

REACHING FOR BLUE GOLD

How the EU can rise to the water challenge
while reaping the rewards

by

Annika Hedberg, Romain Pardo, Andrea Frontini
with Toutia Daryoush





REACHING FOR BLUE GOLD

How the EU can rise to the water challenge while reaping the rewards

EPC ISSUE PAPER No. 80

NOVEMBER 2015

By Annika Hedberg, Romain Pardo and Andrea Frontini
with Toutia Daryoush

**EUROPE'S POLITICAL ECONOMY AND
EUROPE IN THE WORLD PROGRAMMES**

ISSN 1782-494X

EPC's Programmes

*The **Europe's Political Economy (EPE) Programme** monitors and analyses current economic, social and environmental issues which are topical in the EU policy debate. The current focus is on five long-running themes: the euro crisis and its implications for economic governance and the European integration process; Europe's economic future and the development of the Single Market; the EU budget and the debate on the next EU Multi-Annual Financial Framework; health and well-being; and climate change, resource efficiency and energy, including a focus on climate change mitigation and adaptation.*

*The **Europe in the World (EIW) Programme** takes a dual approach to studying the EU's place on the global stage. EU capabilities in foreign policy and its political will to play a role as a global actor are essential to understand the ways in which the Union engages with the world. The Programme does this by analysing the External Action Service, the use of the EU's foreign policy tool box, and political dynamics in Europe. Through seminars, public events, and special projects, the Programme also examines the EU's 'performance' in certain parts of the world (especially in the Balkans and in the EU's neighbourhood, but also in Asia) while addressing thematic and cross-cutting issues, such as foreign policy and international migration, international justice, human rights, crisis management and peacebuilding.*

Table of Contents

Acknowledgements.....iv

Foreword.....v

Executive Summary.....vi

Key recommendations for today - in the light of ongoing policy developments.....ix

1. Introduction..... 1

2. Water nexus.....13

3. From pricing water to ensuring access for all.....29

4. Innovation as a trigger for growth and competitiveness..... 37

5. Implementing the human right to water and sanitation in developing countries..... 53

6. Water: a source of conflict or an opportunity for cooperation?67

7. Recognising the value of water - Action plan for the EU and national policy makers 87

Annexes 93

About the authors

This publication is a result of a collaborative effort from the EPC team. **Annika Hedberg**, EPC Senior Policy Analyst, **Romain Pardo**, EPC Policy Analyst and **Andrea Frontini**, EPC Policy Analyst, wrote this publication with the help and valuable contribution from **Toutia Daryoush**, former EPC Programme Assistant. Romain Pardo made a significant contribution to the introduction and wrote the chapter on “Implementing the human right to water and sanitation in developing countries”. Andrea Frontini authored the section on “Water: a source of conflict or an opportunity for cooperation?”



Acknowledgements

This Issue Paper is the final outcome of the EPC Task Force on 'Blue Gold', which ran for two years. It benefited greatly from the input of EPC members and experts across sectors, who participated and contributed to the different discussions. The EPC would like to thank Egmont - the Royal Institute for International Relations, for their support and cooperation on this project, in particular the Director-General, Marc Otte who chaired the Task Force. The EPC would also like to warmly thank:

The members of the Steering Committee who provided valuable input throughout the project: Marc Bierkens, Professor of Hydrology, Utrecht University; Henry Saint Bris, Senior Vice President Marketing & Institutional Relations, SUEZ; Jacques Delsalle, Policy Officer, Unit for Protection of Water Resources, DG Environment, European Commission; Sergiy Moroz, Policy Director, European Water Partnership; Herbert Oberhaensli, Vice President of Economics and International Relations, Nestlé; Therese Sjömander Magnusson, Director of the Transboundary Water Management Team, Stockholm International Water Institute (SIWI); Patrick ten Brink, Head of Brussels Office & Environmental Economics Programme, The Institute for European Environmental Policy (IEEP); Alexander Verbeek, Strategic Policy Advisor, Climate, Energy, Environment and Water Department at the Ministry of Foreign Affairs of the Netherlands; Yale World Fellow; Associate at the Stockholm Environment Institute; Alexandros Yannis, Senior Expert/Energy and Water Diplomacy, European External Action Service.

Experts including André Liebaert, Thematic Officer - EUWI management, Policy issues focal point, DG Devco, European Commission, and Veronica Girardi, Quality Management Officer, Water Sector, DG Devco, European Commission.

The organisations who provided additional support for individual activities: The European Commission, European Office of the Konrad-Adenauer-Stiftung, Keren Kayemeth LeIsrael-Jewish National Fund (KKL-JNF), SUEZ and WaterAid UK.

Last but not least, a very special thanks to the EPC and former EPC staff who actively and enthusiastically participated in the project: Rosa Balfour, Senior Adviser to EPC on Europe in the World and Senior Fellow at the German Marshall Fund of the United States; Philip Hines, Programme Assistant, EPC and Alice Pappas, Former Programme Assistant at the EPC.

The authors are solely responsible for the content of this paper.

Foreword

Climate change is bad news for water resources – and thus for human development, societies, economies, the environment, and local and global security. The increasing frequency and severity of extreme weather events such as droughts and floods serves as a reminder of the effects climate change can have on the quantity and quality of global water reserves, and thus on various other aspects of life. Even though the effects differ from region to region, this is a global challenge with far-reaching consequences to which Europe is not immune.

As the world leaders gather in Paris in December 2015 to discuss a new international climate deal, it is worth to remind politicians, businesses and citizens of the water challenge and its wider implications, which already affect us today – and which will only get worse with climate change. However, water-related risks resulting from climate change are not a fatality and damage control doesn't have to be the only mantra. Placing the water challenge at the centre of political and security dialogues, development strategies and climate mitigation and adaptation measures, and implementing smarter water management, could also bring great economic, environmental and social benefits, in and outside the European Union. It would also contribute to global security.

Water matters – now more than ever. This is also what this publication demonstrates. Building on the European Policy Centre's, two-year "Blue Gold" project, this publication shows the rationale for action, how the EU could use its existing internal and external policy instruments to tackle the water challenge with its various dimensions and the benefits of action.

Marc Otte
Director-General,
Egmont - The Royal Institute for International Relations
and Chair of the EPC Blue Gold Taskforce
30 November 2015

Executive Summary

Water is an essential factor in all aspects of human life, from health to sanitation, from agriculture to industrial production. It is central to the functioning of ecosystems, which in turn are vital for the provision of water. Water contributes to sustaining human development and prosperity across the globe. It is a key factor influencing local political and economic dynamics and relations. It can be a source of cooperation or a source for destabilisation and conflict. It is 'Blue Gold', although policies, markets and human practices often underestimate its value.

However, not all is good globally, nor within the European Union (EU), with this vital resource. The functioning of ecosystems and thus existing water supplies are increasingly under stress due to agricultural production, unsustainable land use, industrial activities, energy production, urban development, population growth, unsustainable consumption and insufficient waste and pollution management. Contamination and geographically uneven distribution of freshwater sources together with bad water governance are serious challenges. In addition, changes in climate, seen already in the frequency and severity of precipitation and temperature rise, and as a result, an increase in floods and droughts, will have growing negative impacts on water supplies and thus on human security more generally.

Lack of access to good quality water creates a wide range of direct and indirect economic, social, environmental, political, and security challenges. Many of the challenges are similar on both the global and the European level: for example, be it agriculture, energy or economic sectors, availability of water will be a real test case for these sectors' prospects in the future. The state of play on a global level is alarming: we are seeing increasing internal competition over access to food, raw materials and fertile land, interstate disputes over the control of trans-boundary water supplies, health problems due to unsafe water or lack of sanitation and other humanitarian concerns. The situation in Europe remains better, but far from perfect. Pollution remains a serious issue for surface water bodies, rivers especially, but also for groundwater. In addition, it has been estimated that by 2007, at least 11% of the population and 17% of the territory in Europe had been affected by water scarcity. The cost of droughts in Europe has been €100 billion over the last 30 years.

At the same time, it should not be forgotten that the EU also contributes to increasing the pressure on water resources outside its borders. For example, food and textiles that are imported from outside the EU, all have a water footprint. A good example is the large imports of cotton, which have required significant water reserves of producing countries located in dry regions such as Egypt, Uzbekistan and Pakistan. As a consequence, an estimated 84% of the water footprint of cotton consumption in the EU is located outside Europe.

It is important to recognise that the water challenge is not only a local challenge – its implications are felt across borders. For example, the EU has already seen how extreme weather events outside its borders – ranging from floods to droughts – can increase requests for financial and non-financial assistance, which can be expected to grow with climate change. An extreme example of this is the Syrian refugee crisis – partly caused by years of drought resulting in internal pressures, intensifying the political and security crisis in the country – which has turned into an enormous migration challenge for the countries in the region and Europe alike. At the same time, developments not directly related to water in other parts of the world can also affect the EU's water resources. For example air pollution from energy production or transport does not respect borders, and will have a growing negative impact on Europe's freshwater resources.

Water can be a source of inter- or intra-state conflict, but also an opportunity for international and regional cooperation or even integration. It is notable that not less than 148 states across the world share waters with other countries. Thus challenges affecting transboundary waters – spanning from over-exploitation to pollution, all the way to infrastructural development or the manifold impacts of climate change – may trigger considerable socio-economic, political and even security impacts on one or more riparian countries. As the cases of the Nile, the Mekong and Central Asia show, among others, the water-development-security nexus is set to become an overarching foreign policy challenge in its own right. The role of water within countries and in interstate relations depends on a complex and often variable combination of factors, including geography, history, local politics and regional interdependence, and these interlinkages must be understood when diplomatic and technical solutions are sought by riparian countries or external actors.

As water does not stop at national borders, neither should EU policies on water. Managing the water challenge is both a global and a European challenge, and it is in the EU's interest to use its policy framework and available instruments to respond to the challenge on both levels. This requires collaboration between EU member states in adapting measures against unsustainable practices, increasing efficiency and smarter use of water, developing and deploying innovative new solutions, and managing and preparing for extreme events which can have serious implications for the supply of water. At the same time, the EU should encourage stronger cooperation among countries and organisations, as well as the sharing of experience with experts in and outside the EU, in areas as diverse as conflict prevention and crisis response, institutional development, technical capacity-building, development of funding mechanisms, and the creation of a legal and political framework for transboundary water cooperation.

The EU has myriad tools it can use internally and externally to support more sustainable management of water resources, and tackle the challenges related to water quality, quantity and access to water. The European Commission launched in 2012 a *Blueprint to Safeguard Europe's Water Resources*, a strategy that aims to ensure that enough good quality water is available to meet the needs of people, the economy and the environment within the EU. It aimed to bring new energy to the implementation of the *Water Framework Directive*, critical for sustainable water management in Europe. Other legislation, policies and programmes from the *Common Agricultural Policy* to *Research and Innovation Policy* can also play a key role in tackling the water challenge. A good example has been the *European Innovation Partnership on Water*, which aims to facilitate the development of innovative solutions to address the water challenges in and outside the EU while supporting the creation of market opportunities for these innovations. As the EU works on a vision and a strategy for a *circular economy*, water plays a key role in creating a more sustainable European economy, and this should be recognised. The European Citizens' initiative on '*Right2Water*' called for the EU to ensure and to provide all citizens with sufficient and clean drinking water and sanitation within and outside the EU, and as the institutions work on the follow-up measures, this provides an excellent chance to enforce implementation of existing legislation and explore other areas for action. The European External Action Service has helped EU leaders to better grasp the salience of water challenges for international peace and security, and explored tools and options to support transboundary water cooperation both in key regional contexts and in multilateral *fora*, also leading to the *Conclusions of the EU Foreign Affairs Council on EU Water Diplomacy* in July 2013. In addition, water has traditionally been a focal point of humanitarian assistance and development aid, two policy domains where the European Commission retains significant experience and has a strong competence to act.

The EU is in a good position to improve governance, including the political, legal, social, economic and administrative systems that influence the use and management of water. While the basis for action exists, so far the EU's efforts to tackle the challenge and enjoy the benefits have been limited

both within Europe as well as globally. In fact, the emphasis on water seems to have further weakened under the current political leadership of the European Commission. The reality is that the water challenge is not high up enough on the current EU policy agenda. However, as this paper will show, ignoring ongoing, medium and long-term trends and challenges carries the risk that the EU will fail to maximise the related opportunities and minimise the threats, both within Europe and beyond its borders. This Commission's slogan, 'being small on small things, big on big', should be reflected in ensuring that the EU adopts a comprehensive, forward-looking policy framework to tackle the water challenge in and outside its borders. This should build on the initiatives already put in place by the EU and its member states, within and outside Europe.

This study argues that much more could and should be done to use both the EU's internal as well as external policies to meet the water challenge and to develop smart and sustainable water practices. The water challenge cuts across many different policy fields and therefore requires both an interdisciplinary approach and creative institutional and policy solutions. The water challenge is a growing environmental, economic, development, politico-diplomatic, security and social challenge. The EU's ability to prepare and respond to this complex challenge – with an urgency – with its internal and external dimensions, will be a real test for the future.

While the picture is not necessarily rosy, there is a silver lining. The benefits that would come from meeting the water challenge are enormous, ranging from societal, environmental and politico-security advantages to economic gains, including new business opportunities. Thanks to its wide-ranging policy toolbox, the European Union has the potential to become a leader in promoting a concerted and holistic response to the manifold dimensions of this challenge while enabling Europe, its public and private sectors as well as its citizens to enjoy the benefits in a much more cooperative international context.

Water matters. Tackling the growing water challenge, be it linked to water scarcity, quality or access, is not just an environmental issue – it has a strong economic, social, political and security dimension.

Water is not just a local issue. The manifold impacts of the water challenge are increasingly felt across borders. Water resources of a country or region can be affected by actions outside one's borders. This is already a reality in the EU today.

These recognitions should be reflected on the EU policy agenda, across sectors, and in actions within and outside the EU. This publication shows the rationale for EU action and urges the EU to use the existing internal and external policy instruments to tackle the water challenge and promote smarter management of water resources. Adopting a comprehensive, forward-looking policy framework will help the EU to prepare for the water challenge with all its various dimensions and implications. The EU has the tools and expertise, and the benefits would be numerous.

Key recommendations for today

Recognising value of 'Blue Gold' in ongoing policy developments

Circular economy package

As the EU works on a vision and a strategy for a circular economy, water should form an integral part of the package: the EU must encourage the rational use, recycling and reuse of water resources, and recovery of materials from wastewater. The European Commission's *Circular Economy package*, to be published in December 2015, should 1) recognise water as a fundamental contributor to European economy and society, a central resource in the circular processes of the agricultural, energy and industrial sectors, and aim to ensure that water retains its value after each usage. 2) The package should also help to improve the use of resources within water management by taking two concrete measures: (i) it should propose a binding framework on the reuse of water; and (ii) it should build the basis for smarter wastewater management, provide guidelines for energy recovery and help to stimulate the recovery of critical materials from wastewater.

Reuse of water

As the Commission works on an initiative on recycling and reusing water, it should put forward a proposal for a legally binding framework with minimum standards for reuse of water. It should provide a framework for managing health and environmental risks (including treatment standards and water quality benchmarks), and encourage reuse of water especially in water stressed areas. Reuse of water should be seen as a part of integrated water management. The EU and the member states should learn from experiences in and outside the EU in recycling and reusing water, and start with exploring the possibilities for industrial and agricultural purposes.

Follow-up to European Citizens' Initiative on 'Right2Water'

As a follow-up to the European Citizens' Initiative on '*Right2Water*', the Commission has identified transparency and benchmarking of water services as an area of action in order to provide citizens with better quality of and access to water. The Commission should aim to define general principles and identify a minimum set of performance indicators, which can inform both operators and consumers, on areas such as pricing, and water and service quality. As the Parliament has criticised the Commission for its weak response to the Citizens' Initiative, taking action on benchmarking would show its commitment to improve the quality of water supply and sanitation while empowering citizens.

The Commission should also continue to provide a platform for member states and other stakeholders to share best practices on combining the use of pricing mechanisms with equity considerations. This should include discussions on combining the use of traditional and innovative economic instruments with social measures and solidarity instruments to assist people who cannot afford to pay their water bills. Such examples could also feed into discussions on innovative approaches for development assistance.

The European Innovation Partnership

The EU should help to revitalise the *European Innovation Partnership (EIP) on Water*. It remains an important forum for stimulating innovation and encouraging collaboration across member states between public and private actors. It must be used to overcome the fragmentations in the sector and to attract more public and private money for innovation in the sector. Bringing new energy to the partnership would require both strengthened governance of its activities and the use of financial tools to support them.

Preventing and controlling pollutants in water

As the Commission works on the review of the *Drinking Water Directive* with new quality standards and on an initiative to control endocrine disruptors (chemicals found in everyday products that are harmful to health) to be published in 2016, it should take a strong stance on controlling the pollution challenge in European waters. The aim should not be to only prevent endocrine disruptors, but all micro pollutants from entering the water cycle. The EU should aim to prevent and control pollution at the source, be it agricultural pollutants such as pesticides, harmful pharmaceuticals, heavy metals and chemical substances that originate from industrial processes; or substances like micro plastics from domestic households. Preventing the problem requires that polluting is controlled during the authorisation, production, consumption, and disposal of pollutants. Clearer EU obligations are needed on sectors such as agriculture and pharmaceuticals in order to significantly reduce pollution, waste treatment costs and negative externalities. A full implementation of a ‘polluter pays’ principle is needed.

Implementation of the Water Framework Directive

While the implementation of the *Water Framework Directive* has been weak and the Commission’s *Water Blueprint* – that outlined actions to improve its implementation, integrate water policy objectives into other policies and fill the gaps related to water quantity and efficiency – has become a secondary priority in the current Commission, water matters and the EU must continue to enforce smarter management of its water resources. As the Commission starts to work on a review of the *Water Framework Directive*, expected in 2019, it should learn from the current implementation challenges, ensure policy coherence with other initiatives, but also recognise the benefits that implementation of the Directive would bring.

International climate negotiations

As the EU with its global partners continue negotiations on a global climate agreement, to be agreed upon in Paris in December 2015, the disastrous impact of climate change on water resources, and the implications of water-related natural disasters, such as floods, on economies, societies, the environment, human security and geopolitics should be recognised. Not only the global climate framework and financing, but also political and security dialogues as well as development strategies must take better account of these water-related problems, and aim to mitigate and adapt to these challenges. Strengthening the resilience of fragile societies that are most vulnerable to the effects of climate- and water-related challenges is essential. This should also provide an impetus also for improving water management across the world, so that the sector can contribute to global and local mitigation and adaptation efforts.

Implementation of UN Sustainable Development Goals (SDG)

Water is essential to human life, dignity and economic activity and as such is a crucial element for the realisation of other sustainable development goals such as food security, healthy lives and poverty eradication at global level. As a result, the implementation of Goal 6 of the 2030 Agenda for Sustainable Development to “ensure availability and sustainable development of water and sanitation for all” should be at the centre of the Commission and EU member states’ development agendas. The ‘ACP-EU Water Facility’ programme which aimed to achieve the UN Millennium Development Goal on water and sanitation must now be succeeded by an ambitious programme for meeting the SDG on water and sanitation. Greater emphasis must be put on capacity-building at a local level in order to implement projects successfully.

Water security and diplomacy

Further strategic development and on-site implementation of the EU’s ‘water diplomacy’ as a key component of a renewed EU agenda for 21st-century global politics is needed. This should start with a

stronger inclusion of the ‘resource challenge’, including water, in the ongoing preparation of the *EU Global Strategy for Foreign and Security Policy* planned for June 2016 and in the overall strategic planning of EU foreign and security policy. This should also incorporate the further ‘streamlining’ of water diplomacy including in early warning, crisis-response, conflict prevention and mediation.

In-depth diplomatic discussions and stronger coordination between the EU and its member states should be conducted to provide further political impulse to the strengthening of a comprehensive, effective and coherent UN-coordinated policy approach to the manifold challenges of transboundary water management. This includes further support to the ratification and implementation of the UN and UNECE Water Conventions by third countries around the world.

Appropriate emphasis on the role of water resources as a key factor influencing local political and economic dynamics and relations needs to be ensured when framing, developing and implementing the EU’s regional strategies. The EU should also build on its own achievements in the area of transboundary water cooperation and share its ‘lessons learnt’ and the demonstrated benefits of joint action and common institutions at basin or sub-basin level, with priority regions including the Nile, Central Asia, the Mekong, wider Northern Africa and the Middle East, as well as the Sahel.

INTRODUCTION

1.1	What explains the growing water challenge?	2
1.2	Three dimensions of the water challenge	3
	1.2.1 Quantity - too little water	3
	1.2.2 Quantity - too much water	5
	1.2.3 Quality - too 'polluted' water	6
	1.2.4 Access and affordability	6
1.3	Benefits of improved water management	7
1.4.	An overview of the EU toolbox for action	8

Water is a fundamental element in all aspects of human life – the basis for human development and prosperity. It is essential for health and agriculture, but also for industrial and energy production. It is a key factor influencing local political and economic dynamics and relations. It can be a source of cooperation or conflict, security or destabilisation.

However, there is a problem. The source is limited: mankind can only rely on 0.5% of global water stocks for its social and economic activity.¹ Fresh water resources are severely dwindling and degraded due to decades of unsustainable water use. A combination of emerging trends, including population growth, urbanisation and climate change, are further escalating the water challenge. Meeting the increasing water demand, which is expected to grow by 55% globally in 2050, will be a real test for the world.² For too long policies, markets and human practices have underestimated the real value of water. Without significant changes, the United Nations (UN) estimates that the world will only have 60% of the water supplies it requires by 2030.³ While there are many drivers for change and forecasts are only indicative, it has been estimated that global water demand in 2030 could be up to 40% higher than current supply.⁴

The water challenge and its impacts are also felt in the European Union (EU). Be it the challenge related to the quality, quantity, access, affordability and/or governance of water resources, every EU member state has work to do within its borders. While the gravity of the economic, social, political and/or security implications of the water challenge differs within the EU and outside its borders, the possible impacts do not respect borders. Thus, while the EU can guide member states to take action

¹ Martin, R., Fry, A. (2005), "Facts and trends: Water", World Business Council for Sustainable Development, Switzerland, p.1 (available at: http://www.unwater.org/downloads/Water_facts_and_trends.pdf; last accessed on: 20 November 2015)

² UNESCO (2015), "The United Nations World Water Development Report 2015: Water for a sustainable world", Paris, p.2

³ Begley, S. (2015), "UN Report Warns of Serious Water Shortages Within 15 Years", TIME, 20 March 2015 (available at: <http://time.com/3752643/un-water-shortage-2030/>; last accessed on: 20 November 2015)

⁴ The 2030 Water Resources Group (2009), "Charting our water future - Economic frameworks to inform decision-making", McKinsey & Company, New York, p. 40

in Europe, a greater awareness and more efforts are needed to help tackle the challenge also outside its borders.

Adopting a comprehensive, forward-looking policy framework at both the European and global level would help the EU to prepare for the water challenge with all its various dimensions and implications. At the same time, sustainable water management would have multiple societal, environmental and security advantages, as well as economic gains, including new business opportunities.

Thanks to its wide-ranging policy toolbox, the EU has the potential to become a leader in promoting a concerted and holistic response to the manifold dimensions of this challenge, which will enable Europe to also enjoy the benefits. However, so far, the EU's efforts have been limited.

This publication aims to show the rationale for action; why developments with water matter for the EU and its member states; what the benefits of action would be; and how the EU could make better use of its toolbox, including both internal and external policy instruments, to meet the water challenge.

1.1 WHAT EXPLAINS THE GROWING WATER CHALLENGE?

Existing water supplies are under increasing stress due to human activities such as agricultural production, unsustainable land use, industrial activities, energy production, tourism and emerging trends, such as population growth and climate change. Below is a short introduction to some of these drivers for change.

The increase of the world's population, which is expected to reach 9 billion in 2050, is putting enormous pressure on global water resources. However, as water usage is already increasing twice more rapidly than population growth, one also needs to consider the socio-economic factors, such as an expanding middle class and rising incomes in order to understand the challenge.⁵

Agriculture uses 70% of available freshwater worldwide.⁶ In Europe, agriculture accounts for 24% of water abstraction; a figure which rises to more than 50% in southern Europe and even to 80% in some regions.⁷ Meeting the demand for food of a growing population is expected to require an increase of 60% of global food production by 2050 compared to 2005-2007 levels, thus further increasing the sector's demands for water.⁸ The growing middle class in developing countries will have an impact on dietary patterns: meat consumption for example is projected to increase by approximately 73% by 2050.⁹ Agriculture is also a source of pollution: the most common source of chemical contamination of groundwater aquifers is nitrate used in agriculture.

Industry accounts for 22% of global freshwater water withdrawals, a figure which rises to 40% for Europe.¹⁰ 75% of industrial water withdrawals worldwide are used for energy production, which is dependent on water for cooling and extracting processes. Industry will play a significant role in the

⁵ FAO Water Unit (2015), "Hot issues; water scarcity" (available at: <http://www.fao.org/nr/water/issues/scarcity.html>; last accessed on: 20 November 2015)

⁶ UNESCO (2003) "United Nations World Water Development Report: Water for People, Water for Life", Paris, p.17

⁷ European Environment Agency (EEA) (2009), "Water resources across Europe — confronting water scarcity and drought", EEA Report, No2/2009, Copenhagen, p.5

⁸ FAO (2012), "World Agriculture Towards 2030/2050: the 2012 revision", Summary (available at: http://www.fao.org/fileadmin/user_upload/esag/docs/AT2050_revision_summary.pdf; last accessed on: 21 November 2015)

⁹ FAO (2011), "Major gains in efficiency of livestock systems needed", 14 December 2011, Rome (available at: <http://www.fao.org/news/story/en/item/116937/icode/>; last accessed on: 21 November 2015)

¹⁰ UNESCO (2003) "United Nations World Water Development Report: Water for People, Water for Life", Paris, p.19 (available at: <http://unesdoc.unesco.org/images/0012/001295/129556e.pdf>; last accessed on: 20 November 2015) and Forster, J. (2014), "Water use in industry: Cooling for electricity production dominates water use in industry", Eurostat, Statistics in focus 14/2014 (available at: http://ec.europa.eu/eurostat/statistics-explained/index.php/Water_use_in_industry; last accessed on: 21 November 2015)

rise of water usage in the future as demand for water for the manufacturing and electricity sectors is predicted to rise by 400% and 140% respectively through 2050.¹¹ At the same time, industry is also a significant source of water pollution, discharging between 300 and 400 million tons of polluted waste into the world's waters annually.¹² Furthermore, the cooling of power and manufacturing plants is a source of thermal pollution.

Households and cities also have a significant water footprint. Household use, which currently accounts for 8% of global freshwater withdrawals, is expected to rise by 130% by 2050.¹³ Urbanisation can also affect the quality of water resources when water and sanitation facilities do not keep up with urban growth. For instance, more than 80% of sewage in developing countries is released in water bodies without any treatment.¹⁴ Urbanisation can also be a challenge for the inhabitants: if it is not managed, it can lead to growing informal settlements with inadequate access to drinking water and sanitation. While cities are significant users of resources like energy and water, at the same time, if designed well, they can also be forerunners in promoting smarter use of resources, supporting biodiversity through green spaces and contribute to mitigating and adapting to climate change.

In addition to human activities that have led to intensive usage and pollution of water resources, climate change has major repercussions for the quantity and quality of global water stocks. Changing temperatures and extreme weather conditions will impact the water cycle, which in turn will influence precipitation patterns and the flow of water in streams, rivers, and other channels. Changes to the availability of fresh water will – again – have implications, for example, for food and energy production.

More information on the interlinkages between water and agricultural, industrial and energy production, the impacts of climate change, and recommendations for needed action can be found in Chapter 2 on “Water nexus”.

1.2 THREE DIMENSIONS OF THE WATER CHALLENGE

Human activities combined with population growth and climate change have impacts on three dimensions of the water challenge: i) quantity, ii) quality and/or iii) access and affordability of water resources. Be it water scarcity, floods or the reduction of the quality of freshwater reserves, if these challenges are not prevented, controlled or contained, they will have serious impacts on human and economic development. And indeed, the overarching fourth dimension of the water challenge is water governance: improving the political, legal, social, economic and administrative systems that influence the use and management of water.

1.2.1 Quantity - too little water

Water scarcity can be defined as a situation where water availability is insufficient to meet human, economic and social needs. Even though it is difficult to measure thresholds precisely, it can be

¹¹ UN Water (2014), “Global water withdrawals are projected to increase by some 55% through 2050” (available at: <http://www.unwater.org/statistics/statistics-detail/en/c/211820/>; last accessed on: 21 November 2015)

¹² Palaniappan, M., Gleick, P., Allen, L. (2010), “Clearing the Waters: A focus on water quality solutions”, UNEP/Pacific Institute, March 2010, Nairobi, p.7

¹³ UNESCO (2003) “United Nations World Water Development Report: Water for People, Water for Life”, Paris, p.19 and OECD (2012), “OECD Environmental outlook to 2050: The consequences of inaction – Key facts and figure” (available at: <http://www.oecd.org/centrodemexico/medios/42172885.pdf>; last accessed on: 21 November 2015)

¹⁴ Palaniappan, M., Gleick, P., Allen, L. (2010), “Clearing the Waters: A focus on water quality solutions”, UNEP/Pacific Institute, March 2010, Nairobi, p.20

estimated that water scarcity is detrimental to human and economic development when available renewable fresh water per capita is below 1,000 cubic meters annually.¹⁵

Water scarcity affects an important part of the world's population as 85% of mankind lives in the planet's driest areas and 2.8 billion people are already suffering from water stress.¹⁶ The OECD estimates that, without the introduction of new policies, this figure could rise to 3.9 billion, the equivalent of 47% of the world population.¹⁷ However, the uneven geographic distribution of this precious resource means that the effects also differ between regions and populations.

