive or Regulation), several comments from respondents in the second consultation expressed a preference for a Directive, either explicitly or implicitly in view of its binding character together with its flexibility allowing adaptation to local contexts and needs, but this could be achieved with other tools, notably the suggested introduction of the risk assessment approach (see Annex 2). It is true that flexibility is necessary in order to address adequately the risks to local public health and to the local environment. However, it is equally true that a rather uniform approach is needed for the relevant health risks for food products placed on the Internal Market. This should be the main consideration in choosing between amending an existing Directive or introducing a new Directive/Regulation or Guidance.

Requirements linked to the Internal Market are frequently introduced by way of a Regulation to ensure direct applicability to operators. While the main objective of the new initiative is environmental (contributing to alleviating water scarcity), as discussed above, the Internal Market dimension is a crucial link in the intervention logic of the initiative and must be addressed at the same time in order for the initiative to reach its main objective.

On the basis of the above analysis on the most appropriate legal form, both a Directive or a Regulation may be chosen, each with certain advantages and disadvantages.

6.5. Preferred option

On the basis of the above analysis in terms of the efficiency, effectiveness and coherence of the policy options for agricultural irrigation, both the "fit-for-purpose" approach and the baseline are expected to better address the objectives of the initiative than the "one-size-fits-all" approach; the "fit-for-purpose" approach can deliver significantly more benefits than the baseline. Considering all environmental, economic and social implications, a **legal instrument applying the "fit-for-purpose" approach (Ir 2) is the preferred option** rather than a Guidance document because it is able to provide the highest volume of treated waste water at an affordable cost level combined with additional economic and social benefits.

It would enable reusing more than 50% of the total water volume theoretically available for irrigation from wastewater treatment plants in the EU and avoid more than 5% of direct abstraction from water bodies and groundwater, resulting in a more than 5% reduction of water stress overall. This would be a considerable contribution to alleviating water stress in the EU and thereby correspond to the overall objective of the initiative.

The proposed EU legal instrument would have an enabling function and provide for a timely reaction to a growing EU-wide problem. Its implementation is expected to (1) raise awareness, (2) provide reassurance that experts have transparently analysed what is actually safe for all EU citizens and (3) ensure a level playing field and thereby provide an incentive for farmers, industry, citizens and others to explore the opportunities stemming from water reuse. This could include purchasing agricultural products that were currently not chosen by certain consumers; it could also mean further research, technology development and investments, as well as job creation.

For the choice of legal instrument, the possibilities of a Directive or a Regulation are both considered suitable, each with certain advantages and disadvantages. While a Regulation would cater better to the enabling nature of the initiative, a Directive may allow for easier

flexibility in terms of setting more stringent national requirements (while at the same time imposing a transposition burden on all Member States, including those who do not wish to practice water reuse at the present moment).

7. MONITORING AND EVALUATION

Consistent with the objectives of this initiative, its monitoring will aim at evaluating policy effectiveness in the EU in terms of:

- the evolution of water scarcity,
- the development of water reuse for agricultural irrigation,
- compliance of water reuse practices with the minimum requirements, including the risk management approach.

A Fitness Check of EU environmental monitoring was carried out and presented by the Commission in June 2017; it includes an action plan to streamline environmental reporting to be implemented in the coming years⁶⁶. Monitoring needs for the present initiative have been elaborated according to the principles highlighted in this Fitness Check, in particular:

- efficiency of reporting with a moderate, justified and proportionate administrative burden, by avoiding overlaps and streamlining with existing reporting obligations, both in terms of content, timing and frequency;
- relevance in content, by focusing on information that is strategic, quantitative and regulation-driven, and limiting the amount of textual information
- EU added value, by making available comparable and consistent data available at national level complemented with active dissemination of relevant information at national level.

Existing reporting obligations for Member States under the WFD (Article 15) and the UWWTD (Articles 15, 16 and 17) already include the necessary information on indicators relevant to measure the success of this initiative, In particular, under the WFD, Member States are to report every six years for each of their river basins⁶⁷:

- quantitative status of groundwater bodies;
- surface water and groundwater bodies subject to a significant pressure from abstractions, and the main responsible sector(s);

and, in case water abstraction has been identified as a significant pressure in the basin:

- o Water Exploitation Index (WEI+)
- o annual volume of water used by sector (consumptive uses)
- o annual volume of reused water;
- whether water reuse has been included in the river basin management plan as a measure in terms of managing water resources.

Under the UWWTD, Member States are to report every two years, inter alia, for each of their agglomerations (and associated urban waste water treatment plant) whether at least part of the effluent is reused and for which purpose.

Information reported by Member States to the Commission is the basis for the elaboration of periodic Implementation reports by the Commission to the European Parliament and the Council. Recent steps have been taken to improve the quality of reporting on existing

⁶⁶ Report "Actions to Streamline Environmental Reporting" (COM(2017)312) and Fitness Check evaluation (SWD(2017)230)

⁶⁷ WFD reporting guidance 2016

provisions to water reuse and more accurate information is expected to be available as of the next implementation reports under the two Directives in 2018. Taking into account these ongoing improvements, existing reporting streams under the WFD and UWWTD will mostly be sufficient to inform progress as regards the evolution of water scarcity and development of water reuse for agricultural irrigation in the EU and only limited additional monitoring and reporting requirement will be developed to this regards.

The monitoring requirements will primarily be imposed to the operators of the reclamation plants and the Member States shall ensure that the information is made available online to the public. The proposed Regulation would include additional monitoring requirements on the quality of reclaimed water. Member States would need to verify compliance with the permit conditions based on monitoring data obtained pursuant to the legal instrument on water reuse, the Water Framework Directive and the Urban Waste Water Treatment Directive and other relevant information.

Detailed reporting obligations will be developed with consultation of experts in Member States taking into account experience gained in the Fitness Check on environmental reporting and follow-up actions, in particular as regards the use of advanced information and communication technologies (ICT).

Given the expected evolution both in knowledge and in the policy framework as regards contaminants of emerging concern the legal instrument shall include a review clause within 6 years after its entry into force.