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Water and the green economy

Water has a special value in the green economy. As a basic necessity for life and as natural resource providing valuable ecosystem services, water of adequate quantities and quality is indispensable for society, environment and economy and consequently also for the development of a green economy. The role of water in a green economy can be summed through the EEA statement that *"Managing water sustainably in a 'green' economy means using water more efficiently in all sectors and ensuring that ecosystems have the quantity and quality of water needed to function effectively.* Greening the water sector requires a shift from the current practices and to enforcing the implementation of the water management policies that are in place by adopting innovative technologies that provide environmental as well economic benefits

The present report aims to describe the relevance of water within GREECO's perspective of the green economy which is defined "*as one that results in enhanced regional competitiveness and cohesion over the long term, while not exposing territories to significant environmental risks and degradation*". The will focus on those aspects of the water sector having the largest impact on the regional economy, namely water collection, treatment and supply as well as sewerage. The report presents the role of water in a green economy and its inherent characteristics and potentials as well as an overview of the current state of performance of European regions in the water sector. Moreover, the key drivers of green economy in the water sector are identified and analysed, including policy framework, non-policy factors as well as external factors.

The water sector can be characterized as green in itself and that greening of the sector mainly refers to implementing more sustainable water management. Water efficiency is a Resource efficiency which is reflected throughout the EU policy framework is in terms of water efficiency needed for establishing a green growth and recover from the current economic crisis as well as to adapt to climate change and build resilience to disasters. To tackle these challenges holds significant potential in boosting the competitiveness and growth of the water sector in European regions. There is also potential for green growth in other water-related sectors (water-using industries, water technology development etc.) where innovation can increase operational efficiency.

Territorial aspects of the water sector

The territorial characteristics of water are closely linked to the territorial dimensions of available water resources as well as patterns in water consumption. The available fresh water resources are unevenly distributed across the European territory. Likewise the water demand varies across Europe, where the balance between sectors varies significantly. Water management is a key challenge for rural areas and wise water use is known to make direct contributions to rural development issues connected with business competitiveness, environmental conservation, economic diversification and quality of life.

Water management can be considered as a local, place based, concern. Water is different from other natural resources like e.g. oil, coal and metals in terms of its governance. Water policy in Europe is mainly designed by regional or local governance structures together with the central government, which involve governmental policy actions as well as private sector activities and behaviour of different stakeholders (civil society, farmers, industries enterprises, utilities, etc.). Water bodies are cross-territorial per se (More than 60 % of Europe's rivers are "international" which is illustrated in the development of common RBMPs.) and regional cooperation is necessary which has also been further formalized in the WFD administrative structure. Working for common objectives between territories is crucial for obtaining a sustainable water management contributing to a green economy.Water bodies and river basins do not follow administrative borders.

Both urban and rural areas have special significance for the water sector. Cities are key water consumers and require significant transfers of water from rural to urban areas. The growing urban population and the following increase in water use are putting additional pressure on the water bodies and have led to destruction of water borne ecosystems and interrupted/changed the hydrological cycle in many areas in European regions. In addition, rapid urban development often leads to obsolete water and waste water infrastructure as such development cant keep with the urban sprawl, and as a result health problem increases, especially in poorer areas. Rural areas, on the other hand, provide the base

for most of the water bodies. Rural policies will be important e.g. in finding efficient distribution systems and for managing the water resources and maintaining resilient water bodies.

Consumption and production in the water sector

As mentioned above, water is having a direct or indirect impact to practically all economic sectors. The production and consumption aspect of water are therefore strongly interlinked with the water use of different economic sectors that have a direct impact on water consumption. The division of water consumption between sectors varies significantly between European regions. In Western and Eastern Europe the most important water using sector is the electricity production sector while water withdrawals in Southern Europe and in the EU candidate countries are currently dominated by agriculture. Below are a few example of the multi-sectoral importance of water

- Water is vital for agriculture, farming and livestock. Agriculture is a main consumer of water and is responsible for app 34 % of Europe's total fresh water abstraction. There are naturally large territorial differences and in the Mediterranean region, the agricultural sector is counting for app. 65 % of the total water abstraction. Irrigation represents the largest share of the water used for agriculture and the area of irrigated land is constantly increasing. Water inefficiency in the agricultural sector is big and water losses in irrigation account for on average 55 % of total losses. Agriculture is also a major polluter of the water sector and is exemplified by the severe eutrophication of the Baltic Sea as a direct consequence.
- Industry and energy consumes app. 42 % of the abstracted water in Europe. Industry uses water for the manufacturing processes, while energy generation uses water for cooling and other purposes. Increased energy consumption increases water demand. With regards to industry, big differences of water use exist between the regions depending e.g. on the type of production and the level of water efficiency applied. Pulp and paper, chemical, food and textile industries are usually classified as water intensive industries. Impacts from industries on water bodies involve pollution and contamination of water resources in addition to additional water stress due to high water consumption. The use of chemicals in industry also influences the water bodies in Europe.
- In Europe as a whole, public water supply, including households, public buildings and SMEs, stands for 24 % of total water abstraction.

Current state of performance of European regions in the water sector

Water industries, both publicly or privately managed, are key sectors in terms of added value and employment. The European water sector, includes app 9000 active SMEs and provides 600 000 direct jobs in water utilities alone. It is however important to stress that the water sector represent a rather small share of the economy. Data is not available for providing exact figure on European level, but available figures range between 0.27-1 % of the share of the water sector in total GVA (by territorial unit) (all Nace rev.2 categories). It can bee seen that the development of GVA in the sector in general follows a positive trend, where most countries have experienced a growth of the GVA between 2000 and 2009.

Similar to the water sectors share of total GVA, the share of the water sector of the total employment is very small where most countries fall in the range of 0.1-0.5 %. The employment index followed to a large extent the trend of the total industry in the EU-27. However after the 2008, when the economic crisis hit Europe, the water industry remained rather stable compared to the decline in the total industry. The water collection, treatment and supply sector is representing the main share of the employment in the water sector.

The total water abstraction in Europe has been reduced during the past 15 years and currently, app. 13 % of Europe's total freshwater resource is abstracted annually. Most European countries have reduced pressures on water resources by reducing or stabilising abstraction rates per capita between 1989 and 2007.

The water quality is a determining factor for the green economy development as poor quality degrades ecosystem services, causing health problems and restricts economic activities such as agriculture, tourism and industry as well as increases the costs of waste water treatment. Significant progress has been achieved during the last 25 years in reducing pollution in water bodies in Europe which is a result

of e.g. improved waste water treatment, reduced industrial discharges, and reduction in the use of fertilizers and phosphates and reduced emissions to air. Despite the progress, the EEA assessment of status of European waters 2012 concludes that only 52 % of water bodies are predicted to achieve the WFD objective of good ecological status by 2015.

The Water Exploitation Index is an attempt to illustrate water efficiency and provides a measure of sustainability of water consumption based on abstraction compared to the available resources. If the total water abstraction exceeds 20 % of the total available annual resources the territory is considered as water stressed. Five EU countries are considered to be water stressed; Cyprus, Belgium, Italy, Malta and Spain. Over the last two decades the index decreased in 24 European resulting from water savings water efficiency measures.

Connection to public water supply is well developed in Europe and close to all citizens have direct access to public water supply. On average, the ESPON territory has a close to full coverage of water supply. The rate might be lower in rural areas where development of the network is not economically justifiable and the population relies on self supply. Romania which has a connection rate of only 55 % is the laggard among the European countries. Waste water treatment has improved throughout Europe as a result of the implementation of the Urban Waste Water Directive (UWWD) (1991). On average, more than 80 % is connected to waste water treatment in Northern, Southern and Central Europe, while the connection rate is a bit lower in Eastern and South Eastern Europe with app 40-60%.

Driving forces and enabling conditions for green economy in European regions

Driving forces and enablers for green economy developments in the water sector includes the establishment of sound regulatory framework, prioritising government investment to stimulate specific areas and shifting market-based instruments towards promoting green investment and innovation. Policy can be singled out as being the most important driver for a green economy in the water sector. A key driver for green economic growth in the sector is the EU water legislation. Much of the achievement in the improved water resource management, leading to that high levels of public water supply of good quality and improved waste water treatment have been reached in ESPON countries during the last few decades, can be accounted to the improved EU legislation. Although regulation can impose costs on water users in the short term, it can also provide incentives for innovation, which in the medium to long run might reduce or make zero the costs for individual users. At the same time, innovation can offer new trading and export opportunities for European companies and thus be a driver to green growth.

The key multi-sector policies in the EU having clear implications of green economy for the water sector includes the Europe 2020 Strategy's Flagship Initiative on Resource Efficiency and its roadmap to a resource efficient Europe, the Cohesion Policy which is financing a major part of investments into water supply and treatment in ESPON countries. According to the EEA, the Cohesion Policy represent the biggest steps taken to achieve the WFD goal of "good status" of all waters 2015 as it has to a large extent financed infrastructure needed to meet legislative requirements. The recent reform of the CAP has improved its consideration of water scarcity and other environmental and resource management. The most important EU policies for the water sector includes the Water Framework Directive (WFD) which it is the key legislative act setting the priorities and directions for the EU water policy. The WFD is complemented by other regulations in certain areas such as the Groundwater Directive (2006). In addition, related previous legislation includes The Urban Waste Water Directive (1991), The Nitrates Directive (1991) and the new Bathing Water Directive (2006). More recent legislation in the water sector includes the Floods Directive (2007). The Blueprint to safeguard Europe's Water Resources was launched in December 2012 and is a strategy outlining actions that concentrate on better implementation of current water legislation, integration of water policy objectives into other policies, and filling the gaps in particular as regards water quantity and efficiency. The Blueprint process is a response to the challenges identified in achieving the WFD goals and compromises a review of the water policy processes most important to resource efficiency and might strengthen the implementation of the key water directives and strategies.

A range of policy instruments or non-policy drivers can act as enabling factors to foster a green economy, including economic instruments, administrative and institutional framework, information and awareness raising and innovation. Market based instruments can to a certain extent be categorized as

a driver but has limitations as the value of water and the benefits of investment are difficult to estimate in monetary values and has consequently not been assessed properly. This statement was supported by the OECD Ministerial Council Meeting in May 2011: "*investment in natural capital is an area in which public policy intervention is most needed because market incentives are weak or non-existent. This is largely because the contribution of natural capital to production is often not priced and the contribution of natural capital to individual welfare is not appropriately valued. The lack of proper valuation and market incentives or signals can affect the foresight of households and firms in ways that set the economy on trajectories that are unsustainable (or conversely that miss growth opportunities) or that are not necessarily maximising well-being".*

In terms of external factors that are not modifiable, water demand is heavily sensitive to socio-economic changes which is a crucial driver in the transition towards green growth. Economic downturn reduces water use as economic activity is reduced, which has been seen in Europe following the economic crisis, starting in 2008. Other key factors that influence the public water demand include change in demography, population densities and household size, income and consumer behaviour. From a territorial perspective, land-use planning as well as urban-planning is being one of the main drivers of water use. Water bodies are directly impacted by agricultural intensification and abandonment, and natural afforestation as well as urbanisation. The current socio-economic stress on Europe's water resources that are caused by demographic changes, population growth, increased consumption, and land use leading to water scarcity in certain regions and cities will be further exacerbated by climate change. Climate change has a more indirect effect on water quantity than land use change or increased abstraction but will also put additional stress on the areas with already vulnerable water resources, especially in water scarce regions or regions with high occurrence of floods. Climate change will affect not only water supply but also water demand.

Concluding remarks and way forward

Water of good quality and in adequate quantities is necessary for the development of green economy as it is a prerequisite for human well-being, healthy ecosystems and future economic development. Creating a sustainable green economy requires recognition of the interdependence of water, energy and land use, and coordinated actions under a common concept of resource efficiency. Resource efficiency which is reflected throughout the EU policy framework is in terms of water efficiency is needed for establishing a green growth and recover from the current economic crisis as well as to adapt to climate change and build resilience to disasters. To meet the targets in the EU water policy and to tackle the related challenges holds significant potential in boosting the competitiveness and growth of the water sector in European regions. There is also potential for green growth in other water-related sectors (water-using industries, water technology development etc.) where innovation can increase operational efficiency. Investment in water supply and sanitation services generates a number of economic, environmental and social benefits such as to improvements in public health, the environment and for certain economic sectors such as fisheries, tourism and property markets. The role of local and regional authorities in relation to the water sector is especially important as they in general have the responsibility for water management. They are also important factors in increasing the absorption capacity for cohesion policy fund which is a main funding source of water and waste water investments.

Water savings have the potentials to reduce water scarcity and droughts both for companies and individuals. Water savings will also bring benefits in financial and economic terms reducing water bills for both companies and individuals. For instance, water savings could avoid additional investments into water supply infrastructure and would reduce sewage and waste water as well as limit the need to capture new water sources. From the environmental perspective, it can lead to reduced stress in river basins and avoid resource depletion, water scarcity.

Resource efficiency, in this case in terms of water efficiency has the potential of creating new green jobs. Investments in means to store and save water can create employment in producing, installing, and maintaining the necessary equipment. Raising water productivity will require substantial job-creating public investments in off-farm infrastructure. Eco-innovation in water technology is another sector with employment possibilities.

The relation between green economic growth and the full benefits and water has not been sufficiently mapped. This has several reasons but is dependent on that the contribution of water to production is often not priced and the role of water for individual welfare is not appropriately valued. In the GREECO perspective it is also important to highlight that the benefits are in addition highly location-specific and is depending on e.g. the of the existing water bodies and its status, the frequency of water-related diseases and can therefore not be easily aggregated.

The key messages below summaries the way ahead for water in a green economy.

Key Messages Water sector

Water of adequate quality and quantity is a prerequisite for most economic sectors. The lack of water of appropriate quality and quantity can therefore be a significant hinder to development, leading to large social, environmental and economic costs. In a green economy, water efficiency is optimised, the use of water is significantly reduced and less water is being abstracted, consumed and treated. If water efficiency is increased, more water would be available for other purposes such as manufacturing etc., resulting e.g. in job creation in other sectors.

Investments into ecosystems are central in a green economy. In a green economy, it is important to have a fair approach to water abstraction that fulfils not only the needs of competing economic sectors but also the requirements of healthy and resilient freshwater ecosystems. Water ecosystems provide life-supporting services to Europe's economy and society which have an economic value counted in billions of Euro, such as: provisioning and regulating (e.g. water purification and carbon absorption by wetlands).

Investment in water supply and waste water infrastructure can accelerate a transition to a green economy. Improved drinking water service and waste water treatment and the related water infrastructure can provide significant returns both for the economy and the environment as well as it reduces costs to society stemming from poor water and sanitation services. At the same time contribute to the achievement of objectives in the Europe 2020 strategy of creating new jobs and stimulating growth. The potential for growth and jobs creation are especially significant in regions in the new EU MS as there are still large gaps to the EU aqcuis. Moreover, the transition period for the Urban Waste Water Treatment Directive spans until 2015 (for most new MS) and 2018 (Romania).

Water pricing is an efficient way to illustrate scarcity and manage water demand. In a green economy, the role of water in preserving biodiversity and ecosystem services need to be recognised, valued and paid for. Today, water prices do not normally reflect the true value of water. To move towards a green economy usually includes a commitment to charge for the full cost of resource use and has the potential to generate incentives to improve the efficiency of the use of water resources.. Pricing can also be an effective awareness-raising tool for consumers and combines environmental with economic benefits, while stimulating innovation. It can generate revenue for financing investments into sustainable water management. It should however be noted that all individuals have the right to adequate water provision, irrespective of their available financial resources.

Proper valuation of the water resource and better financial instruments are needed to enforce water policy objectives. Economic instruments are major drivers of greening the water sector. Today there is a lack of proper valuation and market incentives for sustainable water management which can negatively affect behaviour in ways that set the economy on an unsustainable path (or conversely missing growth opportunities). It is necessary to improve the assessment of cost and benefits of sustainable water management (including environmental and resource costs) and benefits (including ecosystem services). Adoption of new policies in the water sector should be accompanied with carefully designed economic instruments.

Policy improvements of water management need to be executed and implemented across sectors and across territories. Due to the cross-sectoral significance of water, policies, subsidies, measures, etc. in other sectors which are undermining improvement of water management need to be abolished. Resolving agricultural water use is a key factor to improvements in the water sector as it is a key consumer of water (e.g. subsidies to irrigation which leads to increased water use). Resource efficiency of water resources should be the overall objective in any policy related to water management and should be applied across all sectors. Decoupling water use from economic activity needs to be a key factor in the green economy development

Implementation of best available technique has large potential of water savings. It is estimated that 20% to 40% of Europe's water is wasted and water efficiency could be improved by 40% through technological improvements alone Water saving measures and leakage reduction in water supply systems as well as efficient irrigation techniques have big potential to improve the efficiency in public water supply systems. Huge water quantities are wasted through e.g. leakage and inefficient consumption practices. With a large part of Europe's water infrastructure being up for renewal it is vital

to use this opportunity for technological improvements instead of sustaining inefficient solutions. Water savings also have the potential to avoid additional investments into water supply infrastructure and would reduce sewage and waste water as well as limit the need to capture new water sources. Additionally, water savings would also reduce energy consumption, electricity bills and thus CO2 emissions.

Innovation in the water management and technology sector needs to be further supported. Innovation could increase efficiency throughout the water management cycle, reducing leakage and consumption and at the same time creating jobs and providing value added to the economy as a whole in European territories. In this context, the term 'water technologies' is taken in its broadest meaning. Innovation can include water saving techniques, prevention and reuse approaches, clean processes, end-of-pipe treatments, system design, IT-tools for management, monitoring and control systems, flood forecasting techniques, ecological engineering, appropriate technologies, desalination, etc and should also carry with them the framework conditions – institutional settings and governance – to be effectively deployed. As water is a horizontal sector, innovation would improve water performance and "greening" across sectors. A better water infrastructure could improve water management in industry, building, agriculture and tourism and decrease the environmental pressures of the sectors and it could in addition create new dynamics within the sectors. EU policy has a key role to play here.

Education and awareness of sustainable water management practices is an enabling condition for green growth in the water sector. In order to foster a water saving culture in European regions, all sectors of the economy needs to be involved. If a sense of responsibility of members in a community is established the chance for sustainability in the water management sector increases significantly. Awareness raising is important among general public and public authorities for policy implementation on local level. Policy implementation is closely dependent on business and citizen awareness and should not be underestimated. New policies should be accompanies by capacity building.

Measures to prevent further pressure on water resources due to climate change are necessary to reduce negative impacts on human health and the environment as well as to avoid large costs for society. Europe is increasingly facing water scarcity coupled with increasing occurrence of droughts and floods. This has a negative impact on human well being as well on biodiversity, water quality, deterioration, loss of wetlands, soil erosion, land degradation and desertification. Moreover, it causes economic losses in key water-using sectors and other economic sectors. With increasing climate change, water resources will face additional across the EU territory. Climate change will put additional stress on areas with already vulnerable water resources, especially in water scarce regions or regions with high occurrence of floods and water availability and quality will be key pressures to societies and the environment in a changing climate. Climate change will affect not only water supply but also water demand and preventive measures are needed in both directions.

Take advantage of waste water as a resource. Waste water is not waste but a resource. Waste water is a source for water re-uses, nutritients and heat energy. Reuse of waste water and grey water is important for stimulating growth in water scarce regions, and treated waste water can be used for irrigation which is being increasingly used in certain countries. Water re-use is considered to have lower environmental impact than other alternative water supplies such as desalination or water transfer. The composition of waste water is enabling energy recovery and, for instance, biogas can be produced from the sludge to reduce the plants energy dependency.

1. Introduction: Conceptual elements of green economy in the water sector

Water has a special value in the green economy. As a basic necessity for life and as natural resource providing valuable ecosystem services, water of adequate quantities and quality is indispensable for society, environment and economy and consequently also for the development of a green economy. Being a public good, water has strong impacts on many policy areas that take different forms depending local considerations and territorial characteristics at rural, urban, basin and cross-border levels (OECD, 2011a).

This report aims to describe the relevance of water within GREECO's perspective of the green economy which is defined "as one that results in enhanced regional competitiveness and cohesion over the long term, while not exposing territories to significant environmental risks and degradation". This report will focus on those aspects of the water sector having the largest impact on the regional economy, namely water collection, treatment and supply as well as sewerage. Other aspects having an influence on those sectors, such as water quality and availability and the occurrence of droughts and floods, are also discussed in the report.

1.1 Definition of the water sector

This report centre on the water related activities having the largest impact on the green economy namely: water collection, treatment and supply as well as sewerage. In fact, the water sector can be considered as a green sector in itself. The table below present the economic activities in the water sector according to Eurostat's NACE Rev.2 classification.

Table 1: Economic activities in the water sector (NACE Rev.2 classification)

E 36.0	**Water collection, treatment and supply**	This class includes water collection, treatment and distribution activities for domestic and industrial needs. Collection of water from various sources, as well as distribution by various means is included. The operation of irrigation canals is also included; however the provision of irrigation services through sprinklers, and similar agricultural support services, is not included. This class includes: - collection of water from rivers, lakes, wells etc.; - collection of rain water; - purification of water for water supply purposes; - treatment of water for industrial and other purposes; - desalting of sea or ground water to produce water as the principal product of interest; - distribution of water through mains, by trucks or other means; - operation of irrigation canals; This class excludes: - operation of irrigation equipment for agricultural purposes; - treatment of wastewater in order to prevent pollution; - (long-distance) transport of water via pipelines.
E 37.0	**Sewerage**	This class includes: - operation of sewer systems or sewer treatment facilities; - collecting and transporting of human or industrial wastewater from one or several users, as well as rain water by means of sewerage networks, collectors, tanks and other means of transport (sewage vehicles etc.) - emptying and cleaning of cesspools and septic tanks, sinks and pits from sewage; servicing of chemical toilets; - treatment of wastewater (including human and industrial wastewater, water from swimming pools etc.) by means of physical, chemical and biological processes like dilution, screening, filtering, sedimentation etc.; - maintenance and cleaning of sewers and drains, including sewer rodding. This class excludes: - decontamination of surface water and groundwater at the place of pollution; - cleaning and de-blocking of drainpipes in buildings.

Source: (EUROSTAT, 2008)

The water sector embraces production, operation and service aspects of water and touches upon many sectors through its related services. Associated services in the water sector include manufacturing, installation and operation/service of water efficient techniques, etc. which are all contributors to the green economy. The below table presents the related environmental activities that can be included in the water sector, as defined by Eurostat's Environmental Goods and Services Statistics (EGSS).

Table 2: Environmental services of the water and waste water sector according to EGSS

Water management	Environmental specific services	- Recharge of groundwater bodies to increase/restore water stocks. - measurement, control, laboratories - education, training, etc
	Connected goods	- Rainwater storage tanks.
	Adapted goods	- Tap filters, differentiate systems for flushing toilets, washing machines or dishwashers using less water than the average equivalent product, dry toilets, desalinated water.
	End-of-pipe technologies	- Water restoration, measuring and monitoring equipment
	Integrated technologies	- Reduction of the intake through in-process modification related to the reduction of the water input for the production process: closed-circuit cooling systems, drop irrigation system, de-salinisation of sea water plants, etc.
Wastewater management	Environmental specific services	- collection and treatment of wastewater - monitoring and regulation activities. - Septic tanks and cooling water systems, transport - education, training, etc
	Connected goods	- Equipment to monitoring and controlling quality and discharges of waste waters and waters affected by sewage as well as equipment for the collection, treatment and transport of wastewater and cooling water.
	Adapted goods	- Non-(or less-) water polluting goods as biodegradable soap and detergents
	End-of-pipe technologies	- Sewerage network systems and wastewater treatment plants.
	Integrated technologies	- Equipment or part thereof that reduces the volume of wastewater to be treated or released into the environment.

Source: (EUROSTAT, 2009)

1.2 Water and the green economy

Life depends on water and sustains not only the environment but also the society, economy and culture. The role of water in a green economy is therefore unique and cannot be underestimated. Water can be considered as the single most important natural resource being a necessity for human wellbeing but is also having a direct and indirect impact to virtually all economic sectors through its ecosystem services. The value of water in a green economy can be summed up as providing "*availability of an adequate quantity of water, of sufficient quality*" (UNEP, 2011). At the UN Dublin Statement on Water and Sustainable Development (1992) the inherent value of water was recognised as an economic good: "*Water has economic value in all its competing users and should be recognised as an economic good"*. Managing water as an economic good is an important way of achieving efficient and equitable use, and of encouraging conservation and protection of water resources. Improved drinking water service and waste water treatment and the related water infrastructure can significantly reduce the costs on society and at the same time contribute to green economy development in European regions by creating new jobs and stimulating growth.

It is important to begin to define how water management might be organised in a green economy. The key aspect of water management is 'water efficiency'. The EEA states that "*Managing water sustainably in a 'green' economy means using water more efficiently in all sectors and ensuring that ecosystems have the quantity and quality of water needed to function effectively*" (EEA, 2012a).

Greening the water sector requires a shift from the current practices and to enforcing the implementation of the water management policies that are in place by adopting innovative technologies that provide environmental as well economic benefits (ICLEI, 2013).

As defined by UNEP, water is essential for the development of a Green Economy in three ways: "*it is an asset essential for life and a common good for human well-being, it is a production factor and economic asset essential for economic prosperity, and, integrating these two, it is a vital environmental asset essential for the maintenance and regulation of the ecosystem services that ensure the long-term sustainable provision of the economic and social goods and services on which prosperity depends*" (UNEP, 2011)

In addition to supplying household water requirements, the energy, agriculture, industrial and tourism sectors all depend on reliable freshwater resources. The lack of water of appropriate quality and quantity can therefore be a significant hinder to development, leading to large social, environmental and economic costs. Contaminated water is the single larges cause of sickness and death globally. It is also important to highlight that "*An adequate supply of water is recognized as a basic human need as well as a human right*" (United Nations Human Rights Council, 2010).

In a green economy water efficiency is optimised, the use of water is significantly reduced and less water is being abstracted, consumed and treated. Consequently, in terms of economic growth, the water sector might actually be smaller and provide less gross value added (GVA) compared to a business as usual scenario. In a modelling exercise developed for the UNEP Green Economy Report[1] the green investment scenario indicated that by 2050, total employment and income would be greater than the reference scenario (BAU) while the people working in the water sector is actually lower, meaning that the efficiency of the water sector increases in a green economy. If water efficiency is increased, more water would be available for other purposes such as manufacturing etc., resulting e.g. in job creation in other sectors (UNEP, 2011). In this respect, it should also be highlighted that the saved water needs to be returned to the source to ensure that ecosystem services are intact.

1.2.1 Water as ecosystem services provider

In a green economy, it is important to have a fair approach to water abstraction that fulfils not only the needs of competing economic sectors but also the requirements of healthy and resilient freshwater ecosystems. Water ecosystems provide life-supporting services to Europe's economy and society which have an economic value counted in billions of Euro, such as: through provisioning and regulating (e.g. water purification and carbon absorption by wetlands). Efforts have been made to estimate the benefits associated with implementing the EU water framework directive (WFD). It is estimated that the achievement of the WFD objectives of "Good Ecological Status" in all European water bodies would bring between 2.8 to 37.3 billion EUR annually, with an average value of 20 billion EUR per year. This figure is includes large uncertainties as there is limited actual evidence but it indeed indicates that the benefits can be significant (ACTeon, 2012). The provisions of water ecosystem services can be seen in more details in the table below.

[1] Developed by the Millennium Institute for the UNEP Green Economy Report

Table 3: Water and ecosystem services in the draft common international classification of ecosystem services (CICES)

Theme	Class	Group
Provisioning	Nutrition	Terrestrial plant and animal foodstuffs
		Freshwater plant and animal foodstuffs
		Marine plant and animal foodstuffs
		Potable water
	Materials	Biotic materials
		Abiotic materials
	Energy	Renewable biofuels
		Renewable abiotic energy sources
Regulation and maintenance	Regulation of wastes	Bioremediation
		Dilution and sequestration
	Flow regulation	Air flow regulation
		Water flow regulation
		Mass flow regulation
	Regulation of physical environment	Atmospheric regulation
		Water quality regulation
		Pedogenesis and soil quality regulation
	Regulation of biotic environment	Lifecycle maintenance and habitat protection
		Pest and disease control
		Gene pool protection
Cultural	Symbolic	Aesthetic, heritage
		Religious and spiritual
	Intellectual and experiential	Recreation and community activities
		Information and knowledge

Source: EEA

Water has a value in itself and in the transition towards green economy the role of water in preserving biodiversity and ecosystem services should be well recognised and paid for.

Public and private sector of the economy and society directly benefit from the ecosystem services provided by water and wetlands, including individuals, communities and cities, the agriculture, forestry, energy and health sectors, and many others. At the national and regional scales, the sustainable management of water and wetland-related ecosystem services can thus provide multiple benefits, contributing to national security, human well-being, health and livelihood. Wetlands work as natural infrastructure and networks of natural ecosystems that deliver a range of important ecosystem services, described in section 2.1 above (Krchnak et al., 2011). In some cases they substitute built infrastructure and in other cases complement it, with ecological and man-made infrastructures interlinked (TEEB, 2013).

There are several models for estimating the cost of degradation of groundwater. The cost can be calculated e.g. by the replacement of engineering man-made substitutes for natural resources, through the value of lost production due to resource degradation or based on the Groundwater Degradation Effects on Ecosystem Services (see ICLEI, 2013, p. 3030).

1.2.2 Obsolete water management leading to large cost

Europe is increasingly facing water scarcity coupled with increasing occurrence of droughts and floods. To continue with current trends of water use will lead to significant socio-economic cost for European regions. Water withdrawals have tripled in the past 50 years resulting in groundwater depletion and water scarcity. Moreover, the annual demand for water in Europe is expected to rise with 50 % from 2005 to 2010-2030. Under the business-as-usual scenario, water use remains unsustainable and levels of both surface and groundwater decline (UNEP, 2011). Increased living standards and population growth further stress water bodies.

Although Europe in general has relatively rich water assets, water is today becoming an increasingly scarce resource in many European regions and overexploitation of freshwater use is an increasing problem. In 2007, 11 % of the population and 17 % of the territory experienced water scarcity[2]. According to EEA there is a worrying trend indicating an increasing spread of water scarcity and stress, which is expected rise by up to 50 % by 2030 affecting about half of EU river basins (EC, 2012a). Water scarcity is more pronounced during summer months where it is a problem especially in Southern Europe but is also becoming increasingly important in Northern basins, including UK and Germany. Both droughts and water scarcity are causing economic losses in key water-using sectors and have negative impacts on biodiversity, water quality, deterioration and loss of wetlands, soil erosion, land degradation and desertification. Some of the effects are short-term and conditions quickly return to normal whilst other effects may become permanent (EC, 2012b).

According to EEA report "Urban adaptation to climate change", potential socio-economic impacts of water scarcity in Europe might include:

- public water supply and side-effects on tourism;
- energy production: lack of cooling water limits energy production by thermal power plants, can cause incidents in nuclear power plants, and/or because low water levels in reservoirs limit hydropower production;
- income losses due to reduced economic activities and industrial production
- social impacts created by rising water prices due to the implementation of compensating measures (e.g. desalination);
- impacts on groundwater (aquifer depletion due to over-pumping and seawater intrusion), surface waters (with minimum water flows not always being ensured and increased water temperature and concentrations of pollutants due to less dilution) and wetlands, as well as impacts on soils through erosion and desertification;
- health: water-borne infectious diseases associated with water scarcity and higher water temperatures;
- shrinking and swelling clay threatens the supporting structures in infrastructure.