The lack of water can have adverse effects on people's livelihoods and economic activities. It can be a matter of survival for the rural and poorest populations in the least developed countries, which are particularly vulnerable. Over 40% of the global population that doesn't have access to drinking water lives in Sub-Saharan Africa, a region in which failed harvests due to the absence of rainfall can lead to famine.¹⁸ The 2011 drought in the Horn of Africa, for example, caused a tragic food crisis across Somalia, Djibouti, Ethiopia and Kenya, leading to the death of between 50,000 and 100,000 people, most of them children,¹⁹ and to 13 million people being in need of humanitarian assistance.²⁰ Still today almost one billion people are reported to be undernourished, notably in Sub-Saharan Africa and Asia.²¹ Droughts can also lead to higher food prices not only at the local level, but also on a global scale.

Water shortages can also trigger migration and even conflicts. The UN estimates that 24-700 million people will be forced to migrate from arid or semi-arid regions because of water scarcity.²² A United States Intelligence Community coordinated paper predicts that the combination of water challenges, poverty, social instability and the inability of political institutions to provide adequate responses can lead to state failure.²³ The situation is critical for instance in the Middle East. In the case of both Syria and Yemen, excessive and wasteful irrigation encouraged by governments through subsidies have greatly contributed to the dramatic depletion of water supplies, exacerbating some of the domestic political tensions. The water reserves in Sana'a, the capital of Yemen, are at risk of drying out in the next decade, and the clashes over water in the country are escalating.²⁴ In Syria, as a result of a drought that lasted from 2006 to 2011, farmers relocated to cities because of failed harvest and food insecurity, which created internal tensions and arguably contributed to the start of the civil war.²⁵

¹⁵ Martin, R., Fry, A. (2005), "Facts and trends: Water", World Business Council for Sustainable Development, Switzerland, p.8

¹⁶ UN Water (2013), "An increasing demand", (available at <http://www.unwater.org/water-cooperation-2013/water-cooperation/facts-and-figures/en/>; last accessed on: 21 November 2015); OECD (2007), "The OECD Environmental Outlook to 2030"

¹⁷ OECD (2007), "The OECD Environmental Outlook to 2030"

¹⁸ UN, "Global Issues: Water" (available at: <http://www.un.org/en/globalissues/water/>; last accessed on: 21 November 2015)

¹⁹ Tisdall, S. (2012), "East Africa's drought: the avoidable disaster", The Guardian, 18 January 2012 (available at: <http://www.theguardian.com/world/2012/jan/18/east-africa-drought-disaster-report>; last accessed on: 21 November 2015)

²⁰ European Commission (2011), "Horn of Africa Drought: Covering Kenya, Ethiopia, Somalia and Djibouti", European Commission, Humanitarian Aid and Civil Protection, 11 November 2011 (available at:

http://ec.europa.eu/echo/files/aid/countries/hoa_drought_factsheet.pdf; last accessed on 21 November 2015)

²¹ FAO and Earthscan (2011), "The state of the world's land and water resources for food and agriculture", Rome, p.4

²² UNDESA, "International Decade for Action 'Water for Life' 2005-2015: Water scarcity" (available at:

<http://www.un.org/waterforlifedecade/scarcity.shtml>; last accessed on: 21 November 2015)

²³ Intelligence Community Assessment (2012), "Global Water Security", 2 February 2012, p.iii (available at:

http://www.dni.gov/files/documents/Special%20Report_ICA%20Global%20Water%20Security.pdf; last accessed on: 21 November 2015)

²⁴ OCHA (2010), "Water Scarcity and Humanitarian Action : Key Emerging Trends and Challenges", OCHA Occasional Policy Briefing Series –

No. 4, September 2010, p.7; SciDevNet, "Thousands die in Yemen in fights over water", 25 June 2015 (available at:

<http://www.scidev.net/global/water/news/water-death-yemen-conflict.html>; accessed on: 23 November 2015)

²⁵ More information at Gleick, P. (2014), "Water and Conflict in Syria", Huffington Post, 28 May 2014 (available at:

http://www.huffingtonpost.com/peter-h-gleick/water-and-conflict-in-syr_b_5404774.html; last accessed on: 22 November 2015)

Water scarcity and warm weather conditions can also hamper energy production. For example, almost 93% of onshore oil reserves in the Middle East are vulnerable to risks resulting from the lack of water.²⁶ Furthermore, cooling can become problematic: the 2003 heat wave in France led the energy supplier EDF to diminish its nuclear power production, which had to be covered by electricity imports worth €300 million.²⁷

While the overall impacts have been less severe in the EU, the costs related to water scarcity are increasing. The 2003 drought cost Europe approximately €8.7 billion,²⁸ and the overall cost due to droughts has been €100 billion in the past three decades.²⁹ It has been estimated that, by 2007, at least 11% of Europe's population and 17% of its territory had been affected by water scarcity.³⁰ While the challenge is greater in the southern European basins in the summer months, in the north, countries such as the UK and Germany are also affected. Droughts affecting the continent are predicted to increase in frequency and intensity in the future. As a result, water scarcity in rivers basins is expected to rise by 50% by 2030.³¹

1.2.2 Quantity - too much water

90% of the natural disasters between 1991 and 2000, which cost the lives of more than half a million people, were connected to water.³² Along with droughts, floods are the most frequent water-related natural disasters with very high economic and human costs. The OECD estimates that by 2050 risks associated with floods will affect 20% of the earth's population leading to €35 trillion worth of risks to property.³³

This is no news to the EU. In 2013, the Elbe, Danube and Vltava rivers overflowed, costing more than €12 billion.³⁴ EU data shows that the economic losses resulting from floods could be five times higher by 2050 with an average of €23.5 billion per year.³⁵

The situation may be getting even worse. Sea levels are projected to rise due to the melting of ice sheets, forcing populations in coastal regions to relocate closer to the mainland. This phenomenon of coastal flooding could affect three times as many people by 2070.³⁶

²⁶ World Bank (2014), "Will Water Constrain Our Energy Future?", 16 January 2014 (available at: <http://www.worldbank.org/en/news/feature/2014/01/16/will-water-constrain-our-energy-future>; last accessed on: 22 November 2015)

²⁷ IEA (2012), "Water for Energy, is energy becoming a thirstier resource?", Excerpt from the World Energy Outlook 2012, p.17 (available at: http://www.worldenergyoutlook.org/media/weowebiste/2012/WEO_2012_Water_Excerpt.pdf), last accessed on: 22 November 2015)

²⁸ European Commission (2012), Communication "Report on the Review of the European Water Scarcity and Droughts Policy", COM(2012) 0672 final

²⁹ European Commission (2007), Communication on "Addressing the challenge of water scarcity and droughts in the European Union", COM(2007) 414 final

³⁰ *ibid.*

³¹ European Commission (2012), Communication "Report on the Review of the European Water Scarcity and Droughts Policy"

³² UN Water (2012), "Climate Change" (available at: http://www.unwater.org/downloads/WWD2012_climate_change.pdf; last accessed on: 22 November 2015)

³³ OECD (2013), "Water Security for Better Lives", OECD Studies on Water, Paris, p.15; EurActiv.com (2013), "Europe threatened by greater water risks: OECD report", 3 September 2013 (available at: <http://www.euractiv.com/sustainability/eu-threatened-greater-water-risk-news-530188>; last accessed on 22 November 2015)

³⁴ European Commission (2014), "Science for Environment Policy: European flooding costs could increase almost five-fold by 2050", News Alert, Issue 372, 15 May 2014 (available at: http://ec.europa.eu/environment/integration/research/newsalert/pdf/372na7_en.pdf; last accessed on: 22 November 2015)

³⁵ *ibid.*

³⁶ OECD (2007), "Climate change could triple population at risk from coastal flooding by 2070, finds OECD", 4 December 2007 (available at: <http://www.oecd.org/general/climatechangecouldtriplepopulationatriskfromcoastalfloodingby2070findsoecd.htm>; last accessed on 22 November 2011)

Excessive rainfall also leads to more pollutants being washed into water bodies and can cause sewer systems to overflow and damage water treatment facilities. This has a direct effect on another critical water-related challenge: quality.

1.2.3 Quality - too 'polluted' water

The quality of the existing fresh waters supplies is greatly affected by inadequate water management practices. As described above, this includes pollution from human activities and lack of treatment of human but also industrial and agricultural waste. For example, only 53% of European river and lake water bodies is expected to have a good/high ecological status in 2015 based on the EU standards.³⁷ Around 25% of groundwater has poor chemical status mainly due to use of nitrate in the agriculture sector.³⁸

Access to clean water and sanitation remains a global challenge. The lack of access to clean water, as experienced by 783 million people in 2013, and to adequate sanitation constitutes a great health risk with dramatic consequences for populations, particularly in developing countries.³⁹ Waterborne diseases, which can infect people through bathing, drinking, washing and the preparation and consumption of food, kill more than 5 million people annually, ten times the deaths caused by war.⁴⁰ This is a serious development challenge as illustrated by the United Nations Sustainable Development Goal, which aims to “ensure availability and sustainable management of water and sanitation for all”.⁴¹ However, the challenge is also known in the EU: 20 million Europeans lack access to quality water and safe sanitation.⁴²

The degradation of water quality poses a direct threat not only to human health but also to ecosystems, economic activities and livelihoods. For example, water pollution can be detrimental to agriculture, through the contamination of livestock and the damaging of crops, and costly for fisheries as well as for recreational activities and tourism.

More information on the interlinkages between water and ecosystems, agriculture, industry as well as health, and recommendations for needed action can be found in Chapter 2 on “Water nexus”.

1.2.4 Access and affordability

Access to safe water and sanitation may be hindered due to poor water resources, lack of infrastructure or if people cannot afford these services. In the case of the latter, when part of the challenge is how water is priced, the following needs to be considered.

Water has a value. Its use has a cost for the economy, society and the environment, and managing water resources requires investments. Thus pricing water and using economic instruments such as abstraction, pollution and user charges are valuable tools that can contribute to good water management. Implementing the ‘polluter pays’ principle can make pollution a costly activity and can help to change behaviours while generating revenue.

³⁷ EEA (2015), “Freshwater quality”, European briefing, 18 February 2015 (available at: <http://www.eea.europa.eu/soer-2015/europe/freshwater>; last accessed on: 22 November 2015)

³⁸ EEA (2015), “The European environment: state and outlook”, Copenhagen, p.64

³⁹ UN Water (2013), “An increasing demand”, (available at <http://www.unwater.org/water-cooperation-2013/water-cooperation/facts-and-figures/en/>; last accessed on: 21 November 2015)

⁴⁰ See website of WWF, “Securing water for people and nature” (available at: http://www.panda.org/what_we_do/how_we_work/conservation/freshwater/; last accessed on: 22 November 2015)

⁴¹ More information at UN, “Goal 6: Ensure access to water and sanitation for all” (available at: <http://www.un.org/sustainabledevelopment/water-and-sanitation/>; last accessed on 22 November 2015)

⁴² European Commission (2013), “Statement by EU Commissioner for Environment Janez Potočnik, EU Commissioner for Development Andris Piebalgs and EU Commissioner for Internal Market and Services Michel Barnier on the eve of World Water Day 2013”, MEMO, 21 March 2013 (available at: http://europa.eu/rapid/press-release_MEMO-13-270_en.htm; last accessed on 22 November 2015)

However, recognising the human right to water and sanitation, as set out by the United Nations, means also ensuring access to affordable water. This means a balance must be sought between recovering the costs of water services and ensuring access to water, especially for the most vulnerable in society.

Pricing water and recovering costs, including environmental and resource costs, is not an easy task, as the EU has experienced. Prices must be high enough to incentivise users to use water resources in a more sustainable manner, but also to ensure that costs related to the provision of water services, which include operational and maintenance costs, are recovered to an adequate degree. They should also be fair.

As the costs of water services, and as a result their prices, are likely to continue to increase due to demands on the infrastructure and a stronger emphasis on the 'polluter pays' principle, the EU and its member states have an interest to explore how pricing mechanisms could be complemented with social measures. Water governance and efforts such as benchmarking water services can play an important role in improving people's access to affordable water, in an effective and fair manner.

More information on pricing water, the use of economic instruments, access to affordable water, and recommendations for the way forward can be found in Chapter 3 "From pricing water to ensuring access for all".

1.3 BENEFITS OF IMPROVED WATER MANAGEMENT

An efficient and rational management of water resources could lead to great economic, social, environmental but also security benefits. The rationale for EU action could not be stronger.

The cost of non-action is just too big to keep following a 'business as usual' scenario. For developing countries, the total economic losses due to inadequate water supply and sanitation is estimated at \$260 billion annually.⁴³ Access to sanitation, the practice of good hygiene, and a safe water supply would contribute to healthy lives and could save the lives of 1.5 million children a year.⁴⁴ As the burden of collecting water in developing countries falls predominantly on women and girls, who sometimes need to walk long distances and dedicate many hours to this activity, reducing the distance to a water source can improve gender equality and girls' access to education.

In the case of the EU, failing to address the water challenge and persisting in wasteful practices also leads to economic losses and other missed opportunities. Decreasing water pollution and improving health conditions would save costs. The incomplete implementation of the *Water Framework Directive*, for example, is estimated to cost the EU around €2.8 billion a year.⁴⁵ It has also been estimated that should the EU take further action in, for example, realising flood plans and reducing pharmaceutical residues in urban wastewater, it could save a further €25 billion.⁴⁶

⁴³ WHO (2012), "Global costs and benefits of drinking-water supply and sanitation interventions to reach the MDG target and universal coverage", WHO/HSE/WSH/12.01, Geneva, p.37 (available at:

http://www.who.int/water_sanitation_health/publications/2012/globalcosts.pdf; last accessed on: 22 November 2015)

⁴⁴ See website of UNDESA, "International Decade for Action 'Water for Life' 2005-2015: Access to sanitation" (available at:

<http://www.un.org/waterforlifedecade/sanitation.shtml>; last accessed on: 21 November 2015)

⁴⁵ Zandra, T. (2015), "Water Legislation: Cost of Non-Europe Report" European Parliamentary Research Service, May 2015, p.12 (available at: [http://www.europarl.europa.eu/RegData/etudes/STUD/2015/536369/EPRS_STU\(2015\)536369_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/STUD/2015/536369/EPRS_STU(2015)536369_EN.pdf); last accessed on 22 November 2015)

⁴⁶ Zandra, T. (2015), "Water Legislation: Cost of Non-Europe Report" European Parliamentary Research Service, May 2015, p.20

Encouraging new business opportunities in water innovation could also contribute to economic growth. While overcoming challenges linked to water scarcity and pollution is an enormous endeavour, many solutions already exist; from economic instruments to water-related innovations, which can play a role in improving water management. The reuse of water and smarter wastewater management with recovery of energy and critical materials such as phosphorous, for example, make both environmentally and economically interesting options for the future.

There are great opportunities for the water sector itself to build on this potential in the EU. In 2010, the European water industry was worth €43,84 billion, accounting for 499,000 full-time jobs.⁴⁷ With 9000 SMEs involved in the business, it is an important employer and contributor to society and economy.⁴⁸

A more efficient use of water resources is also an opportunity to combine economic and environmental gains. For example, the preservation of freshwater sources and wetlands can help maximise the benefits of ecosystem services for a wide range of sectors, including the environment, food, health and tourism.

Finally, water relations can provide an opportunity for international cooperation. Sharing common water resources can push governments to work together to develop mutually beneficial solutions. The record of conflicts linked to water is historically low compared to instances of cooperation. Over the last 50 years, there have been 37 cases of violent disputes while 200 water treaties have been peacefully negotiated.⁴⁹

The benefits of improved water management and needed EU actions across policy areas make the storyline for the publication, but more detailed information can be found especially in the Chapters on “Innovation”, “Implementing the human right to water and sanitation in developing countries” and “Water: a source of conflict or an opportunity for cooperation?”.

1.4 AN OVERVIEW OF THE EU TOOLBOX FOR ACTION

The EU has a wide ranging policy framework that it can use to manage the water challenge in and outside the EU. It is in the EU’s interest to adopt and implement a comprehensive, forward-looking policy framework, which will help to tackle the water challenge and bring about the benefits as described above.

Environmental initiatives

In 2012, the European Commission published the *Blueprint to Safeguard Europe’s Water Resources*, a strategy that aims to ensure that enough good quality water is available to meet the needs of people, the economy and the environment within the EU.⁵⁰ It highlights the importance of cross-sectoral thinking and getting sectors, such as industry, agriculture, energy production, tourism, and urban development to manage and use water resources in a sustainable manner. It recognised the need to integrate water policy objectives into other policies and placed an emphasis on measures that can achieve multiple benefits, such as economic and social gains, protecting the environment and tackling climate-related challenges. The Blueprint focuses on three main areas of action, which are the management of water demand, the protection of water ecosystems and the improvement of

⁴⁷ Garzón Delvaux, P.A., De Paoli, G., Strosser, P. (2014), “Potential for stimulating sustainable growth in the water sector in the EU and the marine sector – input to the European Semester”, European Commission, March 2014, Brussels, p.18 (available at: http://www.eureau.org/images/img/Water_Industry_Tasks1to5_Definitive_Version_2014.pdf; last accessed on 22 November 2015)

⁴⁸ European Commission (2012), Communication on “the European Innovation Partnership on Water”, COM(2012) 216 final, p.3

⁴⁹ See website of UNDESA, “International Decade for Action ‘Water for Life’ 2005-2015: Water cooperation” (available at: http://www.un.org/waterforlifedecade/water_cooperation.shtml; last accessed on: 21 November 2015)

⁵⁰ European Commission (2012), Communication on “Blueprint to Safeguard Europe’s Water Resources”, COM(2012) 0673 final

water availability. The Blueprint is linked to the 2011 *Resource Efficiency Roadmap* and it was developed to guide the EU's water policy up to 2050.⁵¹ The Blueprint also sets out strategic approaches to accomplish objectives of several water-related EU policy instruments, such as the *Water Framework Directive*.

The aim of the *Water Framework Directive* (WFD) adopted in 2000 was to accomplish long-term sustainable water management, starting with all surface and groundwater bodies reaching a good ecological status by 2015.⁵² This meant cleaner rivers, lakes and coastal beaches, as well as improving groundwater quality and reducing water scarcity. The Commission recognised that meeting these objectives and successfully tackling pollution requires the implementation of other directives and regulations as well. These include the *Nitrates Directive*,⁵³ which aims to prevent the pollution of groundwater due to nitrates emanating from agriculture; the *Urban Waste Water Treatment Directive*, which addresses the collection, discharge and treatment of urban wastewater;⁵⁴ and the *Industrial Emissions Directive* which addresses the pollution originating from industrial activities by requiring the application of "best available techniques" for environmental protection.⁵⁵ According to the Commission a lot remains to be done to ensure the good status of European freshwater, partly due to decades of degradation and ineffective management.⁵⁶ While overall Europe's waters are in a better state than in 2000, the failure of most member states to comply with and implement EU legislation has been estimated to cost the EU billions of euros.⁵⁷

Agricultural policy

The *Common Agricultural Policy* (CAP) strengthens the role of farmers within the EU in order to meet our food demands.⁵⁸ The CAP equals nearly 40% of EU budget, and primarily provides subsidies for farmers, thus limiting their exposure to external competition. In addition to the *Nitrates Directive*, the CAP contains instruments to protect water sources that are used for agriculture. In order to encourage less wasteful practices, measures are suggested to promote investments in the improvement of irrigation infrastructures and techniques in accordance with the *Nitrates Directive*. Certain payments issued to farmers aim to contribute to the implementation of the *Water Framework Directive*. Attempts to "green" the CAP are ongoing, with the objective of having a more regulated cross-compliance with environmental legislation.⁵⁹ The European Rural Development Funds, a part of CAP, aim to create financial incentives to improve the availability of water and raise awareness of water efficiency.⁶⁰ However, more must be done to remove the existing discrepancies between agricultural and environmental policies and objectives, and enforce implementation of existing legislation.

⁵¹ European Commission (2011), Communication on "Roadmap to a Resource Efficient Europe", COM(2011) 0571 final

⁵² Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for Community action in the field of water policy

⁵³ Council Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources

⁵⁴ Council Directive 91/271/EEC concerning urban waste-water treatment

⁵⁵ Directive 2010/75/EU of the European Parliament and the Council on industrial emissions

⁵⁶ More information at European Commission (2015), Communication on "The Water Framework Directive and the Floods Directive: Actions towards the 'good status' of EU water and to reduce flood risks", COM(2015) 0120 final

⁵⁷ EEA (2015), "The European environment: state and outlook", Copenhagen, pp 63-64

⁵⁸ More information at European Commission website, "The Common Agricultural Policy after 2013" (available at: <http://ec.europa.eu/agriculture/cap-post-2013/>; last accessed on 23 November 2015)

⁵⁹ European Commission, "A partnership between Europe and Farmers- The EU's common agricultural policy (CAP): for our food, for our countryside, for our environment", April 2014, pp 7-9 (available at: http://ec.europa.eu/agriculture/cap-overview/2014_en.pdf; last accessed on: 23 November 2015); EEA (2015), "The European environment: state and outlook", Copenhagen, p.149

⁶⁰ More information at European Court of Auditors (2014), Press Release, ECA 14/19, 13 May 2014 (available at: http://europa.eu/rapid/press-release_ECA-14-19_en.htm; last accessed on 23 November 2015)

Research and innovation policy

The EU has a strong research and innovation arm, which it can use to tackle the water challenge in and outside the EU. Examples of this include funding under the Horizon2020 and the *European Innovation Partnership* (EIP) on water,⁶¹ which aims to promote the development and deployment of innovative products and solutions. The partnership brings together public and private experts to develop innovations in the field of water reuse and recycling, water and wastewater treatment, management of water as part of a water-energy nexus as well as risk management of extreme water events. The EIP is also designed to create market opportunities for these innovations, thereby triggering economic growth and job creation. The initial enthusiasm for EIP water has calmed down, however, it arguably remains an important instrument for building bridges between different stakeholders.

Development policy

Water and sanitation are a focal point of the EU's development policy. The EU allocated approximately €2 billion to these sectors in developing countries between 2008 and 2013, which according to the Commission, contributed to giving 70 million people access to drinking water and improving the sanitation facilities of 24 million people.⁶² One of the instruments that was used by the EU to implement the UN Millennium Development Goal to halve the proportion of people without sustainable access to safe drinking water and to basic sanitation by 2015 has been the *ACP-EU Water Facility* (Africa Caribbean Pacific - European Union Water Facility), which was established in 2004.⁶³ The programme provided and leveraged investment in water and sanitation services in the ACP region. It mobilised a wide range of actors, including local water operators, local governments and civil society with the common objective of improving the management and governance of these services. However, the ACP-EU Water Facility has not yet been renewed and it remains unclear whether or not the EU will resort to a similar program to implement the recent UN Sustainable Development Goal to ensure access to water and sanitation for all by 2030.⁶⁴ The EU also established the *European Water Initiative* to enhance international development cooperation and coordination through policy dialogues between national governments, donors, the water industry and NGOs.⁶⁵

Water diplomacy and security

The Foreign Affairs Council recognised in its "*Water Diplomacy Conclusions*" in 2013 that "during the next decade, tensions and conflicts over access to water are likely to become more frequent and could endanger stability and security in many parts of the world. This could also have a direct bearing on European interests, as on international peace and security".⁶⁶ The Conclusions also build on the realisation that water diplomacy can be used as a tool to "help safeguard security, development, prosperity and the human rights to water and sanitation".⁶⁷ The Council encouraged further EU commitment in this area, including through a proactive engagement in transboundary political and security challenges via collaborative and sustainable water management and regional and international cooperation, including via multilateral *fora* and legal instruments.

⁶¹ European Commission (2012), Communication on "the European Innovation Partnership on Water", COM(2012) 216 final

⁶² European Commission (2013), "World Water Week: 70 million people connected to drinking water thanks to EU aid", Press Release, 2 September 2013 (available at: http://europa.eu/rapid/press-release_MEMO-13-760_en.htm; last accessed on: 23 November 2015)

⁶³ UN Millennium Project (2006), "Goals, targets and indicators" (available at <http://www.unmillenniumproject.org/goals/gti.htm#goal7>; last accessed on: 23 November 2015); More information at European Commission, "ACP - multi-country cooperation – Water" (available at https://ec.europa.eu/europeaid/regions/african-caribbean-and-pacific-acp-region/acp-multi-country-cooperation/acp-eu-water-facility_en, last accessed on 23 November 2015)

⁶⁴ More information at UN, "Goal 6: Ensure access to water and sanitation for all" (available at: <http://www.un.org/sustainabledevelopment/water-and-sanitation/>; last accessed on 22 November 2015)

⁶⁵ More information at Global Water Partnership (2013), "EU Water Initiative" (available at: <http://www.gwp.org/en/About-GWP/Publications/EU-Water-Initiative/>; last accessed on 23 November 2015)

⁶⁶ Council of the European Union, "Council Conclusions on EU Water Diplomacy", 22 July 2013, Brussels, p. 1

⁶⁷ *ibid.*

Recent and future policy developments with an impact on water

The European Citizens' initiative on '*Right2Water*', which gathered more than 1.8 million signatures, demanded that "the EU institutions and member states be obliged to ensure that all inhabitants enjoy the right to water and sanitation"; "water supply and management of water resources not be subject to 'internal market rules' and that water services are excluded from liberalisation"; and that the "EU increases its efforts to achieve universal access to water and sanitation".⁶⁸ In its response to the initiative, the Commission identified several action points, including reinforcing the EU's water quality legislation, creating a more structured dialogue between stakeholders on transparency in the water sector, cooperating with existing initiatives to provide a wider set of benchmarks for water services and stimulating innovative approaches for development assistance.⁶⁹ As a follow-up, the European Parliament issued a resolution in September 2015, reminding the member states and the Commission of the need to implement the *EU Water Framework Directive*, *Urban Waste Water Treatment Directive* and others, and calling to set up a benchmarking system to improve the quality of water supply and sanitation services, to integrate water policy objectives with the CAP, to ensure that a comprehensive water supply is characterised by affordable prices, and to allocate funds to realise the human right to water and sanitation outside Europe.⁷⁰ This is an excellent opportunity for the Commission to bring water on the policy agenda, and show commitment to tackling the water challenge.

The Commission will present a *Circular economy package* in December as a part of the transition towards a more resource-efficient and competitive European economy.⁷¹ Given the environmental and economic value of water, its central role in production and consumption processes, the untapped potential in using wastewater as a resource and the innovative nature of the water sector, the package should be an opportunity to place water at the centre of a more sustainable European economy. There is great potential in building processes that enable water to retain its value after each usage and to encourage reuse of water and smarter wastewater management with recovery of energy and critical materials. To what extent the vision and an action plan will incorporate water considerations, however, remains to be seen.

While water is not part of the official agenda for international climate discussions, it will find its way in. Indeed, as the world leaders aim to conclude a new international climate agreement in Paris in December 2015, the disastrous impact of climate change on water resources, the increased risks of water-related natural disasters, such as floods, implications for geopolitics, and the central role water management and the sector as a whole can play in climate change mitigation and adaptation should not be forgotten. The global climate framework and financing should play an important role in addressing these issues.

⁶⁸ More information at Right2Water, "Water and sanitation are a human right!" (available at: <http://www.right2water.eu/>; last accessed on 23 November 2015)

⁶⁹ European Commission (2014), Communication on the European Citizens' Initiative "Water and sanitation are a human right! Water is a public good, not a commodity!", COM(2014)0177 final

⁷⁰ European Parliament, Resolution of 8 September 2015 on the follow-up to the European Citizens' Initiative Right2Water (2014/2239(INI))

⁷¹ More information at European Commission website, "Moving towards a circular economy" (available at: http://ec.europa.eu/environment/circular-economy/index_en.htm; last accessed on 23 November 2015)

THE WATER NEXUS

2.1	The water nexus is getting more complex, and it is not just a local issue	14
2.2	Further pressures are created by climate change	15
2.3	Water in a circular economy	16
2.4.	General recommendations	17
2.5	Water-environment interlinkages	18
	<i>2.5.1 Recommendations</i>	20
2.6	Water–food nexus	20
	<i>2.6.1 Recommendations</i>	22
2.7	Water-health nexus	22
	<i>2.7.1 Recommendations</i>	24
2.8	Water-energy nexus	25
	<i>2.8.1 Recommendations</i>	27

Water is often considered a purely environmental issue. This is short-sighted as a basis for policy- and decision-making.

Understanding water’s role as the basis for a functioning society and sustainable economy requires an understanding of the bigger picture. Water is a vital component of the environment and economic activities such as agriculture, energy generation, industrial production, and tourism. At the same time, what happens in these sectors has impacts on local and global water resources.

But the picture is even more complex: water is closely connected with challenges related to changing climate, human and national security, human health and productivity, population growth, increasing resource demand, economic growth, migration, and urbanisation. Political, economic and social stability in and outside the EU depend on how we manage our water resources.

As the share of the world’s freshwater reserves is decreasing at an alarming rate due to human activities, it is clear that a more comprehensive approach is needed. This requires an understanding of the interlinkages, ‘the nexus’, between water and water-dependent sectors such as agriculture and energy, the drivers for change, and how changes/actions in one area can have an impact on others. It also requires an understanding of how emerging trends such as climate change, population growth, and urbanisation may affect the water nexus, and what the impacts could be on people and the economic sectors that depend on water.

These interlinkages are often forgotten or ignored, and policies are designed and decisions made in silos. Seeing water purely as a local environmental issue fails to recognise the complexity of the challenge, and undermines the importance of water management as an area for cross-sector action.

However, this view has tended to prevail in the EU. Tackling the water challenge is not a priority for action, and there has been little motivation to incorporate and enforce better management of water, for example in agricultural and energy policies. The unwanted consequences of this are already being felt both in and outside the EU.

Seeing the water challenge through the filter of climate, energy and food security would make it a priority on the policy agenda. Understanding the interlinkages and taking them into account to prepare for wanted and unwanted changes would represent a foundation for smart, forward-looking policy and investment decisions.

2.1 THE WATER NEXUS IS GETTING MORE COMPLEX, AND IT IS NOT JUST A LOCAL ISSUE

World population growth, especially the growing middle class, is putting an enormous pressure on global resources such as energy, land, food and minerals – as well as water. Diets are changing and demand for food is growing. Industrial production and consumerism are booming. More than half of the world's population already live in cities, and continuing urbanisation can lead to ecological destruction through increased industrialisation and pollution. The environment and vital ecosystems are coming under threat. Many of the challenges are similar on the global and the European level: whether in the agriculture or the energy sector, the availability of water will pose real difficulties in the future.

Overexploitation of resources and environmental destruction lead to resource scarcity, including water scarcity, which poses a wide range of economic, social, political and security challenges. On a global level, we are already seeing increasing competition over access to food and fertile land, international disputes over control of transboundary water supplies and maritime resources, health problems due to unsafe water or lack of sanitation, and other humanitarian concerns. The situation is not going to become any easier: it has been estimated that global water demand in 2030 could be up to 40% higher than the current supply.⁷² In addition, one can expect to see a wide range of new challenges, ranging from an increase in food prices to disruptions in energy production, and from the functioning of cities to new migration flows.

The nexus between water, food and energy is one of the most fundamental relationships for our society. As they are so closely inter-related, changes in the supply and use of one resource can have serious implications for the supply and use of others.⁷³ For example, the choice of a food crop will have significant implications on the input side in the amount of water needed for irrigation. At the same time, on the output side, whether the crop is used as food or a biofuel will have impacts on society and the environment.

The effects of resource overexploitation or pollution on water resources are seldom limited to one region: spill-over effects are likely to be felt in geographically distant communities. For example, deforestation of tropical areas changes rainfall patterns and temperatures across the globe from Europe to Asia, affecting for example agricultural production.⁷⁴ As another example, air pollution from energy production or transport does not respect borders, and will have a growing negative impact on Europe's freshwater resources.

⁷² The 2030 Water Resources Group (2009), "Charting our water future - Economic frameworks to inform decision-making, McKinsey & Company", New York, p.40

⁷³ Andrews-Speed, P., *et al.*, (2012), "The global resource nexus: The struggles for land, energy, food, water and minerals", Transatlantic Academy, Washington, D.C.

⁷⁴ Lawrence, D., (2014), "Effects of Tropical Deforestation on Climate and Agriculture – A policymaker summary of the article published in Nature Climate Change", 18 December 2014, (available at: http://www.climateandlandusealliance.org/uploads/PDFs/Effects_of_Tropical_Deforestation_Policymaker_Summary.pdf; last accessed 23 November 2015)

Just as the different dimensions of the water nexus interact with European societies, developments in one part of the EU can also affect other areas. This is extremely important to remember when discussing the challenges connected to water, which is normally considered a 'local' issue. The state of play with water resources in each EU member state is different due to geography and climate, and, consequently, the challenges related to quality, quantity, access and affordability also vary. However, problems in one region can soon become problems in others. For example, water scarcity in southern Europe can impact agricultural production across the continent, leading to greater demands in other parts of the EU. As water scarcity is a growing problem across the EU, affecting both regions with low rainfall and those with high population density, as well as areas with intense agricultural, industrial, tourism activities, member states, regions, businesses in the agricultural sector and other economic operators need to collaborate in sharing best practices and ensuring a coherent approach to managing water resources within the EU.

At the same time, greater awareness is needed of how the EU contributes to increasing the pressure on water resources outside its borders. For example, food and textiles that are imported from outside the EU all have a water footprint. A good example is the large amount of imported cotton, which requires the use of significant water reserves in producing countries located in dry regions such as Egypt, Uzbekistan, and Pakistan. An estimated 84% of the EU's water footprint from cotton consumption is located outside Europe.⁷⁵ In addition, it has been estimated that EU biofuel policy will lead to close to six million more hectares (0.7% of world total) of cereals, oilseeds, sugar crops and palm oil being harvested in the world in 2020, meaning even higher demand for water resources.⁷⁶

2.2 FURTHER PRESSURES ARE CREATED BY CLIMATE CHANGE

Climate change influences both the quality and the quantity of available water. As man-made greenhouse gas emissions continue to rise, climate change and associated extreme weather events are likely to increase, thereby affecting the demand for and availability of freshwater, and consequently, for example, food and energy production. As we have already seen, changing weather systems have meant increasing precipitation in some areas and droughts in others.⁷⁷

Further changes in our weather patterns and an increase in extreme weather events can have devastating consequences for the environment and biodiversity. Such changes can affect inland and marine regions, including different natural environments and species. Land degradation is already a concern: it is estimated that around 20% of irrigated land worldwide is salt-affected, leading to 2,500-5,000 km² of lost production every year.⁷⁸ According to WWF, a 4°C rise in temperature would cause most of the world's glaciers to melt, thereby exhausting the Earth's largest freshwater reservoirs.⁷⁹ Warm weather conditions cause the desiccation of wetlands, putting these fragile ecosystems and the biodiversity they contain under severe threat. Moreover, increasing water temperatures reduce oxygen levels in rivers and as such undermine their capacity to self-purify.

⁷⁵ Chapagain, A.K., Hoekstra, A.Y., Savenije, H.H.G., Gautam, R., (2006), "The water footprint of cotton consumption: An assessment of the impact of worldwide consumption of cotton products on the water resources in the cotton producing countries", *Ecological Economics*, 60, pp186 – 203. (available at: http://waterfootprint.org/media/downloads/Chapagain_et_al_2006_cotton.pdf; last accessed on 23 November 2015)

⁷⁶ Joint Research Centre (2013), "Impacts of the EU biofuel policy on agricultural markets and land use", European Commission, Brussels (available at: <http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=3439>; last accessed 23 November 2015)

⁷⁷ Dim, C., and Rahmstorf, S., (2012), "A decade of weather extremes", *Nature Climate Change*, 2, pp.491-496.

⁷⁸ Nellemann, C., et al., (2009), "The environmental food crisis - The environment's role in averting future food crises", United Nations Environment Programme and GRID-Arendal, Arendal (available at: www.grida.no/publications/rr/food-crisis/page/3567.aspx; last accessed 23 November 2015)

⁷⁹ WWF (2005), "Going, going, gone! - Climate change and global glacier decline", WWF, Berlin, p. 1

Changes in the environment will have serious consequences for people and economic activities. The frequency of droughts intensifies in dry regions, further reducing already limited surface water and groundwater reserves. On the other hand, flood hazards become more frequent, bringing high risks for populations and critical infrastructures. Excessive rainfall leads to more pollutants being washed into water bodies, and can cause sewer systems to overflow and damage water treatment facilities. These changes can have adverse effects on the quality, security and distribution of drinking water. Rising sea levels threaten coastal and low-lying regions and all those sectors that operate in these regions. Changes in global ocean circulation patterns and rising sea levels and ocean salinity affect the biological properties and distribution of species, which will have a significant impact on fisheries, for example. Increased water scarcity will lead to soil degradation, posing a major threat to the sustainability of Europe's land resources and potentially impairing European agriculture's ability to successfully adapt to climate change. Increased salinity may result in land being abandoned as it becomes unsuitable for crops.

Climate change is expected to lead to major changes in water availability across Europe, with increased water scarcity, especially in southern Europe, and an increased risk of flooding throughout the continent. While water scarcity is already posing problems in a number of regions across Europe, and reduced river flows in summer are affecting water availability, climate change is expected to increase the number of high-water-stress areas from the current 19% to 35% by the 2070s.⁸⁰

What happens outside Europe will also have an impact on the continent. The EU has already seen how extreme weather events outside its borders – ranging from floods to droughts – can increase requests for financial and non-financial assistance, and such increases can only be expected to grow with climate change. An extreme example of this is the Syrian refugee crisis, partly caused by years of drought, which resulted in internal pressures that intensified the political and security crisis in the country. The result is now an enormous migration challenge for Europe. Climate change and deterioration of vital resources such as water can be expected to lead to more migration in the future, which could have unknown economic, social and security implications for the EU.⁸¹

2.3 WATER IN A CIRCULAR ECONOMY

The interlinkages between water and other sectors demonstrate how fundamental water is for agricultural, energy and industrial production, as well as people's health. At the same time, the examples show how human activities are affecting the quality and quantity of water. Usage of water in a linear manner – take, make, consume and dispose, leading to water becoming more polluted as it travels through the system – is no longer sustainable.

The European Commission is publishing a Circular Economy package in December 2015, and the expectation is that the role of water will not be highlighted as a central resource in the circular economy. This would be a missed opportunity. As the EU works on promoting a circular economy, water should be seen as an essential part of the new thinking.

Firstly, the aim should be to ensure that water retains its value after each use. This will entail the prevention of contamination and ensuring that the water that is returned to the system will not have adverse impacts on the environment or human populations.

⁸⁰ European Commission (2009), Communication "White Paper on Adapting to climate change: Towards a European framework for action", COM(2009) 147 final. p.5

⁸¹ More on the security dimension of the water challenge can be found in Chapter 6, "Water: a source of conflict or an opportunity for cooperation?".

Secondly, increasing the recycling and reuse of water by creating closed loops that enable repeated use would reduce pressure on freshwater supplies. At the same time, recovering and reusing valuable materials, such as phosphorus, that are otherwise wasted, would be extremely beneficial. In addition, recovering energy from sewage sludge can reduce the need for additional water in electricity production.⁸²

Phosphorus is an essential mineral that is needed for agricultural production as an animal feed and fertilizer. The EU imports close to all of its phosphorus from outside its borders, and has been strongly affected by volatile and increasing fertilizer and food prices. Recycling phosphorus would help to safeguard its supply and reduce the EU's dependence on this critical raw material.

The sections below will describe in more detail the interlinkages between water and other vital factors for human life, well-being and prosperity, and make recommendations for further action.

2.4 GENERAL RECOMMENDATIONS

Policies on water cannot be applied in isolation, as water supply affects and is affected by developments in other sectors.

- Improving governance – the political, legal, social, economic and administrative systems that influence the use and management of water – is essential. While there is no one solution to the water challenge and also the EU and national policies will have to take into account different circumstances within and across countries, the OECD's principles on water governance provide a good basis for decision-making.⁸³ 1) It is important to define clear sustainable water policy goals and targets at all levels of government, to implement those policy goals, and to meet expected targets. 2) Better governance should aim to maximise the benefits of sustainable water management and welfare at the least cost to society. 3) In the process, the objective should be to build public confidence and ensure democratic legitimacy and fairness for society at large.
- The role of water within the global 'resource nexus' and the manifold impacts of water scarcity or abundance on human development need to be fully acknowledged by the EU, and taken into account when designing and implementing policies. Tackling the water challenge requires more vocal recognition of the challenge by EU policy makers and national leaders, as well as the agricultural sector, industry, and citizens. This should be translated into more research on the interlinkages between different policies and sectors, and the findings should be used to guide decision-making on different levels of society. The overall policy framework on water must be built upon a multi-disciplinary approach.
- Striving for a more sustainable economy supports sustainable water management, and vice versa. Policies must be enacted to enable society to use water resources efficiently while maintaining the natural systems that sustain us. As the EU works on a vision and a strategy for a more circular economy, water should be seen as an integral part in the transition. The EU must encourage the rational use, recycling and reuse of water resources, as well as the recovery of materials from wastewater. The Commission's Circular Economy package to be published in December 2015 should recognise water as a fundamental contributor to European economy and society, and a central resource in the circular processes of the agricultural, energy, and industrial sectors.

⁸² More on the reuse of water and recovery of materials can be found in Chapter 4, "Innovation as a trigger for growth and competitiveness".

⁸³ OECD (2015), "OECD Principles on Water Governance"

- Policies that may have direct or indirect impacts on global or European water supplies must be ‘water-proofed’: impacts on the quality and quantity of water supply must be considered, and the aim must be to reduce the negative impacts. Using analytical tools, such as the Water Footprint Assessment, to measure the pressure placed on freshwater resources by human activities – be it the water footprint of an individual person, processes or value chains of a product, businesses, river basins, or nations – would be the first step in helping inform consumers about how much water is hidden in the products they use, businesses about water-related business risks, and governments about water dependency and the role of water in their economies.⁸⁴ The objective must be to recognise the true value of water, and to incorporate this in policy-making.
- Multi-stakeholder cooperation is needed at all levels in order to design effective policies, ensure their implementation, and encourage innovation in processes and products across sectors. Public–private partnerships and collaboration between cities and local stakeholders are needed.
- The potential impacts of climate change on the water–energy–food–health nexus must be assessed and considered when making investments and policy decisions. The increase in extreme weather events such as floods and droughts, brought by climate change, could create significant challenges for water management in countries and cities, and adversely affect sectors such as agriculture and energy production. Climate change mitigation, adaptation, risk prevention, and management – with the objective of ensuring sustainable water management at all times – must be integrated in decisions on all political levels and across sectors.
- As the EU continues negotiations with its global partners on a climate agreement set to be signed in Paris in December 2015, the implications for water resources and the water sector’s role in mitigation and adaptation efforts should be remembered. The global climate framework and financing must aim to mitigate and adapt to the impacts that climate change will have on global water resources and thus on economic activities and human well-being. At the same time, they must be used to improve water management across the world, so that the sector can contribute to mitigation and adaptation efforts.

2.5 WATER-ENVIRONMENT INTERLINKAGES

Water is fundamental for the functioning of the environment, as well as being a resource in itself. The water cycle, from fresh groundwater to seawater and back via evaporation and rain, is central to sustaining life on Earth. At the same time, the environment plays a key role in supporting the water cycle. Unfortunately, the environment has been the first to pay for resource exploitation, including overuse and pollution of water resources. As will be shown below, this has further worsened the water challenge.

For example, agriculture and other economic activities are a significant source of water pollution, especially due to the release of hazardous chemicals. The most common source of chemical contamination of groundwater aquifers is nitrate used in agriculture. Industry discharges between 300 and 400 million tonnes of polluted waste into the world’s waters annually.⁸⁵ Furthermore, thermal pollution – the hot water released from power or manufacturing plants – leads to an increase in the temperature of water bodies, which affects oxygen levels in the water with harmful effects on ecosystems.

⁸⁴ Water Footprint Network, (2015), “What is Water Footprint Assessment?” (available at: <http://waterfootprint.org/en/water-footprint/water-footprint-assessment/>; last accessed 23 November 2015)

⁸⁵ UNEP (2010), “Clearing the Waters”, p.17

According to the head of the China's Ministry of Water Resources, 40% of the country's rivers are "seriously polluted".⁸⁶ This situation is partially due to the 20,000 petrochemical factories built near rivers which regularly release toxic waste into them.⁸⁷

Also other human activities are having detrimental impacts on the environment and ecosystems.⁸⁸ For example, urbanisation is changing land use and impacting on biodiversity. Extensive deforestation leads to increased runoff, as well as reduced evaporation from trees into the atmosphere. This reduces rainfall, leading to drought and a loss of biodiversity.

As a result, especially the biodiversity of freshwater ecosystems has suffered: more than 40% of freshwater species in Europe face an imminent threat of extinction.⁸⁹ Shifting precipitation and nutrient cycles are impacting ground-water stored in the soil, as well as the water that is found in lakes, rivers, and aquifers.⁹⁰ Polluted freshwater ends up in oceans, which also increases their deterioration, endangering marine life and habitats. Ocean ecosystems are also increasingly affected by rising ocean temperatures, leading to detrimental effects such as acidification and hypoxia.⁹¹ Furthermore, hazardous chemicals and toxins absorbed by marine animals can contaminate the food chain, with negative effects also on human health.

This is short-sighted. What happens in the environment is closely linked to human well-being. We rely upon the environment for a wide range of ecosystem services. The ecosystems provide us water. They provide us necessities such as food and medicine. They provide regulating services: for example, the lakes, swamps and peatlands store and release the water that our food production depends on. They also provide possibilities for recreation and tourism. For example, national parks generate income for different regions and are something many countries take pride in. In addition they provide habitat services by protecting biodiversity and nutrient cycles. Loss or degradation of these ecosystems will come with costs and can impact the water cycle and therefore change, for example, the availability of water for downstream agriculture and ecosystems.⁹² It will further exacerbate the challenge of ensuring accessible and affordable clean water supply to people, society and the economies in Europe and across the world. The greatest environmental issue today is that the value of the environment and ecosystem services such as wetlands is not recognised, and their role in supporting the water cycle is not understood.

⁸⁶ Kaiman, J., (2013), "Chinese environment official challenged to swim in polluted river", The Guardian, 21 February 2013 (available at: <http://www.theguardian.com/environment/2013/feb/21/chinese-official-swim-polluted-river>; last accessed 23 November 2015)

⁸⁷ La Monde (2013), "100 tonnes de poissons morts retrouvées dans une rivière de Chine", 4 September 2013 (available at: http://www.lemonde.fr/planete/article/2013/09/04/des-centaines-de-milliers-de-poissons-morts-dans-une-riviere-en-chine_3471284_3244.html; last accessed 23 November 2015)

⁸⁸ Russi, D., *et al*, (2013), "The Economics of Ecosystems and Biodiversity (TEEB) for Water and Wetlands", The Economics of Ecosystems and Biodiversity (TEEB), pp.5-6 (available at: http://www.ramsar.org/sites/default/files/documents/library/teeb_waterwetlands_report_2013.pdf; last accessed 23 November 2015)

⁸⁹ Gleick, P.H., *et al*, (2011), "The World's Water", Island Press, Washington DC., p.56

⁹⁰ Stockholm Environment Institute, (2011), "Understanding the Nexus", p.16 (available at: http://www.water-energy-food.org/documents/understanding_the_nexus.pdf; last accessed 23 November 2015)

⁹¹ The European Environment Agency (2015), The European environment: state and outlook, EEA, Denmark, pp.47-73

⁹² Wetlands International (2010), "Biodiversity loss and the global water crisis: A fact book on the links between biodiversity and water security", p.11

Wetlands are one of the more productive ecosystems in nature. However, in the period 1990-2003 alone, the world lost 50% and Europe lost 60% of its wetlands.⁹³ This was due to reasons such as intensive agricultural production and irrigation, water extraction for domestic and industrial use, urbanisation, and pollution. Such degradation impedes the ecosystem services the wetlands provide, such as clean water for drinking, water for agriculture, and cooling water for the energy sector. Furthermore, wetlands act as carbon sinks, helping reduce CO₂ emissions.

2.5.1 RECOMMENDATIONS:

Encouraging smarter use of water resources while protecting the environment

- The EU must enforce implementation of the *Water Framework Directive*, which aims to provide EU citizens with cleaner rivers, lakes, and coastal beaches, as well as improving groundwater quality and reducing water scarcity. Taking into account that most of the European surface water bodies are not in a good ecological status and that implementation of the directive is estimated to bring the EU around €2.8bn a year, the rationale for action could not be stronger.⁹⁴ As the Commission begins work on a review of the *Water Framework Directive*, expected in 2019, it must learn from the current implementation challenges, ensure policy coherence with other initiatives, but also assess and better communicate the benefits that come from ensuring that a sufficient quantity of good-quality water is available throughout the EU to meet people's needs, as well as those of the economy and the environment.
- The EU should also enforce implementation of the *Groundwater Directive*, the *Drinking Water Directive* and the *Urban Wastewater Directive*. The environmental legislation, also including, for example, directives on biodiversity and flood protection, must be used as a package to help tackle the water challenge.
- Increased efforts are needed to protect the water-based ecosystems and the environmental services they provide. The aim must be to ensure that ecosystems such as wetlands, both in and outside the EU, can continue to function and support the water cycle.
- The value, including the economic and social benefits of ecosystem services, must be assessed and integrated in decision-making. Policies and investments must encourage sustainable land use. Water-related ecosystem services must become integral to water management.
- More must be done to prevent and control pollution at source, before pollutants enter the water cycle. Special attention should be paid to controlling agricultural pollutants such as pesticides, as well as heavy metals and chemical substances that originate from industrial processes, but also substances like microplastics from domestic households. The EU legislation on controlling pollution at source must be enforced, in accordance with the 'polluter pays' principle.

2.6 WATER-FOOD NEXUS

Agriculture is a major water player, consuming and contaminating high volumes of water. Currently, the world uses 70% of its water resources for agriculture and food production. In Europe, agriculture

⁹³ Russi et al. (2013), "The Economics of Ecosystems and Biodiversity (TEEB) for Water and Wetlands", *The Economics of Ecosystems and Biodiversity (TEEB)*, February, p. 14.

⁹⁴ The European Environment Agency (2015), "The European environment: state and outlook", EEA, Denmark, p.64; European Parliamentary Research Service (2015), "The Cost of Non-Europe in Water Legislation", 2015, p.6

accounts for 24% of water abstraction; with some regions in southern Europe using up to 80%.⁹⁵ On average, one litre of water is used to produce one calorie.⁹⁶ As the pressures on water resources increase due to population growth, declining groundwater supply and climate change, the agricultural sector will come under enormous strain. The EU therefore has a significant stake in improving the water footprint of its agricultural sector.

On average, 15,400 litres of water are needed to produce one kilogram of beef.⁹⁷

By 2050, to meet the food demands of the world population, another one billion tonnes of cereals and 200 million extra tonnes of livestock products will have to be produced every year.⁹⁸

Irrigation makes agriculture possible in areas that were originally unsuitable for intensive crop production. However, excessive irrigation in areas with water scarcity is a growing problem, including in southern Europe. In Spain, almost 90% of water is used for irrigation.⁹⁹ The problem is exacerbated by artificially low water prices for agriculture and the use of water tariffs based on the area irrigated rather than on the volumetric water usage.¹⁰⁰ This is neither water- nor cost-efficient, as it encourages excessive usage of water and water-intensive crops.

Agriculture is also a major cause of degradation of surface and groundwater resources through erosion and chemical runoff. Problems arise, for example, when the nitrates used in organic and chemical fertilizers are carried by excess irrigation into runoff and then into streams and rivers.¹⁰¹ To counter this, the EU created the *Nitrate Directive*, which has reduced nitrate loads in water.¹⁰² However, there is still a lot to do, including reducing excessive pesticide and fertilizer application as well as improving water retention measures.

According to the Food and Agriculture Organization (FAO), feeding a global population of nine billion people in 2050 will require a 70% increase in total food production.¹⁰³ This will be a real challenge for food security and the world's water resources, which will only be made worse by people's dietary choices, increases in biofuel production, and climate change. The growth of the meat-eating middle class will have a significant impact on the water footprint of the agricultural sector. Furthermore, biofuel production is becoming a competitor for food crops. Climate change, bringing increasing temperatures and extreme rainfall and weather events, is expected to lead to a higher number of pests and diseases. Increased water scarcity would only add to the challenge.

⁹⁵ European Environment Agency (EEA) (2009), "Water resources across Europe — confronting water scarcity and drought", EEA Report, No2/2009, Copenhagen, p.5

⁹⁶ United Nations Food and Agriculture Organization (FAO), (2009), "Media Fact Sheet: Growing More Food- Using Less Water", Fifth World Water Forum in Istanbul, Turkey, (available at: http://www.fao.org/fileadmin/user_upload/newsroom/docs/water_facts.pdf ; last accessed 23 November 2015)

⁹⁷ Mekonnen, M.M. and Hoekstra, A.Y. (2010), "The green, blue and grey water footprint of farm animals and animal products", Value of Water Research Report, Series No. 48, UNESCO-IHE, Delft, the Netherlands, p. 73

⁹⁸ Food and Agriculture Organization of the United Nations (FAO) and Earthscan (2011), "The state of the world's land and water resources for food and agriculture", FAO and Earthscan, Abingdon, UK, p.4

⁹⁹ Institute of European Environmental Policy (2000), "The Environmental Impacts of Irrigation in the European Union", London, p.16

¹⁰⁰ More on the use of economic instruments to encourage sustainable use of water resources can be found in Chapter 3 on "From pricing water to ensuring access for all".

¹⁰¹ European Commission (2010), "Fact Sheet: The EU Nitrates Directive", p.1 (available at: <http://ec.europa.eu/environment/pubs/pdf/factsheets/nitrates.pdf>; last accessed 23 November 2015)

¹⁰² The European Environment Agency (2015), "The European environment: state and outlook", EEA, Denmark, pp.64-71

¹⁰³ Food and Agriculture Organization of the United Nations (FAO) (2011), "The State of the World's and Land Water Resources for Food and Agriculture: Managing Systems At Risk", Summary Report pp. 7-9

2.6.1 RECOMMENDATIONS:

Agricultural production and water management must become two sides of the same coin

- Discrepancies in the EU policy framework between water and agricultural policies must be overcome. This must start with the alignment of the Common Agricultural Policy (CAP) with the EU's efforts to safeguard Europe's water, as put forward in the *Water Framework Directive*. Direct agricultural subsidies to farmers under the CAP must be stopped and replaced with more outcome-oriented financing via rural development.
- It is in the interest of the EU and the member states, as well as the farmers themselves, to ensure that water is used efficiently. This should include educating farmers and sharing know-how about the most water-efficient practices, new crops, solutions such as drip technologies, and reusing water for irrigation, as well as how soil management can contribute to sustainable water use and help to conserve water. Farmers must be encouraged to assume a stronger role in mitigating and adapting to climate change.
- Farmers must also be encouraged to minimise their pollution. This requires: 1) controlling pollution at source. As reducing use of mineral fertilizers and pesticides could improve water quality with minimal impact on profitability or productivity, for example, the CAP could be used to enforce fines for plots of land/farmers that exceed a certain pesticide threshold. 2) The agricultural sector should be made to pay the true cost of its use of water. This starts with charging for the volume of water used. In addition, stronger enforcement of the 'polluter pays' principle is needed.
- Policy makers at EU and national level, farmers, the food industry, and citizens all have a role in promoting sustainable food production and consumption, as well as in contributing to healthy ecosystems and resilient communities. Regulation should be combined with promoting new partnerships between farmers, the scientific community, civil society, and businesses in order to promote more sustainable food production and consumption. Agricultural lands, including soil and vegetation, should be developed so that they also provide ecosystem services and act as a sink for greenhouse gases. People must be educated about the water footprint of their individual choices, including diets. For example, as the production of meat and dairy products not only requires significant amounts of water but also makes a major contribution to climate change, and as consuming these products can furthermore have adverse health impacts, it is in the interest of authorities to educate and encourage people to change their diets.

2.7 WATER-HEALTH NEXUS

People's health and well-being are affected by various factors, including behaviour, genetic make-up, demographic elements such as age, gender and population sub-group, and, increasingly, by the environment and changing climate. Improper sanitation and scarce water resources remain a serious challenge in many parts of the world. Globally, almost 900 million people lack access to safe water supplies, and 2.5 billion people live without access to adequate sanitation, with at least 80% of those individuals living in rural areas. Yearly, more than 3.5 million deaths occur due to lack of clean water, with water- and vector-borne diseases making up 10% of the total global burden of illness. Globally, 88% of diarrhoea cases are explained by unsafe water, poor sanitation, and lack of hygiene.¹⁰⁴

¹⁰⁴ Schuster-Wallace, C.J., *et al.* (2008). "Safe Water as a Key to Global Health", The United Nations University, p.8, (available at: http://inweh.unu.edu/wp-content/uploads/2013/05/SafeWater_Web_version.pdf; last accessed 23 November 2015)

Water scarcity is made worse by climate change, poverty, population dynamics, and globalisation, factors which all interact to affect water supplies. People who inhabit water-stressed locations are more vulnerable to illnesses. Areas with a reduced water flow in river ecosystems during the summer months are also exposed to a greater risk of bacterial contamination. Rural populations that rely on agriculture in low-rainfall areas are at high risk of malnourishment. Inadequate or inconsistent sources of water lead to an inability to grow crops, increasing undernutrition, which again increases risk of diseases.

Conversely, excess water, by means of heavy rainfall and floods, can greatly influence human health if not properly managed. Beyond the danger of injury or drowning, floods increase the possibility of outbreaks of water- or vector-borne diseases due to the overflow of sewage pipes. Mental health problems among flood victims are also common. Those who live in low-lying coral atolls, such as countries like the Maldives and Bahamas, are very vulnerable to flooding, and the salination of soil and freshwater reservoirs due to increased sea levels can have daunting effects on human and animal health.¹⁰⁵

While regions globally, not only in the EU, are affected every now and then by a sudden lack or excess of water, the frequency and intensity of these events is expected to grow with climate change. Changing rainfall patterns affect both agriculture and freshwater supplies, and thus affect key elements of our well-being: food and water. Droughts can increase malnutrition in areas where populations are particularly dependent on crop and livestock productivity. Droughts and higher precipitation rates can lead to the spread of water-borne diseases, especially among populations where water, sanitation and personal hygiene standards are already low. Extreme weather events from floods to droughts can also severely affect the functioning of cities and healthcare services, and hinder people's access to treatment.