Source: (EEA, 2012b)

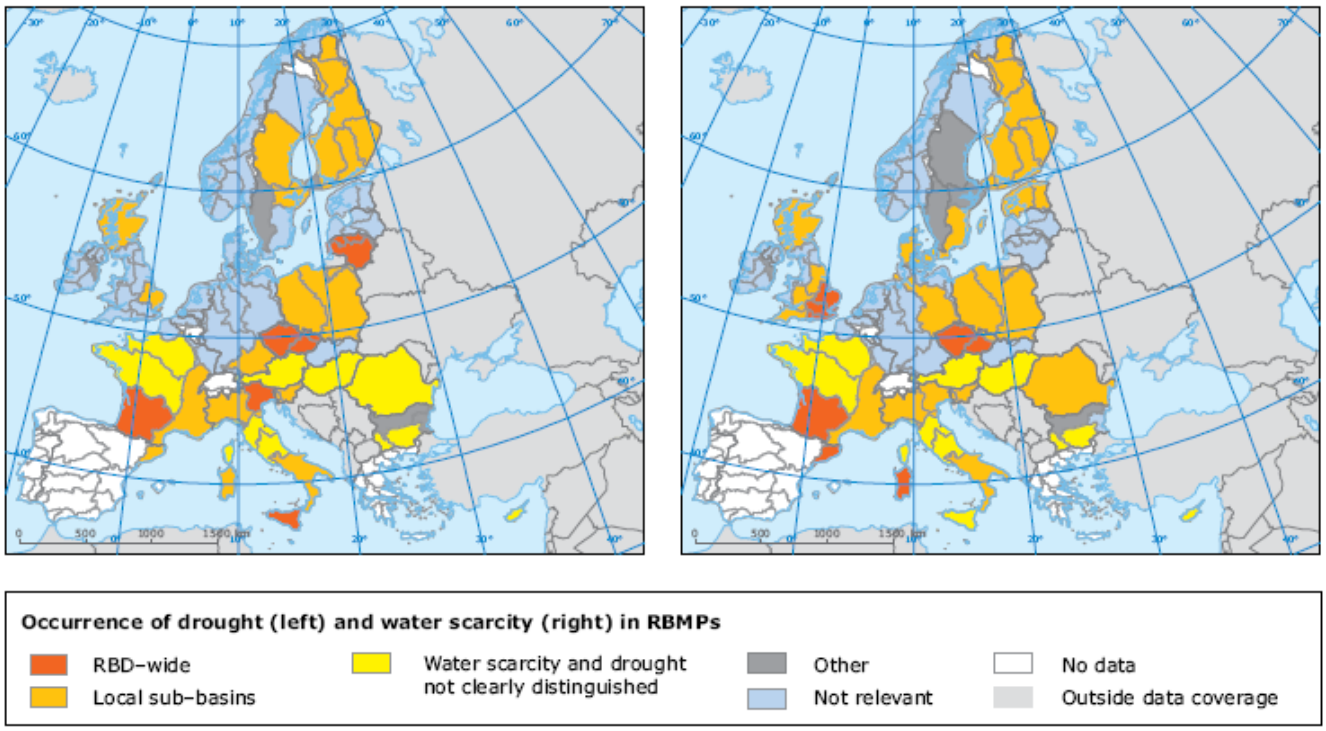
The occurrence of droughts[3] in the EU has increased dramatically over the three past decades and the areas and population affected increased by almost 20 % 1976-2006. The European Commission has estimated that the cost of droughts in Europe over the previous 30 years reached EUR 100 billion (EC, 2007). Droughts and low water flows are also influencing the hydropower production. Impacts from droughts and foods are in many cases concentrated to regions with lower level of development, and in particular in rural areas. This is explained by a lower rate of implementation of drinking water and waste water treatment regulations, to weak enforcement or absence of land-use planning in flood-prone areas, and lower access to water saving technologies and know-how (EC, 2012c).

The increasing flood events in Europe may also cause significant damage to the economy as well as to society and environment. The assets at risk of flooding can be huge and cause significant harm if, for instance, waste water treatment plant or factories holding quantities of toxic chemicals are flooded. In addition wetlands and other sensitive areas risk being destroyed. To illustrate, along the river Rhine more than 10 million people live in areas at risk of extreme floods and the potential damage from flooding have been estimated to 165 billion EUR. Coastal areas in Europe are also at risk of flooding and the total value of economic assets located within 500 meters of the European coastline, including beaches, agricultural land and industrial facilities, is currently estimated at 500 to 1,000 billion EUR (EC, 2004).

[2] 'Water scarcity' means that water demand exceeds the water resources exploitable under sustainable conditions (EEA)

[3] 'Drought' means a temporary decrease in water availability due for instance to rainfall deficiency (EEA)

Figure 1. Occurrence of drought and water scarcity in River Basin Management Plans



Note: 'Other' also includes the cases where there is no clear information about these issues in the RBMPs.

Source: Schmidt and Benítez, 2012 in EEA, 2012, Water resources in Europe in the context of vulnerability - EEA 2012 state of water assessment, EEA report No 11/2012

Europe's water resources will face additional pressures caused by the impacts of climate change across the EU territory. According to the IPPC "Water and its availability and quality will be the main pressures on, and issues for, societies and the environment under climate change" (IPCC Technical paper "Climate Change and water", June 2008). Climate change is putting additional stress on the areas with already vulnerable water resources, especially in water scarce regions or regions with high occurrence of floods. The current socio-economic stress on Europe's water resources that are caused by population growth, increased consumption, and land use leading to water scarcity in certain regions and cities will be exacerbated by climate change. Climate change will also affect the functioning of current water infrastructure such as hydropower plants, irrigation systems as well as water management practices having an impact on the green economy. Current estimations expect a change of precipitation patterns in Europe which will lead to drier summers in the Mediterranean area and wetter winter in Northern Europe. Extreme weather events are also projected to increase, such as floods and droughts. (IPPC water report and EEA, climate change adaptation in Urban areas).

1.3 The Water sector and the GREECO approach

The territorial characteristics of water are closely linked to the territorial dimensions of available water resources as well as the water consuming sectors. The available fresh water resources are unevenly distributed across the European territory. Likewise the water demand varies across Europe, where the balance between sectors varies significantly. Economic development of river basins, with inadequate water allocation between economic sectors, can result in imbalances between water needs and existing water resources (EC, 2007). Such variations are reflected on geographical level across Europe but also in time/seasons. The water conditions therefore vary, both in quantity and quality, between different geographical areas and seasons. This naturally influences the development of green economy in regions.

In the GREECO perspective, the role of the water sector in a green economy is two-fold. Firstly, it is necessary to ensure water of good quality and in rich quantities as it is a foundation for the development of a green economy. Without the necessary water resource, which is a basic need (not just for humans but also for the economy as a whole), no sector can grow in a green direction. Likewise, a green economy will also ensure a sustainable water management and maintain the resilience of water ecosystems.

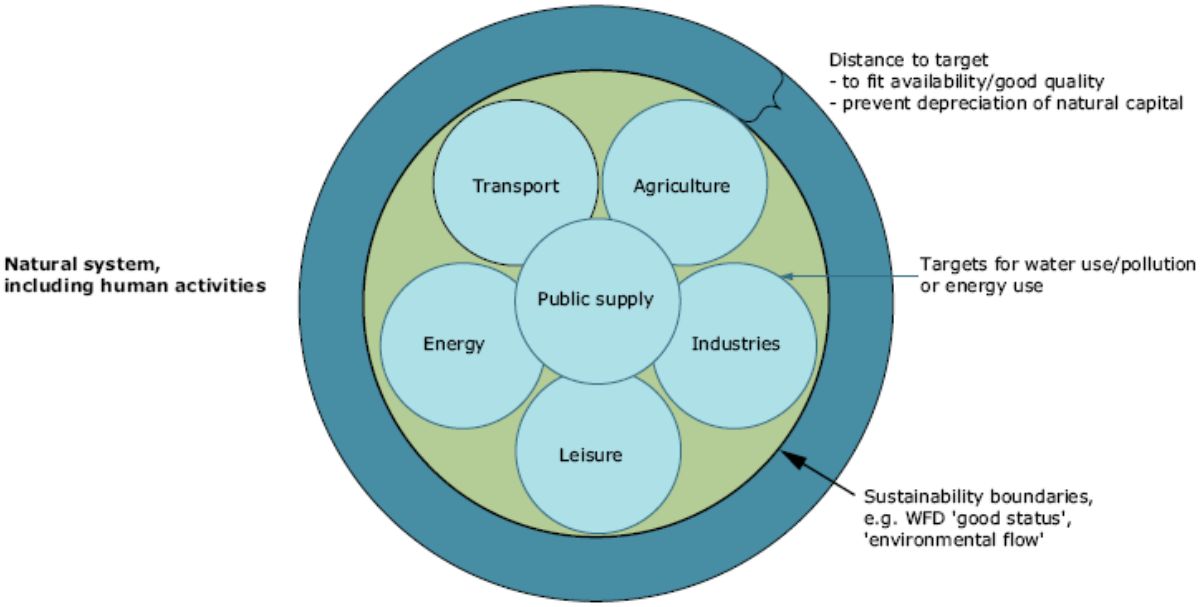
GREECO agrees with the EU Water Hierarchy as defined in the EC Strategy on Water Scarcity and Droughts (COM(2007) 414) which is based on a prioritization where public water always have overriding priority to ensure access to adequate water provision. It also states hat additional water supply infrastructures should only be considered as an option when other options on the demand side have been exhausted, including effective water pricing policy and cost-effective alternatives.

Secondly, improving the efficiency of water management by for instance technological innovation and investments into improved drinking water service and waste water treatment and the related water infrastructure can significantly reduce the environmental impacts and the costs on society stemming from poor water and sanitation services. At the same time it can contribute to creating new jobs and stimulating growth in European regions.

From the GREECO perspective the key concept with regards to greening water sector is *resource efficiency* and *water demand management*. Water use in Europe's regions needs to be more efficient, leading to less water being distributed, consumed and treated. To decouple water use from economic activity is a crucial factor in moving towards a green economy, and resource efficiency should guide any policy related to water management across all sectors. Water use should also be decoupled from environmental impacts.

In developing countries, the direct significance of water in a green economy is very prominent, and where limited access to clean water and adequate sanitation negatively affects health, education and the well-being of citizens can constitute a major barrier to sustainable economic development (UNEP, 2011). Although this might be valid for some European regions, is not the main issue for Europe as a whole. For instance, the health benefits from investing into water and waste water services have, in general, already been gained. However, by investing in the provision of water and sanitation many potential gains are nevertheless still to be achieved.

Figure 2. Sustainable water allocations to ecosystems and competing users



Source: (EEA, 2012a)

1.3.1 Urban-rural relationship

Water management is a key challenge for rural areas and wise water use is known to make direct contributions to rural development issues connected with business competitiveness, environmental conservation, economic diversification and quality of life. Urban development affects water bodies, including rivers, lakes and coastal waters. During the last century, urban development has led to the loss of many ecosystems and habitats and interrupted hydromorphological processes through the development of roads, buildings, parking lots etc. In addition, sewage collection systems have also changed the water flow regime (EEA, 2012c).

Cities require significant transfers of water from rural to urban areas. The growing urban population and the following increase in water use are putting additional pressure on the water bodies in many European regions. In addition, rapid urban development often leads to obsolete water and waste water infrastructure as such development cant keep with the urban sprawl. Lack of access to clean drinking water and sanitation is often the main reason behind poor health in urban areas. Water leakage in the transportation is a common problem. Shrinking resources will mainly affect the urban poor as they are more exposed to rising prices and growing inequalities in the access to resources, be these food, energy, water or similar. Poverty eradication must be part of a green and inclusive economy, and not excluded from a greening of the economy. It should also be mentioned in this context that densification of population in urban areas can reduce the cost of water and sewage infrastructure construction, per capita, compared to dispersed rural areas (ICLEI, 2013).

1.3.2 Governance

Water management can be considered as a local, place based, concern. Water is different from other natural resources like e.g. oil, coal and metals in terms of its governance. Water policy in Europe is mainly designed by regional or local governance structures together with the central government, which involve governmental policy actions as well as private sector activities and behaviour of different stakeholders (civil society, farmers, industries enterprises, utilities, etc.). Usually, the water responsibilities are distributed across ministries, departments and agencies due to the importance and inter-connectedness of water across many sectors. Water and interest in water and its use connect all stakeholders in these and between these different levels. The most relevant actions and measures to be taken for sustainable water management are either driven by national or regional governments and are thus on a macro-economic level, or require management decisions at a sectoral and corporate level (e.g. agriculture or industries). Both levels are highly interrelated and also related to international and inter-regional trade and policies, however serving different purposes (EEA, 2012d). The often wide distribution of responsibilities can lead to fragmentation resulting in gap in funding, institutional framework and policy coherence (OECD, 2011a).

River basins are the territorial unit that most of the EU water legislation is built upon, e.g. the WFD. The river basin embraces most issues related to water management; the water cycle, land use and the interaction and competition between different economic sectors and on different geographical levels; trans boundary, national, regional, local as well as on city-rural level. Assigning responsibility to river basin levels is one way of addressing the administrative gap on national and regional level and to apply a holistic approach to harmonise water policy among different governance levels. Using a river basin perspective facilitates to integrate physical, environmental, social and economical influences on the water bodies. River basins are many times cross boarder, and can in some cases include numerous countries. The WFD has identified 111 river basin districts across the EU, out of which 40 are international districts. Additionally, international river basin districts cover more than 60 % on the EU territory. International district management plans have been developed for the Danube, Rhine, Elbe, Ems, Meuse and Escaut rivers.

As mentioned, the central government often plays a strong role in the design water-policy design, regulation and implementation. This role is however different across Europe; in e.g. France, the Netherlands and Spain where the role of central government is most important for strategic planning, and priority setting, while e.g. in the UK it is more oriented towards economic and environmental regulation. In federal countries such as Belgium the role of central government is less significant as most water competences are transferred to sub-national governments and the water responsibilities are scattered across regions (OECD, 2011a). According to the OECD “the current water crisis is fundamentally a governance crisis” and tackling the present water challenges in Europe will require policy responses at different scales – European, national, regional and local.

1.3.3 Territorial factors for greening the waste sector

Table 4: ***Territorial factors*** **important in relation to greening of the sector:**		
1. ***Settlement types***	***y/n***	***Why? Why Not?***
i. Urban areas	***y***	Urban areas are key water consumers. Urban development, and the construction of roads, parking lots and buildings affects water bodies, including rivers, lakes and coastal waters. Urban development has led to destruction of water borne ecosystems and interrupted/changed the hydrological cycle in many areas. Rapid urban development can also lead that the rate of development of water and waste water infrastructure often lags behind which results in obsolete water services in these areas. Most European countries expect a continuation of current urbanization trend. Improving water efficiency in urban areas, e.g. by introducing e.g. water efficient buildings and distribution systems as well as water saving household appliances will have a significant effect on greening the sector as urban areas are a main water consumer. Long-term urban planning is an important driver in greening the water sector for improving water efficiency but also for maintaining and upgrading water and waste water infrastructure to reduce e.g. leakage. Urban planning also provides an opportunity to integrate greening efforts into other projects such as transport, gas and heating investments.
ii. Rural areas	***y***	Rural areas are the base for most of the water bodies. Rural policies will be important e.g. in finding efficient distribution systems and for managing the water resources and maintaining resilient water bodies. Water management is a key challenge for rural areas and wise water use is known to make direct contributions to rural development issues connected with business competitiveness, environmental conservation, economic diversification and quality of life.
iii. Urban-rural interactions	***y***	Cities require significant transfers of water from rural (many times distant) to urban areas. The growing urban population and the following increase in water use are putting additional pressure on the water bodies in many European regions. From a territorial perspective, land-use planning as well as urban-planning is being one of the main drivers of water use.
2. ***Land and land-based resources***	***y/n***	***Why? Why Not?***
i. Land consumption or dependence	***y***	Alternation of land use from e.g. agricultural land to urban areas, or drainage can change the flow of water bodies and affect the hydrological circle.
ii. Material Consumption or dependence	***y***	In terms of industrial production and the water intensity of the production process of the material at issue.
iii. Energy consumption or dependence on specific energy types or systems	***y***	The local availability of water might influence energy production as water plays an important role in energy generation, notably for hydropower and as a coolant for energy production. Much of it is returned to water courses after use. Increased energy consumption increases water demand in the region. Water production and sanitation also require energy to produce, treat and transport water. Around 2-3 % of the world energy is consumed by water production and sanitation (Olsson, 2012). The energy used per m^3 drinking water is very site-specific and depends on the geographical conditions in the region, the availability of fresh water (from e.g. remote mountainous areas), the level of pollution and the distances. Inefficient water use is therefore increasing the energy consumption, with the attached financial and environmental costs

iv. Management of ecosystem services (types of ecosystems/landscapes; spatial characteristics of ecosystems; options for maintaining and developing these services)	***y***	Water has an essential role in ecosystems providing life-supporting services to Europe's economy and society through provisioning and regulating services. In a green economy, it is important to have a fair approach to water abstraction that fulfils not only the needs of competing economic sectors but also the requirements of healthy and resilient freshwater ecosystems.
3. ***Market relations (Production; consumption; export, import) and innovation***	***y/n***	***Why? Why Not?***
i. Local/regional markets	***y***	The water industry in Europe is mostly organized around municipal utilities. The regional market relations and the economic structure influence the water sector depending on the types of industries in the region, level of consumption etc. Due to the production of export goods certain regions experience additional stress on their water resources.
ii. National markets	***Y***	Like the regional markets, the national market characteristics influence the water industry. This is especially true in terms of the fact that the water sector is spatially managed in relation to actual distribution of water bodies and water catchment areas. As such, it often requires relations between neighboring countries. Likewise, trade between countries with water surpluses versus those with water deficits is common.
iii. EU markets	***N***	European governments are increasingly turning to market allocation approaches; however, water accessibility is not a service that is traded on a pan-European scale.
iv. Global markets	***N***	The water sector as a service provider is mainly a local business. However, water sector also embraces the development of water technology and its related services where the European water industry suppliers are competing on a global market to some extent. Demand for water services on an international level are to a certain extent covered by European companies. To support reaching the Millennium Development Goals to half the number of people without access to safe drinking water and sanitation, the EU has established the EU Water Initiative allocating 1 billion EUR to the EU Water Facility for Africa and ACP countries which could create new markets for European water services and industries. In addition, there are potential in the transfer of technological innovations to countries outside Europe which could have a positive impact on the greening of the water sector also on a global level.
4. ***Inter- and intra-territorial relations***	***y/n***	***Why? Why Not?***
i. Within territories (place based; local cultures; relating to territorial/national policies)	***Y***	As water is a resource that is tightly bound to and dependent on local climatic and ecological conditions, the impacts of water use in any kind of production chain always have to be analysed at the local level and in the catchment where the abstraction for the particular step in the supply chain takes place.
ii. Between territories (networks; competition)	***Y***	Water bodies are cross-territorial per se and regional cooperation is necessary which has also been further formalized in the WFD administrative structure. Working for common objectives between territories is crucial for obtaining a sustainable water management contributing to a green economy.
iii. Across territories (cross-border supply and demand)	***Y***	Water bodies and river basins do not follow administrative borders. More than 60 % of Europe's rivers are "international" which is illustrated in the development of common RBMPs. The Baltic Sea Regional Strategy is a part of a broader effort to implement territorial cohesion via 'macro-regions' that cover several Member States; the ambition is to provide a coordination mechanism for policies with territorial impacts. Efficient and good management across borders are crucial.

5. ***Place-based factors***	***y/n***	***Why? Why Not?***
i. Competitiveness through strong local economies	***N***	
ii. Multi-functionality	***Y***	Water is multifunctional by definition. It is also used for different purposes depending on the territory. Water is basic human need for households and is also a prerequisite for food production, energy, industrial production but also provides recreational values supporting tourism.
iii. Tacit/experiential knowledge	***N***	
iv. PROXIMITY	***y***	The proximity to the water source of the consumer is a relevant factor in water management. E.g in terms of transport from the water body to the treatment plant and further on through the distribution network as well as transportation of sewage to waste water treatment plant from the place of collection.
6. ***Consumer relations***	***y/n***	***Why? Why Not?***
i. Are development and innovation consumer-demand driven?	***N***	Water is a resource that is often not adequately priced. The incentives for consumers to reduce their water consumption are therefore in many cases not strong enough for a consumer driven innovation process.
ii. Are development and innovation producer driven?	***N***	Innovation in the water sector is primarily driven by the need to comply with regulations. In water stressed areas innovation would also be driven by the need of water conservation.
iii. Are development and innovation based on well-defined territorial conditions or on open access?	***N***	
7. ***Accessibility and mobility***	***y/n***	***Why? Why Not?***
i. Transport connections (transport of materials; transport of labor)	***Y***	Transport connections are mainly relevant in the transport of drinking water and sewerage. The distance and the condition of the network are determining factors.
ii. Regional Accessibility (access to markets; access to supply of materials; access to public services)	***n***	
iii. Information connections (use of communication and information services; need of interaction; questions of consumer and producer cultures)	***Y***	Awareness raising is key to the changing consumers and industries behavior towards water efficiency and water saving culture. Water standards, certifications, stewardship, etc are increasing the level of consumer awareness. Better water metering and monitoring would improve households and business awareness of their water consumption. It also enables transparency in the price setting.
8. ***Policy and governance by territorial level***	***y/n***	***Why? Why Not?***
i. Scale of sector-based policy support		
• From the EU Level	***y***	The water sector reflects a clear and fairly well-defined multi-level governance and policy perspective. The EU provides the overall policy for resource efficiency. Water policy is specifically laid down in the water related directives, most importantly the Water Framework Directive, Urban waste water directive and the drinking water directive. This is often translated by national governments into overall frameworks, which are then implemented by local and especially regional governance structures. As such, regional and local institutions play a crucial role in constructing place-based policy approaches and ensuring that it is effectively implemented. These explicitly take into account territorial specificities and local concerns and where cities and
• From the national level	***y***	
• From the regional level	***y***	
• From the local/municipal level	***Y***	

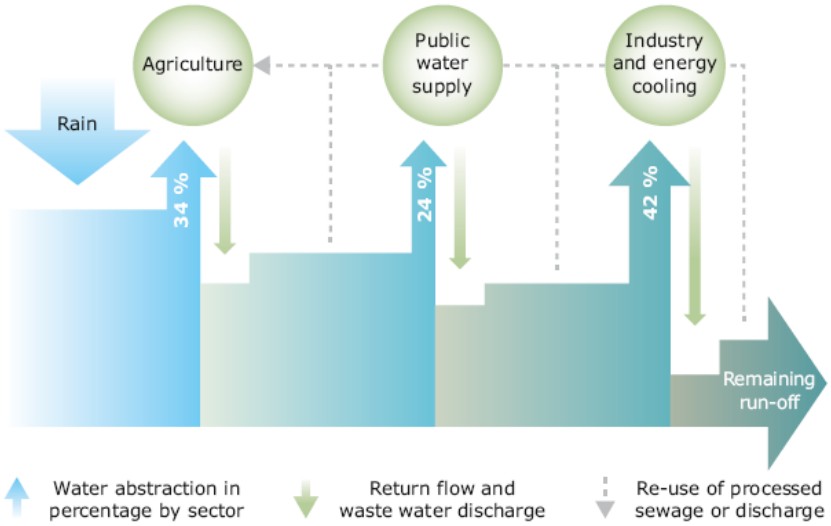
		regions should get bigger responsibility in developing a sustainable and “adaptive” water policy in the context of fiscal consolidation, social, technological and environmental transformation, in response to climate change, demographic and urbanisation pressures.
ii. Role of other EU policies with territorial dimension	***y***	Cohesion policy plays an important role as providing means for complying with the EU directives, especially for investments into water and waste infrastructure, in particular through the support of Cohesion Fund and the ERDF.
iii. Private versus public sector – led development. Are consumer organizations advocating for developing the green economy. At what political scale are they located?	***Y***	Public sector is leading the development as one of the strongest drivers for green economy is policy and regulations. The role of the private sector can have a role in the operation of collection and water treatment services. The private sector is also well-placed to create markets for associated goods. Water management technologies are developed by the private sector.

Table 5: Territorial outcomes of greening the sector:	
Inter- and intra-territorial relations	Increasing relations in order to respond to the challenges facing waters flowing within and across territories; e.g. regarding reducing pollution and finding balanced water allocations. Strong territorial relations are also needed following the EU water policy regulations that apply river basin management approach to water management.
Settlement types	Water efficiency is a key word in any type of settlement in a green economy. Introducing e.g. water efficient buildings and distribution systems and water saving household appliances will have a significant effect on greening the sector as urban areas are a main water consumer. Growing urban population leading to increase in water use puts pressure on the water bodies in many European regions. But it should also be mentioned in this context that densification of population in urban areas can reduce the cost of water and sewage infrastructure construction, per capita, compared to dispersed rural areas.
Land and land based resources	Focus on preserving rich water resources of good quality to maintain ecosystem services which improve water quality and reduce costs of water treatment. Territories with rich and healthy water resources have a competitive advantage. Water management policies must be based on the recognition that water of adequate quantities and quality is indispensable for the functioning of ecosystems.
Market relations (Production; consumption; export, import) and innovation	Focus on innovation in terms of developing new water efficient technology. Other key words are water efficient production and sustainable consumption.
Place-based factors	
Accessibility and mobility	
Policy and governance by territorial level	Issues of multi-level governance are at the heart of the search for environmentally sustainable models of growth in the water sector. It is important to recognizing the need of territorial involvement in the development process in order to comply with both sector and general interests.

1.4. Specific elements of the water sector – water as production factor for several key economic sectors

The supply and demand of the water in Europe today is unbalanced. As a result, water scarcity can also appear in regions with rich water resources when demand exceeds the supply. The production and consumption of water resources is at its most basics sense following the hydrological cycle. As water is abstracted along the supply chain, quality and quantity is diminished. To achieve a sustainable management contributing to green economy, it is crucial that a balance between different economic uses and interests is achieved. The figure below illustrates the water flow, abstractions for the key sectors and returns.

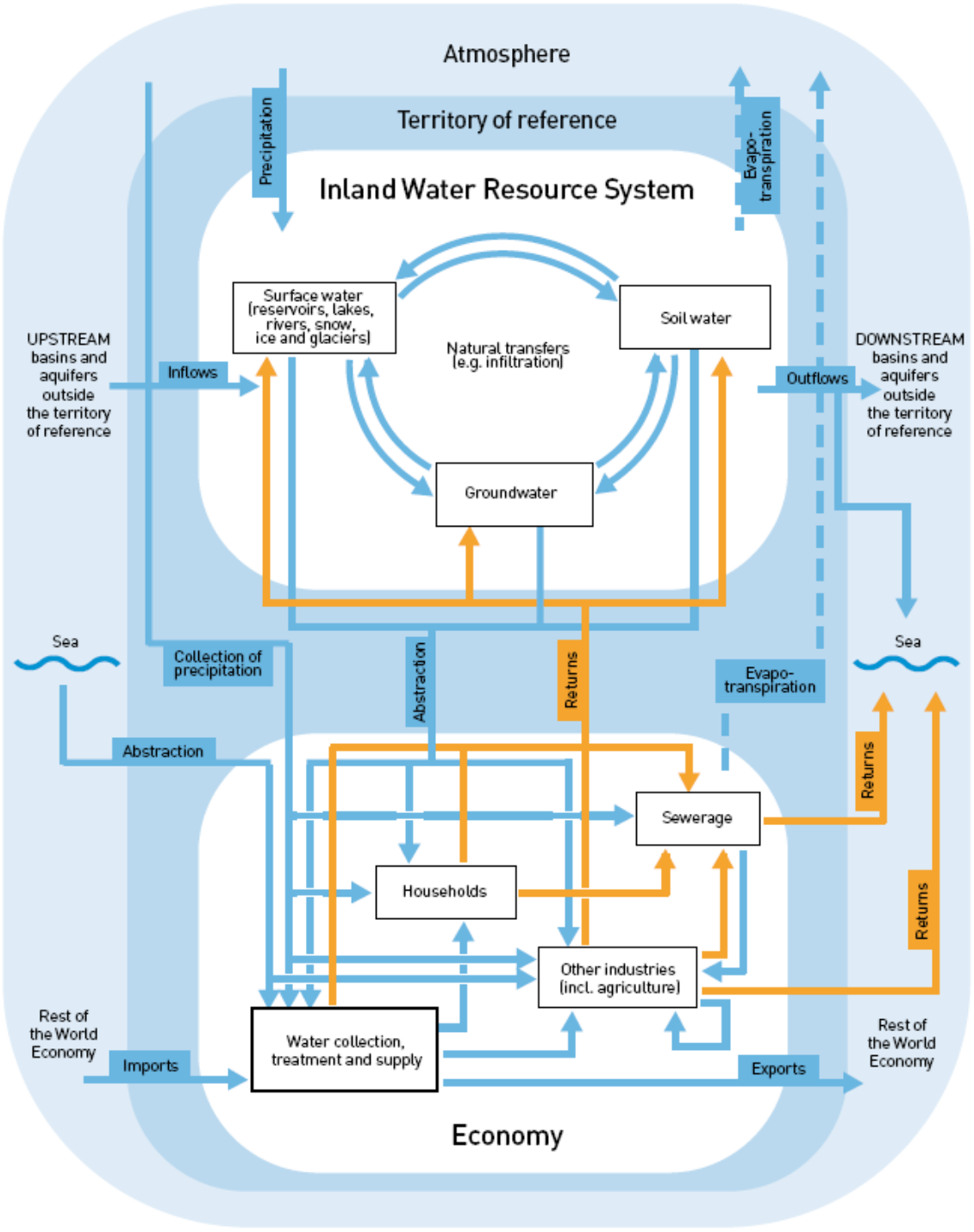
Figure 3. Simplified illustration of water abstraction and return flows



Source: (EEA, 2012e)

The main water flows on territories and its relation to the economy are illustrated in Figure 4 below. The environmental assets (upper part of the figure) are the stocks and flows that make up the hydrological cycle. The physical flow accounts (exchange between the upper and the lower part) shows flows between the environment and the economy, expressed in physical terms (e.g. m3/year). The System of National Accounts flow (lower part of the figure) is purely economic and shows how environment-related transactions can be made more explicit.

Figure 4. Main flows within the inland water resource system and the economy



Source: UNSD (2003)

1.4.1 Production and consumption perspectives of water in Europe - Supply

Water production aspects include water abstraction and transport, water supplied in public water distribution system (population served, and quantity) and reuse of water such as e.g. grey water (http://www.ib-net.org/en/ibnet-toolkit/ibnet-indicators/water-consumption-and-production.php?L=2&S=2&ss=2=). In areas where drinking water demand cannot be met from available freshwater resources, alternative water production is an option and desalination is gradually more used to increase the supply. Currently Spain has the single biggest capacity for desalination in Europe and is planning to dramatically increase its capacity. The high energy consumption and carbon emissions following the desalination process are issues of concerns (EEA, 2012e).