Vector-borne diseases are bacterial, viral, or parasitic diseases transferred by infected mosquitoes or ticks. The Intergovernmental Panel on Climate Change (IPCC) predicts an increase in vector-borne diseases due to climate change and consequent changes in ticks' geographic range, population size, and seasons of activity. The tick distribution in the EU is moving further north, and ticks are also surviving in higher altitudes, due to the climatic shift towards milder winters. This will increase the chance of human exposure to diseases such as Lyme disease and tick-borne encephalitis. There is even a risk of malaria reaching certain parts of Europe.¹⁰⁶

Chemicals in water

There has been an increase in pollutant discharge into Europe's surface, ground, and marine waters due to pesticide use in agriculture, industrial chemicals, pharmaceuticals, personal care products and household detergents. The chemicals that find their way into runoff have serious effects on human health, especially in vulnerable human populations such as pregnant women and small children.¹⁰⁷ Endocrine disruptors – chemicals found in everyday products and which are harmful for health – have been a focus of negative attention lately.

¹⁰⁵ Smith, K.R., A.Woodward, *et al.*, (2014), "Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change", Cambridge University Press, Cambridge, p.717 (available at http://www.ipcc.ch/pdf/assessment-report/ar5/wg2/WGIIAR5-Chap11_FINAL.pdf; last accessed 23 November 2015)

¹⁰⁶ European Commission (2009), "Staff Working Document Human: Animal and Plant Health Impacts of Climate Change", p.5 (Available at: http://ec.europa.eu/health/archive/ph_threats/climate/docs/com_2009-147_en.pdf; last accessed 23 November 2015)

¹⁰⁷ The European Environment Agency (2015), "The European environment: state and outlook", EEA, Denmark, p.122

While everyday products from hygiene products to plastics benefit consumers, the EU has a strong interest in ensuring that the micropollutant chemicals used in these products do not have dangerous side-effects for humans or the environment. The cross-sector regulation *REACH* (Registration, Evaluation, Authorisation and Restriction of Chemicals) works with other legislation to diminish and/or eradicate hazardous waste materials and chemicals. In addition, the EU's *Urban Waste Water Treatment Directive* has aimed to improve water quality and reduce public-health risks. The Commission adopted a *Strategy on Endocrine Disruptors* in 1999; however, its implementation has been slow. A new initiative to control endocrine disruptors is being planned, and is expected to be published in 2016.

Preventing and controlling pollution at source requires control during authorisation, production, consumption, and disposal of pollutants. Continuous efforts are needed to design chemicals that do not have hazardous properties. In addition, more should be done to identify hazardous chemicals and restrict their manufacture, distribution and use more effectively. This will require for example more efficient and thorough evaluation of the impacts of chemicals on human and animal health in order to identify hazardous chemicals. At the same time, as long as there are pollutants in water, new technologies and wastewater treatment are needed to remove hazardous substances before they are released into the environment.

2.7.1 RECOMMENDATIONS:

Access to good-quality water and sanitation determines the health of people

- Reducing the disease burden caused by environmental factors in the EU, and identifying and preventing new health threats caused by environmental factors, require that human health aspects are considered in environmental and other relevant policies. The European Environment and Health Action Plan of 2004–2010 provided a framework for action that should be built on.
- Investment decisions and preparedness plans on national, regional and local levels must be 'climate-proofed' in order to ensure access to quality water and sanitation at all times. For example, health services must have preparedness plans in the case of extreme weather events, floods or droughts that may impact on the availability of water.
- Sufficient wastewater and drinking-water treatment facilities are an essential requirement for public health, and it is important to ensure that infrastructure is maintained and renewed accordingly. Pricing of water and cost recovery should be used as mechanisms to ensure that the infrastructure is fit for purpose.
- Continued efforts are needed to reduce pollution in the water supply. As the Commission works on its review of the *Drinking Water Directive*, with new quality standards and an initiative to control endocrine disruptors, it should take a strong stance on controlling the overall pollution in European waters. While the EU needs to implement science-based criteria in order to phase out dangerous endocrine disruptors, wider discussion is also needed on how to prevent all micropollutants from entering the water cycle. The first aim must be to prevent and control all pollution at the source, be it from agriculture, industry, cities, hospitals, or households, in order to reduce pollution, waste treatment costs, and negative externalities. However, as long as there are pollutants in water, also efficient water treatment solutions are needed.

2.8 WATER–ENERGY NEXUS

The interlinkages between energy and water are well recognised, although policies still do not take them properly into account. Understanding the links requires a consideration of energy from water, energy for water, and water for energy.

Firstly, while the potential of hydropower has been exploited to a great extent, there are other ways to create energy from water. For example, the potential of tidal energy remains unfulfilled, and there is also great potential in generating heat or electricity from wastewater.

Secondly, energy is needed to support water supply. Pumping water (sometimes over long distances), treatment and desalination all require energy. Work remains to be done in making water and wastewater processes more energy efficient. In addition, the energy needs of irrigation could be reduced: more could be done to develop and use low-energy irrigation technologies.

Thirdly, energy that is produced from sources such as biomass, coal, oil, shale gas and nuclear power requires significant amounts of water. 90% of today's power generation consumes water.¹⁰⁸ Globally, the demand for energy, and thus for water, will continue to increase markedly over the coming decades, with more than 1.3 billion people worldwide still lacking access to electricity: electricity demand is expected to grow by 70% by 2035.¹⁰⁹ The concern is that production of both traditional, including coal and gas, and renewable energy is evolving towards more water-intensive technologies, placing further demands on water resources.¹¹⁰

In order to travel roughly 700 kilometres by car, close to 20 litres (five gallons) of water are needed to produce the required amount of natural gas, whereas with shale gas as the energy source the water footprint would be 125 litres (33 gallons). On the other hand, it would take close to 135,000 litres (35,616 gallons) of water to produce enough biofuel from irrigated corn and over 380,000 litres (100,591 gallons) of water for biofuel made out of irrigated soy.¹¹¹

Water withdrawals for energy production represented some 15% of the world's total in 2010. It is projected that withdrawals could increase by 20% by 2035.¹¹²

The EU has structured its energy policy and objectives around energy security, low-carbon energy, and competitiveness. Adding a parameter about sustainable water management would change the way energy policy is promoted, and would arguably have impacts on national energy mixes, especially in countries with growing water challenges. It would make strong argument in favour of renewables such as wind and solar.

Hydropower consumes water through evaporation from open surfaces of reservoirs, and impacts on the availability of water for downstream users, be they neighbouring countries or economic sectors such as agriculture, fisheries and industry.

¹⁰⁸ UNESCO (2014), "Water and Energy: Vol 1", United Nations World Water Development Report, pp. 33-34:

<http://unesdoc.unesco.org/images/0022/002257/225741E.pdf>

¹⁰⁹ *Ibid*, p. 2

¹¹⁰ World Policy Institute (2011), "The Water-Energy Nexus", World Policy Institute, New York, p.3 (available at:

http://www.worldpolicy.org/sites/default/files/policy_papers/THE%20WATER-ENERGY%20NEXUS_0.pdf; last accessed 23 November 2015)

¹¹¹ *Ibid*, p.9

¹¹² United Nations World Water Development Report (2014), "Water and Energy: Vol 1", UNESCO, Paris, p.34, (available at:

<http://unesdoc.unesco.org/images/0022/002257/225741E.pdf>; last accessed 23 November 2015)

Use of bioenergy exemplifies the challenges of the water–energy–food nexus. The environmental and water footprints of different bioenergy sources differ, and depend, e.g., on the irrigation requirements. First-generation biofuels are produced directly from food crops such as wheat and corn to produce ethanol. Taking into account the current water footprint of the agricultural sector and increasing demands for food production, enhancing agricultural production to also provide energy would be neither economically nor environmentally sustainable. Second-generation biofuels are made of non-food crops, for example sawdust or municipal waste. More than two billion people across the world use biomass such as charcoal and firewood as a source of energy for their daily activities.¹¹³ While the water footprint and implications for food security may be lower, the impacts on air pollution and climate change should be taken into account. More advanced, third-generation biofuels can be made for example from algae. It is assumed that the environmental footprints of third-generation biofuels will be lower compared to those of the other options, but more research is needed to sufficiently understand the impacts.¹¹⁴

Fossil-fuel energy production requires water for extraction methods such as hydraulic fracturing and drilling, for refining process, and in combustion, for cooling. Fossil fuels are also a serious cause of water pollution, with their extraction, refining and combustion contaminating annually approximately 15–18 billion m³ freshwater resources.¹¹⁵ While the potential of shale gas remains to be seen within the EU, the impacts of hydraulic fracturing on the environment and on water resources have already raised concerns. As fossil fuels are a significant source of greenhouse gases, thereby contributing to climate change, this has also indirect long-term impacts on water availability and quality.

The thermal power sector is responsible for 43% of total freshwater withdrawals in Europe.¹¹⁶ One example of thermal energy, nuclear, requires enormous amounts of water often from nearby rivers and lakes for cooling processes. After cooling, the warm and sterile water is reintroduced back into the original sources, which is feared to have negative impacts on water ecosystems and aquatic species.¹¹⁷

Climate-change impacts could have serious implications for energy infrastructures and production, and the risks must be carefully considered when building and maintaining technologies whether for hydropower, biomass production, or cooling in power plants. While evaporation will reduce the use of hydropower, increased precipitation can affect biomass production, and increases in water temperature or scarcity can impact negatively on electricity production in thermal power plants that run on coal or nuclear energy. Electricity generation from thermal power plants can also be affected by flooding and increases in ambient air temperature.

The consequences of the 2003 heat wave were particularly dire in France, where it affected water supplies and thus restricted nuclear energy generation, which is the source of almost 80% of the country's electricity. In addition, the authorities were forced to allow high-temperature water from the cooling systems to be drained into rivers, which, it has been argued, caused damage to local flora and fauna.¹¹⁸

¹¹³ *Ibid*, p.79

¹¹⁴ *Ibid*, p.80

¹¹⁵ *Ibid*, p.81

¹¹⁶ *Ibid*, p.34

¹¹⁷ *Ibid*, p.81

¹¹⁸ The Guardian (2003), "Heatwave hits France power production", 12 August 2003 (available at <http://www.theguardian.com/world/2003/aug/12/france.nuclear>; last accessed on 23 November 2015); Kanter, J., (2007), "Climate change puts nuclear energy into hot water". The New York Times, 20 May 2007) (available at: www.nytimes.com/2007/05/20/health/20iht-nuke.1.5788480.html?pagewanted=all; last accessed on 23 November 2015)

In Switzerland, reduced rainfall and increased evaporation are already affecting water levels and thus the functioning of hydropower plants, which generate roughly 60% of the country's electricity. As a result, the industry is compiling information on resource availability, vulnerabilities, and projected electricity demand. The overall aim is to develop a framework for planning the use of hydropower, while taking into account estimated fluctuations in water supply.¹¹⁹

2.8.1 RECOMMENDATIONS:

Water and energy sectors are interdependent

- The EU and national policy makers must integrate water and energy policies, and ensure that, whether in relation to energy from water, energy for water or water for energy, the objective is always to promote sustainable use of water and energy sources. This requires recognition of the impacts of energy production on water resources, and ensuring that meeting the objectives will not undermine global and European water-based ecosystems and water resources. In addition, further efforts are needed to ensure that water management becomes more energy efficient.
- The price for energy should internalise externalities, including impacts on people's health, climate and environment, and so should encompass the cost of the used water resources. Energy companies must be incentivised to reduce pollution of water and to use water more efficiently. An important tool is the 'polluter pays' principle, which should be applied in order to control and reduce adverse impacts of energy production on water resources.
- The potential for recovering and producing energy from wastewater should be incorporated in the upcoming Circular Economy package. The EU should provide guidelines for energy recovery and support research and development in this field.
- As meeting the EU's renewable energy targets by 2020 and 2030 requires increasing the use of biomass for energy production, the priority should be to produce bioenergy from agricultural and forestry residues rather than to take up new land for cultivation of bioenergy crops. The *Water Framework Directive*, the *Renewable Energy Directive* and the CAP must be aligned to ensure sustainable land use for biomass production.
- The Commission should ensure that potential shale-gas extractions in the future will fully conform with the EU's environmental legislation.

¹¹⁹ Meister, H.P, Kroger, I., Richwien, M., Rickerson, W. and Laurent, C., (2009), "Floating Houses and Mosquito Nets: Emerging Climate Change Adaptation Strategies Around the World. Case Studies from Selected Countries", Meister Consultants Group, Boston, USA. p.94

FROM PRICING WATER TO ENSURING ACCESS FOR ALL

3.1	Pricing water – the benefits	29
3.2	Pricing water and using economic instruments – from theory to practice	30
3.3	Ensuring access to affordable water	32
3.4	Improving water services via greater transparency and benchmarking	34
3.5	Recommendations	35

The economics of water builds on recognising the value of water, evaluating the costs of using water, understanding the relationship between water and economic development, and knowing how to ensure improved distribution and access for all. This means finding ways to guarantee an efficient and sustainable production, distribution, use and treatment of water resources while recognising that safe drinking water is a human right and ensuring that everyone can have access to safe water and sanitation services.

These issues are also on the EU agenda. While implementation has been weak, the EU recognises the importance of pricing water and using economic instruments in improving water resource management. At the same time, the economic crisis and the ongoing refugee crisis, which create pressures on society's most vulnerable groups, remind us of the importance of universal access to affordable water.

3.1 PRICING WATER – THE BENEFITS

Giving a price to water gives it a value and using economic instruments can help to guide its sustainable use. They can provide incentives for the agricultural sector, business and citizens, to change the way they use water resources. They can help to increase water efficiency and reduce water pollution by charging polluters.

Charging the full cost of water use can encourage more efficiency: households use one third less water when they are charged for the amount of water they use rather than a flat-fee.¹²⁰ According to a 2012 Eurobarometer survey, around 80% of EU citizens would support being charged for the amount of water they use rather than paying a flat fee.¹²¹

¹²⁰ European Environment Agency (2013), "Assessment of cost recovery through water pricing", p.12

¹²¹ Flash Eurobarometer 344 (2012), "Attitudes of Europeans towards water – related issues", conducted by TNS Political & Social at the request of Directorate General for Environment, European Commission, p.8

In addition, financing is needed to manage water resources and to upgrade water and wastewater systems across the EU. Renewal rates for water infrastructure have been low, and water supply and wastewater infrastructure is ageing. Drinking water networks must be renewed in order to reduce leakage. Cities like London, whose infrastructure network was built in the Victorian Era, has a 40% leakage rate.¹²² Wastewater treatment plants must be upgraded. As water infrastructure is very vulnerable to climate change impacts – increased precipitation levels, for example, can put additional stress on urban drainage systems – these should be considered when making investment plans and budgeting for water resource management. Both public and private money will be needed to meet these demands, and raising revenues can help to minimise the need for public financing.

3.2 PRICING WATER AND USING ECONOMIC INSTRUMENTS – FROM THEORY TO PRACTICE

The EU recognises the importance of water pricing and economic instruments in achieving the objectives of the EU strategy “Blueprint to safeguard Europe’s water resources”, which aims to ensure good quality water for all. The *Water Framework Directive* (Article 9) gives the EU a mandate to promote cost recovery of water services, including financial costs (investment costs, operation and maintenance costs, cost of capital and administrative costs) and environmental and resource costs, and emphasises that this should be done in accordance with the ‘polluter pays’ principle. Pricing policy should also deliver incentives for users to use water resources more efficiently. At the same time the strategy notes that lower cost recovery rates can be justified on social, environmental and economic grounds or on geographic or climatic conditions.¹²³

Traditional financing of the water sector has centred around maintaining and building infrastructure. However, the Commission sees ‘water services’ not only as the provision of drinking water and wastewater treatment but also as the use of water for agricultural, industrial and household purposes. This means that, for example, when surface water is used to produce hydropower, to cool power plants or as inland waterways for transport, these services have costs that should be recovered. While pricing of water will need to be coupled with public investments and regulations that put responsibility with users and push polluters to invest in pollution prevention, it is an important instrument in promoting smarter management of water resources.

Tariffs, taxes and transfers are examples of economic instruments that can be used to cover the costs of supplying water, as well as external costs such as environmental damages.¹²⁴ Tariffs are fees that water utilities charge to water users, for example, for delivering water service. In most cases operating and capital expenditure accounts for 80% of the tariff - covering other externalities such as environmental costs is not done routinely. Taxes paid by citizens, at local or national level, can be used to cover costs related to, for example, water management and sanitation. Transfers of money can be in the form of EU funding (for example Cohesion Funds), development assistance or donations. Many use a mix of economic instruments and try to adjust them to local environments.

Other economic instruments can be used as well to encourage smarter use of water resources. Water markets and trading schemes are an example, and an option for the EU to explore further. Water trading schemes that help to ensure the optimal allocation of water resources or pollution between sectors have been used, for example, in Australia, the USA and Latin America. Overall, the

¹²² OECD Observer (Q3, 2011), “Cool, Clean Water”, No. 286, pp.18-20

¹²³ Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for Community action in the field of water policy

¹²⁴ See e.g. OECD (2009) “Strategic Financial Planning for Water Supply and Sanitation”, and EUREAU (2011) “Methodological guide on Tariffs, Taxes and Transfers in the European Water Sector”

development and use of innovative economic instruments that take into account environmental and societal considerations remains an area for further research and venture for the EU.

It should be noted that in reality, economic instruments are mainly used to recover financial costs of providing water services. However, they could – and arguably should - also be used to achieve environmental objectives, by including the costs of associated negative environmental effects (environmental costs) and forgone opportunities of alternative water uses (resource costs) in the price of water. If used well, they can aim to create the right incentives for behavioural changes and help to increase water efficiency and reduce pollution. Some positive examples on cost recovery exist. For example, in Wales customers adhere to a model that includes paying for environmental externalities. France, among a few other member states, prices water according to the ‘polluter pays’ principle.

Overall, pricing water and translating it into effective cost recovery has proven difficult. The ‘polluter pays’ principle is hardly applied in the EU member states. Reasons are manifold. There are divergent views on what is/should be included in the price; how to ensure that the price is set at an equitable rate for all consumers and that it is high enough to encourage efficiency and recover costs; and how the revenues should be used. A lack of a methodology that attributes costs to certain types of pollution and expensive technologies for monitoring pollution are another set of challenges. It should also be noted that for pricing schemes to work efficiently they require metering. In addition, water pricing and economic instruments can only work if supported by good governance, which for example prohibits the illegal abstraction of water resources and ensures the enforcement of water pollution regulations.

In most cases implementing pricing schemes has failed to combine the objectives of efficiency, fairness and have not allowed a sustainable degree of cost recovery. Including environmental and resource costs in a tariff is difficult if the costs are not shared equally and fairly between users of water. The practices within the agricultural sector, a major user and polluter of water resources, reflects the challenge. In many countries it has proven easier, politically and practically, to charge water drinkers than farmers. When farmers are charged, water prices for irrigation are normally not enough to recover costs of using water. For example, in Mediterranean countries agricultural water prices recover less than 50% of the real cost.¹²⁵ Often farmers are asked to pay a flat fee for water, which remains the same regardless of the volume they use. Farmers that pay a flat rate use 10-20% more water than those paying a volumetric rate, clearly showing that this does not incentivise efficient use of water.¹²⁶ Incoherent policies are also a challenge, and public subsidies in non-water sectors can undermine water policy objectives. For example, farmers in many countries do not pay a full price for the electricity that is used to pump groundwater.

As the work on pricing continues, analytical tools, such as the Water Footprint Assessment, could potentially help in structuring and implementing pricing schemes. Water Footprint Assessment measures the pressure on freshwater resources from human activities and considers both direct and indirect water use of a consumer/producer, and can be used to calculate a water footprint for an individual person, a process, a value chain for a product, for a business, a river basin or a nation.¹²⁷

It should also be remembered that pricing schemes and the use of economic instruments are not a solution for every problem: they will not be sufficient to cover all costs. For example, achieving the objective of a good ecological status of European rivers will continue to need public funding from national and EU budgets (e.g. EU structural funds).

¹²⁵ European Environment Agency (2013), “Assessment of cost recovery through water pricing”, p.19

¹²⁶ *Ibid.* p.12

¹²⁷ See website of Water Footprint Network (available at: <http://waterfootprint.org/en/water-footprint/water-footprint-assessment/>; accessed on 10 November 2015)

3.3 ENSURING ACCESS TO AFFORDABLE WATER

The cost of water services, and as a result their prices, will only continue to increase due to demands on the infrastructure and stronger emphasis on the ‘polluter pays’ principle. At the same time, it is likely that an increasing number of low-income households and the most vulnerable parts of the population will not be able to afford these increasing costs. As artificially low water prices would encourage inefficient use and pollution, the Commission suggests that the best way to deal with affordability and social concerns is to complement pricing mechanisms with targeted social measures.¹²⁸ The aim must be to ensure that the use of pricing mechanisms does not undermine people’s access to safe water and that the poorest who cannot afford to pay their bills will be supported.

For example, in France, the law Brottes 2013/312 stipulates that it is illegal for water utilities to cut water supply even if users do not pay their bills.¹²⁹

Humans need at least 1,5-2 litres of drinking water a day, and access to this resource is the fundamental basis for life. In addition to safe drinking water, water is also needed for daily hygiene and sanitation. Safe water is needed to wash and prepare food. Clean water is required for maintaining health and preventing the spread of diseases.

The UN has declared access to safe drinking water as a human right, and the basic principle should not be forgotten in the EU either. The Citizens Initiative on the ‘Right2Water’ called on the EU institutions and member states to ensure that all European citizens can have a basic right to water.¹³⁰ As a follow-up, the European Parliament has called for the EU to recognise universal access and the human right to water.¹³¹

Ensuring access to safe water and sanitation requires an understanding and tackling of the obstacles. These can include poor water resources due to scarcity or pollution, insufficient wastewater treatment or poor management of sanitation facilities. Safe water and sanitation may not be available everywhere, for example in refugee camps. Or people might not be able to pay for the use of safe water and sanitation.¹³² (It is calculated that on average households can afford to spend 3%–5% of household expenditure to water supplies and sanitation.¹³³)

Tackling these obstacles requires, first of all, good governance; making the needed investments in infrastructure and enforcing the ‘polluter pays’ principle. The EU can and has provided financing to improve water infrastructures in member states, thus increasing the quality of and access to water services. In addition, the EU’s water quality standards are an example of an effort to contain pollution and ensure the presence of safe water for people and the environment. While more needs to be done, this is a start.

¹²⁸ European Commission (2000) Communication on “Pricing policies for enhancing the sustainability of water resources” (COM/2000/0477 final), pp.16-17

¹²⁹ More information at Coordination Eau-Ile de France, “Les coupeurs d’eau pour impayés sont illégaux”, 16 March 2014 (available at: <http://eau-iledefrance.fr/les-coupeurs-deau-pour-impayes-sont-illegales/> ; last accessed on: 22 November 2015)

¹³⁰ More information at Right2Water, “Water and sanitation are a human right!” (available at: <http://www.right2water.eu/>; last accessed on 23 November 2015)

¹³¹ European Parliament resolution of 8 September 2015 on the follow-up to the European Citizens’ Initiative Right2Water (2014/2239(INI))

¹³² UNECE-WHO (2009) “No one left behind, good practices to ensure equitable access to water and sanitation in the pan-European region”, p.14.

¹³³ *Ibid.* p.61.

The EU Cohesion funds have been used to provide over 2.6 million people with improved supply of drinking water and to connect an additional 5.7 million people to improved wastewater treatment.¹³⁴

However, when the challenge is affordability, it also requires developing and implementing solutions to assist people who cannot afford to pay their water bills. While the EU can promote an exchange in best practices, these are actions that are taken on a national or a regional level.

In the Netherlands, in order to ensure equitable access to drinking water, every drinking water company is obliged to apply tariffs that are cost-covering, transparent and non-discriminatory, and make an offer to any person who requests access.¹³⁵

Many examples of social measures that target more vulnerable water users already exist. These can include social protection measures and technical assistance to reduce water consumption levels. In addition, there are social tariffs, subsidies or direct payments to households in financial need. Lifeline tariffs provide a volume of water corresponding to the essential minimum consumption free of cost and cross-subsidies for large or low-income families allow a water utility to charge wealthier households a higher amount in order to compensate for losses brought by the low rates applied to poor households. Solidarity funds can be used to help people that cannot pay their water bill.

Social tariffs are used across the EU to adapt the price of water consumption to the socioeconomic status of the user (household income or size, or health, disability or age of the person).¹³⁶ For example, in Spain, unemployed people and retirees with low pensions can apply for social tariffs. In the UK WaterSure caps the water and sanitation bill for eligible households, and the excess amount is cross-subsidised by the other users.

Innovative solidarity mechanisms include solidarity funds. The City of Paris and the public water operator Eau de Paris finance a special “water solidarity fund” which in 2013 supported 44,000 low-income households with an average contribution per household of 70 euros.¹³⁷ Similarly, a solidarity fund in the Italian Region of Apulia enables the partial reimbursement of the water bill of poor households of an amount between €45 and €135.¹³⁸

While the Citizens Initiative ‘Right2Water’ called for water to be provided by public rather private service operators – since they see water as a public good –, it can be argued that this should be a secondary consideration. The aim must be to resolve affordability challenges and ensure that Europeans will have good, cost-effective access to water. As long as this is achieved, the legal form of the operator does not matter. Competition in the sector between public and private entities can even be beneficial if it puts pressure on those that are performing poorly to improve their operations.

It is in the interest of public and private operators to learn from local examples across the EU of how to tackle the affordability challenge. In addition, collaboration is needed between the different stakeholders in society: governments and municipalities play a key role in designing support

¹³⁴ European Commission (2014), Communication on the European Citizens' Initiative "Water and sanitation are a human right! Water is a public good, not a commodity!", COM(2014)0177 final (available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52014DC0177>; last accessed on 23 November 2015)

¹³⁵ UNECE-WHO (2009) “No one left behind, good practices to ensure equitable access to water and sanitation in the pan-European region”, p.40.

¹³⁶ *Ibid.* p.46

¹³⁷ Fiasconaro, M., Presentation for the EPC Blue Gold task Force Workshop “Water as a human right”, Aqua Publica Europea, 25 March 2014, Brussels.

¹³⁸ *Ibid.*

mechanisms for the most vulnerable, and they should collaborate with the water service operators, consumer organisations and NGOs in getting the solutions right.

In addition, tackling affordability challenges requires awareness raising among consumers, who should be better informed about the economic instruments used, what the water bill and subsidies consist of as well as of the benefits of a more efficient use of water and the ways to do this. For example, installing water meters can encourage efficiency and changing shower heads can help to bring down both water and energy costs.

3.4 IMPROVING WATER SERVICES VIA GREATER TRANSPARENCY AND BENCHMARKING

In its response to the Right2Water Citizen's Initiative, the Commission identified several action points, to ensure better quality of and access to water.¹³⁹ It recognised the need to enforce the implementation of the EU's water legislation and to review existing initiatives such as the *Drinking Water Directive* and the *Water Framework Directive*. In addition, it recognised the importance of transparency and improving the information given to citizens on water quality and services.

The Commission rightly identified that in order to improve transparency and accountability of water services, benchmarking their performance and giving citizens access to comparable data on key economic and quality indicators would be beneficial. A wide range of benchmarking initiatives already exist, which compare performances of water services, including delivery and costs between companies. Benchmarking can provide operators with an incentive to improve their performance and lower their costs in order to remain competitive. However, they could also be used to guide policy making. For example, benchmarking could be used to compare data on recovery of environmental and resource costs and to evaluate to what extent these costs are recovered by the utilities. Providing citizens with transparent information on the quality of water services and using indicators on, for example, accessibility, affordability and quality of services would benefit the consumer.

In the beginning it makes sense to compare and exchange best practices of benchmarking. For example, more discussion is needed on how context, like different conditions due to the age of the network or water quality affect water services and whether this can be taken into account when making comparisons. However, the aim in the medium and longer term should be to define a more structured European approach to benchmarking. This would require defining general principles, identifying a set of performance indicators in areas such as the price, and water and service quality that are usable for both operators and consumers, and providing guidance for all stakeholders involved. As the data used for benchmarking is key, efforts need to be taken to ensure this data is reliable and comparable.

¹³⁹ European Commission (2014), Communication on the European Citizens' Initiative "Water and sanitation are a human right! Water is a public good, not a commodity!", COM(2014)0177 final (available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52014DC0177>; last accessed on 23 November 2015)

3.5 RECOMMENDATIONS

Managing water resources – new approaches needed with economic instruments

1. Enhance knowledge, monitoring and communication

- Transparency is needed on who uses and pollutes water and how much, and who is paying for it on a global and European level.
- A better understanding is needed of the price elasticity of water demand, how much different users are willing/able to pay for their water needs, to what extent the price affects demands for water and to what extent it can be used to encourage water efficiency.
- A better understanding is needed of the functioning, impacts and cost-effectiveness of different economic instruments, to achieve the *Water Framework Directive* objectives of full cost recovery and efficient water use. Member states and water operators should be encouraged to share experiences on implementing cost recovery and the ‘polluter pays’ principle. Indicators are needed to monitor progress.
- Along with households, industry and agricultural sectors need to be informed of the benefits of pricing schemes and cost recovery, including how they can improve water supply and quality of service. A stronger level of engagement would lead to a better alignment of interests in the long term too.
- The possibility to use analytical tools such as the Water Footprint Assessment when structuring and implementing pricing schemes should be explored further.

2. Using pricing schemes and economic instruments

- Prices must be justified and be more reflective of the real cost of using water. Pricing schemes must aim to enhance the efficient use of water resources, be fair and ensure that sufficient amounts can be recovered in order to pay for water services.
- Encouraging users, such as farmers, to be more efficient with water resources, starts with charging for the volume of water used rather than a flat-fee. Water pricing should be coupled with mandatory use of water meters.
- Using economic instruments effectively requires policy coherence and appropriate governance. For example, agriculture and energy should be aligned with the efforts to promote smarter management of water: for instance, farmers’ electricity bills should not be subsidised if it encourages them to pump more groundwater. Appropriate governance includes prohibiting illegal abstraction of water resources and ensuring the enforcement of water pollution regulations.
- Implementing full cost recovery would require a clearer definition and understanding of full cost recovery and what externalities must be internalised and how. The EU should provide guidance on how to account for environmental costs, associated negative environmental effects and for resource costs related to missed opportunities for alternative water uses.
- The ‘polluter pays’ principle must become a reality. This requires controlling pollution at the source and building a methodology that attributes costs to certain types of pollution. Because

externalities cannot be exactly quantified, stakeholders need to be convinced that the cost calculations are largely representative in order to bring legitimacy to pricing schemes.

- Benchmarking performance of water and sanitation services is needed, and the Commission should continue to facilitate cooperation and sharing of best practices between water operators and other stakeholders. In the long-term, the EU should define general principles, identify performance indicators, and provide guidance for stakeholders involved. The indicators should take into account the needs of consumers and consider areas such as the price, and water and service quality. The data must be reliable and comparable, and could be made available on an EU platform. As the Parliament has criticised the Commission for its weak response to the Citizens' Initiative on water, taking action on benchmarking water services would show the commitment of the Commission to improve the quality of the water supply and sanitation services across the EU, whilst empowering citizens at the same time.
- Using funds collected through economic instruments and earmarking revenues for the water sector would provide an important source of support for maintaining and renewing the water systems as well as for innovation in the sector. However, earmarking must be used carefully to avoid inefficiency in spending.

3. Addressing equity concerns and affordability issues

- The implementation of cost recovery should not undermine the human right to safe drinking water. Everyone should have access to safe water and sanitation. Thus the costs must be shared as fairly as possible. Under no circumstances can water be unaffordable to a consumer. When needed, public authorities together with water operators must explore the possibilities of using social measures and solidarity financing solutions to assist people who cannot pay their water bills.
- The service provider needs to know how much the consumer can afford to pay, in order to use tariffs as a driver for the consumer to use less water, and in a more efficient way. Robust data and analysis would be needed to overcome this information asymmetry.
- The consumer has an important role in tackling the affordability challenge. This starts with raising awareness of a more efficient use of water, and informing consumers of what the water bill and subsidies consist of.

INNOVATION AS A TRIGGER FOR GROWTH AND COMPETITIVENESS

4.1	Solutions exist: improving management of existing water resources and water treatment	38
	4.1.1 <i>Improving the water footprint of the agriculture sector</i>	38
	4.1.2 <i>Improving business models</i>	40
	4.1.3 <i>Innovative urban design</i>	42
	4.1.4 <i>Improving household water use</i>	43
	4.1.5 <i>New approaches to water treatment</i>	43
	4.1.6 <i>Desalination as a solution</i>	45
4.2	The EU's role in promoting development and deployment of new water-solutions	45
	4.2.1 <i>Role for EU research and innovation policy</i>	45
	4.2.2 <i>Removing barriers to development and deployment of new water solutions</i>	46
4.3	Reuse and recycling of water – a real innovation test case for the EU	47
4.4	Recommendations	49

Innovation in products and processes must play an important role in helping to solve the water challenge, in and outside the EU. Solutions are needed to improve aging water and wastewater infrastructure and treatment, make water usage more efficient across sectors, better monitor water use and pollution levels, reduce irrigation demand and contamination of surface and ground water, improve the reuse and recycling of water, and to prepare for droughts and floods, and other climate change impacts. Climate change, urbanisation and population growth will provide a growing demand for innovative solutions in the global water sector, promising massive growth opportunities for those who create solutions to the water scarcity and water quality challenges. If Europe manages to seize this opportunity, it could garner great benefits.

The global market for water products and services in 2010 was \$483 billion (€449 billion).¹⁴⁰ Europe itself accounts for over \$93 billion (€86 billion) or nearly 20% of the annual world water market.¹⁴¹ The industrial water markets in the USA and Western Europe are forecasted to grow year-on-year by an average of 3% to 5%, primarily through improving existing water and wastewater infrastructure. In China and India this figure rises to at least 10%, with the creation of new water and wastewater

¹⁴⁰ White, S.B., *et al.*, (2010), "Water Markets of the United States and the World: A Strategic Analysis of Milwaukee Water Council", U.S. Economic Development Administration, p.8 (available at: <http://thewatercouncil.com/wp-content/uploads/2015/08/EDA-Report.pdf>; last accessed 24 November 2015)

¹⁴¹ *Ibid*, p.352

infrastructure.¹⁴² Already, resource management sectors such as energy, waste, and water management are seeing a 5% yearly growth due to the demand on these resources.

Innovation in water-related products and services comes with significant environmental gains, but also with wider social and economic benefits. For example, the Value of Water Coalition report demonstrates that every \$1 million spent on water generates 16 jobs, a greater return in comparison to military spending and personal income tax cuts.¹⁴³ Developing and deploying new solutions to manage and use water resources in a smarter way can enhance Europe's competitiveness and contribute to job creation and economic growth. The market for new solutions is growing as the demand for them is on the rise.

Europe has experience and expertise in water innovations: be it desalination, water reuse, treating wastewater with algae, greywater and rainwater harvesting services, recovering phosphorus from wastewater... Europe should continue to build on this knowledge. However, realising the full potential requires overcoming the barriers that hinder the development and uptake of these solutions, as will be shown below.

It also requires looking beyond one's own borders: learning from the experiences of others and utilising a variety of existing solutions that could benefit Europe. For example, Israel and Singapore have innovative solutions for treating sewage water and converting it into clean drinking water, while the United Arab Emirates and Saudi Arabia are world leaders in large-scale desalination. If the EU is interested in further developing such solutions, it should foster cooperation with its international partners.

Like most countries, Israel is a country that uses the majority of its water for agriculture, however, it is also most developed in its efforts to stem the water scarcity issue. Its water management solutions and water recycling have transformed the agricultural sector while bringing wider societal and economic benefits. Reservoirs are used to collect recycled wastewater and floodwater for agriculture, and the multipurpose reservoirs also supply water for riverbank rehabilitation.¹⁴⁴ Israeli drip irrigation company Netafim has sold over 150 billion drip irrigation devices world-wide, including developing countries, which helps farmers cut down their water use by 90%.¹⁴⁵

In Singapore, 50% of land is used as a water catchment, to collect rainwater.¹⁴⁶ It is also exploring new innovative ways to catch and use rainwater, such as using roofwater of buildings for flushing.

4.1 SOLUTIONS EXIST: IMPROVING MANAGEMENT OF EXISTING WATER RESOURCES AND WATER TREATMENT

4.1.1 Improving the water footprint of the agriculture sector

Agriculture currently accounts for 70% of global water use. Much of this water is wasted due to inefficiencies. The sector is also a significant source of pollutants, the costs of which are paid by

¹⁴² Best Water Technology (2015), "Water- a global market", (available at: <http://www.bwt-group.com/en/water-technology/element-h2o/Pages/water-global-market.aspx> ; last accessed 24 November 2015)

¹⁴³ Water Research Foundation and Water Environment Research Foundation (2014), "National Economic & Labor Impacts of the Water Utility Sector: Executive Report", p.3

¹⁴⁴ Israel's Fourth Aquifer, KKL-JNF, (available at: <http://www.kkl.org.il/eng/water-for-israel/israel-fourth-aquifer/>; last accessed 24 November 2015)

¹⁴⁵ Shamah, D., (2015), "Israel's drip irrigation pioneer says his tech feeds a billion people", Times of Israel, 21 April 2015, (available at: <http://www.timesofisrael.com/israels-drip-irrigation-pioneer-our-tech-feeds-a-billion-people/>; last accessed 24 November 2015)

¹⁴⁶ See website of Rainwater harvesting (available at: <http://www.rainwaterharvesting.org/international/singapore.htm>; last accessed 24 November 2015)

societies. As it is estimated that farmers will have to produce 50% more food by 2030 and double the production by 2050, it is clear that current practices cannot continue.¹⁴⁷

Across the world, farmers' water use is subsidised, dampening the interest in the efficient use of water. The starting point must be to value water: enforcing a 'polluter pays' principle, controlling pollution at the source, and ensuring that the agricultural sector pays a true price for the water it uses (see Chapter 3 on "From pricing water to ensuring access for all"). In addition, consumers need to be better educated about the impact their diets have on water resources and the climate. Equally, farmers need to be informed about the importance of their role and responsibility in managing the negative impacts. These efforts to make the agricultural sector more sustainable can be facilitated by new innovative solutions.

Educating farmers about the water footprint of their farms, including the carrying capacity of the soil, can help to prevent runoff and erosion.¹⁴⁸ For example, under the European Water Stewardship farms are helped to assess local challenges that are then used to help set benchmarks, incentivising action through the publicising of positive farm performance. Farmers are able to assess the potential and resources available for each plot of land, and can contribute to better rainwater use and preservation of the drinkable groundwater.¹⁴⁹

There are technical and management solutions available. Technological innovations in agriculture include surface, sprinkler, and drip irrigation that will reduce water consumption. Comprehensive infrastructure planning and management at the river basin level will allow for protecting freshwater resources. Reducing evaporation and runoff in addition to changing the crops used will enable better profitability without overusing resources.

Developing and taking into use improved crops carries a great potential for developing and developed countries. For example, the pearl millet crop is grown in hot and dry areas of Africa and South Asia, and traditionally yields have been very unstable due to unpredictable rainfall and disease. In order to improve the crop's resilience, actors in Asia and Europe, including research institutes, funding agencies, the Indian government, the seed industry and farmers cooperated to develop a more resistant hybrid in the period of 1990-2010. The new hybrid has been widely adopted by pearl millet farmers. It is less vulnerable to disease and provides greater food security to around 2 million people.¹⁵⁰

The Drought Tolerant Maize for Africa project may generate a billion euros through improved yields, alleviating the poverty of millions.¹⁵¹ The project is seeking to replicate this success with genetically modified variants.

The agronomic and economic impacts of herbicide tolerant and insect resistant GMOs (genetically modified organisms) globally include a 37% drop in chemical pesticide use, and a 22% increase of crop yields, and a 68% rise in farmers' profits.¹⁵²

Innovative measures in the agricultural sector enable growers to practice better water use habits when it comes to watering their crops. Farmers have long used manual instruments called tensiometers to inform the frequency and volume and depth of irrigation. However, in the future,

¹⁴⁷ OECD Observer (2011), "Cool, Clean Water", No. 286, pp.18-20

¹⁴⁸ Levidow, L. *et al.*, (2014), "Improving water-efficient irrigation: Prospects and difficulties of innovative practices", *Agricultural Water Management*, 146, pp.84-94

¹⁴⁹ The Rise Foundation (2014) "The Sustainable Intensification of European Agriculture" p.2

¹⁵⁰ FAO (2013), "Biotechnologies at Work for Smallholders: Case studies from developing countries in crops, livestock and fish", Rome, (available at <http://www.fao.org/3/a-i3403e.pdf>; last accessed 25 November 2015)

¹⁵¹ La Rovere, R., *et al.*, (2014), "Economic, production, and poverty impacts of investing in maize tolerant to drought in africa: an ex-ante assessment", *The Journal of Developing Areas*, 48, pp199-225

¹⁵² Klümper, W., Qaim, M., (2014), "A meta-analysis of the impacts of genetically modified crops", *PLoS ONE*, 9

irrigation scheduling could be based on remote sensing, whereby digital-spectral data on the rate of evaporation and the level of soil moisture content is regularly collected, and irrigation only triggered when absolutely necessary. This would allow reduction in water use and help growers maximise crop quality and yield under ideal conditions as well as recognize the benefits of cost recovery.¹⁵³ At the same time, it must be recognised that farmers using new technologies need to be properly taught and trained. It should also be noted that efficient water use does not necessarily mean a decrease in water use.¹⁵⁴

Spain is a European country that uses the majority of its freshwater for irrigation, and in the Murcia region, reduced rainfall and water allocation creates significant uncertainty. Thus, 90% of farmers in the region use *drip irrigation* in order to improve water efficiency. Drip irrigation introduces the use of a strict watering schedule through plant/soil water sensors. The irrigation uses water pumped from wells, reservoirs, and wastewater treatment plants, which is then slowly dripped to provide optimal irrigation.¹⁵⁵ Studies show that the use of reclaimed saline water from citrus tree farming saves 20-30% of freshwater, without affecting the quantity and quality of the crop.¹⁵⁶

ICT technologies can be used to monitor and control water resources, and the data can be used to improve water management not only in agriculture, but also in industry, as well as in households. Real time monitoring can be used to provide alerts and notifications when readings are abnormal or there is a change in water quality, and it also enables a quick response when there is an irregular water supply, thus enabling the repair of infrastructure in a short timeframe.

The potential of air and soil sensors is enormous.¹⁵⁷ The EU-funded project ENORASIS is an example: the advanced weather prediction system, based on satellite data and field sensors, can be used to inform farmers on the optimal amount of water needed for irrigation. It can aid water companies in making more informed decisions when investing in infrastructure. In addition, it can help in the development of smart water pricing.¹⁵⁸

4.1.2 Improving business models

The private sector will face extreme pressure due to concerns over water scarcity, accessibility, and poor water quality. This may even bring companies in conflict with communities over access to water. A number of major companies already evaluate how water quality and quantity affects their growth strategy. According to the Carbon Disclosure Project, two-thirds of the world's largest companies are reporting that they will be exposed to water risks in the short term, with potential growth limitations.¹⁵⁹

¹⁵³ Environmental Leader (2015), "Smart Irrigation Reduces Agricultural Water Use", (available at: <http://www.environmentalleader.com/2015/04/08/smart-irrigation-reduces-agricultural-water-use/>; last accessed 24 November 2015)

¹⁵⁴ Center for European Policy Studies (2012), "Which Economic Model for a Water-efficient Europe?", p.43

¹⁵⁵ ABB (2009), "Growing more crops with less water", ABB Group, (available at: <http://www.abb.ch/cawp/seitp202/22ea6ffcc5ac1f79c12576330040c62e.aspx>; last accessed at 24 November 2015)

¹⁵⁶ SIRRIMED (2014), "Sustainable use of irrigation water in the Mediterranean Region – SIRRIMED, Summary of Key Findings", p.6 (available at: http://sirrirmed.org/catalogo/d_7_8_sirrirmed_key_findings_v_final.pdf; last accessed 24 November 2015)

¹⁵⁷ Brabeck-Letmathe, P., (2015), "Smart water management to address the crisis", Nestle, (available at: <https://www.water-challenge.com/posts/smart-water-management-to-address-the-crisis>; last accessed 24 November 2015)

¹⁵⁸ Horizon 2020 (2014), "A smart way to irrigate crops – and save water", European Commission, (available at: <http://ec.europa.eu/programmes/horizon2020/en/news/smart-way-irrigate-crops-%E2%80%93-and-save-water>; last accessed 24 November 2015)

¹⁵⁹ Sustainable Brands (2015), "CDP Identifies 853 Water Risks Threatening Growth For World's Largest Companies", (available at: http://www.sustainablebrands.com/news_and_views/next_economy/sustainable_brands/cdp_identifies_853_water_risks_threatening_growth_wor; last accessed 24 November 2015)

It is in the interest of water-dependent industry to find ways to improve their own water footprint but also help those that contribute to sustainable water management. Developing new business models that encourage sustainable water use benefits both industry as well as society and the economy as a whole.

In order to promote *water risk assessment*, the World Wildlife Fund has created a quantitative 'Water Risk Filter Tool' to assess the risks faced by businesses based on the river basin they extract from and their water use. This evidenced-based tool will help educate businesses about the risks and instigate efficient usage.¹⁶⁰

The European Commission sponsored *cross-sectoral project 'AquaFit4Use'* has generated and facilitated solutions for sustainable water use in paper, food, textile, and chemical industries. For example, new water quality management software helped to reduce freshwater usage by 20-50%, depending on the industry.¹⁶¹ This project is a leading example of a cross-sectoral research project pooling expertise to generate improvements across sectors, and to close water cycles in order to increase water reuse and thus lower the EU's water footprint.

The forest and paper industry has taken various efforts to improve its water footprint. For example, in Europe the Confederation of European Paper Industries' (CEPI) Two Team Project led to an innovation to use vapour combined with dry fibres to form paper and board. Once commercialised, this would only use one-thousandth the volume of water used today.¹⁶²

Achievements have been made also in the US, where water use in the forest industry returns 88% of the water used directly to surface waters after treatment. Improvements in this sector have resulted in a 69% reduction in average treated-effluent flow volume from pulp and paper mills since 1959. Effluent quality has also drastically improved due to better wastewater treatment operations.¹⁶³

The chemical industry can also provide an important contribution to improving industrial water management. The European project 'E4Water' brings together academics and the chemical and water industry to achieve 20-40% reductions in water use and 30-70% reductions in wastewater production at the case study sites. One such case study site in Kalundborg, Denmark uses microalgae to clean waste water streams, producing biomass to be resold as proteins and lipids for such products as fish food, thereby reducing waste and adding value to wastewater management.¹⁶⁴

The *food industry* depends on water, and thus has a strong natural interest to promote water efficiency. For example, water-saving projects in Nestlé's factories reduced direct water withdrawals per tonne of product by 6% in 2014 (37% reduction since 2005). The company has identified 31 manufacturing facilities that are located in areas of severe water stress and/or represent a significant portion of its water withdrawals as areas for priority action.¹⁶⁵

¹⁶⁰ WWF (2015), "The Water Risk Filter", (available at: <http://waterriskfilter.panda.org/>; Last accessed 24 November 2015)

¹⁶¹ See the brochure of 'AquaFit4Use' project (available at http://www.aquafit4use.eu/userdata/file/Articles/Aquafit4use_success-stories-h2020_2012.pdf; last accessed 24 November 2015)

¹⁶² CEPI (2013), "The two team project", pp.18-19

¹⁶³ Sappi (2012), "Water Use and Treatment in the Pulp and Paper Industry", Sappi Fine Paper North America, p.3

¹⁶⁴ See website of E4Water (2015), "Economically and Ecologically Efficient Water Management in the European Chemical Industry (E4Water)", (available at: <http://www.e4water.eu/>; last accessed 25 November 2015)

¹⁶⁵ See website of Nestlé (2015), "Water efficiency", (available at: <http://www.nestle.com/csv/water/water-efficiency>; last accessed 24 November 2015) See website of Nestlé: <http://www.nestle.com/csv/water/water-efficiency> (accessed on 21 November 2015)

Water-intensive businesses can benefit from involving local communities in the design of new business models. This can enhance local buy-in and help to develop partnerships that foster long-term sustainable development, in both developed and developing countries. Such partnerships can also be used as the basis to achieve the sustainable development goals.¹⁶⁶

The companies that supply water efficiency solutions would benefit from wider collaboration as well: this would include knowing the needs and interests of their potential customers, but also making them aware of the existing solutions. The starting point would be more active engagement with industry in need of new solutions but also with policy makers that design water-management policies.

4.1.3 Innovative urban design

Cities are major users of resources like energy and water, and thus can play an important role in reducing their water footprint. At the same time, they can also be test centres for new innovative solutions that can help to tackle the water challenge while bringing additional economic, social, environmental and security benefits.

With three quarters of Europeans living in urban areas, cities will need to manage their specific climate-related challenges including exacerbated heat waves due to artificial surfaces and a lack of vegetation, leading to ‘urban heat island’ effects. Cities need to improve their water management, including urban drainage and sewage systems in order to adapt to these changing conditions. At the same time, the innovative use of space through urban greening can create new forms of agriculture, horticulture, and forestry in urban and surrounding areas – while helping to mitigate and adapt to climate change.

New York City has an initiative for “*greener*” storm water infrastructure inspired by challenges faced with traditional storm water management solutions. The NYC Green Infrastructure Plan proposes to invest \$2.4 billion (€2.2 billion) over the next 20 years in amenities such as green roofs, tree pits, and adaptive structural additions to aid in managing combined sewer overflow (CSO).¹⁶⁷ These additions will absorb storm water and eliminate 1.5 billion gallons of CSOs per year. “Blue roofs” can use simple mechanical devices to gradually release storm water and moderate peak flows. The potential benefits are immense, not only for cutting out CSOs but also decreasing public spending. Green infrastructure will increase property values and create around \$400 million (€373 billion) a year that can be used for additional benefits.¹⁶⁸

On the Spanish Mediterranean coast, the economic boom and massive construction projects created unsustainably high levels of water demand and destabilised local ecosystems, leading to *rainwater harvesting and reuse of wastewater*. On the Catalan coast, in the housing settlement Urbanización Panorámica, Sant Jordi, rainwater is collected from the settlement as well as from a nearby golf course, before it is filtered through a water treatment plant and stored separately. Moreover, some of the used water in this housing area is also filtered and re-used. Combined, these methods cover up to 40% of local needs.¹⁶⁹ Such efforts to reduce water consumption can significantly lower the demand for ground water and function as cost-effective prevention in areas of water scarcity.

¹⁶⁶ International Institute for Environment and Development (IIED) (2010), “Business models for sustainable development”, (available at: <http://www.iied.org/business-models-for-sustainable-development>; last accessed 24 November 2015)

¹⁶⁷ OECD Observer, (2011), “Beautiful waterways for the Big Apple”, No. 286, pp.28-29

¹⁶⁸ *Ibid*

¹⁶⁹ Meister, H.P, Kroger, I., Richwien, M., Rickerson, W., Laurent, C., (2009) “Floating Houses and Mosquito Nets: Emerging Climate Change Adaptation Strategies Around the World. Case Studies from Selected Countries”. Meister Consultants Group, Boston, p.97.

4.1.4 Improving household water use

On average, each European uses approximately 130 litres of water directly each day.¹⁷⁰ A significant amount of this is used for personal hygiene, such as taking showers and baths. Each individual can play a role in increasing water efficiency and reducing their water footprint.

Changing people's water consumption behaviour starts with education. People need to be educated and informed about the importance of saving water, as well as how much is being saved when applying small but significant changes to daily activities. For example, not letting the tap run or installing dual flush toilets can greatly impact water consumption by the consumer.¹⁷¹

Solutions such as smart water meters provide information for consumers and enable their accurate billing based on individual consumption. The potential is great: it has been estimated that having water meters at households could save the EU €200 million annually.¹⁷²

According to OECD studies, when people are charged for the amount of water the household uses, consumption falls by approximately 20 %. Coupling education and pricing schemes with up-to-date metering of the volume of water used and water-efficient solutions such as more efficient shower heads can help consumers save both water and money.

The potential with greywater and rainwater harvesting is slowly being recognised across the EU. It is compulsory in Belgium for new housing to be fitted with water tanks to collect rainwater. This allows its reuse as greywater, limiting runoff and reducing flood risk. Their installation is incentivised also in older buildings.¹⁷³

In the housing sector of the Barcelona Metropolitan Area, greywater and rainwater reuse systems provide water to different municipalities. The experience has shown that a more accurate pricing of water services can drive this development. In addition, educating people to maintain the technologies is crucial.¹⁷⁴

4.1.5 New approaches to water treatment

A growing population creates increasing needs for good quality drinking water. At the same time, the water demands of the agricultural sector, industry and energy sector will not disappear. So there is a growing need to treat water and find new ways to ensure access to safe water for people and for the economy. Two options for water treatment include 1) treating raw water and creating drinking water fit for end-use be it for drinking or industry and 2) recycling, treating and reusing wastewater. Wastewater treatment includes cleaning used water from human, industrial, agricultural or other sources of waste, with the end use determining the level of treatment required.

Access to safe water and sanitation remains a real challenge for the developing world, so solutions that can improve this situation are desperately needed. The World Health Organization (WHO) estimates that hygienic practices and clean water would reduce the global burden of disease by 10% and the benefits in monetary terms could be translated in \$84 billion per year.¹⁷⁵ Water-borne diseases such as cholera kill 1.8 million people a year; 88% of these individuals are infected due to poor sanitation and lack of hygiene. Improving water-supply sanitation will allow for a 58.5%

¹⁷⁰ European Environment Agency (2014), "Improving transparency in water services", (available at: <http://www.eea.europa.eu/highlights/improving-transparency-in-water-services>; last accessed 25 November 2015)

¹⁷¹ OECD Observer (2011), "Cool, Clean Water", pp.18-20

¹⁷² European Parliamentary Research Service (2015) "The Cost of Non-Europe in Water Legislation", p.7

¹⁷³ OECD (2013), "Belgium: Climate change impacts on water systems" (available at: <http://www.oecd.org/env/resources/belgium.pdf>; last accessed November 25 2015)

¹⁷⁴ Peter, V., Van Der Veen, G., Doranova, A., Miedzinski, M., (2013) "Screening of Regulatory Framework.", Technopolis Group, pg 97-98.

¹⁷⁵ OECD Observer, (Q3, 2011), "Cool, Clean Water", No. 286, pg 18-20

reduction in morbidity; simply washing hands reduces morbidity by an additional 35%. It should be noted that access to tap water does not mean that the water is safe to drink; investments in sanitation should be made as well. Addressing this challenge could bring great benefits, as the example of city of Salvador in Brazil demonstrates: the implementation of a sanitation and sewerage system for over 90% of the city was able to reduce diarrheal diseases among children by 22%.¹⁷⁶

*Many simple solutions exist to clean water and make it fit for drinking and agriculture. For example, the SODIS method, recommended by the WHO, suggests storing water in a clean PET plastic bottle and then exposing it to the sun for six hours. The sunlight (UV-A radiation) destroys diarrheal-inducing bugs—sterilising it to a point where it is sufficiently safe to drink.*¹⁷⁷

An example of an innovative mechanism to sterilise water is produced by the Israeli company SunDWater. The SunDwater unit is a solar-powered distiller used to provide clean water for drinking and agriculture. It converts contaminated water, unsafe water, or saltwater into drinking water without any need for infrastructure or an external energy source. It uses the sun's rays to produce up to 400 litres a day. Developing nations such as Madagascar and Nigeria have shown great interest in the product. Since there is no need to use electricity to purify the water, it is a cost- and energy-efficient method for producing potable water.¹⁷⁸

Water reuse and recycling carries great potential for municipal and agriculture purposes as well as for industrial processes. However, it requires naturally proper treatment, making the recycled water fit for purpose, be it for drinking, agriculture or industrial use. More on recycling and reuse of water in the European context can be found at the end of this chapter.

*More technological solutions for treating wastewater are emerging as well. For example, Oxyblue™ is a technological innovation, which eliminates non-biodegradable organic pollutants from industrial wastewater. This innovation enables industrial markets that produce heavy chemical oxygen demand (high amount of organic compounds in water) as a by-product from their industry practices to reuse their own wastewater. Food, petrochemicals, paper pulp and pharmaceutical industries could benefit from such a solution, since they have by-products with a heavy chemical oxygen demand. Countries such as China, Brazil, and the United States aim to use this technology for reusing wastewater.*¹⁷⁹

The philanthropist and tech mogul Bill Gates has supported development of an invention called the *Omniprocessor that uses human faeces to create drinkable water and energy* through steam technology. It can be used in both urban and rural areas, even though it is more viable in locations where expensive sewer systems are not implemented. Waste is heated to 1000 degrees Celsius, generating more energy than is needed to power the process itself. The Omniprocessor can process waste from up to 100,000 people, producing up to 86,000 litres of water and 250 kw (kilowatts) of electricity per day. This extra energy can then be put to the market - using human waste as fuel.¹⁸⁰

¹⁷⁶ *Ibid*

¹⁷⁷ SODIS (2015), "SODIS Method- How does it work?", (available at: http://www.sodis.ch/methode/anwendung/index_EN; last accessed 24 November 2015)

¹⁷⁸ Klein A.L., (2013), "SunDwater offers sun power to purify polluted water", 16 April 2013, (available at: <http://www.israel21c.org/environment/sun-power-to-purify-polluted-water/>; last accessed 24 November 2015)

¹⁷⁹ Suez (2012), "OxyBlue™ For Reusing Waste water", *Environnement Magazine*, Issue No. 11, p.10

¹⁸⁰ Gates, B., (2015), "This Ingenious Machine Turns Feces Into Drinking Water", <http://www.gatesnotes.com/Development/Omniprocessor-From-Poop-to-Potable>; last accessed 25 November 2015)

4.1.6 Desalination as a solution

Desalination is increasingly used as a solution to tackle water challenges. Desalination plants use a method called reverse osmosis, which pushes water through a semipermeable membrane to separate out most of the salts.¹⁸¹ However, these plants are expensive to keep running since they are very energy intensive.¹⁸² In addition, regions that use desalination have to dispose of the excess salt removed from the water, normally back to the sea, and the implications of this for marine ecosystems are not sufficiently known.

Despite plant operations being very expensive, island nations rely heavily on desalination methods for potable water. The process of extracting clean water from seawater is now crucial for the water security of regions like the Caribbean, which has put in place 68 desalination plants that produce 782,000 cubic meters of purified water per day.¹⁸³

Advances in technology are making the removal of salt from seawater and groundwater a realistic option. For instance, the use of graphene (or potentially MoS₂) in desalination has the potential to reduce desalination costs by up to 90%.¹⁸⁴ However, this method is neither quick nor cheap enough yet to help solve the water scarcity issue.¹⁸⁵

4.2 THE EU'S ROLE IN PROMOTING DEVELOPMENT AND DEPLOYMENT OF NEW WATER-SOLUTIONS

As is demonstrated in the Chapter 3 on 'Pricing water', stringent regulations that make wasting and polluting water costly provide a basis for a change in attitudes and behaviours. Establishing a framework that values water drives products and processes to become more water efficient and sustainable. One also needs a framework for innovation, and this is what the EU's research and innovation policy framework aims to do.