1.4.2 Production and consumption perspectives of water in Europe - Demand

Water is vital for all economic sectors and on the demand side many interests are competing for the water resource. The production and consumption aspect of water are therefore strongly interlinked with the water use of different economic sectors that have a direct impact on water consumption. As can be seen in Figure 5, the division between sectors varies significantly between European regions. In general public water supply, industry and energy, and agriculture can be identified as key consumer sectors. In Europe as a whole, public water supply, including households, public buildings and SMEs, stands for 24 % of total water abstraction and agriculture for 34 %. Industry and energy consumes the remaining 42 % of the abstracted water. For example in Western Europe and Eastern Europe the most important water using sector is the electricity production sector while water withdrawals in Southern Europe and in the EU candidate countries are currently dominated by agricultural water use.

Figure 5. Key water consuming sectors in Europe

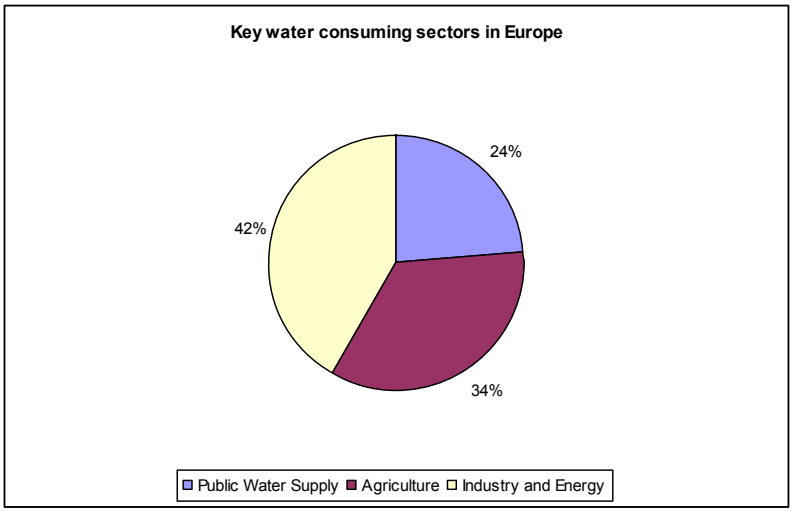
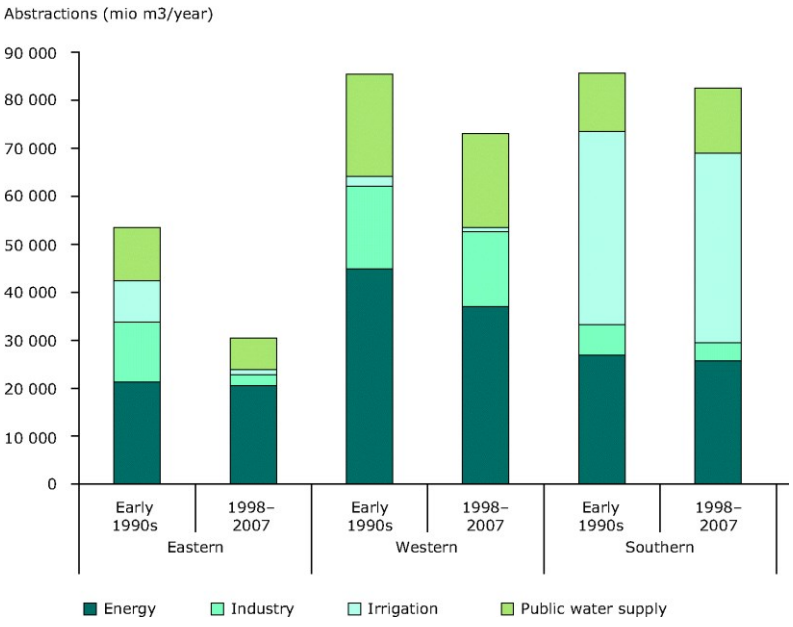


Figure 6. Water abstraction in Europe by sector



Source: EEA, 2012

1.4.3 Economic activities influencing demand of water resources

As mentioned, water is having a direct or indirect impact to practically all economic sectors. The cross-sectoral importance of water is therefore high and is a prerequisite for sustainable growth. Below are a few example of the multi-sectoral importance of water:

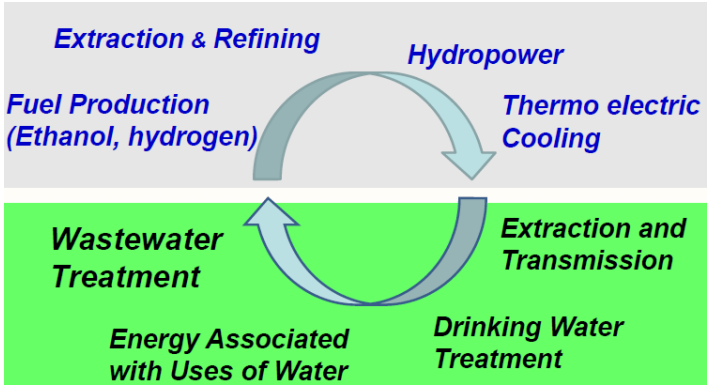
- Water is vital for agriculture, farming and livestock. Agriculture is a main consumer of water.
- Decisions about land-use and development are influenced by the availability of water resources and facilities for wastewater disposal;
- Energy generation uses water for cooling and other purposes. Much of it is returned to water courses after use;
- Industry uses water for the manufacturing processes, while many other sectors of the economy, such as tourism, impact on water resources (UNEP, 2011)

1.4.3.1 Water as a key input to the Energy sector

The link between water and energy is twofold. On one hand, water plays an important role in energy generation, notably for hydropower and as a coolant for energy production. On the other hand water supply and sanitation sector is also a large energy consumer itself as it requires large amounts of energy in pumping, transporting and water treatment (UNEP, 2011). According to Olsson (2012), 2-3% of the world energy is consumed by water production and sanitation and 1-3% of a city's energy demand is used to produce, treat and transport water. 15-20% of a city's total energy demand is used to use the water (Olsson, 2012).The water consumption of electricity production can be seen in Figure 6 below. Increased energy consumption increases water demand. Vice-versa, inefficient water use is also increasing the energy consumption, with the attached financial and environmental costs.

The energy used per m^3 drinking water is very site-specific and depends on the geographical conditions in the region, the availability of fresh water, the level of pollution and the distances (from e.g. remote mountainous areas). The condition of the network is also an influencing factor. Poor water quality means that more energy and resources are needed for treatment and reducing pollution would imply that also energy savings could be made. Energy savings can be successfully achieved by reducing water use and investing in reducing leakages in distribution systems (EEA, 2012a). The annual average power consumption for waste water treatment is estimated to 47 kWh/pe in the EU (Suez Environment). Energy use and material recovery is relevant resource efficiency factors in waste water treatment plants and can be used for e.g. biogas production and heat energy (EEA, 2012a).

Figure 7. Water and Energy circle



Source: Olsson, 2012 based on World Energy Council

Desalination of water is a growing industry as costs have plunged and if planned expansions are implemented, Southern Europe risk to jeopardise the energy and CO2 reduction targets set in the EU Climate and Energy package (EEA, 2012b). Desalination to meet freshwater demand is requiring large amounts of energy in the process, and consumes around 4kWh/m^3 more than traditional freshwater supplies (which requires on average 0.64 kWh/m3 including distribution) (Olsson, 2012). Ways to get around the energy implications and negative impacts of desalination is still on an early stage. Some initiatives have nevertheless been taken, for instance, Spain is exploring the possibilities for solar- or wind-powered desalination. The Llobregat plant, supplying 20 % of Barcelona's drinking water needs,

is highlighted as a good example as it applies energy recycling techniques as well as it dilutes the brine (salt water) with wastewater before discharging it to the sea (EEA, 2012a).

Hydropower is a significant asset for the electricity generation in Europe. In 2011, hydropower in the EU27 accounted for 3.3% of total primary energy production and 16.2% of total primary energy production from renewable sources. This number represented app 67 % of all renewable electricity produced. Challenges remain however to combine hydropower production with the protection of aquatic ecosystems. The share of hydropower in electricity production is generally high in the northern and Alpine countries (Eurostat).

In addition, the water-energy link includes agriculture and land-use sector as the cultivation of crops consumes a lot of water and can be a source of pollution. Therefore, the water-energy-food nexus is of high importance (EEA, 2012a). Recognising the close links between water and energy highlights a number of green investment opportunities (UNEP, 2011). At the regional level this applies, for example, to coordinating river basin management plans and national renewable energy action plans under the Renewables Directive.

Figure 8. Water consumption in electricity production

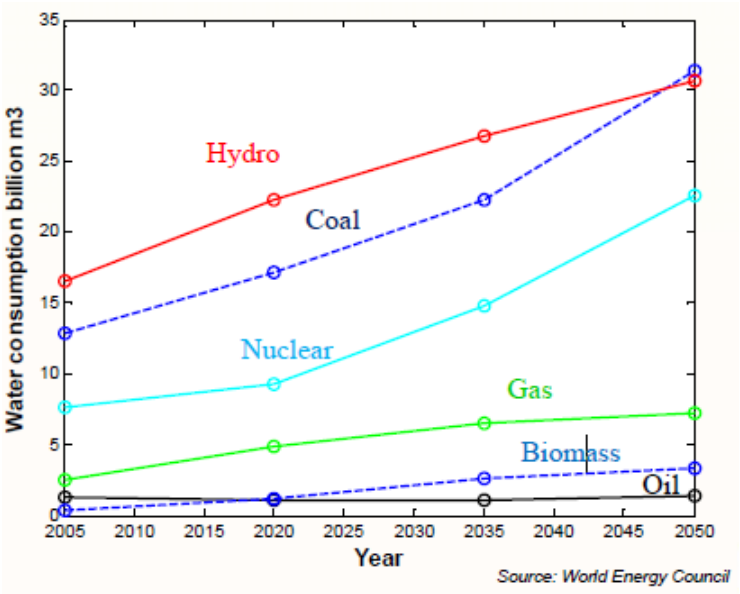
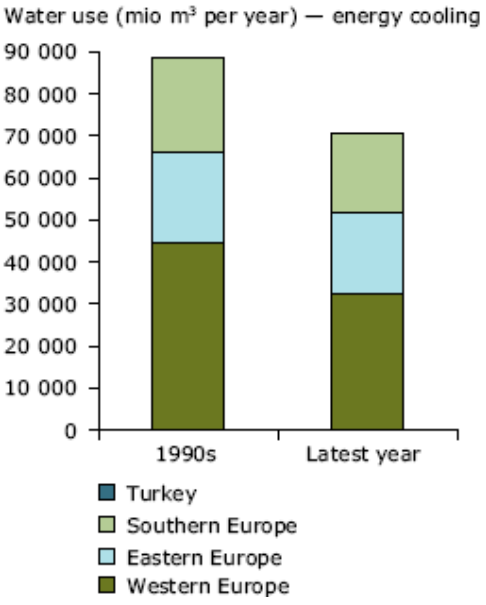
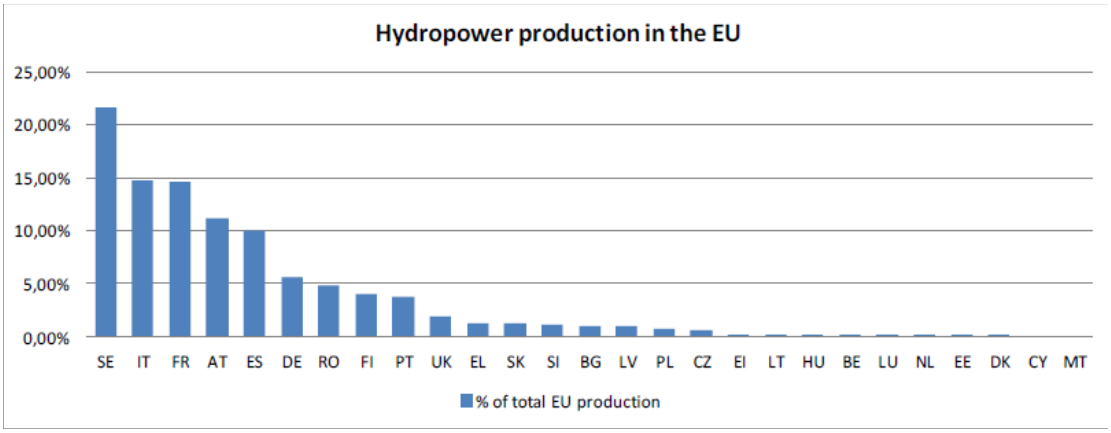


Figure 9. Water abstractions by water use sector Energy in the 1990s and the period 1997–2009 (latest year)



Source: EEA, Environmental indicators report 2012

Figure 10. Hydropower production in the EU



Source: Eurostat

1.4.3.2 Bioeconomy – water key input in agriculture

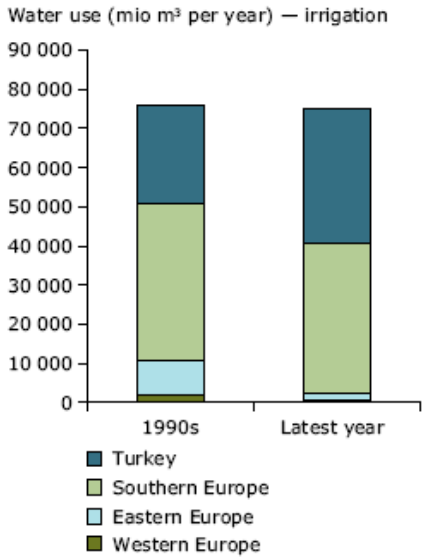
Agriculture is both a major consumer (34% of total abstraction) and a major polluter of the water sector (EEA, 2012a). There are naturally large territorial differences and in the Mediterranean region, the agricultural sector is counting for 65 % on average of the total water abstraction. This number varies greatly within the region and is reaching as high as 83 % in the southern Mediterranean region. Irrigation represents the largest share of the water used for agriculture. Since 1985, the area of irrigated land in southern Europe has gone up by 20%, a number that is predicted to increase (EEA, 2012d). Irrigation can be the cause of counter-productive environmental problems such as depletion of water resources and increased risks of soil salinity and erosion.

Water inefficiency in the agricultural sector is big and water losses in irrigation account for on average 55 % of total losses (UNW-DPC, 2012). According to the EEA, app. 70 % of water abstracted for agricultural purposes, do not return to any water body as consumption and evaporation are significant. In the Mediterranean region, reuse of treated wastewater is done for around 30% of the wastewater discharged and is mainly being applied as irrigation water for agricultural land and green spaces (OECD, 2011b, p. 73).

From a territorial perspective, agriculture plays an important role in river basin management. For instance eutrophication caused by agriculture is an important issue in the Baltic Sea region, where it is one of the main polluters. More than 40 % of Europe's rivers and costal waters are affected by diffuse agricultural pollution and one third of lakes and transitional waters (EEA, 2012c). More than 90% of the RBMPs indicate that agriculture is a significant pressure in the basin, including diffuse or point source pollution by organic matter, nutrients, pesticides and hydromorphological impacts (EC, 2012d). Clean water provides life support to fish species. As the status of commercial fishing activities is directly related to the health of the stock of commercially exploitable fish species, poor water quality can result in increased fishing costs and prices for fish (OECD, 2011b, p. 71)

Another issue impacting the water sector is the extensive loss of farmlands due to a transition to a mote intensive large-scale agriculture system, where high-nature value farming areas supporting biodiversity are increasingly abandoned. Removal of agricultural lands for urban development is a factor leading to higher pollution burdens on water bodies (EEA, 2012d). Several factors will influence the development of agricultural land in Europe in coming decades, together with the resulting effects in terms of landscape and water bodies. The EEA areas identifies, the EU's CAP; EU energy policy, in particular in terms of bio-fuels; and global food demand as key issues (EEA, 2012d) .

Figure 11. Water abstractions by water use in agriculture in the 1990s and the period 1997-2009 (latest year)



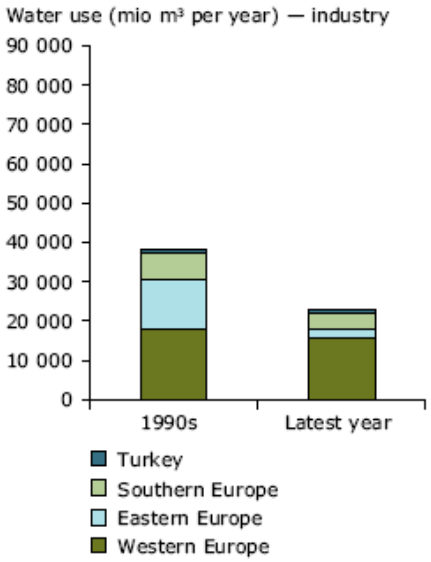
Source: EEA, Environmental indicators report 2012

1.4.3.3 Industry

With regards to industry, big differences of water use exist between the regions depending e.g. on the type of production and the level of water efficiency applied. Pulp and paper, chemical, food and textile industries are usually classified as water intensive industries. Impacts from industries on water bodies involve pollution and contamination of water resources in addition to additional water stress due to high water consumption. The use of chemicals in industry also influences the water bodies in Europe. Industries with high water consumption can reduce their negative impact by applying on-site treatment, water-reuse technologies and re-use of chemicals (EEA, 2012a).

Water abstraction by the industry, especially in Eastern Europe has been reduced as can be seen in the figure below. In Sweden, the water intense industries in the Gulf of Bothnia achieved a clear decoupling between growth and water use in the period 2000-2006. The situation is however the opposite in the northern Baltic where water abstraction increased significantly while value added increased by only 22% indicating a strong link between water use and economic activity.

Figure 12. Water abstractions by water use sector for Industry in the 1990s and the period 1997–2009 (latest year)



1.4.3.4 Tourism

There is a lack on detailed data on water consumption by the tourism sector. But in general it can be said that the tourism sector contributes to significant increases in water consumption, as a result of the additional demand for water from tourism services and leisure activities. In some areas, in particular in southern European coastal areas, it is the biggest consumer of public water supplies (EEA, 2012a). The tourist season also coincide with the summer periods where the competition for water grows and the natural availability is at is lowers (UNW-DPC, 2012).

The MEDSTAT II project compared water consumption between 'quality tourism' (holiday homes), mass tourism, and residential urban areas by using population and monthly water consumption data from six areas within the municipality. The results revealed significant underestimates of actual summer water consumption in quality tourist areas. In fact, quality tourism consumed more water levels per capita than mass tourism (EC, DG Environment, 2011).

In several regions, non-compliance with norms for bathing water quality leads to the closure of beaches and lakes for recreational purposes which influences strongly the local tourism economy (OECD, 2011b). Europe's bathing water however continues to increase. 94%of bathing sites in the EU meet minimum standards for water quality, according to the EEA annual report on bathing water quality in Europe (EEA press release 22/5-13).

Sustainable water management may be a determining factor for the long-term viability of tourism, but will require the political will to impose stricter water policies. Planning authorities and other stakeholders in the tourism sector should take the water issue into account when defining future tourism policies and strategies (EC, DG Environment, 2011).

1.4.3.5 Construction sector

The main issue in the construction sector is water efficiency in buildings. Most Member States have so far not implemented national legislation in terms of water efficiency standards in buildings or water using devices, though some aspects are included in RBMPs (BG, CY, IE, SK). The UK has defined new water efficiency targets for water companies, namely water saving devices; water-efficient construction, design and renovations; and measuring building's performance (EC, 2011a).

2. Current state and performance of European regions in the Water sector

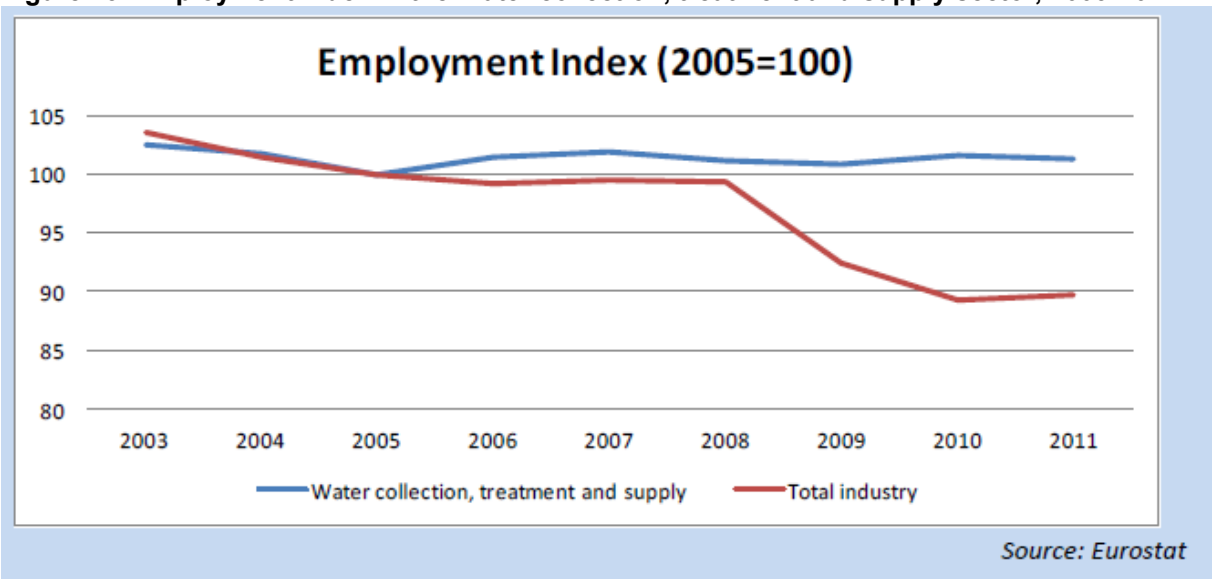
2.1. Structural business accounts of the water sector

Water industries, both publicly or privately managed, are key sectors in terms of added value and employment. The European water sector, includes app 9000 active SMEs and provides 600 000 direct jobs in water utilities alone. It is however important to stress that the water sector represent a rather small share of the economy. Data is not available for providing exact figure on European level, but available figures range between 0.27-1 % of the share of the water sector in total GVA (by territorial unit) (all Nace rev.2 categories), which gives the sector some significance as an economic player. In recent years, the turnover of this sector (about €80 billion in the EU) grew by an average of 5% per year compared with an average of 2.5% total economic growth (http://ec.europa.eu/research/environment/themes/article_1355_en.htm). The water collection, treatment and supply sector is in general across the countries representing a slightly larger share than the sewerage sector.

2.2.2 Employment in the water sector

The employment index followed to a large extent the trend of the total industry in the EU-27. However after the 2008, when the economic crisis hit Europe, the water industry remained rather stable compared to the decline in the total industry. In general, the sector is predominated by large companies (with more than 250 employees) which are responsible for more than three-fifths of the total workforce in the sector in the EU27 (Eurostat, 2007).

Figure 13. Employment index in the Water collection, treatment and supply sector, 2003-2011



Source: (ACTeon, 2013 based on Eurostat)

An Ecorys report from 2012 has estimated the employment in Europe directly dependent on the environment. The estimations for the water sector are available in the table below. The water supply sector saw a growth of 16 % but show a rather significant drop of the employment in the waste water sector. These figures might be a result of the two different methodologies for calculating the employment (figures for 2000 provided by a GHK study 2007) but is probably also an outcome of the improved, less labour intensive, waste water infrastructure in Europe following the implementation of the WWTD (Ecorys, 2012).

Table 6: Direct employment (in thousand FTE) in Environment Related Activities in EU27

	Direct employment 2000	**Direct employment 2007**
Water extraction and supply	399	465
Waste water treatment	428	249

Source: Ecorys, 2012

The table below shows employment in Europe as a percentage of the total employment. Similar to the water sectors share of total GVA, the share of the water sector of the total employment is very small where most countries fall in the range of 0.1-0.5 %.

Figure 14. Employment in the Water supply and Sewerage sector as a share of total employment

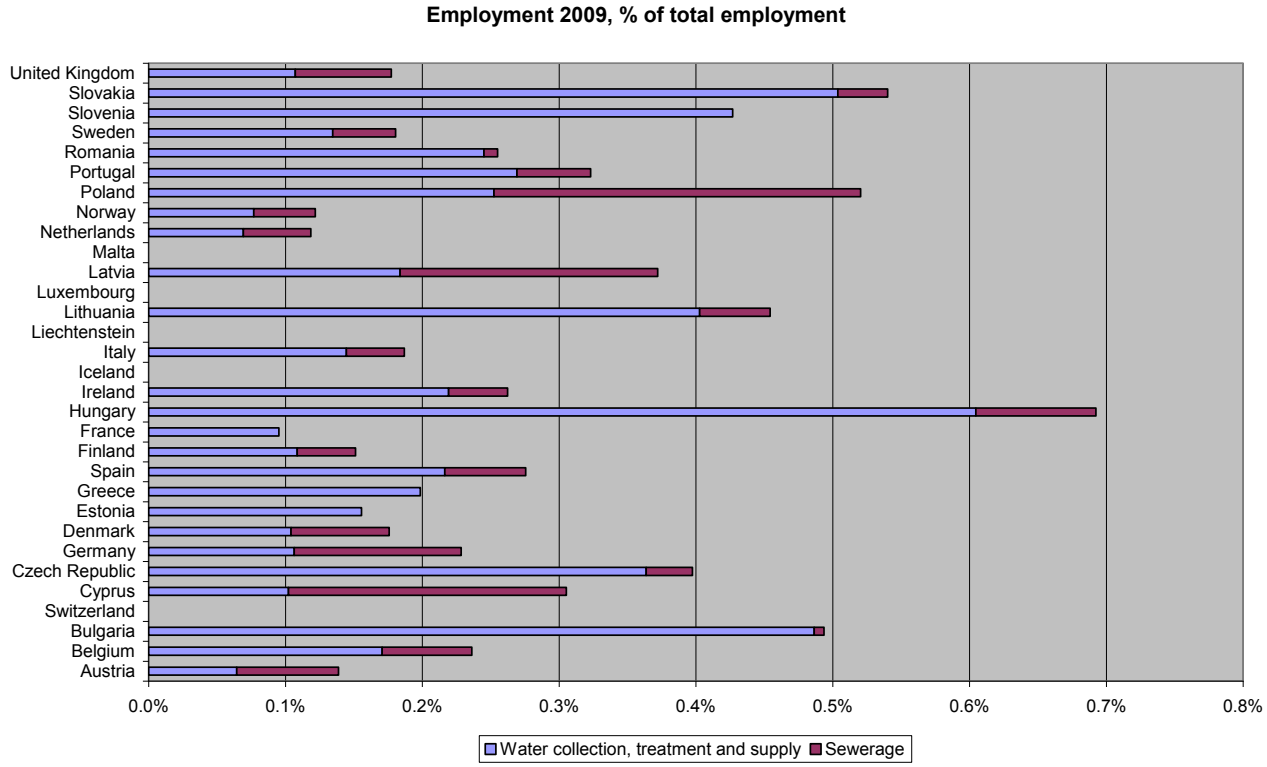
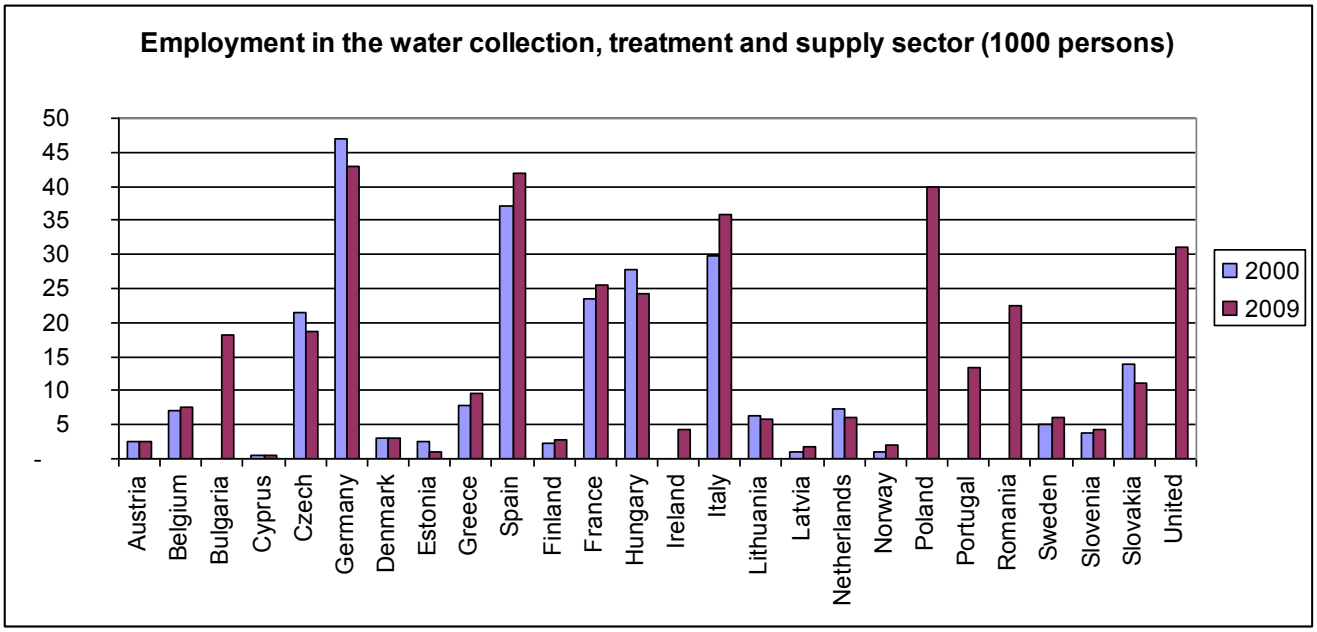


Figure 15. Employment in the water supply sector

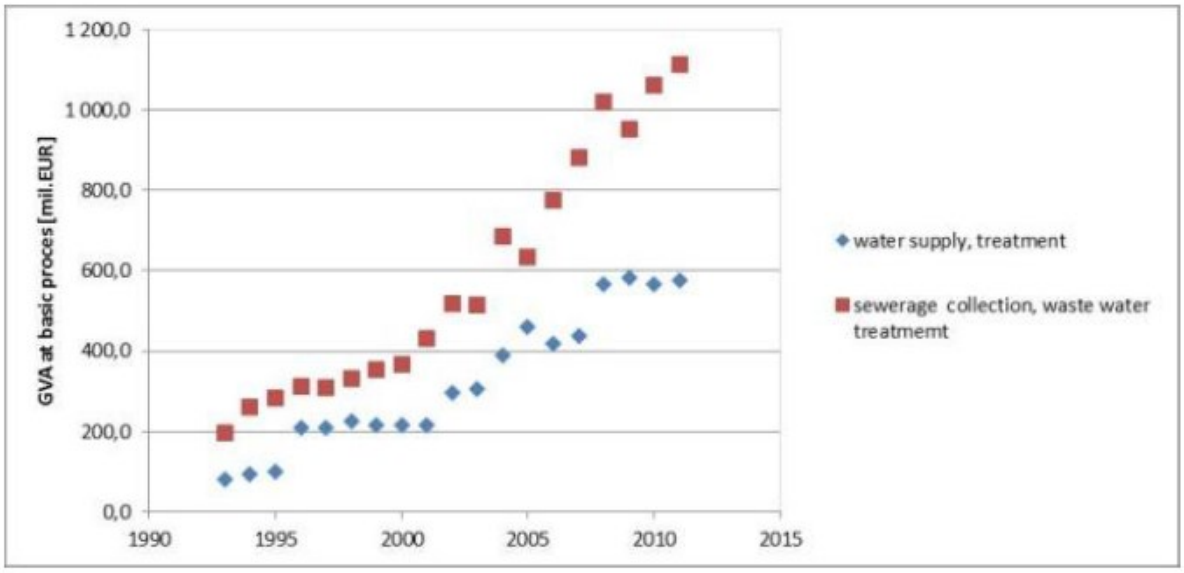


The water collection, treatment and supply sector is representing the lion's share of the employment in the water sector. It should be noted here that the employment in this sector is also a measure on the efficiency of the sector where a low percentage of the total employment can be an indication of an efficient labour productivity. In addition to the employment figures mentioned in the Table above, there are also many jobs indirectly related to the water sector, such as in water-using industries, technology development etc.

2.2.2 Gross Value Added of the Water sector

In 2010 the sector stood for about 0.27 % of the total value added produced by the EU-27 industry. It can bee seen that the development of GVA in the sector in general follows a positive trend, where most countries have experienced a growth of the GVA between 2000 and 2009. For the majority of the EU countries growth is recognised. The table below is showing the GVA of the water sector in 2009, as this is the numeric value the bigger countries is naturally showing a bigger GVA.

Figure 16. Trends in the GVA produced in the Water industry sector



Source: (ACTeon, 2013)

Figure 17. GVA in the water sector in EU 27

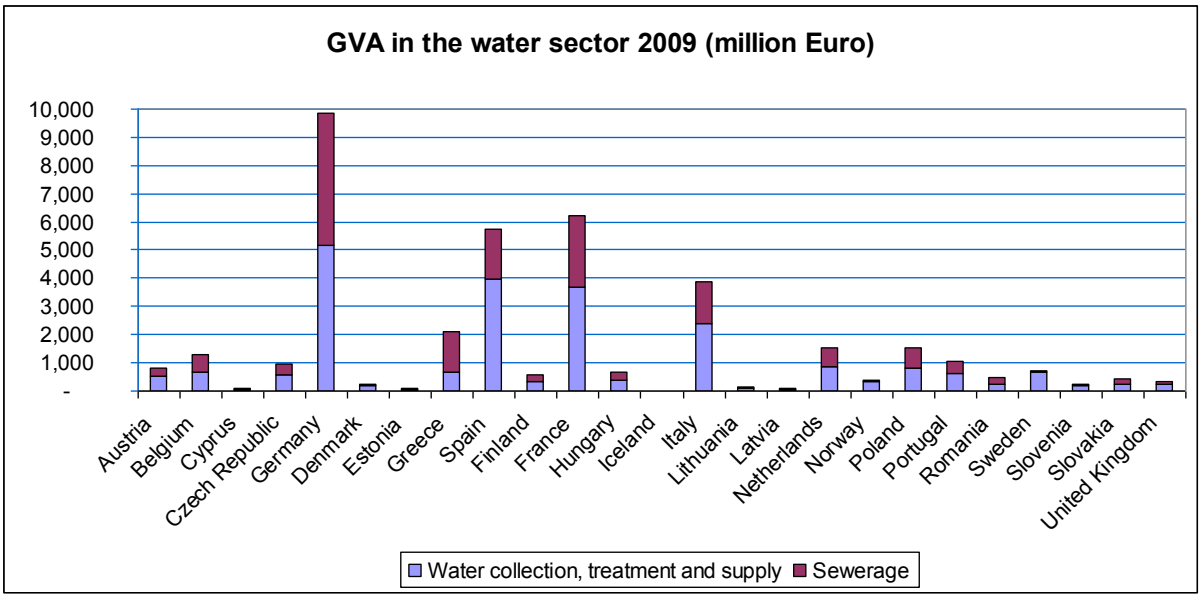
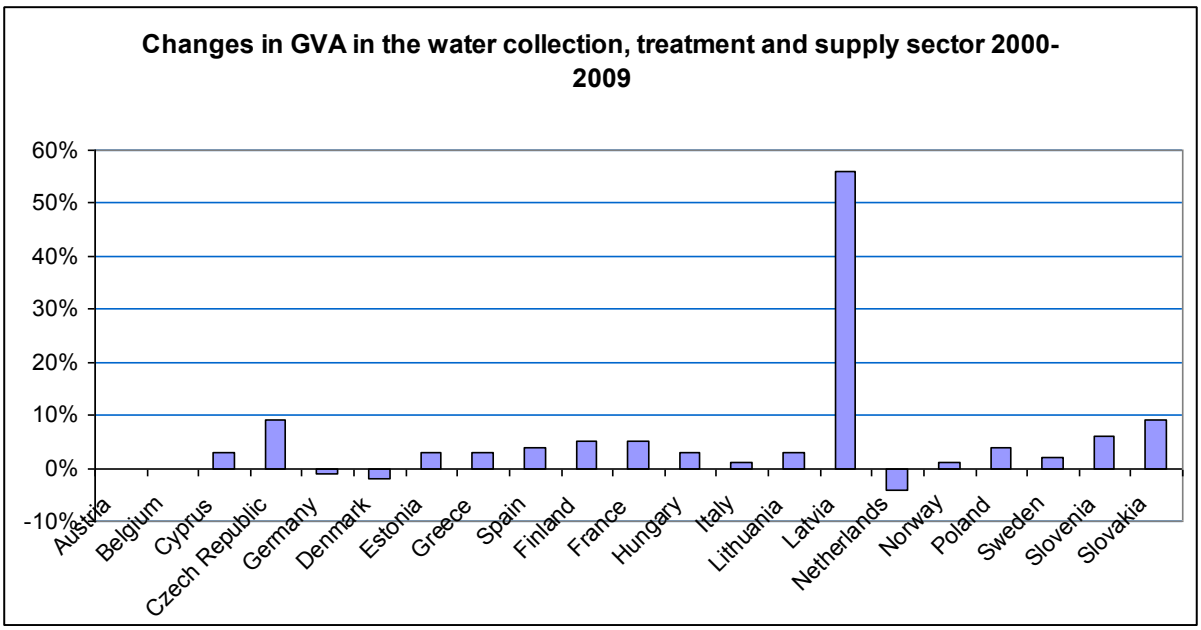


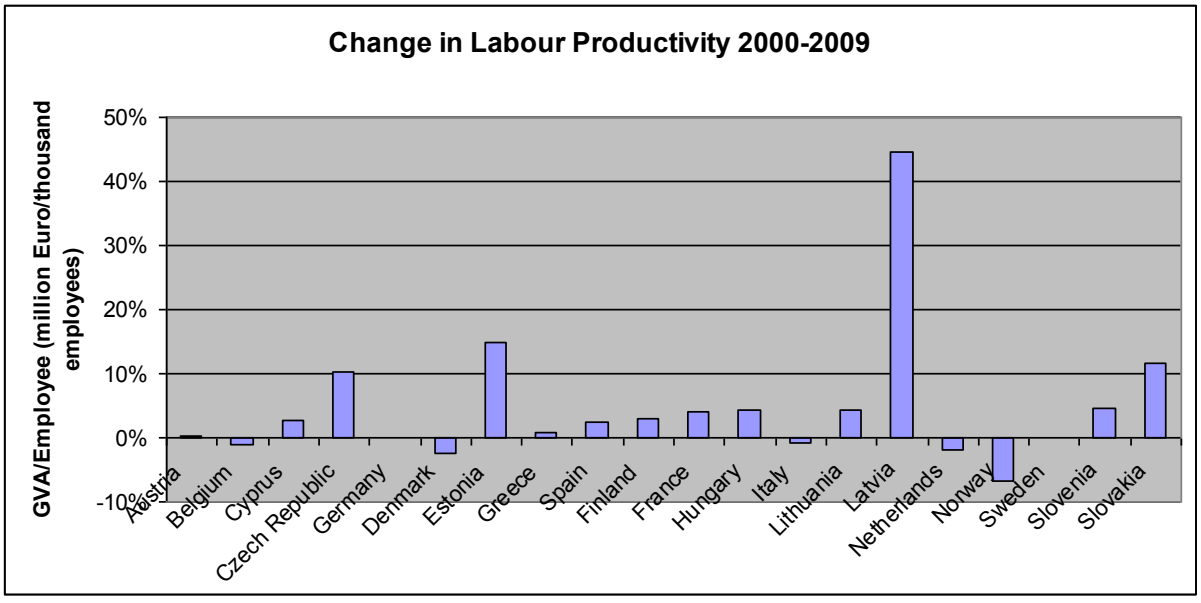
Figure 18. Changes in GVA 2000-2009



Growth of gross value added per employed person

The annual compound rate 2000-2009 for the growth of gross value added per employed person ((Person productivity 2009/Person productivity 2000)^(1/9)-1) has a low data coverage. In the water collection, treatment and supply sector the GVA per employed person is largely differing between the ESPON countries as can be seen in the table below. The labour productivity is a measure which also reflects the cost of the water grid. The better infrastructure the more expensive it is probably is, meaning a lower labour productivity.

Figure 19. Change in labour productivity

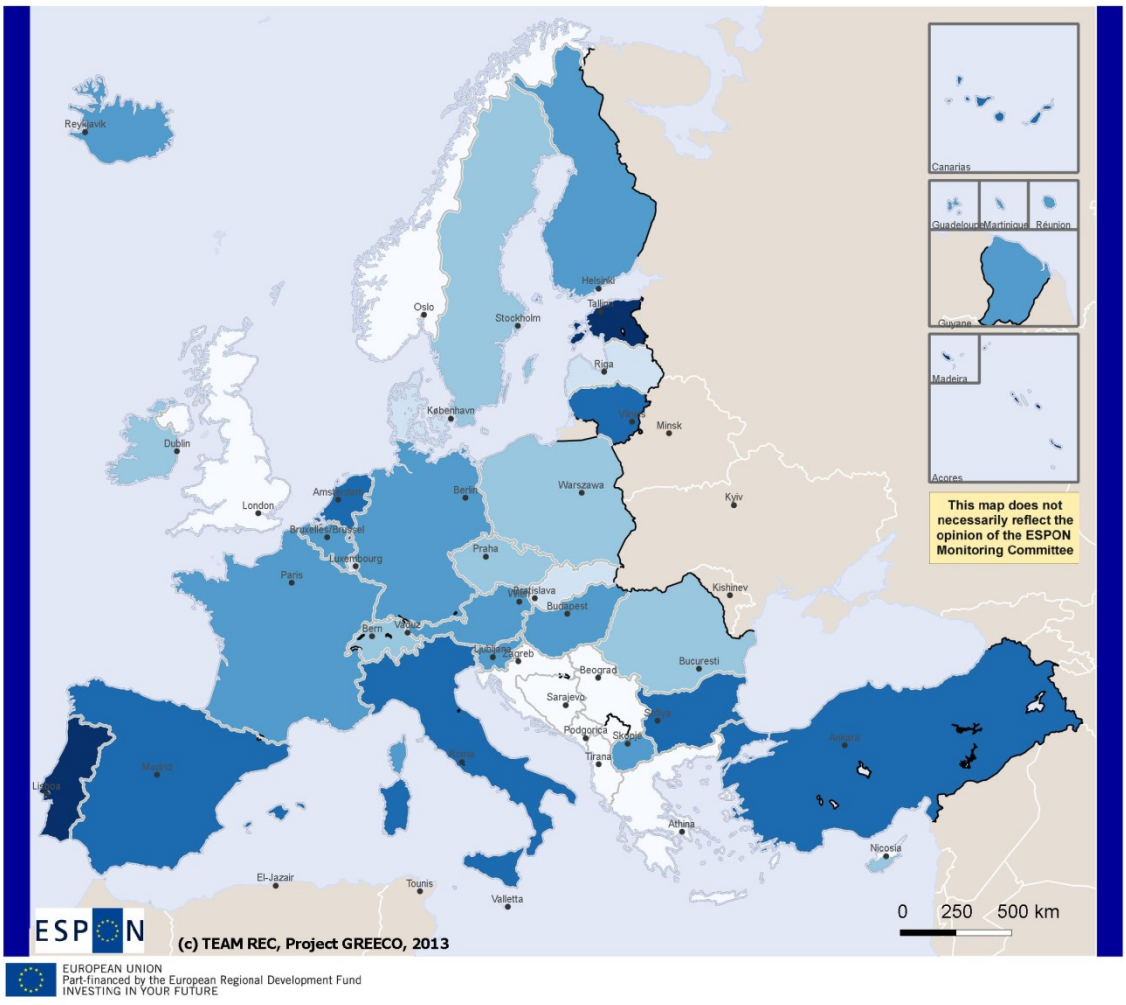


2.2. Water input and production statistics

2.2.1 Water availability and abstraction

The total water abstraction in Europe has been reduced during the past 15 years and currently, app. 13 % of Europe's total freshwater resource is abstracted annually. Most European countries have reduced pressures on water resources by reducing or stabilising abstraction rates per capita between 1989 and 2007 (EUROSTAT, 2010). The most significant decrease in water abstraction in Europe was seen in the period 1991-1997. The biggest reduction in water abstraction (35-40 % in the same period) took place in central Europe as a result of higher water prices and the general economic downturn. In the Northern and Western EEA countries the reduction was less dramatic with an average of 15 %. Like in central Europe, this change was driven by increased water prices but was also an effect of changes in awareness and behaviour. By contrast, the water abstraction has increased in the Southern European regions (EEA, http://www.eea.europa.eu/themes/water/water-resources/water-abstraction).

Map 1. Total fresh water abstraction per capita

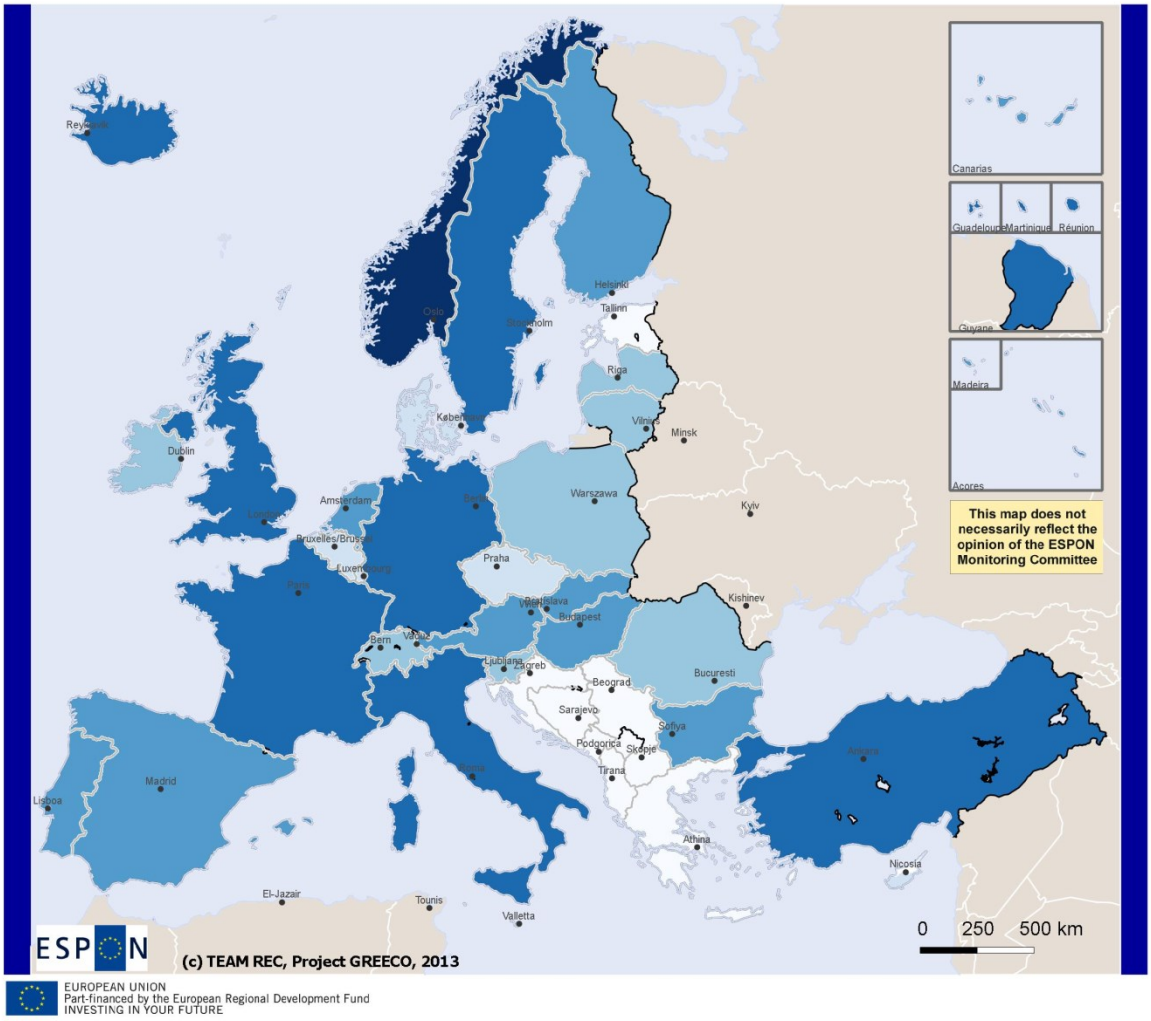


Total fresh water abstraction per capita (m³ per capita)

- No data
- 78.0000 - 128.0000
- 128.0000 - 357.0000
- 357.0000 - 587.0000
- 587.0000 - 805.0000
- 805.0000 - 1097.0000

Surface water, as being the most easily accessed water resource, account for 81 % of the total water abstracted. Groundwater on the other hand is the main source for public water demand (app. 55 %) as it possesses a generally higher water quality compared to surface water and gives a more reliable supply (EEA, 2012e). As can be seen in Map 2 below, Iceland and Norway record the highest freshwater annual resources per capita, followed by Sweden and Finland (around 20 000 m³ per inhabitant or more). In contrast, relatively low levels (below 3 000 m³ per capita) were recorded in the six largest Member States (France, Italy, the United Kingdom, Spain, Germany and Poland), as well as in Belgium and the Czech Republic, with the lowest level in Cyprus (410 m³ per inhabitant) (Eurostat).

Map 2. Total fresh water resources per capita (long term average)



Total Fresh water resources per capita (long term average), cubic meters per inhabitant

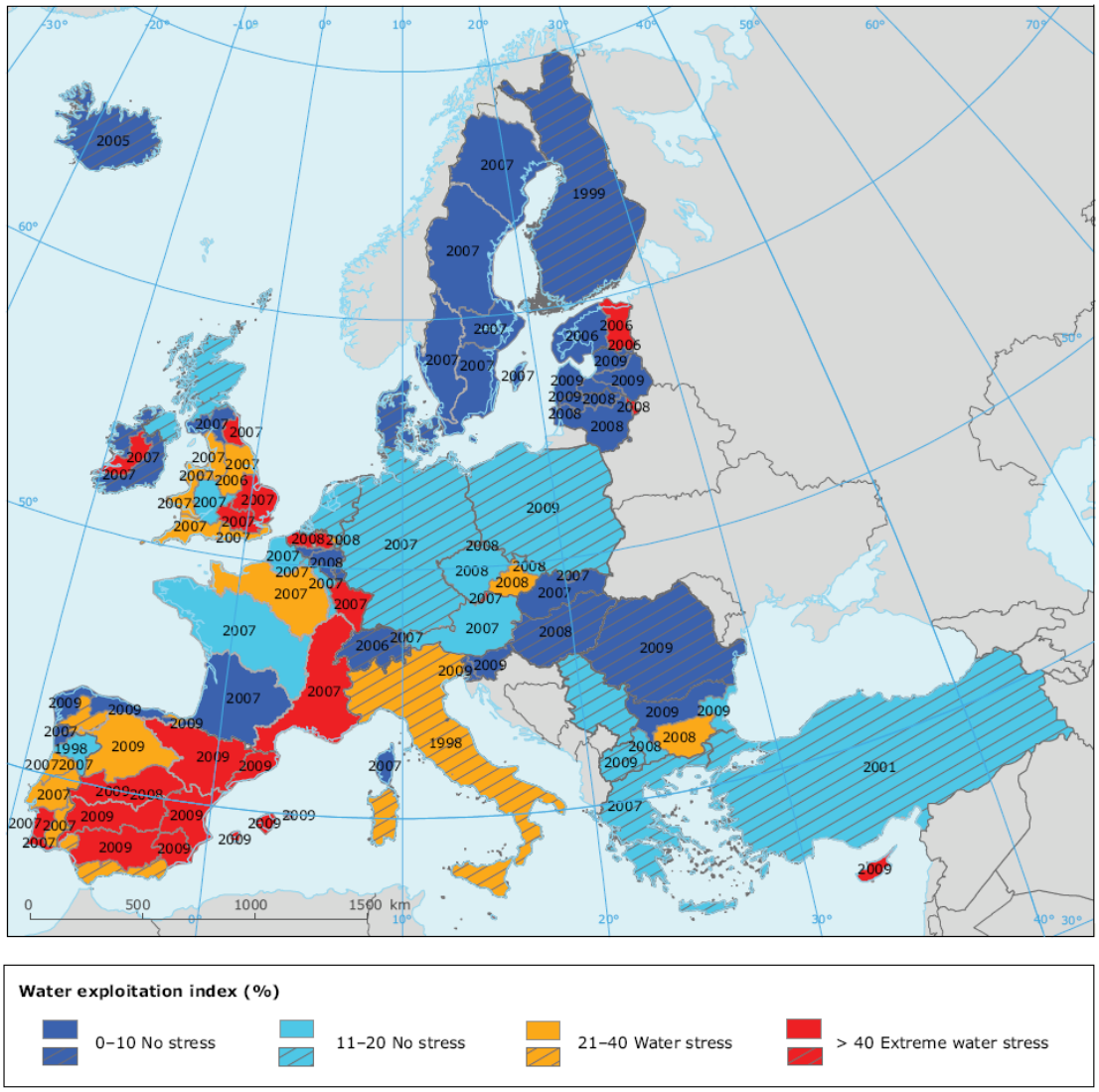
- No data
- < 19933
- 19933 - 63100
- 63100 - 116430
- 116430 - 234300
- 234300 - 384015

Water Exploitation Index

So far no indicator set to describe specifically resource efficiency in the water area has been developed. The Water Exploitation Index (WEI) is an attempt to illustrate efficiency and provides a

measure of sustainability of water consumption in a region as it shows the total abstraction compared to the available resources. A territory is considered to be water stressed if the total water abstraction exceeds 20 % of the total available annual resources. As shown by the figure below, five European countries fall within this category; Cyprus, Belgium, Italy, Malta and Spain. Cyprus is the only country that surpasses 40 % and is consequently considered to be under extreme water stress (EEA, 2012e) (EEA, website http://www.eea.europa.eu/themes/water/water-resources/water-abstraction). Over the last 10-17 years the WEI decreased in 24 EEA countries, as a result of water saving and water efficiency measures (EEA website).

Map 3. Water Exploitation Index on regional level



Note: The map shows the maximum current disaggregation with data available from different sources. Further refinement and gap filling for all RBDs are in progress.

Legend: full colour: RBD-level data; shaded: country-level data.

Source: Data come from multiple sources as follows:
Combination of WISE-SoE#3 and WFD: AT2000-Rhine, AT5000-Elbe, BG1000-Danube Region, BG2000-Black Sea Basin, BG3000-East Aegean, BG4000-West Aegean, SK30000-Vistula, SK40000-Danube.
Combination of WISE-SoE#3 and websources: IEGBNISH-Shannon.
Websources: ES014-Galician Coast, ES016-Cantabrian, ES020-Duero, ES030-Tagus, ES040-Guardiana, ES050-Guadalquivir, ES07-Segura, ES080-Jucar, ES091-Ebro, ES100-Internal Basins of Catalonia, ES110-Balearic Islands, ES120-Gran Canaria.
http://servicios2.marm.es/sia/visualizacion/lda/recursos/superficiales_escorrentia.jsp (Total water resources in the natural system (hm³/year) Average value for the period between 1941–2009). Reported to DG ENV for the Interim Report: PTRH3, PTRH4, PTRH5, PTRH6, PTRH7, PTRH8.
WISE-SoE#3: All other RBDs.
Eurostat JQ IWA: All country-level data.

Source: (EEA, 2012a, p. 40)[4]

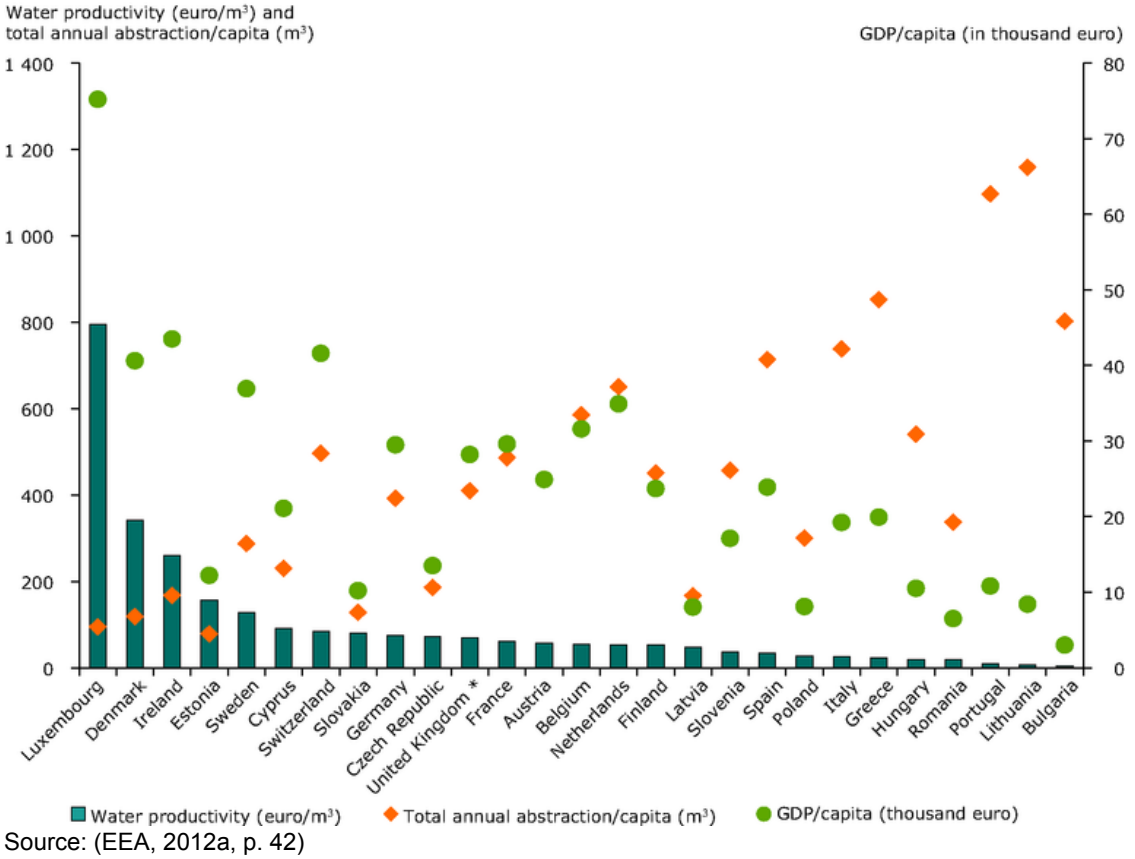
[4] It needs to be highlighted that the WEI do not reflect the seasonal variation in water availability and water use (EEA, 2012a) or other impacts from pressures such as pollution and fragmentation.

The map above shows that the southern parts of Spain, Portugal and France as well as Malta and Eastern parts of the UK are areas facing extreme water stress, with abstraction exceeding 40 % of available resources. The regions in the Mediterranean climate zone have a rather high WEI due to the dense population and the large abstractions of water for agriculture (EEA, 2012f). The map also shows that water scarcity can appear in water rich areas when the demand is higher than the supply. An example of this is the high water stress in South Eastern England which is a consequence of insufficient water infrastructure and the large ecological footprint of the region (Olsson, 2012). Over exploitation of water resources as is the case in the red areas in the figure have negative impact on the green economy as it reduces the ecosystem's capacity to absorb other pressures such as pollution, damming (e.g. fragmentation), dredging and other anthropological modifications, and the predicted impacts of climate change (EEA, 2012a). Having in mind that the situation can vary significantly between regions within a country, the WEI shows that in most European countries the reduction in water abstraction rates reduced the pressure on water resources in the period 1990–2007. In particular, the decrease was important in some new Member States, such as Bulgaria, the Czech Republic, Romania, Lithuania and Estonia. Some countries show an increase in the WEI which is due to increases in water abstraction. This is the case for Greece, the Netherlands and Slovenia (EUROSTAT, 2010).

2.2.2 Water productivity

In the report “Towards efficient use of water resources”, the EEA attempts to illustrate the relationship between different indicators relevant to water-resource efficiency. The table below is a broad scale example on the water productivity (GDP/m3 of abstracted water), water abstraction/capita and GDP/capita in selected EEA member countries. It should however be stressed here that water productivity alone does not provide an indication of the environmental impacts and sustainability of economic activities. The production activities in a region take very different forms and the water efficiency of production is also just an indicator on the type of economic activities within a region; e.g. the type of crops grown and the type of goods being produced. The tables provided here should therefore just be taken as illustrative examples of relationship between production, GDP and water use.