4.2.1 Role for EU research and innovation policy

The EU is already a major player in international science and technology, and a clear leader in many areas such as renewable energy and environmental protection.¹⁸⁶ The Commission's EU 2020 Innovation Union is a flagship initiative under the Europe 2020 strategy for smart, sustainable and inclusive growth. It has suggested over 30 measures that could help improve Europe's status as a world-class scientific performer by removing barriers to innovation, and revolutionising how public and private sectors work together.¹⁸⁷ Much is also ongoing in the field of water.

¹⁸¹ Gillis, J., (2015), "For Drinking Water in Drought, California Looks Warily to Sea", New York Times, 11 April 2015

¹⁸² Westerling, K., (2015), "Bet On Potable Water Reuse", Water Online, 24 Mar. 2015 (available at: <http://www.wateronline.com/doc/bet-on-potable-water-reuse-0001>; last accessed 25 November 2015)

¹⁸³ Balch, O., (2015), "Making rain: can technology drought-proof the Caribbean?", The Guardian, 18 February 2015 (available at: http://www.theguardian.com/sustainable-business/2015/feb/18/caribbean-water-crisis-forcing-long-term-reliance-on-desalination?CMP=new_1194&CMP=; last accessed 25 November 2015)

¹⁸⁴ Harper, T., (2015), "Can graphene make the world's water clean?", Global Agenda Council on Nanotechnology, 10 July 2015 (available at: <https://agenda.weforum.org/2015/07/can-graphene-make-the-worlds-water-clean/>; last accessed 25 November 2015)

¹⁸⁵ Farnsworth, C.B., (2014), "Is Mining Seawater the Answer to Drought?", GreenBuilder, 7 May 2014 (available at: <http://www.greenbuildermedia.com/news/blog/news/is-mining-seawater-the-answer-to-drought>; last accessed 25 November 2015)

¹⁸⁶ European Commission (2014), "Research and Innovation: Pushing boundaries and improving the quality of life", European Union, p.12 (available at: http://europa.eu/pol/pdf/flipbook/en/research_en.pdf; last accessed 25 November 2015)

¹⁸⁷ European Commission (2015), "Innovation Union: A Europe 2020 Initiative", (available at: http://ec.europa.eu/research/innovation-union/index_en.cfm?pg=intro; last accessed 25 November 2015)

The Commission attempts to harness the potential of oceans, seas, and coasts for jobs and growth, as envisaged through the Blue Growth Agenda. The purpose of this agenda is to protect the diversity of marine life, enable sustainable harvesting of the deep-sea resources, address the socioeconomic dimension of offshore activities, and fund sea observation technologies. For example, the aquatic resource innovation section of H2020 aims to increase the sustainable use of fisheries and aquaculture. This will aim to boost food security and reduce the Union's heavy dependence on seafood imports. Even though this publication does not study marine resources more specifically as a source of growth, their role should not be forgotten.

The Commission provides important financial support for the development of water-related solutions, including by providing support for demonstration projects and real-life showcases. Horizon 2020 (H2020) is the biggest EU Research and Innovation programme ever, with nearly €80 billion of funding available over seven years (2014 to 2020). It aims to address societal challenges related to food security, sustainable agriculture and forestry, marine, maritime and inland water research, and the bio-economy. This strategy enhances the EU's production of products and services in these areas and is expected to create 3.7 million jobs, while increasing the EU's annual GDP by nearly €800 billion.¹⁸⁸ The cross-cutting nature of the water challenge sees related initiatives prevalent across the H2020. Part of the available funding under H2020 is used to support the development of key enabling technologies that are needed to tackle the water challenges Europe and the world are facing.¹⁸⁹ The Commission is also linking H2020 funds with those from the European Investment Bank to help finance research and innovation across the entire value chain of the water sector (InnovFin).¹⁹⁰

The Commission has also aimed to promote a new kind of collaboration via the European Innovation Partnership on Water (EIP Water), in order to build upon the innovation potential that the global water challenge presents. EIP Water aims to bring innovators together and create market opportunities for these innovations, both in and outside of Europe. The Strategic Implementation Plan, or SIP, of EIP Water has identified eight priority areas for action: five thematic and three cross cutting. The thematic areas include water reuse and recycling, the water-energy nexus, water and wastewater treatment (including recovery of resources), flood and drought risk management, and ecosystem services. The three cross-cutting priorities of the EIP Water are financing for innovation, decision support systems and monitoring and water governance. There are currently 29 action groups, consisting of public and private sector, and non-governmental organisations. They aim to develop, test, scale up, and disseminate innovative solutions to water-related challenges. The EIP Water got off to a good start with great enthusiasm. However, the momentum has slowed down. While the expectation is that EIP Water will be supported by existing EU financial tools including Horizon 2020, regional and cohesion funds, and the LIFE programme, finding enough funds has proven to be difficult. Lack of coordination from the top-down and weak cooperation between stakeholders on the ground have destabilised the effort.

4.2.2 Removing barriers to development and deployment of new water solutions

Barriers to the development and uptake of innovations are manifold.¹⁹¹ First and foremost, fragmentation on a national and an EU level remain a challenge for realising the potential of water innovation in Europe. Whilst the EIP on Water has aimed to reduce this, more work remains to be

¹⁸⁸ European Commission (2014), "Research and Innovation Pushing boundaries and improving the quality of life", European Union, p.12

¹⁸⁹ European Commission (2015), Communication on "Preparing for our future: Developing a common strategy for key enabling technologies in the EU" p.2, COM/2009/0512 final

¹⁹⁰ European Investment Bank (2015), "InnovFin – EU Finance for innovators", (available at: <http://www.eib.org/products/blending/innovfin/>; last accessed 25 November 2015)

¹⁹¹ European Innovation Partnership on Water (EIP Water) (2014), "Diagnosis of barriers and bottlenecks for innovation, Final Report" pp.5-6, (available at: http://www.eip-water.eu/sites/default/files/DiagnosisBarriersBottlenecks-Final_0.pdf; last accessed 25/11/2016)

done. Greater cooperation requires the engagement of the public and private sectors, and of producers and consumers in the development process.

Another challenge is funding. Small medium-sized enterprises (SMEs) create innovative products, but due to a lack of financial resources the products or services often do not reach further development. Low rates of return on investment as well as lack of access to additional sources of funding remain challenges for many.

In addition, inconsistencies can occur due to incoherency or the improper implementation of directives. For example, the current pollution discharge limits for industry are based on pollution concentrations rather than loads, and as such do not encourage water efficiency. If industry manages to save water they should not be punished for it.

Lastly, getting products to the market is often inefficient at an EU and national level. For example, product approvals and financing requirements are complex. Water treatment technologies that are certified at the EU level often require different certificates in various countries. Certifying products in multiple countries limits new technologies' access to the single market, preventing large-scale use.

As the challenges to development and the uptake of new solutions demonstrate, the policy framework for incentivising water-related innovations is still in the making. The EU's support for research and innovation is an important basis, but it must also be coupled with the support from industrial, agricultural, environmental, and regional policies in order to popularise the solutions. The single market should be used as a basis to encourage a more efficient uptake of the solutions.

4.3 REUSE AND RECYCLING OF WATER – A REAL INNOVATION TEST CASE FOR THE EU

The European Commission's 2012 *Blueprint on safeguarding Europe's water sources* identified water reuse as one of the priorities that should be addressed. It has also been promoted as a priority in the Strategic Implementation Plan of the EIP Water. Water reuse can provide great economic, social, and environmental benefits. Properly designed systems can provide significant savings if the reusable water is treated for the specific industry's purpose only. Water reuse mechanisms allow for lower quality water to be used in applications that do not need higher quality of water. It is more cost- and resource-efficient to reuse water for irrigation than to desalinate seawater for irrigation, for example.¹⁹² Reuse can also prevent an increase of wastewater being discharged into the environment, and allow for better control over nutrient runoff into streams and lakes. The market for innovative ways to recycle and reuse water is expected to grow, especially in areas of high water stress.

Highly water-stressed countries such as Israel have already well-developed practices in recycling municipal wastewater for agricultural irrigation. Some EU countries that suffer from water scarcity (e.g. Spain, Italy, Cyprus,) have integrated the reuse of water in their water resources management. Industrial plants across Europe have integrated reuse capacity into their production systems, often with the aid of public finance, and in partnership with other enterprises, local authorities, universities and research institutes.

¹⁹² Kemira (2014) "Questions and answers on water reuse", (available at:<http://www.kemira.com/en/newsroom/whats-new/pages/questions-and-answers-on-water-reuse.aspx>; last accessed 24 November 2015)

There is vast experience in reusing water in countries such as Israel, where 92% of wastewater undergoes treatment, 75% of which is used for agricultural irrigation, leading to a situation where nearly half of the irrigation comes from recycled wastewater. Currently Israel treats more water than what it can store in reservoirs. By 2025, Israel plans to recycle 95% of its wastewater, to be used for irrigation.¹⁹³

In Singapore, used water, which is purified using advanced membrane technologies, called NEWater supplies around one third of the country's water demand. This figure is expected to reach over 55% by 2060.¹⁹⁴

Water reuse technology is available and in use, and it is expected that the market for innovations in water reuse and recycling will only continue to grow in and outside of Europe. There is growing recognition to protect and preserve quality water for drinking and use treated wastewater for agricultural and industrial purposes. It is in the EU's interest to ensure that it has a framework in place, which will allow the European industry to expand its expertise in water reuse.

Barriers to the reuse of water

On a European level, the water reuse still remains limited: only around 2.4% of wastewater is reused. This is due to a number of factors. The public consultation launched by the European Commission showed that the main reasons included low public acceptance of reuse solutions and limited awareness of its benefits, a lack of clarity in the regulations on managing reuse risks and fear of trade barriers for food products that are irrigated with reused water.¹⁹⁵ The lack of a policy framework and common EU environmental and health standards for reused water is considered a challenge as well. For example, diverging end of waste criteria between member states inhibits industrial water reuse in the EU. Another one is the shortage of financial incentives: as long as reuse costs the same, or more as freshwater abstraction, there will be limited interest in utilising the technology. In addition, the absence of industrial processes that would be able to use different qualities of water and sub-optimal markets for recovered nutrients have been raised as barriers for reusing water. Whilst Europe has the technological know-how, more skilled workers, including engineers, would be needed to bring a fundamental change to the recycling and reusing water.

Next steps

Diverging national policies on reuse are emerging, and it is widely recognised that greater collaboration on water reuse across the EU is needed. The Commission published a roadmap for the initiative "Maximisation of water reuse in the EU (a new EU instrument)" in September 2015 and is planning to develop an EU-level instrument on water reuse.¹⁹⁶ A common regulatory framework with legally binding EU standards on reuse would be beneficial as it would help to bring clarity to existing national requirements and enable business to operate across borders. The expectation is that the potential of water reuse will also be recognised in the Commission's new Circular Economy Package. However, it remains to be seen what role will be given to recovery of energy and materials from wastewater that are otherwise wasted in the process.

¹⁹³ Schreiber, Y., (2014) "To recycle or not to recycle, that is the question", a paper prepared by KKL-JNF for the Blue Gold Task Force, 29 October 2014.

¹⁹⁴ See website of PUB, Singapore's national water agency on NEWater (available at: <http://www.pub.gov.sg/water/newater/Pages/default.aspx#newaterusage>; last accessed 24 November 2015)

¹⁹⁵ BIO by Deloitte (2015), "Optimising water reuse in the EU – public consultation analysis report" prepared for the European Commission

¹⁹⁶ European Commission roadmap (2015), "Maximisation of water reuse in the EU (a new EU instrument)" (available at http://ec.europa.eu/smart-regulation/roadmaps/docs/2015_env_001_water_reuse_en.pdf; last accessed 25 November 2015)

The potential for both water reuse and recovery of resources is great. Water treatment plants across the EU could help to produce water that can be reused while recovering energy and materials. A number of industries already reuse water and recover materials from the processes, and better guidelines could help to improve business models even further.

Phosphorous is classed as being of critical value to the EU, and technologies exist to recover it from wastewater. This potential can be utilized, if the EU creates a stable regulatory framework for its recovery and uptake. Review of the *EU Fertiliser Regulation* and widening its scope would be an important stepping-stone in encouraging recovery and recycling of nutrients.

It should be noted that the water needs for urban, industrial, agricultural and environmental uses differ, and a clearer definition of water quality requirements for different applications is needed. The aim should be to allow different water qualities to be used for different applications, while ensuring that safety and environmental considerations are taken properly into account. As member states and industries' interests and needs differ, the reuse of water should not be imposed on anyone, but the policy framework should provide guidance, including technical guidelines, for those member states and economic sectors that wish to build on the potential. The industrial and agricultural sectors have good experiences in the reuse of water, and this should provide valuable lessons for other users.

At the same time it should be remembered that the more advanced the wastewater treatment, the more expensive it will be and the more energy it will consume – and even the most sophisticated systems combining more than one type of filtration cannot eliminate all micropollutants or pharmaceuticals from wastewater. So while it is worth exploring how different economic and other incentives could promote water reuse, if the EU is interested in fully realising the potential or reuse, and making it an economically, environmentally and socially viable solution, it should start with reducing pollution at the source.

Case study: noPILLS in waters¹⁹⁷

The EU-supported noPILLS project studied different ways to reduce the pollution in waters caused by pharmaceutical residues. It showed that treatment and technical measures can support the objective, but the primary aim should be to reduce medicines in wastewater. This starts by changing consumers' behavior, for example, with regard to medicine intake, and by the sustainable disposal of unused medicine. Reducing micropollutants and pharmaceuticals in waters needs targeted interventions along the chain: during production and authorisation, consumption, disposal, and as the last measure during treatment.

4.4 RECOMMENDATIONS

Managing the water challenge by encouraging innovation and uptake of new solutions

1. A more systemic approach to innovation is needed

- Research and innovation policies should help to encourage a multi-disciplinary and more systematic approach to addressing current and future challenges with water. They should support painting a comprehensive picture of the water challenge with its multiple economic, social, environmental, political and security implications and provide the basis for smarter, more cross-sectoral policy making. For example, smarter approaches to water should be seen as contributions to the development of a greener economy and vice-versa.

¹⁹⁷ Website of noPILLS project (available at <http://www.no-pills.eu/>; last accessed 25 November 2015)

- The European Innovation Partnership (EIP) on Water must be revitalised. It remains an important forum for stimulating innovation and encouraging collaboration across EU member states between public and private actors. It must be used to overcome the fragmentations in the sector and to attract more public and private money for innovation in the sector.

2. New approaches to development of smart water solutions

- Greater collaboration is needed between public and private sectors. While the Horizon 2020 and EIP Water already encourage joint public-private innovation initiatives, more could be done to encourage burden-sharing and investments in areas where public and private objectives are aligned, like in water reuse and efficiency.

3. Encouraging uptake of innovative solutions

- EU regional funds and policy should be used to encourage investments in water innovation. The focus on smart specialisation should provide an incentive for a number of regions to specialise in managing the water challenge. Regional policies should also be used to provide a platform for exchanging best practices between European regions.
- When the benefits for the EU as a whole would be significant, it should encourage sharing best practices with specific solutions and even the uptake of these the solutions. For example, a roll-out of smart meters would increase people's awareness of their water consumption and could help to improve water efficiency, while the use of technologies such as drip irrigation in agriculture could lead to significant water savings.
- The EU should also encourage exchanging experiences on how the uptake of new solutions can be promoted while overcoming cost and maintenance issues. For example, in the case of grey and rainwater harvesting a service contract could help to make these solutions available for households that cannot afford the upfront costs of these systems.

4. Encouraging agricultural and industrial sectors to innovate

- Policy makers at the EU and national levels should encourage relevant actors, including the agricultural sector and industry, to share best practices and exchange lessons learned. Good examples exist across sectors how greening production and reducing water footprint can benefit both the industry as well as the society as a whole.
- Fully implementing existing regulation such as the *Water Framework Directive* and ensuring that the polluter pay principle is applied would provide a strong signal to the agricultural sector and industries to improve their processes and impacts on water supplies.
- When needed, the existing regulations should be updated. For example, the current pollution discharge limits for industry that are based on pollution concentrations rather than loads do not encourage water efficiency. If the industrial sector manages to save water it should not be punished for it. In addition, the end-of-waste criteria must be unified across Europe in order to enable the exchange of industrial material between industrial partners in different countries/within the same country and to enable water reuse. There is also a need for more stringent regulation in order to prevent pollution at the source. An example would be to regulate the level of pharmaceutical residues allowed in urban wastewater streams.

- The use of voluntary incentives such as the water stewardship should be further encouraged. Educating businesses about the risks they face due to water scarcity and pollution, and needed measures can encourage them to innovate their products and processes and thus contribute to managing global and local water resources in a sustainable way.
- The EU, its member states, and employers within different sectors, should invest in the skill-sets of their citizens and employees. Europe requires, for example, more knowhow on recycling and reusing water. Equally, it requires experts with a multi-disciplinary understanding in order to develop innovative solutions that can tackle the water challenge and other societal challenges at the same time, within and beyond its borders.

5. Addressing the risks and building on the potential with recycling and reusing water

- The Commission's Circular Economy package, expected in December 2015, should recognise water as a central resource in the circular economy. This should lead to following actions: 1) aim to ensure that water retains its value after each usage, be it for agricultural, energy or industrial purposes and 2) make water management more resource-efficient by encouraging the recovery of energy and materials.
- The EU must create a policy framework for the recycling and reusing of water. This should comprise a binding framework on reuse of water, with treatment standards and water quality benchmarks for different uses. The aim should be to encourage reuse of water, especially in water-stressed areas, and have it integrated in medium- and long-term water management plans. The EU should also provide guidelines for energy recovery and stimulate the recovery of critical materials from wastewater. Upcoming revision of the *Fertilizers Regulation* should contribute to building a stable regulatory framework for recovery and reuse of materials from wastewater, such as phosphorous.
- The EU should help to address public acceptance concerns related to the recycling and reusing of water. Education, public awareness and communication, including on the wider environmental and social benefits, are essential to change the image of reused water and encourage the best use of it. This requires continuing research on scientific uncertainties, and where possible, gathering and communicating information on risks and benefits to the population. Proper governance and monitoring of water is also needed to promote trust in water reuse. The EU should help to guide member states and encourage sharing of knowledge from outside the EU: for example, the experiences of Israel in the recycling and reusing of water could provide a valuable lesson for the EU.
- As concerns over pollutants affect the image of reused water, much more attention needs to be paid to the source of the pollution. Preventing the problem requires controlled production, authorisation, consumption and disposal of waste.
- The potential of economic and other incentives to encourage reuse of water should be explored. Implementation of the *Water Framework Directive*, realistic water prices and better monitoring of fresh water abstraction are a starting point. Seeing water reuse as a component of water management could also encourage new ways of thinking. In addition, evaluating and accounting for non-monetary benefits of water reuse like preservation of the environment and of national water resources would be needed. Harmonising water reuse standards would create a level playing field for, for example, food producers that use treated water for irrigation. In addition,

the EU should learn from others and see whether their experiences could be applicable in Europe: for example, in Israel guaranteed supply of reused water over fresh water has incentivised the use of the former. In order to get projects of the ground, the use of financing mechanisms such as EU loans may also be required.

IMPLEMENTING THE HUMAN RIGHT TO WATER AND SANITATION IN DEVELOPING COUNTRIES

5.1	A recognised human right under European and international law	54
5.2	The state of play in implementing the right to water and sanitation	55
5.3	A cross-cutting challenge with different layers of inequalities	55
5.4	Financing as a backbone	57
5.5	Innovative partnerships: An attractive solution for water and sanitation management at local level	60
5.6	Public-private partnerships: Building on the strengths of the private sector	62
5.7	From education to new solutions	63
5.8	Scaling up EU efforts to achieve universal access to safe water and sanitation	64
5.9	Recommendations	65

The right of every person to have access to safe water and adequate sanitation has been universally acknowledged and enshrined in international legislation. However, even though there has been progress, the commitments and repeated calls for action made by the international community and the EU have not yet led to the full realisation of this right on the ground. A significant number of the world's poorest population still does not have access to drinking water and adequate sanitation. This situation is all the more concerning as safe water, sanitation and hygiene are essential elements for the achievement of other development objectives such as improving food security and health. The Global Goals on Sustainable Development, which were agreed upon at a United Nations summit in September 2015, helped to place water, sanitation and hygiene, or WASH, at the forefront of the development agenda.¹⁹⁸ In Europe, public opinion is sensitive to this issue as demonstrated by the Right2Water Citizens' Initiative, which was supported by more than 1.8 million citizens in its call for the EU to "increase its efforts to achieve universal access to water and sanitation".¹⁹⁹

However, as previous experience has shown, setting goals and targets alone is not enough to guarantee sustainable access to water and sanitation for all, if it is not followed by the allocation of adequate financial resources, the involvement of local populations, strong political commitment and institutions and enhanced international cooperation. This vision is ambitious but achievable. It is

¹⁹⁸ More information at UN, "Sustainable Development Goals", Sustainable Development Knowledge Platform (available at <https://sustainabledevelopment.un.org/topics>; last accessed on: 23 November 2015)

¹⁹⁹ More information at Right2Water, "Water and sanitation are a human right!" (available at <http://www.right2water.eu/>; last accessed on: 23 November 2015)

necessary to build on the progress that has been made so far by strong leadership across the sector and a comprehensive financial package.

5.1 A RECOGNISED HUMAN RIGHT UNDER EUROPEAN AND INTERNATIONAL LAW

The United Nations has enshrined the human right to water and sanitation and recognised that access to clean water and sanitation is “essential for the full enjoyment of life and all human rights”.²⁰⁰ The UN Human Rights Council has also called upon states to adopt holistic planning, provide adequate funding, establish accountability mechanisms and ensure the sustainability, independent regulation and monitoring of the water and sanitation sectors.²⁰¹

In the EU, both Resolution 1693/2009 of the Parliamentary Assembly of the Council of Europe and the European Parliament Resolution 2012/2552(RSP) state that access to water is a fundamental human right.²⁰² While water and sanitation are not mentioned in the Charter of Fundamental Rights of the European Union, member states recognise them as a human right under international legislation. Moreover, universal access to WASH has repeatedly been recognised as an EU development priority.

The Millennium Development Goals (MDGs), agreed upon in 2000, set targets to halve the proportion of people without sustainable access to safe drinking water and to basic sanitation by 2015.²⁰³ The EU repeated its commitment to do its best to help achieve the MDGs and “promote improved access to drinking water and sanitation facilities” in its 2013 Communication “A Decent Life for All: Ending poverty and giving the world a sustainable future”.²⁰⁴ This pledge was echoed by the EU Council Conclusions on the Overarching Post 2015 Agenda.²⁰⁵

The new global framework of action to eradicate poverty and achieve sustainable development by 2030, “Transforming our world: the 2030 Agenda for Sustainable Development”, which was adopted by the world community at a UN summit in September 2015, includes a Goal 6 to “ensure availability and sustainable management of water and sanitation for all”.²⁰⁶ This approach does not simply go beyond the MDG targets, but is also more comprehensive, with targets to improve water quality, water-use efficiency, transboundary cooperation and capacity-building, while strengthening the participation of local communities. The European Commission also proposed similar goals in its 2 June 2014 Communication “A Decent Life for All: From vision to collective action”.²⁰⁷ These calls for actions show that, even though progress has been made, a lot remains to be done.

²⁰⁰ United Nations General Assembly, Resolution of 28 July 2010, “The human right to water and sanitation” (Resolution 64/292)

²⁰¹ United Nations Human Rights Council, Resolution of 6 October 2010 on “Human rights and access to safe drinking water and sanitation” (Resolution 15/9)

²⁰² Parliamentary Assembly of the Council of Europe, Resolution of 2 October 2009, “Water: a strategic challenge for the Mediterranean Basin” (Resolution 1693 (2009)); European Parliament, Resolution of 6 March 2012 on the 6th World Water Forum (2012/2552(RSP))

²⁰³ UN Millennium Project (2006), “Goals, targets and indicators” (available at <http://www.unmillenniumproject.org/goals/gti.htm#goal7>; last accessed on: 23 November 2015)

²⁰⁴ European Commission (2013), Communication on “A Decent Life for All: Ending poverty and giving the world a sustainable future”, COM (2013) 92 final

²⁰⁵ European Council, 25 June 2013, “Conclusions on the Overarching Post 2015 Agenda”

²⁰⁶ United Nations General Assembly, Resolution of 25 September 2015 on “Transforming our world: the 2030 Agenda for Sustainable Development”, Resolution 70/1

²⁰⁷ European Commission (2014), Communication on “A Decent Life for All: From vision to collective action”, COM (2014) 0335 final

5.2 THE STATE OF PLAY IN IMPLEMENTING THE RIGHT TO WATER AND SANITATION

The most celebrated progress has been the achievement of the MDG target of halving the proportion of people without sustainable access to safe drinking water, years before the 2015 deadline. At the end of 2010, 6.1 billion people, the equivalent of 89% of the world's population, had access to improved water sources. The number could reach 92% in 2015, according to the UN.²⁰⁸ The EU has contributed to this success, claiming that "as a direct result of EU assistance, more than 70 million people gained access to improved water supply and 24 million to sanitation facilities between 2004 and 2013".²⁰⁹

Nonetheless, this remarkable achievement needs to be tempered. In 2015, 605 million people still did not have access to an improved source of drinking water.²¹⁰ Europe is not immune, as 100 million Europeans did not enjoy safe drinking water in 2008.²¹¹ Furthermore, precisely measuring water quality worldwide and keeping track of its safety, reliability and sustainability is an extremely complex task. According to the WHO, 1.8 billion people drink water contaminated by faeces, which underlines the strong interlinkage between water and sanitation.²¹²

Ensuring access to sanitation for the world's poorest remains a considerable challenge, especially in Africa and South Asia. It was estimated that in 2011, one billion people - 15% of the global population - were practicing open defecation.²¹³ In 2015, 2.4 billion people were still deprived of improved sanitation facilities and the MDG target for sanitation has been missed by approximately 700 million people.²¹⁴ Challenges linked to access to water and sanitation are all the more difficult to tackle because of several layers of complexity and inequalities.

5.3 A CROSS-CUTTING CHALLENGE WITH DIFFERENT LAYERS OF INEQUALITIES

The water and sanitation crisis is a worldwide challenge. However, the situation is particularly worrying in low Human Development Index (HDI) countries, where 65% of the population does not have access to improved sanitation and 38% to improved water.²¹⁵ Over 40% of all people without access to improved drinking water live in sub-Saharan Africa.²¹⁶ Inequalities within medium HDI countries are also cause for concern. It is estimated that half of the people living in these countries do not have access to improved sanitation and one person out of eight to improved water.²¹⁷ For example, more than 70% of inhabitants of the Bihar region in India are deprived of basic sanitation.²¹⁸ Closing this inequality gap has not been tackled head on by governments in low and

²⁰⁸ WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation Report (2012), "Progress on drinking water and sanitation", New York, p.4

²⁰⁹ European Commission (2014), Communication on "the European Citizens' Initiative "Water and sanitation are a human right! Water is a public good, not a commodity!""", COM (2014) 177 final

²¹⁰ United Nations (2012), "Report on the Millennium Development Goals", New York, p.52

²¹¹ UN News Centre, "Over 100 million Europeans lack access to safe drinking water, UN says", 14 March 2008 (available at <http://www.un.org/apps/news/story.asp?NewsID=25978>; last accessed on: 23 November 2015)

²¹² WHO/UNICEF (2014), "Progress on drinking-water and sanitation – 2014 update", New York, p.42

²¹³ UNICEF Press Centre, "Water, Sanitation and Hygiene (WASH)", 10 March 2014 (available at http://www.unicef.org/media/media_45481.html; last accessed on: 23 November 2015)

²¹⁴ WHO/UNICEF (2015), "Progress on drinking-water and sanitation – 2015 update", New York, p.5

²¹⁵ UNDP (2011), "Human Development Report 2011 - Sustainability and Equity: A Better Future for All", New York, p.53

²¹⁶ UN, "Global issues-Water" (available at <http://www.un.org/en/globalissues/water/>; last accessed on: 23 November 2015)

²¹⁷ UNDP (2011), "Human Development Report 2011 - Sustainability and Equity: A Better Future for All", New York, p.53

²¹⁸ *Ibid.* p.46

middle income countries, as only 17% apply financial measures to reduce inequalities in access to sanitation for the poor, compared with 23% for drinking water.²¹⁹

There are important differences between urban and rural areas. Poor and rural populations are the most affected by the lack of improved water and sanitation, even though the number has decreased from 1.1 billion in 1990 to 653 million in 2010.²²⁰ Cities also face a significant number of obstacles linked to water quality, such as wastewater discharge. Moreover, water and sanitation facilities do not always keep up with urban growth and the proliferation of slums and informal settlements. By resorting to informal providers, populations living in these areas are also exposed to the risk of paying high amounts of money to benefit from poor quality water. The number of people living in cities without access to an improved drinking water source actually increased from 111 million in 1990 to 149 million in 2012.²²¹

The lack of access to WASH is also a gender issue in developing countries. The burden of collecting water falls predominantly on women and girls. They bear this responsibility in 70% of households in 45 developing countries and can spend up to six hours per day collecting water.²²² The fact that this situation is also detrimental to their education and employment underlines the connection between water and other pressing development challenges. Furthermore, in some countries, the lack of menstrual hygiene management threatens the health, dignity and education of women and girls.