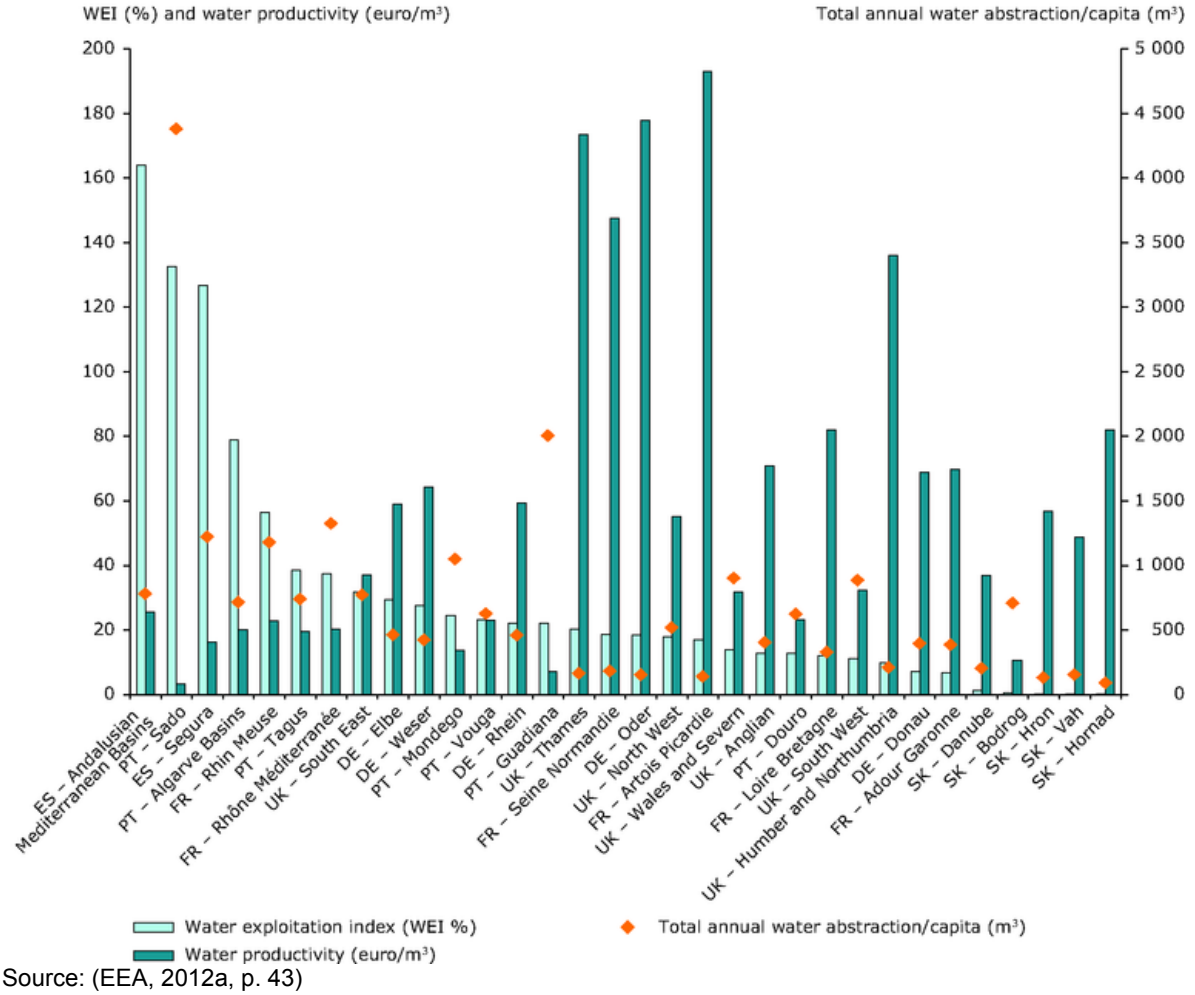
Figure 20. Water productivity, economic output per capita, and water use per capita



Source: (EEA, 2012a, p. 42)

It can be seen in the table that Luxembourg has the highest water productivity with a high GDP per capita and a low total annual abstraction of water while Bulgaria has the lowest productivity among the measured countries. The table above does not explain the differences in water productivity and rates of abstraction/capita in countries with similar GDP and more detailed analysis is needed to provide a reliable picture. Further details about the environmental impact and the sustainability of economic activities can be seen when assessing the water productivity together with the water exploitation index, assessed above. As can be seen in Figure 18 below, water stressed areas tend to have lower water productivity than areas with low water abstraction that tend to have greater water use efficiency which is an interesting observation. This implies that there is a lot of potential for water efficiency measures in production that could improve the situation in water stressed areas.

Figure 21. Water productivity and water exploitation in EU river basins and river basin districts, 2007



Source: (EEA, 2012a, p. 43)

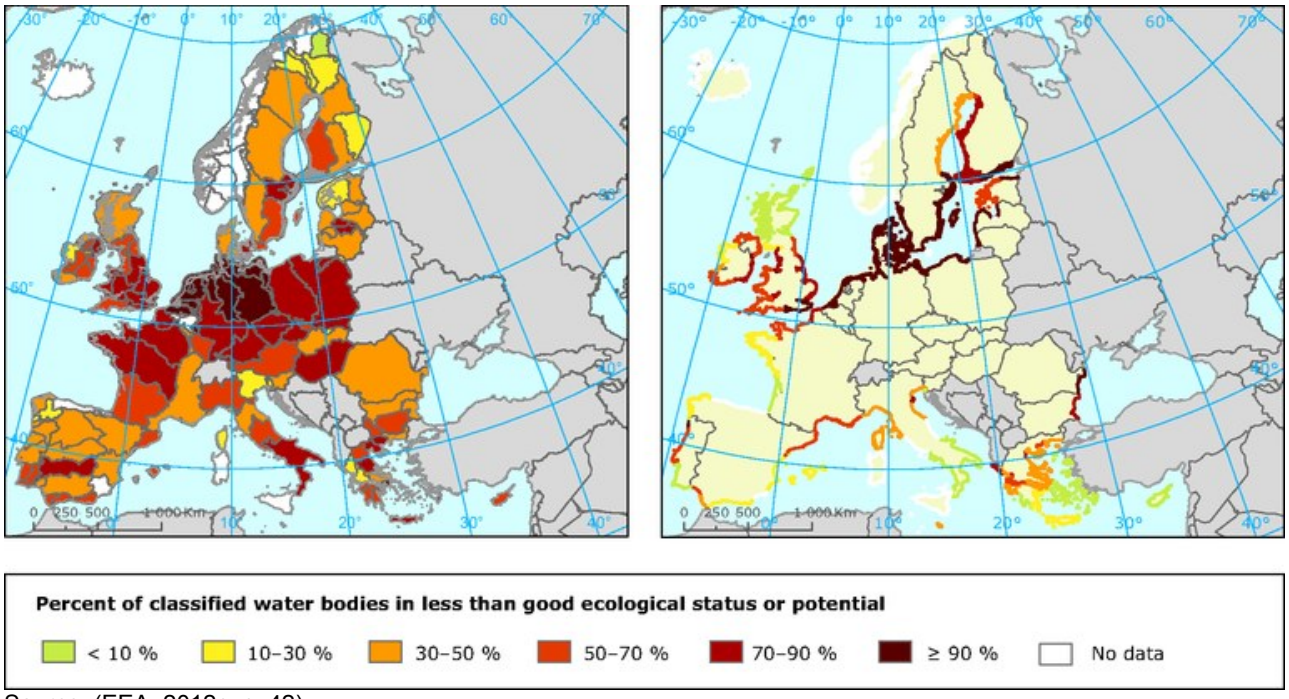
2.2.3 Water quality

The water quality is a determining factor for the green economy development as poor water quality degrades ecosystem services, causing health problems and restricts economic activities such as agriculture, tourism and industry as well as increases the costs of waste water treatment.

Significant progress has been achieved during the last 25 years in reducing pollution in water bodies in Europe. The progress is a result of e.g. improved waste water treatment, reduced industrial discharges, and reduction in the use of fertilisers and phosphates and reduced emissions to air. Despite the progress, the EEA assessment of status of European waters (November 2012) conclude that "*water bodies in Europe are generally improving, but not quickly enough to meet the targets set by the WFD*". The same report conclude that only 52 % of water bodies are predicted to achieve good ecological status by 2015 (EEA, 2012c).

Around 80 % of Europe's rivers are affected by human-induced impacts suffering from water pollution, water removal (for hydropower and irrigation) structural alterations or impacts from dams (or a combination of all), suggests a large study performed under the EU EFI+ project. Depending on the geographical region, the type and severity of the impact varies. The worst affected regions were found in the Central Highlands (i.e. Austria and Germany, the western highlands (in France and Switzerland), the Hungarian lowlands, and the Western plains (predominantly in France). The study also showed that in general lowland rivers were worse affected, being exposed to multiple impacts, compared to sites near the source of the river (EC, DG Environment, 2012).

Figure 22. Proportion of classified surface water bodies in different RBDs in less than good ecological status or potential



Source: (EEA, 2012c, p. 42)

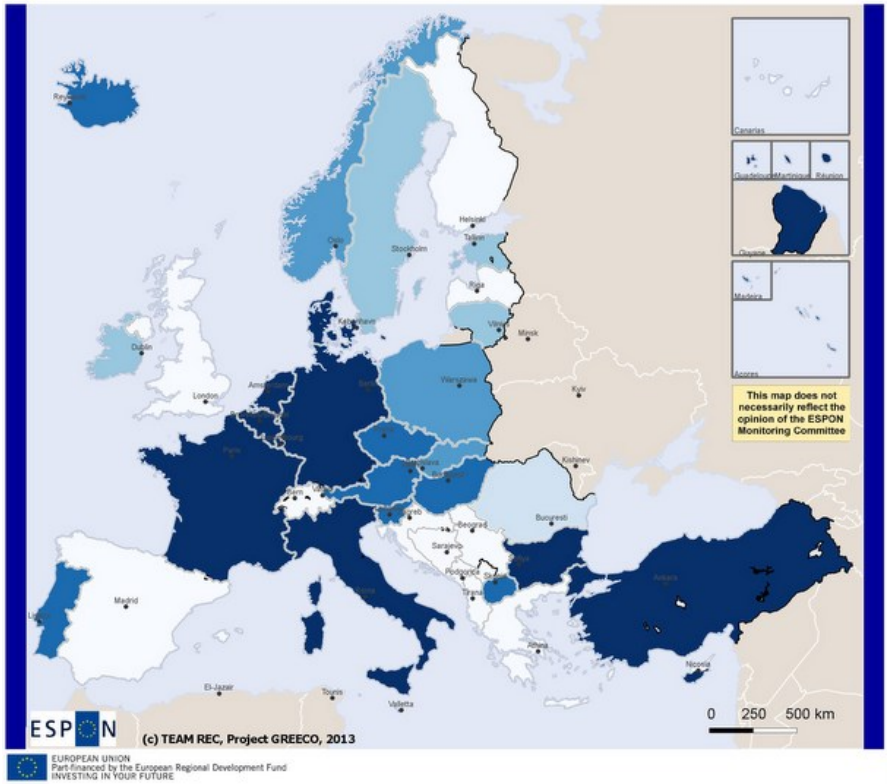
As seen in the figure above, the worst areas of Europe concerning status and pressures in freshwater are in central and north-western Europe, while for coastal and transitional waters, the Baltic Sea and Greater North Sea regions are the worst[5].

2.2.4 Public water supply

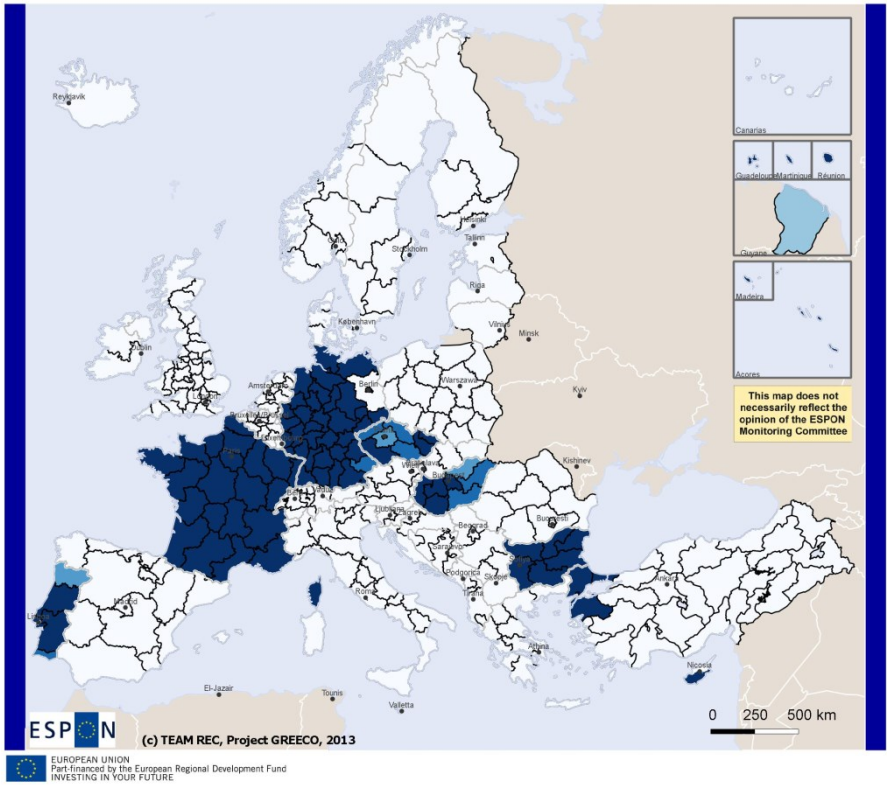
Connection to public water supply is well developed in Europe and close to all citizens have direct access to public water supply. The connection rate might be lower in rural areas where development of the network is not economically justifiable and where the population relies on self supply (EUROSTAT, 2010). This view is supported by the WHO that states the prevalence of inadequate water supply in rural and urban territories are non-existing (mainly in EU-15, Norway, Switzerland) or very small (EU-12) in most of Europe although some water supply inequalities were found in e.g. Portugal, Greece, Estonia and Latvia). The prevalence of inadequate water supply in Europe decreased between 1990 and 2008, starting from an already very good level, where it decreased from 0.7% to 0% in EU-15 and from 2% to less than 1% in EU-12 among the rural population. The available data on sub-national level (NUTS 2) indicates that the connection rate to public water is representative to the national averages but that the urbanised regions in general have a slightly higher connection rate. Romania stands out in comparison to European average, with a connection rate of 55 % in 2009. Map 4. and 5. below shows the coverage of public water supply on Nuts 0 and Nuts 2 levels (wherever available.

[5] See the EEA ETC/ICM technical report for more details and the methodology used for assessing ecological status or potential (EEA ETC/ICM, 2012a). The results are calculated as a percentage of the total number of classified water bodies.

Map 4. Population connected to public water supply, Nuts 0 level



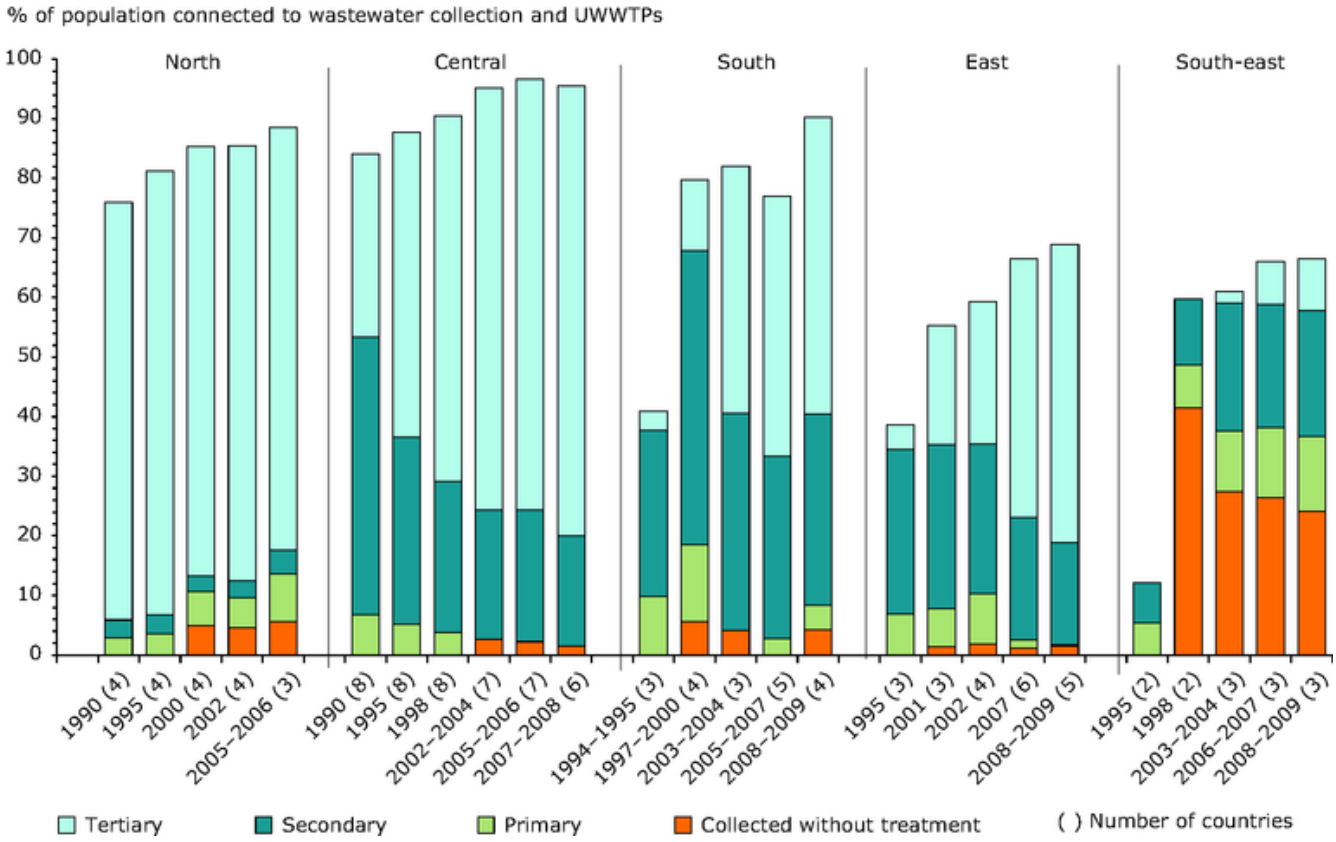
Map 5. Population connected to public water supply, Nuts 2 level



2.2.5 Waste water treatment

During the last two decades, waste water treatment has improved throughout Europe as a result of the implementation of the Urban Waste Water Directive (UWWTD) (1991). About 80 % of the population is connected to some kind of waste water treatment in northern and southern European countries. The central European countries have an even higher connection rate, reaching 90 %. The Southern, South-eastern and Eastern Europe countries have a comparative low percentage of the population connected to wastewater treatment, although it has increased during last ten years. In Eastern Europe, about 65 % of total population is connected to wastewater treatment, on the basis of data reported in 2006-2007. The average connection rate in South-Eastern Europe (including Turkey, Bulgaria and Romania) is about 40 % (EEA website and EC, 2012e).

Figure 23. Changes in wastewater treatment in regions of Europe between 1990 and 2009

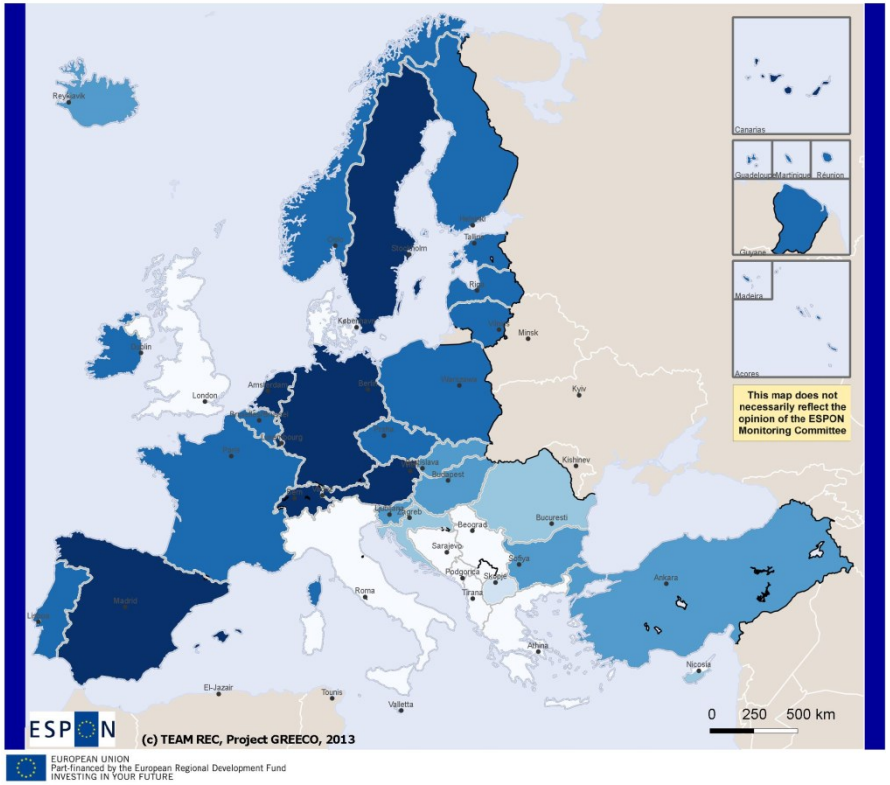


This figure above represents the percentage population per European region connected to a waste water collection and treatment systems (UWWTPs) over the period 1990 to 2009. In addition, a breakdown by treatment type is portrayed (EEA).

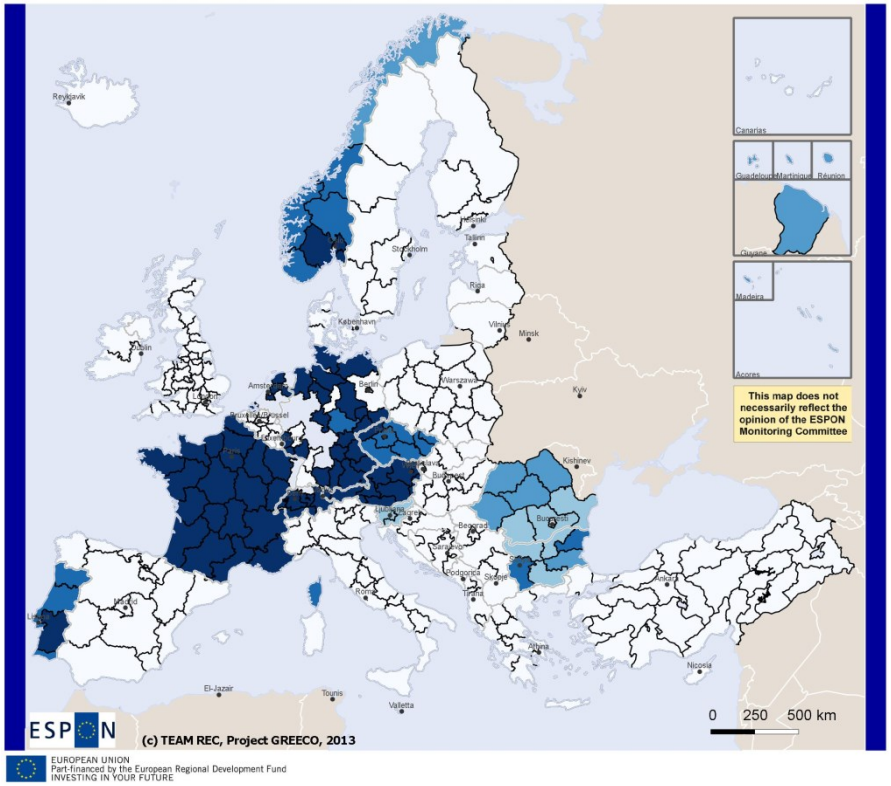
Map 6. and 7. below show the percentage of population connected to all types of urban waste water treatment on Nuts 0 and broken down to Nits 2 level, where available. In EU-15, the implementation of the UWWD is rather mixed. Significant investments have been made and key infrastructure is in place to a far extent. But there is still a number of agglomerations, for instance in Belgium, France, Greece, Italy and Spain, which completely lack waste water collecting systems and treatment facilities, although progress have been seen in latest years (IEEP, 2011). Against this background it is however important to look at the amount of waste water that undergo at least secondary treatment[6]. More than one third of the European countries for which data is available are connected to secondary waste water treatment.

[6] Secondary treatment involves biological treatment with a secondary settlement or other process, resulting in a biochemical oxygen demand (BOD) removal of at least 70% and a chemical oxygen demand (COD) removal of at least 75%.

Map 6. Population connected to wastewater collection and treatment systems, Nuts 0



Map 7. Population connected to wastewater collection and treatment systems, Nuts 2



3. Effectiveness of water policy as a driver for green economy

Driving forces and enablers for green economy developments in the water sector includes the establishment of sound regulatory framework, prioritising government investment to stimulate specific areas and shifting market-based instruments towards promoting green investment and innovation. In a wider perspective, the importance of 'soft measures' which include the social aspects of governance (including public participation in water boards and round tables, as seen under the WFD), information are significant and a precondition for the transparent implementation of a green economy (UNEP, 2012). Other important external drivers that affect the water sector are e.g. socio-economic and demographic changes.

The implementation of water regulation drives green economy by:

- Promoting investment and spending in areas that stimulate a green economy;
- Supporting economic sectors that directly use water related ecosystem services;
- Benefits the the wider population and economy through reductions in health risk;
- stimulating innovation that can (partly or fully) make up for the costs imposed on some water use sectors.

This analysis will give an overview of the most relevant drivers and enablers for water related green economy. The following section will focus on drivers and enablers in the form of:

- policy framework, including EU-multi sectoral policies, EU directives and communications;
- economic instruments;
- Non policy drivers, including institutional framework, human resources as well as demography patterns (discussed in chapter 4).

3.1. EU headline policy framework as a driver of water-related green economy

GREECO has included some of the major multi-sector policies in the EU in the analysis which have clear implications of green economy in the water sector.

A key driver for green economic growth in the sector is the EU water legislation. Much of the achievement in the improved water resource management, leading to that high level of public water supply of good quality and a high level of sanitation has been reached in Europe during the last few decades, can be accounted to the improved EU legislation. The EU water policy has developed from purely addressing human and economy's water needs to a more holistic policy embracing the environmental impacts of water use and the needs of the ecosystem, which is a central aspect of the WFD. The role of water in green economy has received an increasing attention in the EU policy framework and has through the concept of resource efficiency received a central position in the EC communications.

The Europe 2020 Strategy's **Flagship Initiative on Resource Efficiency** (COM(2011) 21) departs from the growing concern of the increased pressure on natural resources in Europe. The initiative recognises water as a basic resource that supports our ecosystems and biodiversity. Water is acknowledged to be a vital element in various economic sectors and vital to the role of natural resources in underpinning the functioning of the European economy. The flagship initiative therefore set an objective to decouple resource use from economic growth and to decouple environmental impacts from resource use. It is stated that a water policy characterised by water saving measures and water efficiency is a priority medium-term measure component to deliver the flagship initiative, in order to ensure that water "is available in sufficient quantities, is of appropriate quality, is used sustainably and with minimum resource input, and is ultimately returned to the environment with acceptable quality". The flagship initiative is also reflecting the issue of water pricing, which is a red thread throughout the EU water policy framework. It states that greater emphasis should be placed on 'getting prices right' in order to improve resource efficiency and overall economic competitiveness, so that prices reflect the full costs of resource use to society (e.g. in terms of environment and

health) and do not create adverse incentives. The role of smart water metering is mentioned as a having potentials in this respect.
Following the flagship initiative the **Roadmap to a resource efficient Europe** (COM(2011) 571) was elaborated in 2011. The roadmap outlines how Europe's economy can be transformed into a sustainable one by 2050. It recognises that a resource efficient Europe will allow the EU's economy to grow in a way that respects resource constraints, providing an economy which is competitive, inclusive and provides a high standard of living with much lower environmental impacts. The roadmap proposes ways to increase resource productivity and decouple economic growth from resource use and its environmental impact. The roadmap recognises water as a vital element in various economic sectors and a basis to the role of natural resources in underpinning the functioning of the European economy. The roadmap urges MS set water efficiency targets for 2020 at River Basin level, including outlining complementary measures and account the variety of situations across economic sectors and geographic areas. The ideal future scenario spelled out by the roadmap, exemplified by the "milestones", includes that by 2020 water abstraction should stay below 20% of available renewable water resources, that all WFD River RBMPs have long been implemented, that the WFD objective of Good status – quality, quantity and use - of waters was attained in all EU river basins in 2015 and that the impacts of droughts and floods are minimised, with adapted crops, increased water retention in soils and efficient irrigation. The scenario also foresees that alternative water supply options are only relied upon when all cheaper savings opportunities are taken.

The **EC White Paper on Adapting to Climate Change** (COM(2009) 147) highlights the need "to promote strategies which increase the resilience to climate change of health, property and the productive functions of land, inter alia by improving the management of water resources and ecosystems." It proposes several measures to improve the management of water resources in Europe but gives specific emphasis to the proper implementation of the WFD, the Floods Directive as well as the Water Scarcity and Droughts Strategy for the delivery of adaptation with regard to water. It also called MS to ensure that measures for adaptation and water management are embedded in the rural development national strategies and programmes 2007-2013. or the 2015 round of RBMPs to be 'climate proofed', and that climate change impacts should be integrated into actions to implement the Floods Directive (EC, 2009c). It also called MS to ensure that measures for adaptation and water management are embedded in the rural development national strategies and programmes 2007-2013. As part of the actions included in the White Paper, the **Guidance document on River Basin Management in a changing climate** (2009) aims to ensure that the RBMPs are climate-proofed. The guidance will require Member States to clearly demonstrate how climate change projections have been considered in the assessment of pressures and impacts, monitoring programmes and appraisal of measures. The document describes guiding principles for adaptation, and relates each to steps in RBMP. The principles are intentionally broad to be applicable across all Member States regardless of regional variations in potential impacts.

The **EU Cohesion policy** has a central role for territorial cohesion of water management at the EU level. The Cohesion policy is guided by three objectives: Convergence, Competitiveness and Employment and European Territorial Cooperation. The contribution of European territorial policy strategies to green economy in the water sector is most significant in the 'Convergence' and the 'European territorial cooperation' objectives. The Convergence objective provides investment for infrastructure such as wastewater treatment plants (WWTPs) while the latter supports initiatives for better water management and governance across regions. EU cohesion policy is mainly implemented through the spending of three funds; European Regional Development Fund (ERDF), the European Social Fund (ESF) and the Cohesion Fund (CF) which represents 35.7 % of the total EU budget 2007-2013.

Table 7: Types of activities under the WFD that can be funded by Cohesion Policy and the Structural Funds

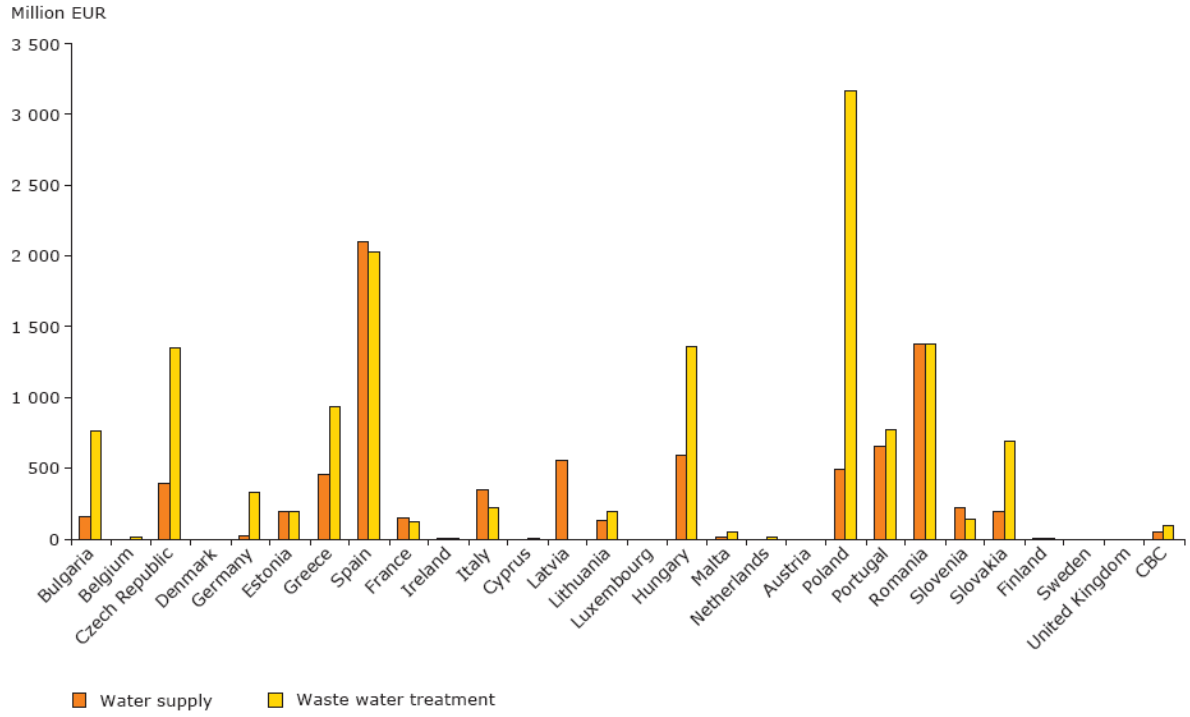
Cost item	Funding options		
	ERDF ([37])	ESF ([38])	Cohesion fund
Framework for management and administration			
Administration of River Basin Authorities (RBAs)			
Strengthening of RBAs	X	X	
Technical capacity building for RBAs	X	X	
Support and capacity building of stakeholders/interested parties by RBAs	X	X	
Setting up a stakeholder network and managing the participatory processes by RBAs		X	
Scientific studies inventories, mapping	X	X	
Awareness-raising campaigns		X	
Operation and monitoring			
Monitoring systems and risk analyses	X		
Flood risk management	X		
Erosion control	X		
Water-saving solutions for agriculture			
Vegetation restoration			
Water-saving solutions for industry	X		
Pollution control			
Infrastructure			
Adapting existing water infrastructure	X		
New infrastructure for the management of water resources	X		X
Improvement of water networks	X		X
Wetland restoration	X		
Equipment acquisition	X		

Source: WWF 2005 cited in EEA territorial perspectives (2012)

Cohesion Policy financing has strong interactions with the WFD and other EU water legislation, most notably the drinking water directive and UWWT directive. According to the EEA, the Cohesion Policy investments into water supply and treatment represent the biggest steps taken to achieve the WFD goal of "good status" of all waters 2015 as it can finance infrastructure needed to meet legislative requirements, especially important in high cost areas such as waste water treatment. Cohesion Policy can also play a role in support regional projects and develop common tools and methodologies for implementation of EU water legislation across the European territory. At the same time, Cohesion Policy investment projects can also have negative impact on water bodies and territories through its financed investments and it is therefore important that proper assessments are made before approving programmes and projects (EEA, 2012d).

Construction of water supply infrastructure and WWTPs has been one of the main spending areas of the Cohesion Policy. In the 2000-2006 programming period, water and wastewater infrastructure represented 40 % of ERDF environmental expenditure (4 billion Euro for WWTP), with additional support from the Cohesion Fund. The spending is even higher in the current period 2007-2013 with 44.6 % of environmental expenditure, representing 6.4 % of the total funds. The new Member States have received the largest share of investment as the investments needs are biggest there (EEA, 2012d).

Figure 24. Funding allocations for water supply and waste water treatment for all Cohesion Policy funds 2007-2013 by Member States



Note: CBC = Cross border cooperation.

Source: DG Regio data cited in EEA 2012c

The role of the regions is especially important in increasing the absorption capacity of the Cohesion Policy fund, which is a difficulty in many MS. The pressure to rapidly invest and spend the money has also consequently caused poorly planned investments projects where EIA and proper business planning have been neglected in order to move forward with the investment plans, leading to a failing cost recovery of operations. In the end the result is contradictory to the WFD objectives that set cost-recovery for water collection, treatment and supply as a central aim. Regional authorities can help in strengthening capacity for project management and financial assessments which is often causing delays in the implementation of infrastructure projects. The new 'macro-regions' created such as the Baltic Sea and the Danube (which both have RBMP developed) have potential to provide a link between natural geographic areas and Cohesion Policy priorities (EEA, 2012d).

Previously, the **EU Common Agriculture Policy** (CAP) did not reflect water scarcity or other environmental and resource costs to a significant extent. In many cases, CAP subsidies very given to water intensive crops and inefficiency technologies leading to an inefficient use of water resources. Successive reforms of the CAP and in particular the financial support to rural development have improved the situation. In November 2010, the EC presented its proposal for the future CAP after 2014, which identifies three main objectives including food production; sustainable management of natural resources and climate action and balanced territorial development. The proposal gives significant importance to the management of natural resources including water management and also involves the territorial dimension to a great extent. For instance, it is suggested that future direct payments should include a mandatory greening component. They could contribute to the improvement of water resources, as

farmers will have to engage actively in farming practices that bring benefits also for water quality and improve water management.

The main CAP instruments promoting sustainable water management are the following:

- Certain rural development measures support investments for improving the state of irrigation infrastructures or irrigation techniques that require the abstraction of lower volumes of water, as well as actions to improve water quality.
- The cross-compliance framework includes statutory requirements related to water protection and management arising from the implementation of the groundwater directive and nitrates directive, as well as GAEC standards.
- Payments under Article 38 of the Rural Development Regulation will contribute to the implementation of the Water Framework Directive.

Member States plan to spend 26.9% of CAP Health-Check and European Economic Recovery Plan funds on water management. Of these funds, for the remainder of the current period, the various rural development programmes set out planned spending of 184 million Euros for water storage, 568 million Euros on water savings technologies and 119 million Euros for wetland restoration. In the coming years rural development policy will remain an indispensable tool for improving care for the EU's precious water resources. Following the CAP Health Check, from 2010 the Member States will have to define standards applying at farm level for compliance with existing national authorisation procedures when using water for irrigation. In 2010, all but one Member State notified standards on authorisation for the use of water for irrigation, linking the payments with permitting (EC, 2011a).

3.2. EU legislation with implications on water green economy

A number of EU strategies and directives are related to water management and the below section will present an overview of the most relevant water strategies and legislation. The section first reviews the most important EU legislation where most attention will be given to the Water Framework Directive (WFD) as it is the key legislative act, setting the course for the EU water policy. The WFD is complemented by other regulations in certain areas such as the Groundwater Directive (2006) and the Environmental Quality Standards Directive (2008). In addition, related previous legislation includes The Urban Waste Water Directive (1991), The Nitrates Directive (1991) and the new Bathing Water Directive (2006). More recent legislation in the water sector includes the Floods Directive (2007) and the Marine Strategy Framework Directive (2008). The sector continues with reviewing the related EU strategies and policy communications having an impact on green economy in the water sector.

In summary, the analysis follows several steps:

- Description of the policy and the targets;
- Description of territorial implication of the policy;
- Characterization of territorial implication;
- Identification of indicators for measuring policy implementation;
- Assessing distance-to-target (if possible) with the help of existing data;
- If this is not possible, provide nominal figures for related GVA or related quantity of water
- Characterization of region/country bin terms of distance to target;
- Assessment of the effectiveness of the policy as a driver of green economy;
- Identification of potential for development of green economy based on the above.

Type of policy	EU framework directive
Name	**Water Framework Directive 2000/60/EC**
Description	The WFD is framing the regulation and protection of water resources in Europe comprising lakes, rivers, coastal water and groundwater. The WFD applies a novel approach to water management using a "source-to-sink thinking". The main objective is to "achieve the desired quality of the water resources and to ensure that there is enough clean water for different uses." The WFD also makes the case for the use of economic instruments.
Targets	• To achieve "good status" of all surface and ground water bodies by 2015. Good status for surface waters involves both chemical characteristics and the health of their ecosystems. Groundwater bodies should attain good chemical status and good quantitative status

- Water pricing policies should be in place since 2010 promoting sustainable use of water.

The WFD classification scheme for surface water ecological status includes five categories: high, good, moderate, poor and bad. 'High status' means no or very low human pressure. 'Good status' means a 'slight' deviation from this condition, 'moderate status' means 'moderate' deviation, and so on (WFD leaflet, EC website). The directive allows only limited possibility for extending the 2015 deadline, achieving a lower standard or allowing deterioration in conditions. For example, a failure to achieve good status is allowed under specific conditions; one is that any modifications are of 'overriding public interest'." (EEA spatial perspective)

Territorial implication

- Applies a river basin approach to governance and planning and the measures proposed in the directive are explicitly territorial.
- The Directive establishes governance by natural geographical units, river basin districts. Identification of water bodies is central;
- A river basin management plan (RBMP) shall be established for each river basin in the EU analysing the water bodies characteristics and drawing up a programme of measures to address major problems. The RBMPs shall be renewed every six years, and the next round of plans is due by 2015.
- it calls on Member States to cooperate on cross-boundary RBDs;
- the Directive establishes a planning system at the level of RBDs, and calls for public participation in river basin planning;
- Consideration of natural boundaries and areas (RDB and water bodies) is key;
- it establishes the principle of the recovery of the costs of water services, 'including environmental and resource costs' which effectively recognises the value of ecosystem services (EEA, territorial dimension of environmental sustainability)

Characterization of territorial implication

Strong

Indicators

Water quality of all water bodies

Distance to target (graph)

The objective of good status will not be achieved for a number of countries. The EEA State of Water report and the Commission's assessment of the RBMPs show that good ecological status is currently achieved in 43 % of the reported freshwater bodies and that the additional measures included in the plans are expected to increase this to 53 % by 2015. Changes to water bodies are the main threat including hydropower, dams, draining land for agriculture etc (EC, 2012a). The assessment of the RBMPs by the Commission stresses that hydromorphological pressures, pollution and overabstraction remain the main pressures on the water environment. There is also a prevailing lack of implementation of policy instruments, more on that below.

It emerges that there is a clear gap in monitoring. This shows that around 15% of surface water bodies in the EU are in unknown ecological status and 40% in unknown chemical status. In some Member States ecological and chemical water status is unknown for more than 50% of the water bodies (EC, 2012d).

In principle, starting January 2010 all EU countries should have moved from the "preparation" stage to the "implementation" phase of the Water Framework Directive. However, the European Commission has noticed serious delays in the delivery of river basin management plans (RBMP) In several EU countries, consultation processes are still ongoing, while in others (Portugal, Malta and Greece), they have not even started. To date, 91 hydrographical districts have published their plans, out of 170, which represents only 14 countries delivering their RBMP on time (EC, 2012d).

Policy effectiveness

Wider and more stringent application by Member States is needed.

Characterization

Medium

Potential for green economy development

- The WFD objective of efficient use of water resources in a backbone in a green economy.

In the case of the WFD, however, the main areas of benefits relate to environmental benefits associated with reaching Good Ecological Status, which are particularly difficult to quantify as these are linked largely to non-use values.

- The WFD establishes the principle of the recovery of the costs of

water services, 'including environmental and resource costs' which effectively recognises the value of ecosystem services."

- The wide approach to water management taken by the WFD has opportunity to impact many sectors as water is involved in a huge range of human activities, and therefore in the policies applied to regulate them. For example in agriculture, land-use and development, energy generation, industry, as well as the indispensable role of water in ecosystems.
- Article 4.7 of the WFD on new projects and modifications to water bodies frames the conditions under which trade-offs between water protection and economic developments can be established. Only a very few RBMP refer to such exemptions which could be further used for he sustainable development of economic activities under a framework of real integrated water management.

The territorial dimension of policy and governance within the WFD is strong. The territorial approach of the WFD, to plan along side geographical boarders rather than according to administrative, is novel in the EU policy framework. International districts cover about 60 % of EU territory. For instance, the Danube and Rhine River brings together several countries and they both have recent regional RBMPs developed. The territorial impact of implementing the WFD is improving the environmental quality in rural and urban regions as agricultural regions will reduce pollution and urban areas will have to be equipped with improved sewerage and water filtration systems (EEA, 2012d).

Spatial planning has a series of characteristics and approaches that can support the development and implementation of RBMPs. For example, spatial planning:

- brings a long-term, strategic focus covering large areas, similar to the perspective of the WFD;
- influences a broad range of economic sectors that affect river basins through water consumption and pollution as well as the modification of water bodies;
- • influences the type and location of new polluting activities and thus water status;
- can also be used to translate water management goals — such as measures for more efficient water consumption — into local government action, for example for new housing developments;
- shares a number of key tools with RBMP, including, for example, SEA and public participation;
- is a key tool in addressing flood risks.

Source: Based on Carter 2007, quoted in EEA 2012d

To establish a sustainable water resource management system it is important to control the various uses of water through planning and economic instruments, in particular related to irrigation and non-wasteful use of water in industry, commerce and private households. Despite the potential synergies, the RDMP developed has not sufficiently taken this opportunity. In a review of the Baltic Sea countries it could be concluded that spatial planning and water management remained separate in most countries, despite the WFD. The results show that more efforts are needed in this direction (EEA, 2012d).

Type of policy	EU directive
Name	**Groundwater Directive (2006/118/EC)**
Description	The directive is new from 2006, and is a daughter directive to the WFD. The directive establishes measures as defined in WFD in order to prevent and control groundwater pollution. These measures include in particular: ▪ criteria for the assessment of good groundwater chemical status; ▪ criteria for the identification and reversal of significant and sustained upward trends and for the definition of starting points for trend reversals. ▪ Preventing and limiting indirect discharges (after percolation through soil or subsoil) of pollutants into groundwater. The directive also complements the provisions preventing or limiting inputs of pollutants into groundwater already contained in WFD, and aims to prevent the deterioration of the status of all bodies of groundwater. Includes measures to prevent or limit inputs of pollutants into groundwater to be operational so that WFD environmental objectives can be achieved by 2015.
Targets	Compliance with good chemical status criteria (based on EU standards of nitrates and pesticides and on threshold values established by Member States):

	• nitrate levels should be below the limit of 50mg/l • active pesticide ingredients, their metabolites and reaction products should not exceed 0.1 µg/l (a total of 0.5 µg/l for all pesticides measured); • the levels of certain high-risk substances should be below the threshold values set by Member States; including ammonium, arsenic, cadmium, chloride, lead, mercury, sulphate, trichloroethylene and tetrachloroethylene; • the concentration of any other pollutants conforms to the definition of good chemical status as set out in Annex V to the WFD.
Territorial implication	• Strong link to WFD. Measures in the GWD are linked to the RBMP established in the WFD. • Member States required establishing quality standards at the most appropriate level and taking into account local or regional conditions. • MS must identify significant upward trend in levels of pollutants found in bodies of groundwater. Following that, they must establish a monitoring programme.
Characterization of territorial implication	Strong
Indicators	Water quality of ground water
Distance to target (graph)	Not available on European level
Policy effectiveness Characterization	
Potential for green economy development	• Groundwater is used for the abstraction of drinking water, for industry and for agriculture, etc. Polluted groundwater can endanger human health and threaten economic activities; • Contaminated groundwater is harder to clean than surface water and the consequences can last for decades; • Groundwater provides the base flow for many rivers and directly influences the water quality of surface water (it can provide up to 90% of the flow in some watercourses); • it acts as a stock supply through dry periods, and is essential for maintaining wetlands.
Type of policy	EU directive
Name	**Urban Waste Water Directive (UWWD) 91/271/EEC**
Description	• The UWWD has the objective to protect the environment from the adverse effects of urban waste water discharges and discharges from certain industrial sectors (available in Annex III of the Directive) and concerns the collection, treatment and discharge such waste water. Four main principles are laid down in the Directive: Planning, Regulation, Monitoring and Information and reporting.
Targets	• The collection and treatment of waste water in all agglomerations of >2000 population equivalents (p.e.); • Secondary treatment of all discharges from agglomerations of > 2000 p.e., and more advanced treatment for agglomerations >10 000 population equivalents in designated sensitive areas and their catchments.
Territorial implication	• Under the UWWTD the relevant authorities in each MS are required to, bi-annually, report on the disposal of UWW and sludge.
Characterization of territorial implication	Medium
Indicators	Population covered by WWT (at least secondary)
Distance to target (graph)	A few countries have fully implemented the UWWD, including Austria, Germany and the Netherlands. As for the EU-12, implementation of the Directive is subject to transition periods up to 2018. The Directive presents major challenges which relate both to the establishment (or improvement) of waste water collection systems and to the development of the necessary levels of treatment to comply with the Directive. Availability of resources to

cover investments remains a bottleneck for compliance. Therefore, cost-effective innovative technical solutions should be promoted.

The EC has opened many infringements cases and the European Court of Justice has issued a considerable number of judgements against Member States, including failures to determine sensitive areas, treatment of discharges in these areas, failure to provide secondary or equivalent treatments as well as tertiary treatments or collecting systems for urban waste water (IEEP, 2011). The table below illustrate the waste water infrastructure in place in 2007/2008 in EU-15 and EU-12.

In summary, charts 1a (EU-15) and 1b (EU-12) illustrate the waste water infrastructure in place in 2007/2008.

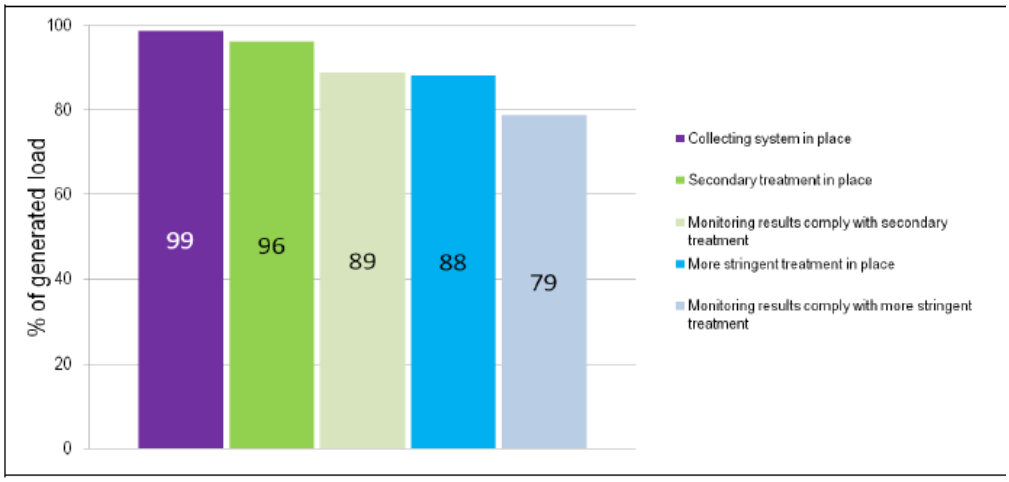


Chart 1a: Average share of generated load collected in collecting systems, treated by secondary treatment and more stringent treatment for EU-15.

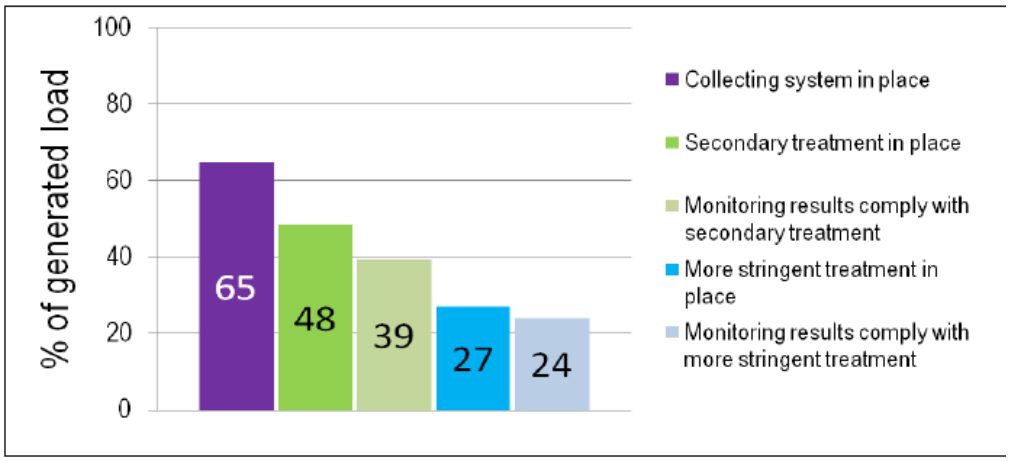


Chart 1b: Average share of generated load collected in collecting systems, treated by secondary treatment and more stringent treatment for EU-12.

Source: (EC, 2011b)

Policy effectiveness Characterization	The Water Policy Fitness Check concluded that wastewater treatment all over Europe has improved during the last 20 years as a result of the UWWD. Efficient
Potential for green economy development	Investment into waste water infrastructure presents an opportunity to create new jobs, especially in new MS which has bigger gaps in implementing the UWWD having transition periods until 2015 and 2018 (Romania). Improved WWT also reduces the cost borne by society due to improved health etc.

The tables below are based on an EC commissioned study on the cost of compliance with the UWWD (2010), with the purpose to see possible financing gaps in MS. The compliance costs

estimates (table 9) do not take the actual state of the infrastructure into account. Such estimation is therefore available in table report from 2010 (see COWI, 2010)

Table 8: Overview of compliance cost estimates - million EUR from 2005/2006 until relevant compliance date (cover only new investments - not reinvestment/renovation of existing infrastructure)

	Article 3 - collection of wastewater in agglomerations above 2000 p.e.	**Article 4** secondary treatment of collected wastewater	**Article 5** stringent treatment for discharge to sensitive water bodies	**Total**
Austria	0	0	0	0
Belgium	223	107	832	1161
Bulgaria	4208	126	791	5125
Cyprus	295	50	18	363
Czech Republic	845	224	435	1524
Denmark	0	0	13	13
Estonia	117	4	58	178
Finland	0	0	243	243
France	0	198	1424	1623
Greece	559	279	12	890
Germany	1	0	4	4
Hungary	0	2	8	10
Ireland	0	53	195	248
Italy	2040	714	650	3404
Latvia	149	26	112	287
Lithuania	0	2	67	69
Luxembourg	0	3	64	67
Malta	0	0	58	58
Netherlands	0	0	0	0
Poland	10126	557	4373	15056
Portugal	291	152	15	458
Romania	7875	1527	1940	11341
Slovakia	442	91	343	876
Slovenia	321	94	13	428
Spain	780	213	494	1488
Sweden	0	0	0	0
United Kingdom	0	50	298	347
Total	**28312**	**4495**	**12445**	**45 262**

Source: (COWI, 2010)

The key uncertainty with regards to the compliance investment costs is the need for renovation/rehabilitation of the entire existing infrastructure. The re-investments could amount to more than the estimated compliance investments but the timing of these investments are not known. As many Member States have only recently completed a lot of the necessary treatment infrastructure, the need for re-investment might be 15 to 20 years ahead. An overview of the estimated re-investment costs for the current situation (2005/2006) and for the future full compliance situation is available in the COWI report on cost of implementing the UWWDT from 2010. The costs are calculated in several hundreds and even thousands EUR for most MS (COWI, 2010).

It is difficult to estimate the available financing and the existing possible gaps that exist. The table below makes an attempt. It can be seen that some countries have indicated that they might face difficulties in financing the needed investments; Bulgaria, Poland and Romania. Other countries such as Italy, Latvia and Greece have expressed uncertainty about future financing. For some Member States (e.g. the Czech Republic) the compliance date is beyond

the period 2007 to 2013 but that does not mean that there will be no investment during that period so allocated EU funds might support achieving a later deadline (COWI, 2010).

Table 9: Indicative financing gaps for 2007 to 2013 and for 2014 until full compliance

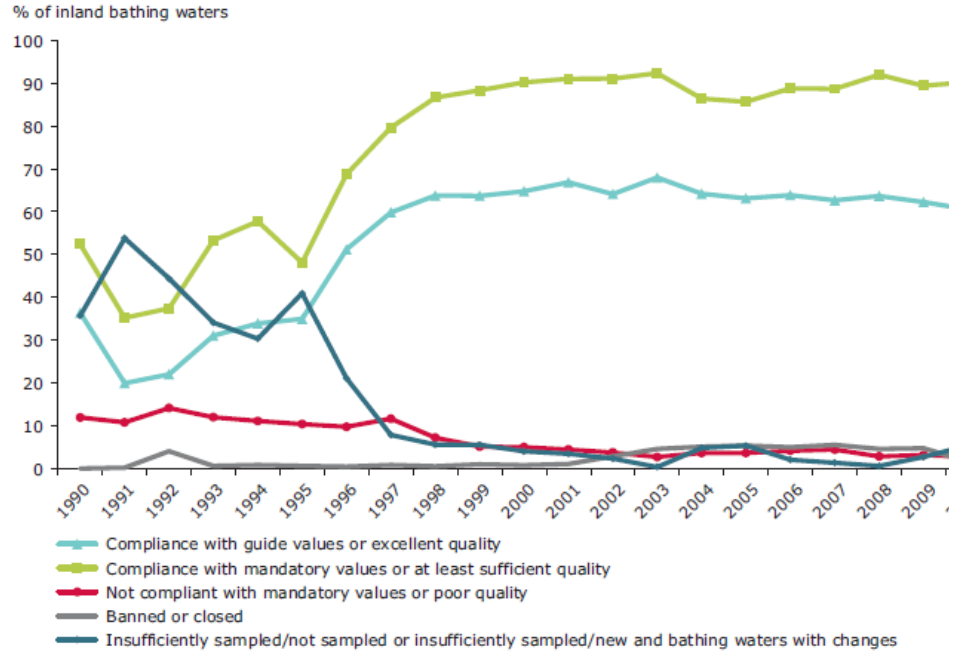
	Compliance costs		Total reported supply of finance (data incomplete)		Financing gap	
	2007-2013	**2014-**	**2007-2013**	**2014-**	**2007-2013**	**2014-**
Belgium	1161	-	2998	452	1836	452
Bulgaria	3105	2020	939	-	-2166	-2020
Czech Republic	1524	-	6077	-	4553	-
Estonia	178	-	745	127	576	127
Ireland	248	-	1092	-	844	-
Cyprus	363	-	1553	40	1169	40
Lithuania	69	-	263	-	193	-
Luxemburg	67	-	797	-	730	-
Hungary	8	2	2291	140	2283	138
Poland	13756	1300	5078	-	-8678	-1300
Portugal	458	-	1474	-	1017	-
Romania	5003	6338	4067	1077	-936	-5261
Slovenia	150	278	517	-	367	-278
Slovakia	789	87	2181	293	1392	206
UK	348	-	3184	746	2836	746
Denmark	13	-	-	-	13	-
Netherlands	0	-	-	-	-	-
Germany	4	-	342	-	338	-
Greece	890	-	1101	-	211	-
France	1623	-	127	-	-1496	-
Italy	3404	-	228	-	-3176	-
Latvia	171	116	1	-	-170	-116
Malta	58	-	43	-	-16	-
Austria	0	-	-	-	-	-
Finland	243	-	-	-	243	-
Sweden	0	-	-	-	-	-
Spain	1484	4	3826	-	2342	-4

Source: (COWI, 2010)

Type of policy	EU directive
Name	**The Drinking Water Directive (DWD) 98/83/EC**
Description	The directive sets quality standards for drinking water quality at the tap and includes the general provision that drinking water must be wholesome and clean. Member States are obliged to regularly monitor drinking water quality and to provide consumers with adequate and up-to-date information on their drinking water quality. MS may exempt water supplies serving less than 50 persons or providing less than 10 m3 of drinking water per day as an average and water in food-processing undertakings where the quality of water cannot affect the wholesomeness of the foodstuff in its finished form.
Targets	To make sure drinking water everywhere in the EU is healthy, clean and tasty, the DWDe sets standards for the most common substances (so-called parameters) that can be found in drinking water. In the DWD a total of 48 microbiological and chemical parameters must be monitored and tested regularly. WHO guidelines for drinking water are used as a basis for the standards in the directive. • 31 December 1998: all agglomerations of more than 10 000 p.e. which discharge their effluent into sensitive areas must have a proper collection and treatment system; • 31 December 2000: all agglomerations of more than 15 000 p.e. which do not discharge their effluent into a sensitive area must have a collection and treatment system which enables them to satisfy the requirements in Table 1 of Annex I; • 31 December 2005: all agglomerations of between 2 000 and 10 000 p.e. which discharge their effluent into sensitive areas, and all

	agglomerations of between 2 000 and 15 000 p.e. which do not discharge into such areas must have a collection and treatment system.
Territorial implication	• MS are required to draw up lists of sensitive and less sensitive areas which receive the treated waters. • MS are responsible for monitoring both discharges from treatment plants and the receiving waters and must ensure that the competent national authorities publish a bi-annual situation report • MS must establish national programmes for the implementation of the directive
Characterization of territorial implication	Medium
Indicators	Drinking water quality
Distance to target (graph)	The quality of drinking water in the EU is relatively high. 10 countries complied with all parameters (microbiological, chemical and indicator). Only few countries reported compliance level below 90 %. (The quality of drinking water in the European Union 2005-2007, Synthesis report on the quality of drinking water in the Member States of the European Union in the period 2005-2007 Directive 98/83/EC, Dec 2011, (KWR)
Policy effectiveness Characterization	Medium
Potential for green economy development	Investment into drinking water infrastructure presents an opportunity to create new jobs, especially in new MS which has bigger gaps in implementing the DWD.