WASH is also important to guarantee food security and good health. Populations affected by the lack of WASH are often the same as those who suffer from undernutrition. There are 793 million people worldwide who are undernourished.²²³ This situation can result from insufficient water for agricultural production, but also from unsafe water, inadequate sanitation or insufficient hygiene. The WHO estimated that half of global malnutrition was caused by repeated incidence of diarrhoea and intestinal worms resulting from poor WASH.²²⁴ Diarrhoea caused by poor WASH is responsible for the deaths of 842,000 people annually, including 361,000 children under the age of five.²²⁵ Moreover, 38% of hospitals and clinics in 54 developing countries do not have access to any water source.²²⁶ The lack of WASH in healthcare facilities, beyond the impossibility of providing safe care, also weakens the ability to help prevent and respond to disease outbreaks such as the recent Ebola crisis.

The important role WASH plays in a wide range of development challenges emphasises the pressing need for policy coherence in developing countries. Problems arise when there are contradictory incentives across policy areas. For instance, in India, the fact that the cost of energy to pump water

²¹⁹ UN Water/WHO (2014), "Investing in water and sanitation: Increasing access reducing inequalities", UN-Water Global Analysis and Assessment of Sanitation and Drinking-Water GLAAS 2014 Report, Geneva p.15

²²⁰ United Nations, "Global issues-Water" (available at <http://www.un.org/en/globalissues/water/>; last accessed on: 23 November 2015)

²²¹ Vallo, M. (2015), "La crise de l'eau illustrée en 5 graphiques", LeMonde, 20 March 2015 (available at http://www.lemonde.fr/ressources-naturelles/article/2015/03/20/la-crise-de-l-eau-illustree-en-5-graphiques_4597592_1652731.html; last accessed on: 23 November 2015)

²²² WHO/UNICEF (2015), "Progress on drinking-water and sanitation – 2015 update", New York, p.38; United Nations, "Water and gender", 2013 (available at http://www.unwater.org/fileadmin/user_upload/unwater_new/docs/water_and_gender.pdf; last accessed on: 23 November 2015)

²²³ FAO (2015), "The State of Food Insecurity in the World 2015" (available at <http://www.fao.org/hunger/key-messages/en/>; last accessed on: 23 November 2015)

²²⁴ More information at WaterAid, London School of Hygiene and Tropical Medicine, Sanitation and Hygiene Applied Research for Equity (SHARE), "Under-nutrition and water, sanitation and hygiene", July 2013

²²⁵ WHO (2015), "Drinking water", Fact sheet N°391, June 2015 (available at <http://www.who.int/mediacentre/factsheets/fs391/en/>; last accessed on: 23 November 2015)

²²⁶ Neira, M., Kelley E., Bahl R., Chopra M., Wijesekera S., WHO-UNICEF (2015), "Water, sanitation and hygiene in health care facilities. Status in low- and middle-income countries and way forward", Geneva, p.iv

for agriculture is subsidised has led farmers to extract more water than necessary, thus hampering the development of more efficient and sustainable practices.²²⁷

This cross-cutting nature of water is reflected in the EU's 2011 Communication "Increasing the impact of EU Development Policy: an Agenda for Change" and its subsequent Framework for Action for the period 2014 to 2020, which recognises the links between water and food and energy security.²²⁸

5.4 FINANCING AS A BACKBONE

A sustainable development goal on water and sanitation will not be met without allocating adequate financial resources. According to the "3Ts model", the sources of financing for water and sanitation are "tariffs" paid by users, taxes and transfers by external sources such as official development assistance (ODA).²²⁹ Ensuring that enough financial resources are efficiently allocated to water and sanitation remains an enormous undertaking.

One significant barrier is the lack of money being allocated to the water and sanitation sector by the national governments of vulnerable countries. The 2008 eThekweni commitment signed by 30 African governments to allocate at least 0.5% of GDP in funding in sanitation and hygiene is respected by very few countries.²³⁰ Furthermore, many developing countries lack mechanisms to track funding for water and sanitation, making it very difficult to ensure that financial resources are really allocated to this sector. As it happens, one of the proposed measures of the Addis Ababa Action Agenda, agreed upon by UN member states in July 2015 to successfully implement the SDGs, is to encourage countries to set appropriate national spending targets for investments in essential public services such as water and sanitation.²³¹

Nonetheless, external support can be vital for recipient countries and can even constitute, as in Burkina Faso, the biggest share of financing for WASH. Globally, \$10.9 billion in ODA was allocated to water and sanitation in 2012. Even if this is a 30% increase from the \$8.3 billion allocated in 2010, there is still a significant financial gap to be addressed.²³² No less than \$27 billion would be required annually to provide access to improved water supply and sanitation.²³³ A total of \$9.5 billion would be necessary to achieve the MDG 2015 sanitation goal; a figure that could rise to \$100 billion, the equivalent of the entire annual ODA, if tertiary wastewater treatment for waste streams in urban

²²⁷ Clay, J. (2013), "Are agricultural subsidies causing more harm than good?", *The Guardian*, 8 August 2013 (available at <http://www.theguardian.com/sustainable-business/agricultural-subsidies-reform-government-support>; last accessed on: 23 November 2015)

²²⁸ European Commission (2011) Communication on "Increasing the impact of EU Development Policy: an Agenda for Change", COM (2011) 0637 final; Dalamangas, S., Presentation for the EPC Blue Gold Task Force Workshop, "Water: A factor of instability or an opportunity for cooperation?", Directorate General for Development and Cooperation, European Commission, 9 December 2015, Brussels

²²⁹ More information at Global Water Partnership Toolbox (2013), "Generating basic revenues for water (A3.03)" (available at <http://www.gwp.org/en/ToolBox/TOOLS/The-Enabling-Environment/Investment-and-Financing-Structures/Generating-basic-revenues-for-water/>; last accessed on: 23 November 2015)

²³⁰ WaterAid (2013), Report, "Keeping promises: why African leaders need now to deliver on their past water and sanitation commitments"

²³¹ United Nations (2015), Addis Ababa Action Agenda of the Third International Conference on Financing for Development (Addis Ababa Action Agenda), The final text of the outcome document adopted at the Third International Conference on Financing for Development (Addis Ababa, Ethiopia, 13–16 July 2015) and endorsed by the General Assembly in its resolution 69/313 of 27 July 2015, New York

²³² UN Water/WHO (2014), "Investing in water and sanitation: Increasing access reducing inequalities", UN-Water Global Analysis and Assessment of Sanitation and Drinking-Water GLAAS 2014 Report, Geneva, p.x

²³³ Sachs, J., Schmidt-Traub, G. (2014), "Financing Sustainable Development: Implementing the SDGs through Effective Investment Strategies and Partnerships", Sustainable Development Solutions Network, 30 November 2014, New York, p.8

areas is included.²³⁴ According to the UK-based international NGO WaterAid, the achievement of universal access to water, sanitation and hygiene will require the amount of ODA for these sectors to at least double from current levels by 2020.²³⁵

The EU and its member states are the largest donors in the water sector, providing €1.5 billion every year for water and sanitation programmes in developing countries. For example, the EU allocates €81 million to water through its 'Global Public Goods and Challenges' (GPGC) programme.²³⁶ In order to help achieve the MDG on water and sanitation, the EU set up the ACP-EU Water Facility (Africa Caribbean Pacific - European Union Water Facility) in 2004.²³⁷ The programme provided and leveraged investment in water and sanitation services in the ACP region. It mobilised a wide range of actors, including local water operators, local governments and civil society, with the common objective of improving the management and governance of these services. However, the ACP-EU Water Facility has not yet been renewed. This is a cause for concern, as the implementation and financing of the SDGs is an immense undertaking that will greatly benefit from an ambitious EU programme succeeding the Facility. This can only be done with the support of the European Parliament and member states.

A better targeting of funds would lead to greater aid effectiveness. For example, aid fragmentation is a problem, as numerous small African countries have to work with 25 or more different donors.²³⁸ This fragmentation makes financial management and the coordination of programmes more complex. It is therefore paramount to enhance good collaborative behaviours between all donors, including the EU. According to the International Water and Sanitation Centre (IRC), building sustainable water and sanitation sector financing strategies that incorporate financial data on all 3Ts, enhancing government leadership of sector planning processes, setting up a single information and mutual accountability platform built around a multi-stakeholder, government-led cycle of planning, monitoring and learning are all measures that could increase aid effectiveness.²³⁹

Public funds alone will not be sufficient to fill the financing gap. In order to leverage additional financing, the EU resorts to blending, a mechanism that links grants provided by ODA with loans or equity from public and private financiers. Even though blending has been used primarily for public investments, it is also a catalyst for private financing. Since 2007, this tool has been used for 168 projects and €1.2 billion worth of EU grants generated investments of €32 billion. Water currently represents 20% of the blending instrument behind energy (35%) and transport (26%).²⁴⁰ Reporting and accountability mechanisms must, however, be implemented to ensure that investments meet development objectives effectively.

²³⁴ UN (2014), "International Decade for Action "Water For Life" 2005-2015: Financing Water" (available at <http://www.un.org/waterforlifedecade/financing.shtml>; last accessed on: 23 November 2015)

²³⁵ WaterAid (2015), "Essential element: why international aid for water, sanitation and hygiene is still a critical source of finance for many countries. - A WaterAid report with analysis provided by Development Initiatives", July 2015, p.7

²³⁶ European Commission (2014), Communication on "the European Citizens' Initiative "Water and sanitation are a human right! Water is a public good, not a commodity!""", COM (2014) 0177 final; Dalamangas, S., Presentation for the EPC Blue Gold Task Force Workshop, "Water: A factor of instability or an opportunity for cooperation?", Directorate General for Development and Cooperation, European Commission, 9 December 2015, Brussels

²³⁷ More information at European Commission, "ACP - multi-country cooperation – Water" (available at https://ec.europa.eu/europeaid/regions/african-caribbean-and-pacific-acp-region/acp-multi-country-cooperation/acp-eu-water-facility_en; last accessed on: 23 November 2015)

²³⁸ OECD (2011), "Trends in In-country Aid Fragmentation and Donor Proliferation; An Analysis of Changes in Aid Allocation Patterns between 2005 and 2009", Paris, p.7

²³⁹ Uytewaal, E. (2015), "Change behaviors for sustainable water and sanitation services", IRC, 10 September 2015 (available at <http://www.ircwash.org/news/change-behaviors-sustainable-water-and-sanitation-services>; last accessed on: 23 November 2015)

²⁴⁰ Dalamangas, S., Presentation for the EPC Blue Gold Task Force Workshop, "Water: A factor of instability or an opportunity for cooperation?", Directorate General for Development and Cooperation, European Commission, 9 December 2015, Brussels

Micro-credits are an underdeveloped tool when it comes to supplying water and sanitation to the poorest, by providing loans to small enterprises and households. Microfinance activities in the water and sanitation sector can be put into three categories.²⁴¹ Firstly, “Retail” loans, ranging from \$30 to \$250, can be used by households to invest in water connections, the construction of wells, toilets or buying water purifiers.

A revolving sanitation fund in Vietnam set up by the World Bank and the Australian, Finnish and Danish governments for a total of \$3 million provided small loans of an amount of \$145 with partially subsidised rates to low income households. The loans stimulated household investments which, in combination with other sources of funding, enabled them to build or improve sanitation facilities such as composting latrines, sewer connections and, predominantly, septic tanks. It was managed by the Women’s Union of Vietnam and benefited 200,000 people between 2001 and 2008. The main problem with this mechanism was that very poor households could not resort to the loan because of their inability to pay it back.²⁴²

Similarly, *The Water-credit programme* elaborated by the US non-profit organisation Water.org enables households to contract small loans of an average of \$194 by connecting financial institutions to communities. The repaid loans are then redeployed to other individuals with the advantage of freeing up subsidies for the poorest of the poor. Water.org has leveraged \$97 million in commercial and social capital for an initial investment of \$10.9 million in WaterCredit, benefiting 2.1 million people across nine countries (Bangladesh, Cambodia, Ghana, India, Indonesia, Kenya, Peru, Philippines and Uganda). Interestingly, women constitute more than 90% of the clients.²⁴³

Secondly, loans can be made to small and medium enterprises, including water vendors, sanitation service providers or community groups. Finally, loans can be contracted for urban upgrading and shared facilities, including slums.²⁴⁴ Microfinance institutions include NGOs, banks, non-bank financial institutions and cooperative credit unions.

In order to tackle challenges linked to affordability and inequality, solidarity financing mechanisms could provide an interesting option. For example, with lifeline tariffs, people in need can have access to a volume of water corresponding to the essential minimum consumption, free of cost. Cross subsidies is a system enabling water utilities to charge wealthier households a higher amount, in order to compensate for rates applied to poor households below marginal costs. Solidarity funds can also be used to help people who cannot afford their water bill. As described in Chapter 3 Pricing water while ensuring access to water for all, a range of such solidarity financing mechanisms exist within Europe, which could also provide valuable lessons for emerging economies and developing countries.

Several solidarity financing mechanisms also enable European member states and local authorities to finance water and sanitation projects in developing countries and target populations who are often overlooked, such as populations living in rural areas or informal settlements.

²⁴¹ More information at Mehta, M. (2008), “Assessing microfinance for water and sanitation – Exploring opportunities for Sustainable Scaling up”, Study for the Bill and Melinda Gates Foundation, 5 July 2008

²⁴² Van Huyen, M., Thuy, C., Trémolet, S. (2010), “Financing On-Site Sanitation for the Poor: A Six Country Comparative Review and Analysis – Annex F: Vietnam Case Study”, WSP/The World Bank, January 2010, Washington, p.129

²⁴³ Water.org, “Water credit”, July 2015 (available at <http://water.org/solutions/watercredit/>; last accessed on: 23 November 2015)

²⁴⁴ More information at OECD (2010), “Innovative financing mechanisms for the water sector”, Paris

In France, *the Oudin Santini law*, adopted in 2005, enables local authorities and water agencies to allocate up to 1% of their resources to water and sanitation projects in developing countries. This mechanism helped mobilise €150 million between 2006 and 2013.²⁴⁵

In the UK, households receive leaflets with appeals for donations with their water bills. This cooperation between WaterAid and the water industry has raised £123 million since the early 90s to finance water and sanitation projects in developing countries.²⁴⁶

5.5 INNOVATIVE PARTNERSHIPS: AN ATTRACTIVE SOLUTION FOR WATER AND SANITATION MANAGEMENT AT LOCAL LEVEL

Resolving financing challenges is only one part of the equation. Empowering local communities and authorities, including through capacity building, and providing tailored solutions is also of paramount importance. In this regard, decentralised cooperation has proven its valuable contribution in achieving development-related objectives.

As defined by the United Nations Development Programme (UNDP), decentralised cooperation “is a situation in which local and sub-national governments, civil society, NGOs, the private sector and academia work with counterparts in other countries to achieve sustainable development objectives”.²⁴⁷ Cooperation projects, with a goal of promoting water as a human right, are triggered by a demand made by the local and regional authorities, therefore enabling them to safeguard the ownership of the process. They are centred on training, institutional support and exchange of experiences. These mechanisms must be explored further, especially when countries do not necessarily have sufficient human resources to allocate for planning, monitoring, operational and maintenance tasks and do not have clear strategies in this regard. The UN-Water Global Analysis and Assessment of Sanitation and Drinking-Water GLAAS 2014 Report indicates that, despite important constraints linked to a lack of staff, especially in rural areas, only one third of the 94 surveyed countries carry out human resources strategies in the water sector.²⁴⁸

Some national instruments in EU member states encourage these types of innovative partnerships. The French Oudin Santini Law enables French local governments and river basin agencies to work closely with their counterparts in developing countries. Similar legal dispositions exist in other member states, such as the Dutch “*Motie Koppejan*” Law, the Swiss *Solidarit’eau* and the Spanish *Cánon del agua*.

²⁴⁵ Noblot, C., Presentation for the EPC–European Commission Workshop, “Innovative partnerships and financing mechanisms: A means to deliver better access to drinking water and sanitation in developing countries”, pS-Eau, 10 March 2015, Brussels (available at http://www.epc.eu/prog_forum_details.php?cat_id=12&pub_id=5613&prog_id=2&forum_id=33; last accessed on: 25 November 2015)

²⁴⁶ More information at WaterAid (2014), “Annual Report and Financial Statements 2013-14”, London

²⁴⁷ UNDP (2013), “Global Water Solidarity: Practice Guidelines on Decentralized Cooperation Water and Sanitation”, Geneva

²⁴⁸ UN Water/WHO (2014), “Investing in water and sanitation: Increasing access, reducing inequalities”, UN-Water Global Analysis and Assessment of Sanitation and Drinking-Water GLAAS 2014 Report, p.42, Geneva

The non-profit organisation pS-eau, created by the French Government, sets up and coordinates a network comprising international and French public and local authorities, such as French water agencies and international cooperation and professional organisations.²⁴⁹ One of its aims, through its backup support activity, is to enhance and improve local cooperation in the design, preparation, implementation and monitoring of water projects. The organisation estimates that almost 230 French local authorities participated in solidarity activities in 2013, implemented in areas such as sub-Saharan Africa and the Mediterranean region.²⁵⁰

At global level, decentralised cooperation is promoted by the Global Water Solidarity platform (GWS), which has been set up by the UNDP as a complement to its ART initiative (“Articulation of Territorial Networks for Sustainable Human Development”) and in cooperation with several actors such as local, regional and national authorities, international organisations, civil society, NGOs and the private sector.²⁵¹ The platform matches the needs expressed by authorities in developing countries with existing solutions offered by water and sanitation partners. It is also a knowledge hub, which facilitates technical cooperation, the exchange of know-how and transfer of competencies in areas such as wastewater management and water quality monitoring. GWS also creates a leverage and multiplier effect for financing and introduces solidarity financing mechanisms by enabling a favourable environment for financial cooperation and presenting attractive projects to donors.

As an example, through ART and GWS, the UNDP has created a water and sanitation laboratory in the Moroccan l’Oriental region, which is vulnerable to water shortages, with the financial and technical support of the region of Tuscany. Given that these water shortages are detrimental to the agricultural, industrial and tourism sectors, the overall goal of the project is to strengthen the capacities of local institutions for water resource management and protection and provision in rural areas.²⁵²

Another example of decentralised cooperation is the Global Water Operators Partnerships Alliance (GWOPA) under UN Habitat, which provides a network for Water Operators Partnerships (WOPs) - peer-to-peer partnerships between water and sanitation operators who work together in order to increase their capacity to provide these services.²⁵³

²⁴⁹ More information at <http://www.pseau.org/>

²⁵⁰ pS-Eau, “Working together for access to water and sanitation: French local authorities are working to improve living conditions for people most in need through “1% water”” (available at <http://bibliotheque.i-blio.com/fr/cooperation-decentralisee-livret-forum-eau-en-e560#page/1>; last accessed on: 23 November 2015)

²⁵¹ More information at UNDP, Global Water Solidarity (available at http://www.europe.undp.org/content/geneva/en/home/partnerships_initiatives/global-water-solidarity.html; last accessed on: 23 November 2015)

²⁵² UNDP (2013), “Global Water Solidarity: Practice Guidelines on Decentralized Cooperation Water and Sanitation”, Geneva, pp. 55-56

²⁵³ More information at GWOPA (available at <http://www.gwopa.org/en/>; last accessed on: 23 November 2015)

For instance, the Dutch organisation Vitens Evides International (VEI), a collaboration between the two Dutch companies Vitens and Evides Water Company, has implemented successful WOPs across several countries including Kenya, Ethiopia, Uganda, Mozambique and Rwanda.²⁵⁴ The NGO Aqua for All in Holland provides a further example of how people can show their solidarity; they work with employees of water companies who wish to donate their expertise and time to water and sanitation projects.²⁵⁵ Partnerships also include South-South cooperation models, as shown by the collaboration between the Manila Water Company, Inc. (Mentor) and PDAM Kota Surabaya (Recipient) in Indonesia.²⁵⁶ These South-South partnerships may have the advantage of building trust more easily between partners which have shared similar circumstances.

At EU level, the European Water Initiative (EUWI), launched in 2002, is coordinated by the Directorate-General for International Cooperation and Development (DG DEVCO), in association with several other Directorate Generals (Environment, Joint Research Centre, Research and Innovation, Neighbourhood and Enlargement Negotiations). It brings various stakeholders together to strengthen political commitment, improve water governance and management and promote river basin cooperation and sustainable financing in Africa; Eastern Europe, Caucasus and Central Asia; Latin America; and the Mediterranean.²⁵⁷

5.6 PUBLIC-PRIVATE PARTNERSHIPS: BUILDING ON THE STRENGTHS OF THE PRIVATE SECTOR

Even though national governments have the primary responsibility for delivering access to safe water and adequate sanitation, public authorities recognise that the private sector has an important role to play in achieving sustainable development goals. The European Commissioner in charge of International Cooperation and Development, Neven Mimica, has indicated that business could help development progress in areas such as resource efficiency. In this regard, Public Private Partnerships (PPPs) are models that can contribute to delivering sustainable water and sanitation services to the poorest by building on some of the strengths of the private sector. According to the World Bank, from 1992 to 2012 there were a total of 51 PPPs in the water and sewerage sector in Africa, for a total investment of just over \$3 billion, mostly directed at North African countries.²⁵⁸

Through PPPs, the private sector can complement the public sector capacity in the creation, operation and maintenance of infrastructure. PPPs can benefit from the private sector's ability to deliver efficiency gains such as the reduction of leakages in water systems and the expansion of water supply coverage. These models can also improve the delivery of water and sanitation services through the introduction of private sector technology and innovation.

However, setting up PPPs can be challenging. Strong political support and public acceptance are crucial for their success. Yet the support from local populations can be difficult to gather if these populations have the impression that they are losing ownership of their natural resources. Moreover, in order to incentivise private sector involvement, water tariffs must be high enough to provide a

²⁵⁴ More information at Vitens Evides International (2015), "Water Operators Partnership" (available at <http://www.vitensevidesinternational.com/project/water-operators-partnership-wop/>; last accessed on: 23 September 2015)

²⁵⁵ pS-Eau, SEE-SWE, 1%, "In the Netherlands: a legal framework allowing the water utilities to dedicate up to 1% to international solidarity" (available at <http://www.water-1percent.org/en/netherlands-legal-framework-allowing-water-utilities-dedicate-1-international-solidarity>; last accessed on: 23 November 2015)

²⁵⁶ Water Links (2015), PDAM Kota Surabaya (available at <http://www.waterlinks.org/partners/partners/25>; last accessed on: 23 November 2015)

²⁵⁷ More information at Global Water Partnership (2013), "EU Water Initiative" (available at <http://www.gwp.org/fr/About-GWP/Publications/EU-Water-Initiative/>; last accessed on: 25 November 2015)

²⁵⁸ World Bank (2014), "Water PPPs in Africa", Washington, July 2014, p.7

return on investments. This means that, in order to help the poor, governments may need to reduce tariff levels through subsidies and solidarity instruments.

Nonetheless, the advantages offered by PPPs should not be discarded. Clear evidence-based guidelines are useful to incentivise public authorities and the private sector to engage in these models with the common objective of achieving sustainable development goals. In this respect, the United Nations Economic Commission for Europe (UNECE) has set up the UNECE International PPP Centre of Excellence, which identifies best practices, assists governments that wish to implement them and encourages the sharing of experiences between countries.²⁵⁹

The example of the city of Manila shows the benefits and challenges of private sector involvement. In 1995, the Philippine government decided to privatise the Metropolitan Waterworks and Sewerage System (MWSS) of the city, which was heavily indebted to two concessionaries. The system was inefficient, as three-quarters of households situated in the eastern half of the city did not have an uninterrupted 24-hour water service and only 8% had sewer connections. Improvements since then have been very significant. In 2014, services provided water 24/7 to 99% of its population, with 97.8% enjoying a 24-hour uninterrupted water supply. Furthermore, water losses decreased from 45% to 12% in the Eastern Zone and from 66% to 39% for the Western Zone of the area. However, as a result, tariffs increased: in 2012, tariffs were 50 and 100% higher than before privatisation. Part of the explanation is that the services were underpriced before and increasing productivity gains would have been impossible without this increase. This underlines the difficulty of striking a balance between full cost recovery for companies and ensuring that the poorest can afford these services, serving as a reminder of the importance of additional social measures.²⁶⁰

5.7 FROM EDUCATION TO NEW SOLUTIONS

Bringing about behavioural changes is paramount to reach WASH objectives. In this respect, raising awareness and encouraging behavioural changes represent a powerful cost-effective solution to reducing health risks. It is estimated that hand washing alone would reduce almost by half the risk of diarrhoea and therefore save hundreds of lives on a daily basis.²⁶¹ Strong political leadership can play an important role in breaking taboos with regards to sanitation and hygiene, as has been seen with the “zero open defecation” campaigns in rural parts of Bangladesh.²⁶²

In addition, acknowledging the role of the agricultural sector as a major user and polluter of water resources should translate into more efforts to educate farmers about their water footprint and necessary measures, particularly in the face of climate change. This includes increasing awareness of smarter use of rainwater, preservation of drinkable groundwater and new crops. Drip irrigation systems, which can help to save up to 90% of water, are a good example of an existing solution, which, however, requires that farmers are trained to use and maintain the material.²⁶³

²⁵⁹ More information at UNECE, “About the UNECE International PPP Centre of Excellence (ICoE)” (available at <http://www.unece.org/index.php?id=32395>; last accessed on: 23 November 2015)

²⁶⁰ Verougstraete, M., Enders, I. (April 2014), “Public Private Partnerships case study: Efficiency Gains: the Case of Water Services in Manila”, UN ESCAP

²⁶¹ WaterAid, “Handwashing saves lives”, October 2015 (available at <http://www.wateraid.org/au/news/news/handwashing-saves-lives>; last accessed on: 23 November 2015)

²⁶² Sachs, J., Schmidt-Traub, G. (2014), “Financing Sustainable Development: Implementing the SDGs through Effective Investment Strategies and Partnerships”, Sustainable Development Solutions Network, 30 November 2014, New York, p.69

²⁶³ Smith, M., Muñoz, G., Sanz Alvarez, J. (2014), FAO, “Irrigation Techniques for Small-scale Farmers”, Rome (available at <http://www.fao.org/3/a-i3765e.pdf>; last accessed on: 23 November 2015)

Even though they are insufficient in themselves, various technical solutions can contribute to reducing risks linked to water scarcity, quality and sanitation. As described in Chapter 4 'Innovation', numerous solutions exist that can help developing countries. For example, rainwater harvesting has the advantage of being relatively cheap with low maintenance costs. Furthermore, the solutions to improve water treatment are increasing in number, including also a range of low-cost solutions.

However, more work is still needed. For example, in 2010, the conclusions of an international conference organised by the Food and Agriculture Organization of the United Nations (FAO) found that biotechnologies have not adequately benefited smallholder farmers and that more research and development should be done in accordance with their needs.²⁶⁴

5.8 SCALING UP EU EFFORTS TO ACHIEVE UNIVERSAL ACCESS TO SAFE WATER AND SANITATION

Even though water issues have been a priority of the EU's development policy for more than a decade, recent European policy developments linked to the Right2Water Citizens' Initiative have prompted EU institutions to reaffirm their commitment to the universal access to safe water and adequate sanitation and to identify additional action points to achieve this aim.

The "Right2Water" Citizens' Initiative was built on three demands, one of which is for the EU to increase its efforts to achieve universal access to water and sanitation. In its response to the initiative, the European Commission recognised the need for further discussion on the potential role of the EU in tackling the challenge in developing countries.²⁶⁵ Several action points were identified, including stimulating innovative approaches for development assistance, such as partnerships between water operators and public-public partnerships, promoting sharing of best practices between member states on solidarity instruments and identifying new opportunities for cooperation.

In order to discuss the EU's role and these mechanisms, the European Policy Centre organised a workshop on 10 March 2013 with relevant public and private stakeholders, on "Innovative partnerships and financing mechanisms: A means to deliver better access to drinking water and sanitation in developing countries", in cooperation with the Commission.²⁶⁶ Some of the recommendations issued at this event are listed in the "Recommendations" section below.

The European Parliament issued a resolution on 8 September 2015, criticising the Commission for a weak response to the initiative and its lack of ambition.²⁶⁷ The resolution, which contains a section on "EU external policy and development policy in the water sector", also urged the EU to promote public-public and public-private partnerships and commended the water operators that allocate a percentage of their annual turnover to partnerships in developing countries.

The momentum created by these policy developments, along with the 2030 Agenda for Sustainable Development, should be maintained in order to ensure that achieving universal access to water and sanitation in developing countries is at the top of the EU's development agenda. Achieving this

²⁶⁴ The FAO international technical conference on "Agricultural biotechnologies in developing countries: Options and opportunities in crops, forestry, livestock, fisheries and agro-industry to face the challenges of food insecurity and climate change" (ABDC-10), 1-4 March 2010, Guadalajara

²⁶⁵ European Commission (2014), Communication on "the European Citizens' Initiative "Water and sanitation are a human right! Water is a public good, not a commodity!""", COM (2014) 177 final

²⁶⁶ More information at http://www.epc.eu/prog_forum_details.php?cat_id=12&pub_id=5613&prog_id=2&forum_id=33

²⁶⁷ European Parliament, Resolution of 8 September 2015, on the follow-up to the European Citizens' Initiative Right2Water (2014/2239(INI))

objective will require the mobilisation of a wide range of actors, including member states, local authorities, public and private water operators and civil society.