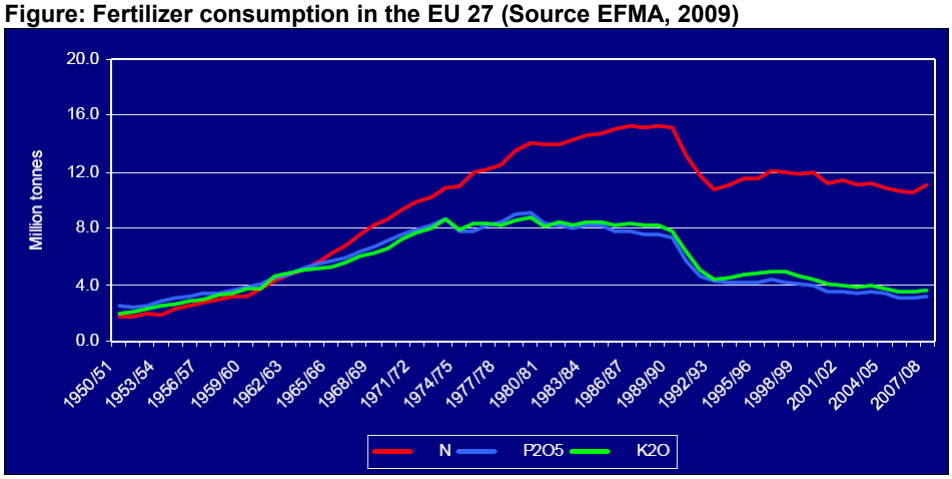
Type of policy	EU directive
Name	**Floods Directive 2007/60/EC**
Description	The Flood Directive is a framework directive a that requires Member States to follow a certain process, namely to assess if all water courses and coast lines are at risk from flooding, to map the flood extent and assets and humans at risk in these areas and to take adequate and coordinated measures to reduce this flood risk. • Undertake a Preliminary Flood Risk Assessment (2011) • Prepare flood hazard and risk maps (2013) • Prepare flood risk management plans (2015)
Targets	The aim of the flood directive is to reduce and manage the risks that floods pose to human health, the environment, cultural heritage and economic activity.
Territorial implication	The EU Floods Directive is closely related to the WFD and which itself has strong synergies with territorial cohesion: • calls for mapping and planning to address flood risks to protect human life, the environment, cultural heritage and economic activities. • MS required to draw up flood risk maps (by 2013) and establish flood risk management plans (by 2015) for the management of flood risks in all waters in their territory. Flood risk assessment is required to be performed on RDB and associated coastal area level. Plans to be periodically reviewed. Coordination expected with RDBP s developed under WFD, including cross-boundary. • Urban floods are explicitly mentioned.
Characterization of territorial implication	Strong
Indicators	Availability of flood risk assessment, risk maps and flood risk management plans.
Distance to target (graph)	A majority of the MS have fulfilled the requirement of the preliminary flood risk assessment. Bulgaria, Greece, France, Malta and Slovenia have only partially fulfilled while Portugal has not submitted the assessment (EU website http://ec.europa.eu/environment/water/flood_risk/timetable.htm).
Policy effectiveness	Strong

Characterization	
Potential for green economy development	• Flood prevention would reduce the large costs of flood events borne by society. Since 1998 at least € 25 billion in insured economic losses. • reduce the impact and occurrence of water–related disasters • With climate change, floods are predicted to further increase and it in necessary to anticipate these changes now and protect society, economy and the environment from the negative effects of floods.
Type of policy	EU directive
Name	**Bathing Water Directive 2006/7/EC**
Description	The BWD applies to surface waters that can be used for bathing except for swimming pools and spa pools, confined waters subject to treatment or used for therapeutic purposes and confined waters artificially separated from surface water and groundwater. The waters are classified according to their level of quality: poor, sufficient, good or excellent, linked to clear numerical quality standards for bacteriological quality. Where water is classified as "poor", Member States should take certain management measures, e.g. banning bathing or posting a notice advising against it, providing information to the public, and suitable corrective measures.
Targets	• MS should achieve the minimum quality standard of "sufficient" bathing waters by 2015.
Territorial implication	• MS carries out sampling by Member States at different intervals for the different polluting substances (according to Annex).
Characterization of territorial implication	Medium
Indicators	Bathing water quality
Distance to target	In 2012, 94 % of bathing waters in the EU met the minimum water quality standards. The proportion of bathing waters with excellent quality increased by 3.5 % compared to 2010, reaching 77.1 %. The share of non-compliant bathing waters was 1.8 %. In 2011, 207 bathing waters were banned or closed (1 %), which is 57 more compared to the 2010 season. As can be seen in the graph bathing water quality in the EU has significantly improved since the 1990's. **Graph: Percentage of inland bathing waters in the EU per compliance category or quality class 1990-2012**  **Source:** WISE bathing water quality database (data from annual reports by EU Member States). (EEA, 2013)
Policy effectiveness Characterizat	Strong

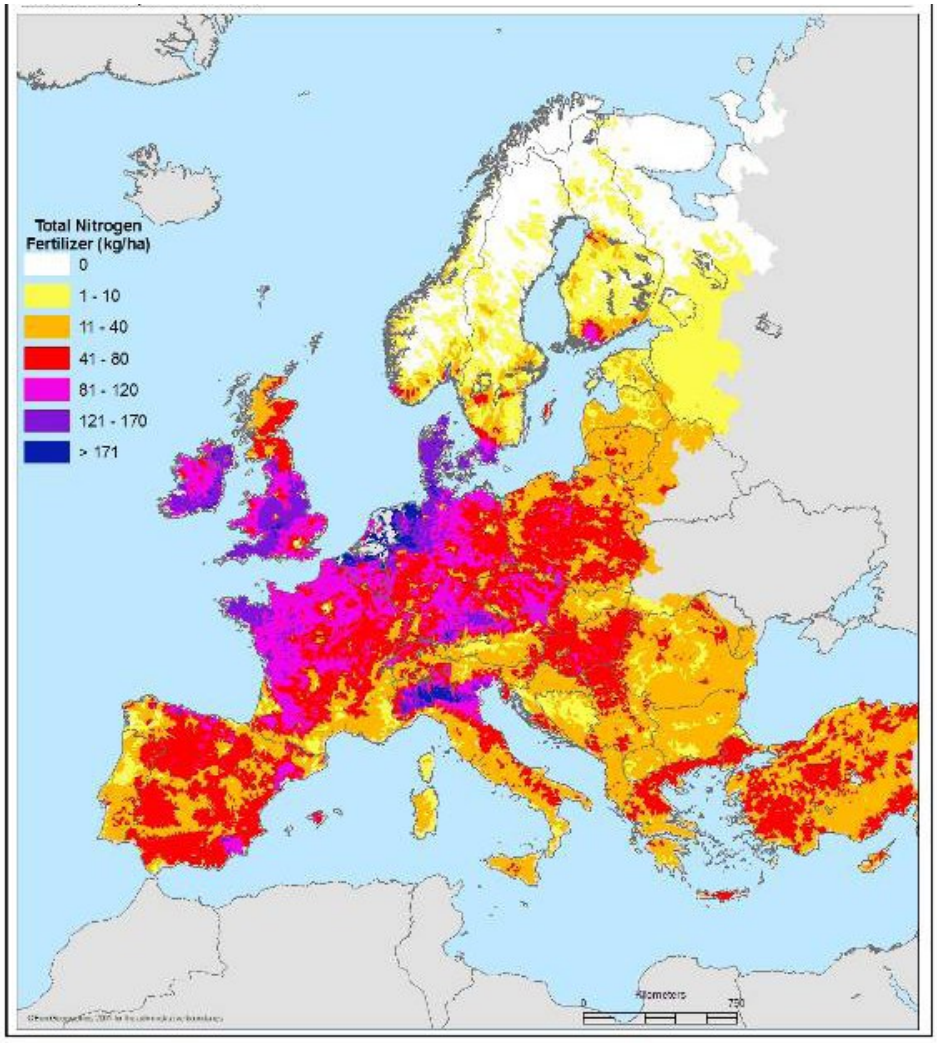
ion	
Potential for green economy development	Clean bathing water is a prerequisite for green tourism development.

Type of policy	EU directive
Name	**Nitrates Directive (91/676/EEC)**
Description	The directive forms an integral part of the WFD and is one of the key instruments in the protection of waters against agricultural pressures. The Nitrates Directive (1991) aims to protect water quality across Europe by preventing nitrates from agricultural sources polluting ground and surface waters and by promoting the use of good farming practices.
Targets	• nitrate levels should be below the limit of 50mg/l • the limit of 170kg nitrogen per hectare per year from livestock manure
Territorial implication	• Directive integral part of the WFD. • MS shall identify vulnerable zones on their territories and draw up an action programme taking into account the environmental conditions in the relevant regions. • MS required to analyse their waters' nitrate concentration levels and trophic state. • MS rewuired to draw up action programmes: there are more than 300 of them across the whole EU. The quality of programmes is improving. Across the 27 EU Member States, 39.6% of territory is subject to the implementation of action programmes
Characterization of territorial implication	Medium to strong
Distance to target (graph)	Latest reporting shows that 15% of groundwater monitoring stations in the EU-27 found nitrate levels above the limit. 66% reported levels below 25 mg/l. According to data on fresh surface water, 21% of monitoring stations in the EU-27 found nitrate concentrations below 2 mg/l, and only 3% reported more than 50 mg/l. At EU-15 level, 70% of sites reported stable or falling levels of nitrates compared to the period 2000-2003 (EU factsheet, Nitrates directive, 2010).

Figure: Fertilizer consumption in the EU 27 (Source EFMA, 2009)



Map: Total Nitrogen Fertiliser for year 2005



Policy effectiveness

Implementation of the Nitrates Directive has been a major challenge for the EU Member States, resulting in a number of infringement actions by the Commission and a considerable number of EC judgements over the years. Nevertheless, progress has been made in reducing water pollution caused/induced by nitrates from agricultural sources. During the last decade, the extent of designation of sensitive areas and the quality of action programmes has improved in several Member States. Additionally, very significant reductions in chemical N and P inputs have taken place across the EU15 since the introduction of the Directive (though 34% of EU15 monitoring stations showed an upward trend in nitrate concentrations in the period 2004-2007) (EC, 2012e).

Characterization Potential for green economy development

- Clean water is vital to human health, ecosystem and the basis for many economic sectors, so the implementation of the directive has significant importance for green economy.
- Agriculture is a major water and soil polluter and more sustainable farming practices would benefit to the economy as a whole as clean water would boost many other sectors.
- Reducing nitrogen consumption would benefit the implementation of other directives such as the WFD and the groundwater directive, for example.
- Potential for technology development and innovation as new farming technologies such as manure processing are growing in popularity and off er new ways to deal with pollution.

3.3 EU Communications with implication on water-related green economy

Type of policy	EU communication
Name	**Blueprint to safeguard Europe's Water Resources** (COM(2012) 673)
Description	The Blueprint is a strategy outlining actions that concentrate on better implementation of current water legislation, integration of water policy objectives into other policies, and filling the gaps in particular as regards water quantity and efficiency. The Blueprint is one of the water milestones on the 2011 Roadmap to a resource efficient Europe. The Blueprint process is a response to the challenges identified in achieving the WFD goals and compromises a review of the water policy processes most important to resource efficiency: the strategy for water scarcity and droughts; the water-related part of Europe's climate change vulnerability and adaptation policy; and the state of play in the implementation of the Water Framework Directive including an assessment of RDBPs delivered by MS. The Blueprint timeframe is 2020 and is syncronised with the Europe 2020 targets, and in particular to the 2011 Resource Efficiency Roadmap, but will also include objectives for 2050. The Blueprint is supported by the Innovation Partnership on Water launched in May 2012. To achieve the already existing WFD objective of good water status by 2015, the Water Blueprint sets out a three-tier strategic approach: • Improving implementation of current EU water policy by making full use of the opportunities provided by the current laws. For example, increasing the take-up of natural water retention measures such as the restoration of wetlands and floodplains or improving implementation of the "polluter pays" principle through metering, water-pricing and better economic analysis. • Increasing the integration of water policy objectives into other relevant policy areas such as agriculture, fisheries, renewable energy, transport and the Cohesion and Structural Funds. • Filling the gaps of the current framework, particularly in relation to the tools needed to increase water efficiency. In this regard, the Water Blueprint envisages water accounts and water efficiency targets to be set by Member States and the development of EU standards for water re-use.
Targets	• No formal targets. The objective is to “ensure that a sufficient quantity of good quality water is available for people's needs, the economy and the environment throughout the EU”.
Territorial implication	• Strong
Characterization of territorial implication	▪ Directly related to the WFD implementation ▪ Strong link to land use planning
Distance to target	-
Policy effectiveness Characterization	Not possible to assess as it was recently published.
Potential for green economy development	The Water Blueprint highlights that preserving water is not only about environmental protection, health and well-being but is also highly significant for economic growth and prosperity. “It is a way of ensuring that the EU water industry develops fully its growth potential and that all the economic sectors that depend on availability of water of a certain quality can prosper thereby creating growth and job opportunities”.

The **Blue growth strategy** (EC COM(2012) 494) aims to support growth in the maritime sector as a whole. Blue growth focuses on existing, emerging and potential activities such as short-sea shipping, coastal tourism, offshore wind energy, desalination and use of marine resources in the pharmaceutical and cosmetics industries. The EU's blue economy represents 5.4 million jobs and a gross added value of just less than 500 billion EUR annually and is identified as a main driver of the economy. The strategy recognizes that sustainable growth in the blue sector is offers new and innovative ways to help steer the EU out of the current economic crisis.

Type of policy	EU communication

Name	**Addressing Water Scarcity and Droughts in the EU**, COM(2007) 414 final
Description	The communication outlines a strategy for water Scarcity and Droughts in the EU and sets a number of policy options for addressing the challenge of water scarcity, two issues that are becoming even more burning in light of climate change: • putting the right price tag on water; • allocating water and water-related funding more efficiently; • improving drought risk management; • considering additional water supply infrastructures; • fostering water efficient technologies and practices; • fostering the emergence of a water-saving culture in Europe; • improving knowledge and data collection
Targets	• No formal targets. Policy options proposed with a view to open up for debate.
Territorial implication	• Strong
Characterization of territorial implication	▪ Directly related to the WFD implementation ▪ Strong link to land use planning
Distance to target	The 2012 review of the implementation of the strategy has showed that the main objective in reverting the trends on droughts and scarcity has not been achieved. The strategy has not been sufficiently integrated into sectoral policies. Limited progress has been achieved on the seven policy instruments identified (EC, 2012b).
Policy effectiveness Characterization	
Potential for green economy development	According to the comm." The challenge of water scarcity and droughts needs to be addressed both as an essential environmental issue and also as a precondition for sustainable economic growth in Europe. As the EU seeks to revitalise and reinvigorate its economy and to continue to lead on tackling climate change, the devising of an effective strategy towards water efficiency can make a substantial contribution". • Water scarcity and droughts have a direct impact on citizens and economic sectors which use and depend on water, such as agriculture, tourism, industry, energy and transport. • Water scarcity and droughts generate significant costs to society.
Type of policy	EU communication
Name	**Flood risk management - Flood prevention, protection and mitigation** COM(2004)472
Description	Present the first resolute action towards flood risk management at EU level. The strategy includes a number of actions including: - flood risk management plans for affected river basins and coastal zones, - flood risk maps showing the areas at risk of flooding. - co-ordination of information exchange, ensuring the contribution of all relevant EU policies; and - increasing public awareness. Additionally, the COM includes guidelines for the development and implementation of flood risk management plans and flood risk maps. The COM proposes that MS and the EC work together to develop and implement a co-ordinated flood prevention, protection and mitigation action programme.
Targets	No formal targets
Territorial implication	• Flood management plans are based on river basins • MS will co-operate and coordinate to develop and implement *flood risk management plans* at river basin level and within coastal areas to prevent problems being passed on from one area to another • The risk of flooding is present in large territories in the EU. Therefore it is imperative that flood protection is dealt with in a concerted and co-ordinated manner along the whole length of the river.
Characterization of territorial implication	Medium to strong
Indicators	

Distance to target (graph)	n/a
Policy effectiveness Characterization	
Potential for green economy development	The potential are similar to the aspects identified for the Floods directive saying that flood prevention would reduce the impact and occurrence of water–related disasters and would reduce the large costs resulting from flood events borne by society.

4. General factors – drivers and barriers of policy implementation

Policy can be singled out as being the most important driver for a green economy in the water sector. However, a range of policy instruments can be used to foster a green economy relevant to water management, as presented in the table below. It is not possible to single out a certain mechanism that has the greatest potential to drive the development of green economy as the efficiency is dependent on the regional circumstances and the specific needs. Often a combination of different instruments are applied for instance for the provision of financing new infrastructure.

Table 10: Selected policy instruments applicable to water management

Regulatory approaches (Command and control)	**Economic instruments**	**Information and other instruments**
Norms and standards for water quality	Charges (e.g. abstraction, pollution)	Metering of water use
Environmental Impact Assessment	User tariffs (e.g for water services)	Eco-labelling and certification (e.g. for agriculture, household equipments)
	Payment for watershed services (e.g. for protection for catchment upstream)	
	Taxes	
Performance based standards	Reform of EHS (e.g. production linked agricultural support, energy subsidies for pumping water)	Voluntary agreements between business and government for water efficiency
Restrictions or bans on activities which have impact on water resources	Subsidies (e.g. for public investment in infrastructure, social pricing of water)	Education, awareness raising and training
Abstraction and discharge permits	Tradable water rights and quotas	Stakeholder initiatives and cooperative arrangements seeking to improve water systems (e.g. between farmers and public utilities.
Water rights		
Land use regulations and zoning (e.g. buffer zone requirements for pesticides application)	Insurance schemes	Planning tools, (e.g.IRBMP)
		Cost-benefit analyses of water management policies

Source: (OECD, 2011a)

The below sections present the key factors that are influencing the green economy development in the water sector.

4.1. Economic Instruments

In general it can be said that tariffs, taxes and subsidies are used to influence influencing consumer's and producer's behaviour. Tradable permit schemes and compensation schemes are instead creating new markets for water activities.

Factor	*Economic drivers and barriers*
Description	Economic instruments such as tariffs, taxes and subsidies are used to influence consumer's and producer's behaviour. They address environmental externalities and market failures and can thus contribute to green economy development. They can also create dynamic incentives for continuing to improve efficiency and pollution abatement via innovation and industrial restructuring. Water pricing can be a very powerful instrument in pursuing the different water policy objectives.

Table: Marked based instruments for water

Type	Description	Examples
Tariffs or charges	Can include several types of charges. Water charges - Cover costs of providing environmental services and abatement. Compromises the costs for water utilities to process the water; collecting, storing, treating, supplying, Water pollution levies that encourages reduced pollution and applying the PPP. Revenue generated to compensate damage.	In several MS water-tariffs have been introduced recently (AT, BG, BE, EE, ES, NL, SE, UK) or are under development (CY, CZ, IE, RO, SK) in order to ensure cost recovery for water services. The Dutch water pollution charge gives a good example of an incentive of an economic instrument in environmental policy that led to that industry started to reduce polluting discharges to water, both by means of pollution prevention and by investing in their own wastewater treatment.
Taxes	Aims to alter the behaviour of consumers and producers and is raising revenue to finance investments to water infrastructure. Required payment to general governments.	Traditionally, national budgets have to a large extent financed water management and water abstraction taxes can be found in several MS. For instance, Germany, have introduced effluent taxes to internalise the externalised costs of discharging polluted water, Denmark and the Netherlands are other examples.
Subsidies	Payments from governments to producers to influence their behaviour. Examples are to stimulate development of new technology, create new markets, and encourage consumer choices. It can also have cause negative effects by Environmental Harmful Subsidies (EHS).	EHS – Spain's irrigation subsidies enables farmers to continue with in efficient irrigation methods Water stewardship Programme, initiated by European Water Partnership introduces management standards for industry.
Tradable permits schemes	Limits the possibilities to resource use and to pollute. Market mechanism to reward users that reduce or cease a water-affecting activity	Wetland banking schemes developed in the USA, requires a user that wants to drain one wetland to restore or protect another. (OECD, GE)

Source, Adapted from (EEA, 2012a) and (EU Water Initiative, 2012)

Water policymakers often apply water pricing for its revenue effects. The revenue raised by water pricing instruments can then be used to fund the variety of water resource management functions needed to achieve the water policy objectives. In some countries they are the main source of revenue for the water sector – over 90% for countries like France and the Netherlands. It is difficult to find complete and consistent data on supply of finance for an area such as wastewater collection and treatment. At national level the use of national budgets (BG, FR, EE, ES, LU, MT, PT, SK), EU funds (CY, CZ, HU, MT, SK) and private funds (IT, PT) were reported to be used to finance better water management and to improve water efficiency (EC, 2011c). In many Member States, wastewater investments are financed through user charges which are either relatively independent utilities or under municipal ownership (EC, 2011a).

Water pricing

Historically, the price of water in Europe has rarely reflected its true value. Water tariffs set

	below the cost-recovery level face the risk of not being sufficient to fund infrastructure replacements and reduce leakages and thus not achieving green economy objectives. The 'polluter pays principle' requires that the polluter should bear the cost of reducing environmental impact from economic activity. Often it has been the citizens that have stood for the costs of treating water polluted by industries, though its tax payments (EEA, 2012a). Better water pricing to ensure a sustainable use of water is a key provision of the WFD and is stipulated in Article 9 through the concepts of cost-recovery; polluter pays principle and incentive pricing. The WFD requires Member States to take account of cost recovery of water services (including environmental and resource costs) from users including farmers, industry and ordinary household consumers, based on the polluter-pays principle. ***Current barriers*:** The price of water is in general to low, if viewed upon having the ambition to achieve cost-recovery of WWS investments. Low water tariffs leaves limited possibilities of funding further developing the water sector as described above. The low price of water is also problematic in the sense that it does not create an incentive for water savings for consumers and industries. **Water metering** is a key condition for proper pricing, forming an important part of the tariff setting. Metering increases the transparency of price setting and provides, communication and control mechanisms for the users. The metering of water consumption was reported being extended in most Member States (EC, 2011c) however it is still insufficient despite the fact that this is a necessary pre-condition for the implementation of incentive pricing policies (EC, 2012c). Water metering is also an important tool for raising awareness about water use. The Impact assessment undertaken in the Blueprint process states that a key problem to achieving sustainable growth in the water sector is the insufficient use of economic instruments to address market failures that prevent the implementation measures including the current pricing schemes across Europe that often fail to combine the objectives of efficiency and fairness and do not allow a sustainable degree of cost recovery for the financing of the greening the sector. An assessment of the WFD RBMPs reveals a poor quality of the assessments of costs and benefits and that incentive and transparent water pricing is not applied across all Member States and water-using sectors, also due to the lack of metering. Only 49 % of RBMPs plan to change the water pricing system to foster a more efficient use of water and only 40 % include measures to improve water metering (EC, 2012a). There are very few Member States that have implemented a transparent recovery of environmental and resource costs. Cost recovery is implemented, to a greater or lesser extent, in households and industry. For agriculture, in many areas, water is charged only to a limited extent.
Specificity for the green economy	Economic instruments are major drivers of greening the water sector. To move towards a green economy usually includes a commitment to charge for the full cost of resource use. Pricing can also be an effective awareness-raising tool for consumers and combines environmental with economic benefits, while stimulating innovation.
Probable impact on the green economy spheres	**Economic: impact depends on levels (+/-)** They might have positive as well as negative impact and this is closely dependent on their levels. **Environmental: impact (+)** Water pricing is a mechanisms that can be used which signal scarcity as well as it creates incentives for water efficiency across sectors; agriculture, industry, public supply, etc.. Positive environmental will be achieved if economic instruments reduced the water consumption and waste water discharges across sectors leading to less water and water stress and pollution on water bodies. **Social: depends on level** Water pricing should take into account the social aspect of water and that it is a basic human need. The share of the dispensable income that is used to pay the water bill is very different across Europe. The highest, relative price as compared to income is found in Hungary with 4.6 %. Spain and Romania is at the other end of the scale with app 1.4 % and 1.5% respectively (DANVA, 2012). **Territorial: varies** Water pricing instruments are applied at different levels (national, regional, municipal, river basin) and by many different agencies. The level of water charges are in many MS set on municipal level.
Trade-offs: mixed +/-	The use of water pricing involves considering impact of the trade-offs between different water policy objectives. For example, water can be allocated to productive uses or to ecological

impacts on green economic spheres?	flows. In this case, water pricing may help to ease the trade-off by reducing the demand of water for productive uses. In the area of Water Supply and Sanitation (WSS) services, water pricing is at the heart of a trade-off between financial sustainability of service providers on one side and economic efficiency and environmental protection on the other side (EU Water Initiative, 2012).
Externalities: impact on other sectors / case studies	Water efficiency gains can also be realised across all sectors using water pricing. Agriculture is a large water consumer. Historically, the water charges imposed on the agricultural sector have rarely reflected water scarcity or other environmental and resource costs, which is a result of CAP policy among others. A key challenge lies in establishing water pricing in agriculture that minimises impacts on farm income but incentivises water conservation and recovers a larger share of costs, including those related to environmental degradation. The process needs to reflect local and regional circumstances and incorporate broad stakeholder consultation to help establish prices that are socially and politically acceptable. Appropriate pricing levels and tariff structures should encourage industries that send high concentration wastewater to a municipal plant for treatment to undertake greater on-site treatment, including recycling and reusing water and chemicals. (EEA, 2012f)
Interactions with other factors	
Causal level of operation (proximate/direct versus underlying/indirect factors)	Indirect factor
Spatial level of operation (internal versus external factors)	
Type of market force involved	Economic instruments determine behaviour of market players in the framework of water management systems. Incentive pricing involves price-setting that gives incentives for users to use water resources efficiently.
Policy recommendations: making the link between policy and non-policy factors	Adoption of new policies should be accompanied with carefully designed economic instruments. As stipulated in the WFD, the water price should be set to first reflect the environmental externalities from water use and secondly to achieve full cost recovery which is necessary to maintain infrastructure and cover future investments. It is necessary to improvement the assessment of cost and benefits of sustainable water management (including environmental and resource costs) and benefits (including ecosystem services).
Possibile indicators	• Water price levels

Factor	***Market based drivers and barriers***
Description	Water allocation, such as water accounts, tradable permit schemes and compensation schemes are instead new markets for water activities. **Water accounting** is a method of providing decision-makers with suitable indicators for estimating the economic value and allows informed prioritisation of water allocation. Water accounts include indicators on e.g. water availability, use and productivity and water associated expenditures and benefits. Such indicators can be expressed in physical units or as monetary values. Water accounting can fill a similar function of e.g. carbon intensity of GDP. According to the Third Follow up Report to the Communication on water scarcity and droughts in the European Union COM (2007) 414 final, the use of an authorization procedure for water abstraction is widespread in the EU, and some Member States (MT, IE) are improving their

	current procedures in order to comply with the WFD. In the EU and in Switzerland restrictions in water use are applied in order to preserve aquatic life and ecological status of water bodies (AT, CY, CZ, ES, FR, HU, IT, NL, PT, RO, SK, SE, UK) although these have not yet been fully implemented everywhere (BE, BG, EE, IE, LU, MT) (EC, 2011a). Current water account systems in Europe are compiled largely on a country-wide basis and presented yearly (EEA, 2012f). The UN's System of Environmental–Economic Accounting for Water (SEEA-W) could serve as a central framework for arranging data from different data sources (such as hydrological services and statistical agencies) and generating a comprehensive picture of the natural hydrological cycle and its links to the economy. A different model is Water Footprint Assessment. **Water trading** - Payments for water-related tradable rights do not generate major financial resources to undertake WRM functions, but on certain contexts they can be useful instruments to ensure that water and water-related ecosystems are better managed. There are three basic types of water-related tradable rights: tradable water abstraction rights, tradable water pollution rights and wetland development rights. Water abstraction rights allow the owner of an abstraction right to trade it in exchange of money. In Europe, Spain is the only country where, since 1999, trading water use rights has been possible. Since 2005, water markets emerged with a diversity of informal and formal trading mechanisms. During the 2005-2008 drought in Spain, water market exchanges alleviated the conditions of those basins where water scarcity was most severe (EC, 2012b).
Specificity for the green economy	Marked based instruments act a driver towards greening the water sector. Water allocation mechanisms, such as water rights, can be used to allocate water where it is most needed (OECD, 2012). Especially in water scare areas, water allocation between productive sectors and the needs of aquatic ecosystems becomes a central issue for the overall green economic development of a given territory or country.
Probable impact on the green economy spheres	**Economic: positive (+)** Might have positive as well as negative impact and this is closely dependent on their levels. Water can be allocated where the economic gains can be most efficiently achieved. Water trading can generate revenue to finance water-saving measures **Environmental: impact (+)** Water allocation can ease pressure on certain stressed areas as seen in the example of Spain above. It also provides and incentive for water efficiency and savings. **Social: depends on level** **Territorial: varies**
Trade-offs: mixed +/- impacts on green economic spheres?	Marked based instruments such as water markets (e.g. water trading) is efficient in allocating the water to optimise production and economic gain but it also as several limitations. The difficulties of market oriented water mechanisms result from water's fundamental importance in sustaining biological, social and economic systems. To merely allocate water to the highest bidder is potentially deeply problematic if humans or ecosystems are unable to meet their basic needs. Water character as a public good (and in some cases private good or common good), further complicates market orientation (EEA, 2012a, p. 29).
Externalities: impact on other sectors / case studies	
Interactions with other factors	
Causal level of operation (proximate/direct versus underlying/indirect factors)	Indirect factor
Spatial level of operation (internal versus external	

factors)	
Type of market force involved	Influences the behaviour of market players in the framework of water management systems. Provides incentives for water savings and investments into water efficient technology.
Policy recommendations: making the link between policy and non-policy factors	The report concludes that there is an absolute need to asses water-resource use and management against ecosystem resilience and the limits of sustainability when developing policy options in order to balance the competing needs of water users. Water accounts could provide a way to allow an informed priotitisation process of water investments towards a green economy. Indicators on e.g. water availability, use and productivity and water associated expenditures and benefits could be used in addition to national accounts such as GDP, to give a more holistic view on a country or a regions performance.
Possibile indicators	•

4.2. Innovation and water technology development as a driver to green growth

Factor	***Innovation - drivers and barriers***
Description	Innovation and new technology development is a key driver for meeting the challenge of sustainable development of the water sector. Innovation could increase efficiency throughout the water management cycle, reducing leakage and consumption supporting green growth. EC has a role here to support innovation. Innovation is already a key driver of increased energy; carbon, water and material efficiency; and the improved performance of goods and services. *Innovation is a driver of multi factor productivity change through new products, entrepreneurship and business models, and new consumption patterns.* In this context, the term 'water technologies' is taken in its broadest meaning. Water saving techniques, prevention and reuse approaches, clean processes, end-of-pipe treatments, system design, IT-tools for management, monitoring and control systems, flood forecasting techniques, ecological engineering, appropriate technologies, desalination, etc. should all be embraced. And they should also carry with them the framework conditions – institutional settings and governance – to be effectively deployed. With a large part of Europe's water infrastructure being up for renewal it is vital to use this opportunity for technological improvements instead of sustaining inefficient solutions. The production of these technologies is also considered as a part of the water management related economy. It is also important to stress that the uptake of existing BAT and technology transfer also drives the green economy development. Water saving measures and leakage reduction in water supply systems have big potential to improve the efficiency in public water supply systems. As much as 50 % of water abstracted is lost along the distribution system in some parts of Europe, although large differences exist across regions in Europe. It is illustrative that only 20 % of water used by the sectors receiving a public water supply is actually consumed. The remaining is returned to the environment, primarily as treated wastewater (EEA, 2012d). In a Europe where water resources are overexploited in many areas efficiency measures of water use offer an important tool that enables society to maximise its earnings from scarce water resources
Specificity for the green economy	Technology development and eco-innovation in the water sector is an important driver for green growth.
Provable impact on the green economy spheres	**Economic: positive impact (+)** Innovation and technology development brings positive economic effects. Export of water technology is an important factor for green growth in several European countries and regions, especially in the Nordic Countries and in e.g. Austria, Germany and the Netherlands. It has large potentials of creating jobs

	and providing value added to the economy as a whole. **Environmental: positive impact (+)** Production and manufacturing of technical components and infrastructure a toll on the environment and modifies the landscape. However, once it is in place water management becomes more efficient and less polluting and is bringing positive long-term effects on the environment. **Social: positive (+)** Possibility of job creation and employment opportunities. **Territorial: positive (+)** The construction of any of the above mentioned facilities necessarily has territiorial argumentation and territorial meaning. The available capacities make certain territorial sense and in the planning phase waste generation within a certain territory (big city or region) is taken into consideration.
Trade-offs: mixed +/- impacts on green economic spheres?	Technology lock-in.
Externalities: impact on other sectors / case studies	Water, being a horizontal sector, influences all economic sectors studied within GREECO. Technology development would improve water performance and "greening" across sectors. A better water infrastructure would improve water management in industry, building, agriculture and tourism. It will decrease the environmental pressures of the sectors and it could also create new dynamics within the sectors.
Interactions with other factors	Available innovation capacity is closely interlinked with the policy and economic factors (such as expenditure on R&D. Its functioning is closely dependent on the administrative capacity within the region/municipality.
Causal level of operation (proximate/direct versus underlying/indirect factors)	
Spatial level of operation (internal versus external factors)	Innovation is in general connected to the availability of public investment in research and development. But also regional enabling conditions is influencing such as the availability of regional clusters etc.
Type of market force involved	The involvement of the private sector depends on the profit opportunities. Profit opportunities depends on the cost of the service in terms of gate fees which might be market or administratively driven.
Policy recommendations: making the link between policy and non-policy factors	Strengthening the water technology development and innovation has potential to support green growth in the water sector through developing water effieicent technology and water treatment methods at the same time it is providing GVA and jobs.
Possibile indicators	• Number of patents (per capita) in the water sector • Share of water technologies in total export • Public investments in water supply and waste water

4.3 Administrative drivers and barriers

Factor	***Administrative drivers and barriers***
Description	Functioning governance and institutional capacity are key to realizing green growth in the water sector. Administrative competence and capacity includes: - availability of sufficient number of competent staff; - cooperation of implementation between different bodies; - training on new regulation. **Gaps in governance structures and capacity** The governance systems and the support, or lack of, from governments and responsible authorities is an enabling condition in realizing the potentials of

	greening the water infrastructure. Lack of institutional capacity is a common obstacle to planning and implementing key water infrastructure. The cross-sectoral significance of water can be a hindering factor towards an inclusive green growth. The often wide distribution of responsibilities of issues related to water can lead to fragmentation resulting in gap in funding, institutional framework and policy coherence. Responsibilities can easily fall between the chairs. Shaping governance to achieve efficient and equitable allocation of water requires an effective stakeholder dialogue within a catchment and at other relevant scales, which can help foster cross-sectoral integration and Exchange" (UNEP, 2012). Regions are particularly important drivers in the green economy development as much of the water policy is designed and governed on local level. **Enforcement measures:** the monitoring, penalty imposition and prosecution of infractions contribute significantly to better policy implementation. **Non-legally binding drivers** • Voluntary instruments: EMS and EMAS, business projects that include environmental improvements, consumer information and education, eco-labels, green or full-cost accounting (Huhtinen, 2009) • Corporate Social Responsibility – water aspects
Specificity for the green economy	Administrative capacity is key for good water management as the water management systems need to be created and later managed. The level of implementation of policy depends on the size and quality of the administration. Long-term solutions such as the establishment of reliable, stable governance arrangementsnts for the supply of water are central to a green economy. By building functioning administrative set-ups on all relevant governance levels there are more opportunities to speed up the green economy transition (UNEP, 2011).
Probable impact on the green economy spheres	**Economic: positive impact (+)** Properly managed water management system unlocks market interactions. **Environmental: positive impact (+)** The administration is in the capacity to design such policies and economic instruments which drive water management to less environmentally harmul treatment methods. **Social: positive (+)** **Territorial: positive (+)** Competent administration brings numerous benefits to the territory under its jurisdiction.
Trade-offs: mixed +/- impacts on green economic spheres?	-
Externalities: impact on other sectors / case studies	Close link to the technical infrastructure but also regional/local policy making
Interactions with other factors	Enforcement and compliance goes hand in hand with regulatory drivers. If the enforcement is weak the effectiveness of policy drivers is also weak. There is a need to integrate water policy with other sectors and not develop it in isolation (UNEP, 2012) For instance, urban policies will be important for developing water efficient buildings and distribution systems and rural policies will be important e.g. in managing the water resources and maintaining resilient water bodies. Issues of multi-level governance are at the heart of the search for environmentally sustainable models of growth (OECD, 2011a).
Causal level of operation (proximate/direct versus	Indirect

underlying/indirect factors)	
Spatial level of operation (internal versus external factors)	The response to water-governance challenges relies on place-based approaches that take into account territorial specificities and local concerns and where cities and regions should get bigger responsibility in developing a sustainable and "adaptive" water policy in the context of fiscal consolidation, social, technological and environmental transformation, in response to climate change, demographic and urbanisation pressures.
Type of market force involved	-
Policy recommendations: making the link between policy and non-policy factors	Improved communication between the water sector and other sectors will be important in efforts to balance the water use of competing economic sectors (agriculture, industry, utilities, etc.).
Possible indicators	• Number of staff responsible for water management on local level; • Number of staff responsible for water management on municipal level; • Number of infringement procedures (measuring the enforcement capacity)

4.4. Knowledge drivers and barriers

Factor	***Knowledge drivers and barriers***
Description	Education and awareness of sustainable water management practices is an enabling condition for green growth in the water sector. In order to foster a water saving culture in Europe needs to involve all sectors of the economy. If a sense of responsibility of members in a community is established the chance the concern for sustainability of the water management increases significantly (UNEP, 2011). **Awareness raising**: important among general public and public authorities for policy implementation on local level **Voluntary agreements** Voluntary agreements for business or private sector, such as certification and labelling schemes enable consumers to express their environmental and social values through their purchasing decisions, making the production and supply chain values of the product more transparent. The European Water Stewardship scheme defines sustainable water management principles and criteria and addresses operational evaluation of sustainable water management, including issues such as impacts on local river basins, integrated response solutions and risk management. Criteria for certification are closely linked with the main WFD requirements and the EWS can therefore be a useful tool to organize water management at RB level (EC, 2012b). Labelling products based on their water efficiency can be an effective way of reaching consumers as well as water efficiency standards for e.g. new buildings. The European Water Label is a voluntary labeling scheme for the reduction of water consumption in sanitary tap ware, initiated to improve the water consumption and performance of taps, valves and shower heads. **Gaps of knowledge about state-of-implementation:** lack of reliable data on water consumption. New tools: waste management plans and waste prevention systems; Inspections need to target implementation deficits and training should focus on problematic areas. **Cooperation and stakeholder involvement.** Cooperation between bodies is a key driver; multiple stakeholders involved and therefore knowledge sharing is key.

	Educational tools Better water management is also about change of mindsets of different stakeholders. It starts with the design of the product and its composition as well as the organisation of industrial processes. Consumers of key sectors (industries, agriculture, public sector as well as households) are a main target for awareness as they are an indispensable part of any water management system through their efforts for sensible consumption.
Specificity for the green economy	Improved knowledge is necessary to change the behaviour of consumers (especially among industries and agriculture) to move a more sustainable water management based on water efficiency.
Probable impact on the green economy spheres	**Economic: positive impact (+)** Water savings could be achieved by raising awareness among key consumers. That would allow water saved to be returned to ecosystems providing services which have positive impact on the economy as a whole. Water savings in one sector would also make water available for use in different sector. **Environmental: positive impact (+)** Better knowledge and awareness will has a positive impact on the environment as water consumption and following water discharged could be reduced being the main causes for water scarcity and a source of pollution. **Social: positive (+)** **Territorial: neutral**
Trade-offs: mixed +/- impacts on green economic spheres?	Schemes that focus on water consumption can be problematic, however, if they inadvertently cause other aspects of production, such as the wider environmental, social or economic burden, to increase
Externalities: impact on other sectors / case studies	Better knowledge of water management will benefit agriculture, construction and industry dramatically. There is a potential for complete change of paradigms in these sectors due to better and innovative water management techniques and interactions.
Interactions with other factors	Strong administration and NGOs sector are mainly responsible for improving the awareness of citizens and business operators. Policy and economic drivers may urge citizens to become better educated in waste management in order to save costs and avoid fines.
Causal level of operation (proximate/direct versus underlying/indirect factors)	
Spatial level of operation (internal versus external factors)	-
Type of market force involved	**-**
Policy recommendations: making the link between policy and non-policy factors	Policy implementation is closely dependent on business and citizen awareness therefore it should not be underestimated. New policies should be accompanies by capacity building.
Possible indicators	•

4.5. External factors as drivers and barriers

External factors that are not modifiable and have a big impact on the water sector include

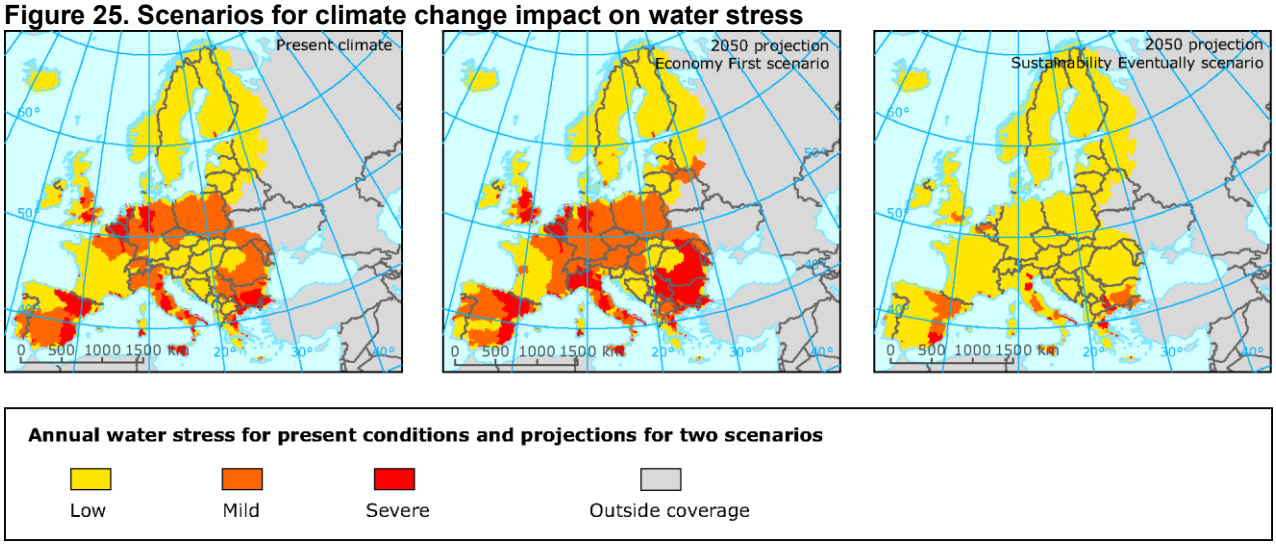
- Socio economic changes
- Land use changes
- Demography changes
- Climate change

Water demand is heavily sensitive to **socio-economic changes** and is therefore a crucial driver in the transition towards green growth. Economic downturn reduces water use as economic activity is reduced, which has been seen in Europe following the economic crisis, starting in 2008. Other key factors that influence the public water demand include **change in demography**, population densities and household size, income and consumer behaviour.

From a territorial perspective, **land-use planning** as well as urban-planning is being one of the main drivers of water use. Most European countries expect a continuation of current land use trends: agricultural intensification and abandonment, and natural afforestation (EEA, 2010d). Both water shortages and floods are phenomenon that can be said to represent structural problems resulting from inadequate spatial development (EEA, 2012d). Integration of water management measures into the of land and settlement development are crucial in establishing sustainable and efficient use of water. Integrated spatial planning can thus drive the green growth development integrating sustainable water management with differing hydrological, political and territorial significance. Long-term urban planning is an important driver in maintaining and upgrading water and waste water infrastructure to reduce e.g. leakage, as it provides an opportunity to integrate such efforts into other projects such as transport, gas and heating investments (EEA, 2012c). One instrument than can be used is SEA in planning, which is an environmental planning tool for improving decision making at the strategic level of policies, legislation, strategies, plans and programmes. It can be used to ensure that spatial plans address water goals, and that RBMPs incorporate environmental goals in spatial plans. A pragmatic shift is required in order to change policymaking patterns and to move forward effective land use planning at the appropriate levels (EEA, 2012d).

Europe's water resources will face additional pressures caused by the **impacts of climate change** across the EU territory which could be defined as a relevant factor for greening the sector. According to the IPPC "*Water and its availability and quality will be the main pressures on, and issues for, societies and the environment under climate change*" (IPCC Technical paper Climate Change and water, June 2008). Climate change has a more indirect effect on water quantity than land use change or increased abstraction but will put additional stress on the areas with already vulnerable water resources, especially in water scarce regions or regions with high occurrence of floods. Climate change will affect not only water supply but also water demand. Water demand for irrigation is projected to increase in many regions.

Figure 25. Scenarios for climate change impact on water stress



Source: EEA, Climate change impacts in Europe 2020.

The current socio-economic stress on Europe's water resources that are caused by demographic changes, population growth, increased consumption, and land use leading to water scarcity in certain regions and cities will be further exacerbated by climate change. Climate change will also affect the functioning of current water infrastructure such as hydropower plants, irrigation systems as well as water management practices having an impact on the green economy. Current estimations expect a change of precipitation patterns in Europe which will lead to drier summers in the Mediterranean area and wetter winter in

Northern Europe. Extreme weather events are also projected to increase, such as floods and droughts. (IPPC water report and EEA, climate change adaptation in Urban areas). There are also indications that the demand for public water supply will increase. Climate change is therefore a key driver for greening the water sector and applying means of water efficiency and sustainable water management. Limited water resources hinder green economic development and can also be an obstacle to green growth. On the other hand, it also implies an inherent potential as water stress forces deliberate development decisions in terms of water efficiency, balanced water allocation and innovation. According to the EEA, the effects of Climate change was not sufficiently included in the RBMPs prepared in 2009, which is planned to be strengthen in the next rounds of RBMPs to be published in 2015.

5. Way Ahead - Regional Opportunities for developing green economy in the water sector

Investment in water supply and waste water infrastructure
Investment into water infrastructure can provide significant returns both for the economy and the environment. Reliable access to clean water is essential to green growth. Improved drinking water service and waste water treatment and the related water infrastructure can significantly reduce the costs on society and at the same time contribute to the achievement of objectives in the Europe 2020 strategy of creating new jobs and stimulating growth. This is especially relevant in areas where lack of water and sanitation causes large costs of health and loss of economic opportunities. For the NMS, the transition period for the UWWD until 2015 (most new MS) and 2018 (Romania) and there are still large gaps to live up to the EU acquis. The potential for growth and jobs in regions in the NMS are therefore significant. It should however be mentioned in this context that there is an enormous gap between available funding and the need for investments into water infrastructure. This is especially relevant in Eastern Europe where the Cohesion Policy funds only partially cover the needed investments and the national budgets can not bridge the gap. Given the significance of water in various economic sectors, to speed up investments in water infrastructure and water management can therefore be expected to accelerate a transition to a green economy.

Investing in water storage and distribution system is especially important in water scarce regions. It needs to be taken into account that large infrastructure projects (such as e.g. dams) can damage water ecosystems areas. Soft infrastructure such as (wetlands, flood plains, ground water recharge) is in general more ecologically sensitive and cost-efficient.

A number of benefits of can be linked to the different steps in carrying out investment into water and wastewater infrastructure. The table below gives an overview of the different activities and the types of benefits to society, environment and economy.

Table 11: Potential benefits along the WSS value chain

Type of investment	Types of benefits
Providing access to safe water and sanitation	
Access to safe water near/in the home Build water access points Build and extend networks (water and sewers) Build and operate water treatment plants Provide point-of-use water treatment methods **Access to sanitation and hygiene** Build sanitation and hygiene facilities Promote adoption of hygienic practices **Wastewater collection and transport** Collect wastewater via sewerage networks Collect and transport pit sludge outside the home	**Health benefits** Reduced incidence of diseases, especially waterborne and water-washed diseases **Economic benefits** Time saved for productive activities Increase in productivity Reduced coping costs Use of urine and faeces as economic input Impact on tourism from improved amenity **Other benefits** Increase in cleanliness, dignity and pride Increased school attendance (especially for girls)
Investing downstream in wastewater treatment for safe disposal and reuse	

Wastewater treatment Build and operate wastewater treatment plants Rely on natural treatment processes Safe disposal of residual sludge	**Health benefits** Additional health benefits, such as those from improved quality of recreational waters **Environmental benefits** Reduced eutrophication **Economic benefits** Reduced pre-treatment costs downstream (for drinking water and industrial purposes) Protection of commercial fish stocks and aquaculture Enhanced tourism activities Increased water supply for irrigation Saving of fertilisers through use of sludge **Other benefits** Improved amenity Increased property values
Investing upstream in managing the supply/demand balance sustainably	
Protecting water resources Establish catchment protection zones Establish voluntary agreements Establish regulations **Augmenting and ensuring supply** Build storage capacity Build abstraction capacity Develop alternative sources, such as aquifer recharge, desalination, re-use of treated effluent Adopt drought and flood management plans **Managing demand** Reduce leakage (on the network and within customers' premises) Introduce incentive pricing Install water saving devices Raise awareness, educate the public	**Environmental benefits** Reduced pressure on available resources and improved river flows Economic impact on use of water for economic activities (agriculture, hydropower) **Economic benefits** Reduced in-water pre-treatment costs Uninterrupted supply for production processes Reduced coping costs from unreliable water supplies Downsizing of facilities Reduced need for desalination **Other benefits** Increased quality of life due to reliable water supply Indirect benefits: recreational activities on dams or reservoirs

Source: (OECD, 2011b, pp. 32–33)

Water pricing as a mean to illustrate scarcity and manage demand

In a green economy, the role of water in preserving biodiversity and ecosystem services need to be recognised, valued and paid for. Today, water prices do not normally reflect the true value of water. Moving towards a green economy generally involves a commitment charge for the full costs of resource use. This however, is also involving a moral aspect as access to clean water and adequate sanitation services is a human right (UNEP, 2011). Water pricing, based on the true value of water, has the potential to generate incentives to improve the efficiency of the use of water resources. It can also generate revenue to finance investments into sustainable water management. It should however be noted that all individuals have the right to adequate water provision, irrespective of their available financial resources (EU Water Initiative, 2012).

Balance allocation of water where it adds most value

Economic development of river basins, with inadequate water allocation between economic sectors, can result in imbalances between water needs and existing water resources (EC, 2007). Water allocation across territories is a complex issue and justice and social welfare issues are central components. The relationship between cities and urban areas are relevant here as well as the division between industries and the public. Land-use changes, for instance planting a forest or constructing dams, often affect (reduces) the run-off and can lead to reduced water available for extraction (UNEP, 2011). Market based instruments, (tradable) allocation rights, information based instruments such as smart metering are mechanisms are all instruments that can help with allocating the water resource. To fully consider the social

aspects of water allocation, governments might need to go beyond market based instruments do not always fully reflect such aspects.

Catalyse investment and innovation to support green growth and create economic opportunities

As mentioned above, technology development and eco-innovation are important drivers for green growth. Water saving measures and leakage reduction in water supply systems have big potential to improve the efficiency in public water supply systems. Huge water quantities are wasted through e.g. leakage and inefficient consumption practices. It is estimated that 20% to 40% of Europe's water is wasted and water efficiency could be improved by 40% through technological improvements alone (EC). Water efficiency equipments and practices in buildings, agriculture, industry etc therefore have big potentials of water savings. Water efficiency measures can be grouped into:

- **Water saving technologies** – there is a growing market for water-efficient appliances or water saving devices, such as washing machines, dishwasher, toilets (accounts for 25-30 % of domestic water use), water efficient taps and shower heads and plumbing devices etc. In new buildings these are often standard but there is a big potential for greater uptake across Europe. Efficient irrigation is an important area, where large savings can be achieved. Introducing such technologies could reduce the EU average water consumption from 150 litres/person/day (average in the EU) to an 80 litres/person/day, leading to an estimate of potential saving up to 33% of today's abstraction (Ecologic, 2007)
- **Rainwater harvesting** – can be used for gardening, car wash etc and help to reduce households demand for treated water.
- **Smart water grids -** integrates smart water meters with sensing technologies and enables water utilities to more efficiently measure water consumption and providing water customers with data to help them monitor their water usage and reduce costs. Leak detection and identifying non-water revenue are also key benefits. Water use can me minimise and quality ensured.

Resource recovery

Waste water is not waste but a resource. Waste water is a source for water re-use, nutritients and heat energy. Also sludge is a source of energy. Reuse of waste water and grey water is important for stimulating growth in water scarce regions; treated waste water can be used for irrigation which is being increasingly used in certain countries such as Spain, Italy, Greece and Cyprus. In Gran Canaria for instance, 20 % of all water, used across all sectors, is supplied from treated waste water. Grey-water is water from domestic use other from toilets, such as from showers, washing machines, kitchen, etc. Water recycling, e.g. in industries and energy production is another important area. Water re-use is considered to have lower environmental impact than other alternative water supplies such as desalination or water transfer.

The composition of waste water is enabling energy recovery and, for instance, biogas can be produced from the sludge to reduce the plants energy dependency. In Stockholm, biogas from waste water is used as transport fuel and the excess heat is used in district heating systems (EEA, 2012a).

5.1. Potentials for water savings contributing to green economy

Water savings have the potentials to reduce water scarcity and droughts both for companies and individuals. Water savings will also bring benefits in financial and economic terms reducing water bills for both companies and individuals. For instance, water savings could avoid additional investments into water supply infrastructure and would reduce sewage and waste water as well as limit the need to capture new water sources. From the environmental perspective, it can lead to reduced stress in river basins and avoid resource depletion, water scarcity. Increased groundwater table-levels would e.g. reduce the cost of pumping water. It should be noted however that "net" water savings leading to environmental improvements in the status of aquatic ecosystems will only be achieved if all water saved in one sector is not used elsewhere by the same or another sector. In water scarce regions reductions in water

supply uncertainty might provide opportunities for setting up industries and economic activities supporting rural development. Last but not least, water savings will also bring additional ancillary benefits, for example by reducing energy consumption, electricity bills and thus CO2 emissions – thus contributing to climate change strategies and policy actions. The role of regions in reducing the water consumption in Europe is significant, by introducing efficiency technologies in the regional waste water treatment plants, etc., reducing leakages in distribution systems, etc.

The EC commissioned a study on the water saving potentials in Europe (Ecologic, 2007) and the section below summarises their results.

Supply side
Reducing leakage in the water supply network by introducing water saving technologies can be characterised as a "low hanging fruit" as they are relatively easy to introduce and such investments have short payback periods, further enhancing their uptake possibilities. Upgrading pipes has contributed to net savings of 20% of potable water in many industrialized cities (ICLEI, 2013).

Demand side
In *agriculture*, water savings is largely dependent on improvements in irrigation infrastructure and technologies as it is the largest water consumer in many regions in the agriculture sector. Potential water savings resulting from improvements in the conveyance efficiency[7] of irrigation systems ranges between 10 to 25% of their water withdrawals. Water savings resulting from improving application efficiency are estimated at 15% to 60% of water use. Additional water savings can be expected from changes in irrigation practices (30%), use of more drought-resistant crops (up to 50%) or reuse of treated sewage effluent (around 10%). The potential water savings in the irrigation sector would amount to 43% of the current agricultural volume abstracted. "Addressing the issue of water management in irrigated agriculture is fundamental to avoid the impairment of the region's water resource base and irreversible degradation of soil. Improved water management could bring about considerable water savings – about 86 km3 per year in 2025 – where the potential for water savings in agriculture accounts for 65 % of total water savings in the region (UNW-DPC, 2012).

The potential savings from improved conveyance efficiency is estimated to 25 % of water abstracted. Drip irrigation systems also have potential to improve water efficiency as the "field application efficiency" is as high as 90%. However, increased irrigation efficiency does not mean water savings per se and examples have shown that it might just leads to an expansion of the irrigated area (EEA, 2012a). Efficiency measures of irrigation system therefore needs to be campaigned with information to farmers. Changing agricultural practices can have bigger potential in reaching water savings though for instance growing less water intensive crops and soil moisture conservation.

As regards industry, the application of technical measures (e.g. applying more water intensive, higher recycling rates or rainwater use) have potential to lead to estimated savings between 15 and 90% with a global estimate up to 43% of today's abstraction. The potential for water savings in the energy sector is of less importance as the majority of the water abstracted is returned to the source after use.

Figure 26. Potential water savings per sector

[7] Conveyance efficiency refers to the abstracted water that is delivered to the field.

	Current Industrial consumption (ETC/IW, 1997)	Potential water savings per sector													
		Chemical		Steel and Iron		Pulp and paper		Food and drinks		Mining		Oil and petroleum		Textiles	
		M m3	M Eur	M m3	M Eur	M m3	M Eur	M m3	M Eur	M m3	M Eur	M m3	M Eur	M m3	M Eur
Belgium	210	15	3	27	6	6	1	2	0	9	2	n.a	n.a	n.a	n.a
Finland	1111	79	17	27	6	160	34	3	1	3	1	3	1	0	0
Germany	6475	927	198	194	42	79	17	n.a	n.a	505	108	n.a	n.a	n.a	n.a
Italy	7980	1205	258	263	56	226	48	257	55	n.a	n.a	48	10	147	31
Netherlands	507	119	25	14	3	2	0	9	2	0	0	32	7	0	0
Portugal	241	5	1	5	1	13	3	4	1	2	0	n.a	n.a	28	6
Sweden	1479	141	30	84	18	126	27	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
	Total	2491	533	814	131	812	131	275	59	519	111	83	18	175	37

Source: (Ecologic, 2007)

Technical water saving measures for the tourism sector is similar to those for households. Since some of the measures identified show a potential for a maximum of 80-90% savings, tourist accommodations could considerably reduce costs by buying more efficient appliances that only have payback periods of three years or less. Irrigation is also relevant to the tourism case of irrigation of golf courses and sporting areas, and more efficient irrigation techniques or rain water harvesting could provide additional savings up to 70% (Ecologic, 2007).

5.2 Potentials for job creation in the water sector

Resource efficiency, in this case in terms of water efficiency has the potential of creating new green jobs. Investments in means to store and save water can create employment in producing, installing, and maintaining the necessary equipment. Integrated water management, also involves labour inputs. Other sources of work include rehabilitating dams, barrages, and embankments that improve the flow of rivers. Raising water productivity will require substantial job-creating public investments in off-farm infrastructure (Ecorys, 2012). Eco-innovation in water technology is another sector with employment possibilities.

6. Concluding remarks

Water of good quality and in adequate quantities is necessary for human well-being, healthy ecosystems and for future economic development. Water is a fundamental basis for all economic sectors. Creating a sustainable green economy requires recognition of the interdependence of water, energy and land use, and coordinated actions under a common concept of resource efficiency.

Firstly, it should be mentioned that the water sector is green in itself and that greening of the sector mainly refers to implementing more sustainable water management. Resource efficiency which is reflected throughout the EU policy framework is in terms of water efficiency is needed for establishing a green growth and recover from the current economic crisis as well as to adapt to climate change and build resilience to disasters. To tackle these challenges holds significant potential in boosting the competitiveness and growth of the water sector in European regions. There is also potential for green growth in other water-related sectors (water-using industries, water technology development etc.) where innovation can increase operational efficiency.

The relation between green economic growth and the full benefits and water has not been sufficiently mapped. According to the literature reviewed this has several reasons but do in general relate to that the benefits are often “non-economic” that are difficult to quantify but are of high value to the concerned individuals and society. This is largely because the contribution of water to production is often not priced and the contribution of water individual welfare is not appropriately valued. Additionally, overall well-being including social status and hygiene are often under estimated. In the GREECO perspective it is also important to state that the benefits are in addition highly location-specific and is depending on e.g. the frequency of

water-related diseases or the condition of receiving water bodies and therefore cannot be easily aggregated. The lack of proper valuation and market incentives can affect behaviour and hold back potentials of households and companies to embark on a more sustainable path that would also benefit general well-being. It a way, growth opportunities are missed. Meeting the targets set in the EU water directives can also be a source of innovation and growth. Investment in water supply and sanitation services generates a number of economic, environmental and social benefits such as to improvements in public health, the environment and for certain economic sectors such as fisheries, tourism and property markets. Implementing EU water regulation in a smart manner also has positive impacts for other environmental policies and can reduce the costs of these policies.

In Europe, the sanitation sector requires more investment than the water supply sector as the number of households without access to adequate sanitation services is much higher. With the current development of wastewater infrastructure e.g. in Eastern and South-Eastern Europe, there is also an opportunity to integrate modern techniques and operation practices that achieve both optimal energy use and higher treatment levels and use those investments to increase efficiency (EEA, 2012a). Thus are huge potentials for eco-innovation for water efficiency in European regions. The uptake of water efficiency techniques and household appliances can be further developed. Improvements in W and WWS can not be done in isolation. E.g. all benefits identified can become costs if adequate wastewater treatment facilities are not provided in parallel to drinking water and sewerage services. Protecting water resources from pollution and managing water supply and demand in a sustainable manner can deliver clear and sizeable benefits for both investors in the services and end water users. Investments in managing water resources are going to be increasingly needed in the context of increasing water scarcity at the global level."

The role of local and regional authorities in relation to the water sector is especially important as they in general have the responsibility for water management. They are also important factors in increasing the absorption capacity for cohesion policy fund which is a main funding source of water and waste water investments.

6.1 Inventory of drivers, enablers and barriers for a green economy in the water sector

Policy can be singled out as being the most important driver for a green economy in the water sector. Europe is on a rather developed level in terms of drinking water supply which is close to complete across the European territory and policy regulation therefore push the future development. Market based instruments can to a certain extent be categorized as a driver but has limitations as the value of water and the benefits of investment are difficult to estimate in monetary values. This rationale is supported by the OECD Ministerial Council Meeting on 25-26 May 2011: "*investment in natural capital is an area in which public policy intervention is most needed because market incentives are weak or non-existent. This is largely because the contribution of natural capital to production is often not priced and the contribution of natural capital to individual welfare is not appropriately valued. The lack of proper valuation and market incentives or signals can affect behaviour and truncate the foresight of households and firms in ways that set the economy on trajectories that are unsustainable (or conversely that miss growth opportunities) or that are not necessarily maximising well-being".* Although regulation can impose costs on water users in the short term, it can also provide incentives for innovation, which in the medium to long run might reduce or make zero the costs for individual users. At the same time, innovation can offer new trading and export opportunities for European companies and thus be a driver to green growth.

The table below presents an overview of the key drivers and enablers, as well as the barriers identified, for the development of a green economy in the water sector. The factors are organized in easily "modifiable" in the short term and "non-modifiable" for those for which there is a significant time lag. Certain factors lie in a grey zone between the two. For instance, it is also relatively easy to organize awareness-raising for companies on advantages of innovations and water efficiency. However, real change of behaviour of companies takes time

and depends on a number of other factors such as market pressure; company culture; competitive environment, etc. Also, economic instruments are considered a driver but at the same time the low price of water in many regions is acting as a barrier to green growth. It should also be noted that all factors identified as drivers can also have hindering effect, e.g. when the policy framework holds back/lock in innovation for example. Likewise, in some cases barriers can also be considered as drivers as for instance water stress can function as a driver of water savings.

Table 12: Inventory of Drivers and Barriers		
Drivers and Enablers		
Policy framework	The regulatory framework is the key driver for green growth in the water sector. The EU water legislation has during the last two decades driven the water sector in to reach a high level of public water supply of good quality and a high level of sanitation.	Modifiable
Economic instruments	Economic instruments address environmental externalities and market failures and can thus contribute to green economy development.	Non-Modifiable
Market based instruments	Water accounting and tradable water rights creates incentives for water savings and investments in to water efficiency	Modifiable in the long term
Technology development and innovation	Innovation is a driver of multi factor productivity change through new products, entrepreneurship and business models, and new consumption patterns.	Non-modifiable/long term modifiable
Barriers		
Lack of institutional capacity	. Lack of institutional capacity is a common obstacle to planning and implementing key water infrastructure.	Non-modifiable
Lack of sectoral integration and communication	Improved communication between the water sector and other sectors will be important in efforts to balance the water use of competing economic sectors (agriculture, industry, utilities, etc.).	Modifiable
Lack of awareness	Data and information about the economic aspects of the WFD, full cost recovery and the real cost of water are not properly reflected in economic development at the regional and river basin district level.	Modifiable
Land use and Socio-economic changes	Population growth, urbanisation, puts additional stress on water bodies increasing consumption levels and the pollution burden. Climate change is likely to exacerbate current pressures on Europe's water resources.	Non-modifiable

6.2 Green economy indicators for the water sector

The table below presents the key indicators that could monitor the green economy development in the water sector.

Table 13: Key indicators to measure progress in greening of the sector
Available fresh water resources (m3 per capita)
Total fresh water abstraction (m3 per capita)
Water abstraction as a share of available water resources (Also called Water Exploitation

Index)
Share of population connected to waste water treatment (at least secondary)
Share of population connected to public water supply
Employment in the water sector
Water productivity (EUR/m3)
R%D expenditure on water innovation, e.g. Patents for abating Water pollution

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