5.9 RECOMMENDATIONS

Strengthening water considerations in the EU's development policy

1. Putting the implementation of Goal 6 of the post-2030 Agenda for Sustainable Development at the forefront of the EU's development policy.

- The implementation of Goal 6 of the 2030 Agenda for Sustainable Development to “ensure availability and sustainable development of water and sanitation for all” should be one of the main priorities of the Commission's and member states' development policy. WASH is of paramount importance in itself, but it is also an essential element to achieve other sustainable development objectives, such as food security, healthy lives, gender equality and poverty alleviation. The allocation of EU funds and Official Development Assistance towards the WASH sector should reflect this prioritisation.
- The ‘ACP-EU Water Facility’ programme, which aimed to achieve the MDG on water and sanitation, must now be succeeded by an ambitious programme for meeting the SDG on water and sanitation. This will necessitate the support of the European Parliament and member states. In order to attract funding and achieve political buy-in, it would be helpful to outline the gains of past projects funded by the Water Facility programmes in the field of partnerships, capacity building, water governance and infrastructure financing.
- As water is a cross-cutting issue, there is a pressing need to consider funding for water in combination with other complementary programmes, particularly those committed to improving the environment and, in the context of climate change adaptation, reducing carbon emissions and improving local conditions.

2. Encouraging developing countries and local populations to take ownership of water and sanitation management.

- Action at local level should be the focus. Target 6.b of the SDGs aims to “support and strengthen the participation of local communities in improving water and sanitation management”. The interest and participation of local actors must be sought when elaborating and carrying out projects. They might fail if the population does not have any sense of ownership.
- Capacity building is an important and necessary complement to the investment in infrastructure. The continued, sustainable success of projects is predicated upon the up-skilling of local partners.
- The EU should encourage developing countries to treat WASH as a priority area and, in accordance with the Addis Ababa Action Agenda, to set national appropriate spending targets for public services in this sector.

3. Stimulating decentralised cooperation and innovative partnerships.

- The Commission should follow through on its commitment made in the 19 March 2014 Communication in response to the European Citizens' Initiative to stimulate innovative

approaches for development assistance, such as partnerships between water operators and public-public partnerships, and encourage the dissemination of best practices across member states. The local authorities throughout Europe should be encouraged to share experiences on decentralised cooperation for water and sanitation, including the ‘1% mechanism’.

- In Public-Private partnerships, the involved partners would benefit from the creation of clear and evidence-based guidelines, which would reinforce trust and outline tools for the successful implementation of projects. The EU could play a role in elaborating such guidelines.

4. Tackling the dual challenge of raising revenue for water and sanitation services while enabling the poorest part of the population to benefit from these services.

- The EU and its members should share their lessons learned by coupling the use of pricing mechanisms with equity considerations. Encouraging the use of a ‘polluter pays’ principle could help to promote a sustainable use of natural resources in farming, forestry and mining. While, for example, tariffs, fees and taxes can be used to cover infrastructure, operational and maintenance costs for water supply, the use of economic instruments should not undermine people’s right to water.
- The EU and its members should share their experiences with emerging economies on solidarity financing solutions, which can be used to assist people who cannot afford to pay their water bills

WATER: A SOURCE OF CONFLICT OR AN OPPORTUNITY FOR COOPERATION?

6.1	Water challenges: an emerging threat-multiplier for international peace and security?	67
	6.1.1 <i>Water security and global stability: a general overview</i>	67
	6.1.2 <i>Water stress as a factor of regional and local fragility: a selection of case studies</i>	70
	6.1.3 <i>Water security and the EU: an overview of key policy developments</i>	73
6.2	Water diplomacy: a comprehensive response to transboundary water challenges?	75
	6.2.1 <i>Water diplomacy: a sketched conceptual introduction</i>	75
	6.2.2 <i>Water diplomacy 'at work': some political, institutional and legal elements, challenges and lessons learnt</i>	77
	6.2.3 <i>Water diplomacy and the EU: an overview of key policy developments</i>	80
6.3	Recommendations	82

6.1 WATER CHALLENGES: AN EMERGING THREAT-MULTIPLIER FOR INTERNATIONAL PEACE AND SECURITY?

6.1.1 Water security and global stability: a general overview

Water is set to play an increasingly relevant role as an emerging and multi-dimensional security and foreign policy challenge in the next few decades. In turn, this is likely to generate wide-ranging effects on the international policy agenda of key global and regional players, including the European Union and its member states, in the foreseeable future.

According to a comprehensive analysis by the United States (US) National Intelligence Council in 2012, three main categories of water problems are likely to affect global and regional security in the next decade and beyond.²⁶⁸ Firstly, fresh water shortages are expected to increase between now and 2040, due to a dangerous mismatch between increasing demand (mostly driven by population increases, domestic and cross-border migratory pressures and shifting consumption patterns) and diminishing supply (mainly caused by the impacts of climate change on water reserves, e.g., via reduced meltwater from glaciers and seasonal snow packs). Such shortages will result in higher levels

²⁶⁸ US National Intelligence Council (2012), "Intelligence Community Assessment on Global Water Security", US National Intelligence Council, 2 February 2015, Washington DC (available at: http://www.dni.gov/files/documents/Special%20Report_ICA%20Global%20Water%20Security.pdf; last accessed on: 11 November 2015).

of ‘water stress’ at a regional, national and local level in many areas of the world, from the Western US all the way to China. Secondly, poor water management is expected to add further strain on human communities in many areas of the world, due to inefficient consumption and risky land use patterns, including deforestation and soil grading, poor water infrastructure (notably in cities), evaporation from artificial reservoirs, inadequate ‘water budget’ knowledge and economic modelling, or insufficient awareness of water rights by local constituencies. Such mismanaging behaviours will thus bear serious consequences both on a domestic (given the multitude of political, economic and social issues involved) and international (notably when water-sharing arrangements between one or more states are concerned) level, potentially resulting in increased instability in several ‘hotspots’ around the world. Thirdly, another set of security-relevant water challenges are discernible, including poor water quality (given an expected decrease in drinking water due to salt-water intrusion and industrial, agricultural, energy and sanitation uses of water, among others), as well as a foreseeable increase in risks of droughts and floods and other forms of extreme weather events, in several areas of the world.²⁶⁹

The distinctive impacts of the above-mentioned water challenges on global and regional stability are manifold and potentially severe. While, admittedly, water challenges seem unlikely to *directly* provoke state failure or inter-state conflicts, these can still serve as an *aggravating* factor when added to domestic poverty, social animosities, environmental degradation and overall state weakness, or else when combined with pre-existing (high- or low-degree) political conflicts between two or more states. In the former case, when governments fail to address water shortage problems, notably due to lack of financial resources or technical capacities, the resulting socio-economic tensions have the potential to erupt into political instability and even fully-fledged state collapse, with far-reaching security, humanitarian and migratory implications. This particularly applies to the least developed countries and/or weak or failing states in areas such as Sub-Saharan Africa, the Middle East and North Africa. However, the pervasive effects of water stress on state and societal resilience can also be observable, although to lesser and varying degrees, in several emerging or developing countries in Asia, Africa and the Americas. Although existing research has clearly shown the historic unlikelihood of ‘water wars’ between states²⁷⁰, predictably, growing pressures on water reserves in many areas of the world can increase existing tensions *within* countries, strain political relations *between* states sharing transboundary water basins such as rivers and lakes, or harm regional cooperation across the whole policy board. This particularly applies to historically troublesome and ‘power asymmetric’ relations between upstream and downstream countries. The cases of the Indus, Jordan, Mekong, Nile, Tigris-Euphrates, Amu-Darya and Brahmaputra river basins, with their local specificities and different ‘escalating potentials’, all provide examples of the risks and

²⁶⁹ National Intelligence Council (2012), *ibidem*, pp. 1-3. For further analysis, see also: European Strategy and Policy Analysis System (2015), “Global Trends to 2030: Can the EU Meet the Challenges Ahead?”, European Union, pp. 37-41 (available at: <http://europa.eu/espas/pdf/espas-report-2015.pdf>; last accessed on: 11 November 2015), and World Economic Forum (2015), “Global Risks 2015”, Insight Report, 10th Edition, World Economic Forum, Geneva (available at: http://www3.weforum.org/docs/WEF_Global_Risks_2015_Report15.pdf; last accessed on: 25 November 2015).

²⁷⁰ See, for example: Wolf, A.T. *et alia* (2006), “Water Can Be a Pathway to Peace, Not War”, Navigating Peace No. 1/July 2006, Woodrow Wilson International Center for Scholars, July 2006, Washington DC (available at: <https://www.wilsoncenter.org/sites/default/files/NavigatingPeaceIssue1.pdf>; last accessed on: 11 November 2015).

opportunities of cooperation entailed in transboundary water relations.²⁷¹ Some of these will be illustrated more extensively in the following sub-section.

Overall, water problems can become wide-ranging ‘threat-multipliers’ in already fragile and highly volatile political and societal environments. Thus, the security risks associated with present and future water challenges around the world must be properly assessed, and fully understood, in the wider context of the global ‘resource nexus’, strongly linking water with other resources such as land, energy, food and minerals, as well as in the light of the overarching, and even more complex, impacts of climate change on international peace and security.

On the one hand, water and its related challenges cannot be analysed and tackled in isolation from the ever-closer interconnectedness of water with other natural resources (as either input or output for various human usages), nor from the wider ‘scramble’ between states and communities for increasingly scarce (hence, precious) resources. This, in turn, generates a cascading effect on the whole ‘life cycle’ of intra-resource management at all levels, as well as considerable geopolitical, geo-economic and ‘geo-ecological’ impacts on global markets, national interests and foreign policy strategies of state actors, and human security at large.²⁷² On the other hand, water-related security challenges are aggravated, and in several cases caused, by the destabilising impacts of climate change. The repercussions can increase state fragility and can affect inter-state relations due to local resource competition, livelihood insecurity and migration, extreme weather events and disasters, volatile food prices and provisions, transboundary water management, sea-level rise and coastal degradation.²⁷³

This requires that any analytical assessment and conceptualisation of water-related security challenges must be sector-specific, given the ecological and technical complexities of the water cycle, but must also be holistic and connected to the wider picture of climate change-fuelled state weakness and societal fragility, and international competition for (scarce) resources. From a more operational viewpoint, the tackling of water-related security and foreign policy challenges needs to draw on a wide variety of policy areas in the realm of external relations, including ‘uphill’ strategic planning, early warning and risk assessment, ‘classical’ diplomatic tools such as inter-governmental consultation, negotiation and treaty-making, crisis-response, peacebuilding and conflict prevention and mediation, development aid, humanitarian assistance and disaster management, as well as climate financing and climate change diplomacy, among others.²⁷⁴ The comprehensiveness of any possible policy response at national, regional or global level is even more necessary in order to prevent, or at least mitigate, the potential or existing risks of ‘securitisation’ of water problems, which can further fuel political disputes and even military conflicts across the world.

²⁷¹ National Intelligence Council (2012), *ibidem*, pp. 3-4. For an interesting attempt to measure the intensity and operational strength of transboundary water cooperation, see also: Strategic Foresight Group (2015), “Water Cooperation Quotient”, Mumbai (available at: http://strategicforesight.com/publication_pdf/28799WCQ-web.pdf; last accessed on: 11 November 2015).

²⁷² Andrews-Speed, P. *et alia* (2012), “The Global Resource Nexus: The Struggles for Land, Energy, Food, Water and Minerals”, Transatlantic Academy, May 2012, Washington DC (available at: http://www.transatlanticacademy.org/sites/default/files/publications/TA%202012%20report_web_version.pdf; last accessed on: 11 November 2015).

²⁷³ Rüttinger, L. *et alia* (2015), “A New Climate for Peace: Taking Action on Climate and Fragility Risks”, Independent Report Commissioned by the G7 Members, Adelphi, International Alert, Woodrow Wilson International Center for Scholars, and European Union Institute for Security Studies, Berlin (available at: <https://www.newclimateforpeace.org>; last accessed on: 11 November 2015).

²⁷⁴ See also: Rüttinger, L. *et alia* (2015), *ibidem*, pp. 77-107.

6.1.2 Water stress as a factor of regional and local fragility: a selection of case studies

The manifold and cross-cutting ways in which water stress can impact human and state security at various levels can be best exemplified by a number of indicative case studies around the world.²⁷⁵

The *Nile river basin* provides a ‘classic’ case of how transboundary water management can interact with long-standing political rivalries and underlying power games between two riparian countries, as well as with fast-paced demographic and economic transformations in the wider region.²⁷⁶ Despite the historic confrontation over water sharing between downstream (and highly ‘Nile-dependent’) Egypt and other upstream countries, in 1999 the establishment of the Nile Basin Initiative (NBI) promised to inaugurate a more constructive era of transboundary water cooperation in the region. Yet, continuing disagreement by Egypt and Sudan over the signing and subsequent implementation of the Cooperative Framework Agreement (CFA), and especially downstream Ethiopia’s decision to build the ‘Grand Renaissance Dam’ in 2011, led to a fierce and rapidly escalating political crisis between Egypt and Ethiopia. While some encouraging *rapprochement* has taken place in recent times between the two countries, also involving Sudan, the Nile river basin remains a potential ‘hotspot’ for regional instability and still requires continuing political attention, funding and technical support, and even political mediation efforts by the international community, including the EU.²⁷⁷

The *Niger river basin* shows how water scarcity can heavily impact regional stability and human security at large.²⁷⁸ Indeed, the endemic link between droughts, shortage of drinking water, food insecurity, health problems and widespread extreme poverty is the basis for far-reaching political and economic crises witnessed by several riparian states in the Sahel/Western Africa. Climate change and a regional demographic boom are further aggravating the situation. In addition, the lack of socio-economic prospects has led many locals in countries in the region, such as Mali and Nigeria, to join extremist religious groups, triggering a vicious and self-reinforcing cycle between resource scarcity, underdevelopment and human insecurity. In order to tackle at least some of the root causes of the region’s appalling poverty, some upstream riparian countries such as Mali, Niger and Guinea have built dams for sustaining local livelihoods and economic activities, but such moves are perceived by downstream countries, notably Nigeria, as an attempt to further weaken their political and socio-economic stance. The potential risks of a security and humanitarian crisis in the basin thus weigh heavily on the prospects of regional development and long-term stabilisation. This offers clear incentives for local and external players to promptly design a fair, sustainable and resilient water management arrangement for the entire river basin.²⁷⁹

²⁷⁵ A comprehensive and exhaustive collection of case studies is available in: Pohl, B. *et alia* (2014), “The Rise of Hydro-Diplomacy: Strengthening Foreign Policy for Transboundary Waters”, Report, Adelphi, Berlin (available at: https://www.adelphi.de/sites/default/files/mediathek/bilder/en/publications/application/pdf/the_rise_of_hydro-diplomacy.pdf; last accessed on: 11 November 2015).

²⁷⁶ For an overall analysis of the manifold challenges affecting the Nile river basin, see for example: Strategic Foresight Group (2015), “Blue Peace for the Nile”, Mumbai (available at: http://www.strategicforesight.com/publication_pdf/11374Nile%20concise.pdf; last accessed on: 11 November 2015).

²⁷⁷ See, for example: Lienhard V, J. H., and Strzepek, K.M. (2015), “How to Share Water Along the Nile”, The New York Times, 28 September 2015 (available at: http://www.nytimes.com/2015/09/29/opinion/how-to-share-water-along-the-nile.html?_r=0; last accessed on: 11 November 2015).

²⁷⁸ See, for example: Goulden, M., and Few, R. (2011), “Climate Change, Water and Conflict in the Niger River Basin”, International Alert and University of East Anglia, December 2011 (available at: http://www.international-alert.org/sites/default/files/ClimateChange_WaterConflictNigerRiver_EN_2011.pdf; last accessed on: 11 November 2015).

²⁷⁹ See also: Michel, D., and Passarelli, M. (2014), “The Climate Wars Are Already Here”, Foreign Policy (available at: <http://foreignpolicy.com/2014/12/17/niger-river-basin-climate-wars-are-already-here/>; last accessed on: 11 November 2015).

In the case of *Central Asia*, and particularly the *Syr Darya and Amu Darya river basins*, the end of Soviet-era resource-sharing arrangements, demographic increase, outdated agricultural methods, state ineffectiveness due to endemic corruption, poor infrastructure development and the effects of climate change are being coupled with rising nationalism, border disputes and regional competition among riparian countries. All this risks injecting a dangerously deteriorating political dynamic, jeopardising the already low degree of transboundary water cooperation in the region. Among the most difficult regional water *dossiers* stands the current row between upstream Tajikistan, which is planning the construction of the Rogun hydroelectric dam, and downstream Uzbekistan, which has adopted tariffs and restricted travel between the two countries, as a way to discourage a project that is feared by Tashkent to have a deep impact on its own water share for agricultural use. While the possibility of a fully-fledged regional conflict over water seems, for the time being, rather unlikely, the current *status quo* does not bode well for the long-term stability and prosperity of the area. A combination of high-level political *détente*, technical cooperation on issues such as data-sharing and joint risk assessment, modernisation of water infrastructure and longer-term reconversion of economic patterns (particularly by shifting away from water-intensive agricultural production in some of the countries) is much-needed to avert the dangers of persisting regional tensions and mistrust. An active and more concerted role by external and neighbouring players, including the EU, the US, Russia and even China, as well as solid buy-in from the Central Asian countries themselves, would be crucial in this respect.²⁸⁰

Water disputes in Southern Asia, particularly over the Ganges-Brahmaputra-Meghna and the Indus-Kabul river basins, also offer an illustrative context where underperforming water management and governance mechanisms, both domestic and transboundary, have failed to meet the combined pressures of regional demography and climate change, amid rising nationalism and a lurking tendency by several regional players to ‘securitise’ water disputes. This results in even more strained bilateral relations, notably but certainly not solely between India and Pakistan (despite the existence of the ‘crisis-resilient’ 1960 Indus Waters Treaty) and between Pakistan and Afghanistan. The overall regional outlook therefore commands continuing political goodwill and self-restraint by all the parties involved in order to avoid any potential escalation, but also requires concrete actions in areas such as improvement of domestic water management, enhancement of data-collection and sharing, and the revision of existing water treaties, among others.²⁸¹

The *Mekong river basin* provides another noteworthy instance of a fairly institutionalised, cooperation-based transboundary water context being increasingly affected by the wider effects of climate change, as well as by the unilateral decisions of some upstream countries on hydropower development, and by the lack of planning coordination and practical cooperation among several riparian states. Despite the existence of a river basin organisation such as the Mekong River Commission (MRC) bringing together most of the riparian countries (although with the exception of Myanmar and, especially, China), recent decisions by Laos and China to build a number of dams (in the case of China, also outside its own borders) have heightened regional tensions, due to the potential alterations in the quantity and quality of water used for agriculture and fishing by several downstream countries. Revitalisation of the multilateral track of transboundary water cooperation

²⁸⁰ See, for instance: International Crisis Group (2014), “Water Pressures in Central Asia”, Europe and Central Asia Report n. 233, Brussels, 11 September 2015 (available at: <http://www.crisisgroup.org/~media/Files/europe/central-asia/233-water-pressures-in-central-asia.pdf>, last accessed on: 11 November 2015).

²⁸¹ See, in particular: Price, G. (2014), “Attitudes to Water in South Asia”, Chatham House, London (available at: <https://www.chathamhouse.org/publication/attitudes-water-south-asia>; last accessed on: 11 November 2015).

embodied by the MRC and increased technical cooperation among the countries in the region are thus essential to prevent further political confrontation. Continuing support and stronger coordination by the various external donors involved in the area are also needed.²⁸²

The *Southern Mediterranean region* at large can be regarded as an example of how climate change in general, and water scarcity in particular, may problematically interact with weakened state institutions and governance capacities, potentially leading to heightened human insecurity and widespread regional instability. Indeed, the wider political and economic repercussions of the Arab Spring have curtailed the institutional capacities and financial resources of several countries in the region (e.g., Egypt and Tunisia), or simply extinguished them (e.g., Libya), delayed infrastructural investment plans aimed at tackling the wide-ranging regional effects of climate change, including water scarcity, or merely diverted political attention and funding opportunities to the advantage of more urgent domestic policy objectives. The resulting inability by several countries in the region to pursue a prompt climate-adaptation strategy has the potential to further complicate the local transition towards a sustainable political and socio-economic path. Once again, state fragility and water challenges influence each other and might carry high risks for regional stability.²⁸³ The gravity of such a picture seems to be also confirmed by some recent data projections: according to the World Resource Institute, 14 of the 33 countries most likely to be water-stressed in 2040 are in the Middle East proper²⁸⁴, while all the North African countries, with the only exception of Egypt, are included in the same ranking.²⁸⁵ A multi-dimensional, cross-sector and internationally coordinated adaptation strategy by local and external actors, including the EU and its member states, should therefore be put in place in order to limit the risky security spill-overs of water scarcity and climate change in the Middle East and North Africa (MENA) region.

In this wider context, *Syria* provides a dramatic example of how water scarcity can play a considerable role in a highly devastating political and societal conflict, with severe security, humanitarian and migratory consequences, both for the region and beyond. Indeed, while Syria's civil war was driven by a wide variety of heterogeneous factors, between 2006 and 2011 the worst long-term droughts in the country's history are thought to have displaced 1.5 million people from the periphery to urban areas, strongly contributing to the deterioration of social and economic conditions in the country.²⁸⁶

²⁸² For a detailed analysis of the various challenges in the Mekong region, see for example: Schmeier, S. (2011), "Resilience to Climate Change-Induced Challenges in the Mekong River Basin - The Role of the MRC", Working Paper, 2011/05/01, World Bank, Washington DC (available at: <http://documents.worldbank.org/curated/en/2011/05/14187896/resilience-climate-change-induced-challenges-mekong-river-basin-role-mrc>; last accessed on: 12 November 2015).

²⁸³ See, for example: Ruettinger, L. (2013), "Climate Change and Security in the OSCE Region: Scenarios for Action and Cooperation", Adelphi, Berlin (available at: https://www.adelphi.de/sites/default/files/mediathek/bilder/uploads/andere/pdf/application/pdf/climate-change-and-security-in-the-osce-region_osce_eea_adelphi.pdf; last accessed on: 11 November 2015).

²⁸⁴ For an overall analysis of water scarcity-related challenges in the Middle East region, see in particular: Strategic Foresight Group (2013), "Water Cooperation for a Secure World – Focus on the Middle East, 2013", Report, Mumbai (available at: <http://www.strategicforesight.com/publications.php#VkcRxUtrVXk>; last accessed on: 14 November 2015).

²⁸⁵ Maddock, A., Young, R. S., and Reig, P. (2015), "Ranking the World's Most Water-Stressed Countries in 2040", Blog, World Resource Institute (available at: <http://www.wri.org/blog/2015/08/ranking-world's-most-water-stressed-countries-2040>; last accessed on: 13 November 2015).

²⁸⁶ See, for example: Van der Heijden, K., Otto, B., and Maddocks, A. (2015), "Beyond Conflict, Water Stress Contributed to Europe's Migration Crisis", Blog, World Resource Institute (available at: <http://www.wri.org/blog/2015/11/beyond-conflict-water-stress-contributed-europe's-migration-crisis>; last accessed on: 11 November 2015), and Plumer, B. (2013), "Drought Helped Cause Syria's War. Will Climate Change Bring More Like It?", The Washington Post, 10 September 2013 (available at: <http://www.washingtonpost.com/archive/local/2013/09/10/>).

6.1.3 Water security and the EU: an overview of key policy developments

The rising security salience of water-related problems is very likely to influence the EU's international positioning, as well as the planning and very conduct of its overall external policies, in the next decade or so.

From a general, strategic viewpoint, the EU has progressively developed its own understanding of water-related challenges as part of the potential, negative impacts of climate change on international peace and security. While the 2003 European Security Strategy (ESS) had already 'predicted' that "competition for natural resources - notably water - [...] is likely to create further turbulence and migratory movements in various regions"²⁸⁷, the subsequent 'Report on the Implementation of the ESS' in 2008 underlined that "increasing tensions over water and raw materials [...] require multilateral solutions", clearly also mentioning water as a key challenge for regional stability and cooperation with the EU in areas such as the Southern Mediterranean and Central Asia.²⁸⁸ Earlier in 2008, the (then) High Representative for the Common Foreign and Security Policy and Secretary General of the Council of the European Union, together with the European Commission, had also released a key paper on "Climate Change and International Security", which clearly identified water shortages as a crucial threat for international stability, notably in regions such as Africa and the Middle East, as well as Southern and Central Asia. They also tabled a number of policy recommendations in the areas of EU-level capacities, multilateral engagement and cooperation and political dialogue with third countries.²⁸⁹

Importantly, following an earlier Gymnich meeting on this topic in September 2012²⁹⁰, in July 2013 the Foreign Affairs Council (FAC) issued its first-ever 'Conclusions on EU Water Diplomacy' and authoritatively recognised, in the very first paragraph of the Conclusions, that "during the next decade, tensions and conflicts over access to water are likely to become more frequent and could endanger stability and security in many parts of the world. This could also have a direct bearing on European interests, as on international peace and security".²⁹¹

Such a high-level political realisation of the wide-ranging implications of water-related challenges for European security interests was further reflected in two important documents in the realm of EU foreign and security policy. Firstly, the Report ahead of the European Council by the High Representative of the Union for Foreign Affairs and Security Policy/Vice-President of the European Commission (HR/VP) in May 2015 stated that "ensuring access to energy, water or raw materials are all critical functions for European stability and security" and added that "build[ing] climate change resilient European defence can also play an important role in addressing environmental and natural

<https://www.washingtonpost.com/news/wonk/wp/2013/09/10/drought-helped-caused-syrias-war-will-climate-change-bring-more-like-it/>; last accessed on: 11 November 2015).

²⁸⁷ Council of the European Union (2003), "A Secure Europe in a Better World: European Security Strategy", European Union, 12 September 2003, Brussels, p. 3 (available at: <http://www.consilium.europa.eu/uedocs/cmsupload/78367.pdf>; last accessed on: 13 November 2015).

²⁸⁸ Council of the European Union (2008), "Report on the Implementation of the European Security Strategy: Providing Security in a Changing World", S407/08, 11 December 2008, pp. 8 and 10-11 (available at: http://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressdata/EN/reports/104630.pdf; last accessed on: 13 November 2015).

²⁸⁹ European Union (2008), "Climate Change and International Security: Paper from the High Representative and the European Commission to the European Council", S113/08, Brussels, 14 March 2008 (available at: http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/reports/99387.pdf; last accessed on: 14 November 2015).

²⁹⁰ European External Action Service (2015), "Gymnich: Ministers Discuss Syrian Crisis, Water and Education", 7 September 2015, Brussels (available at: http://eeas.europa.eu/top_stories/2012/070912_gymnich_cyprus_en.htm; last accessed on: 13 November 2015).

²⁹¹ Council of the European Union, "Council Conclusions on EU Water Diplomacy", 22 July 2013, Brussels, p. 1 (available at: http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/EN/foraff/138253.pdf; last accessed on: 11 November 2015).

resources threats”.²⁹² Secondly, and more importantly, in her ‘Strategic Review’ in July 2015, in preparation for an ‘EU Global Strategy on Foreign and Security Policy’ by June 2016, the HR/VP noted that “climate change and resource scarcity, coupled with demographic growth, contribute to international conflicts and are expected to do so even more in the future”, highlighting that “water management has become more contentious” and explicitly emphasising the Nile river basins and Central Asia as cases in point.²⁹³

There seems to be a growing understanding inside the EU of the importance of water security for regional and global stability, which in a way also mirrors similar processes of strategic thinking outside Europe, e.g., at the United Nations²⁹⁴ or in the US.²⁹⁵ However, the more concrete issue of the progressive ‘operationalisation’ of the climate change-water-security nexus in EU policies still remains in many respects harder to achieve, due to the complexity of the issues at stake and the variability (or even unpredictability) of local conditions, actors and circumstances.

Nonetheless, in late 2013, the HR/VP and the European Commission issued a Joint Communication on “The EU’s Comprehensive Approach to External Conflict and Crises”²⁹⁶, which aims at maximising the effectiveness of the EU’s broader crisis response capacities by combining all its instruments and resources, spanning the diplomatic, security, defence, financial, trade, development cooperation and humanitarian aid fields. The Communication covers all stages of the cycle of conflict or other external crises, through early warning and preparedness, conflict prevention, crisis response and management to early recovery, stabilisation and peacebuilding. While the implementation of such an ambitious, yet much-needed policy approach admittedly requires a great deal of coordination across policy areas and among all the actors involved, both within (EU institutions and bodies, and member states) and outside the EU, the comprehensive approach has the potential to provide an indispensable policy framework to successfully address the impact of water challenges on the stability and security of many areas of the world, as fully recognised in the Communication. A systematic consideration in the future of climate change and resource scarcity, including water, and concrete application of the EU’s comprehensive approach in targeted regions, particularly but not solely in Africa, is therefore essential.

More generally, stronger awareness of, and longer-term adaptation to, the widely conceived security impacts of the water challenge, both close to and far from Europe’s borders, as well as its progressive embedment in the EU’s strategic planning and various crisis response mechanisms (including in the

²⁹² High Representative of the Union for Foreign Affairs and Security Policy/ Vice-President of the Commission/ Head of the European Defence Agency (EDA), “Report ahead of the European Council by the High Representative and Vice-President and Head of the European Defence Agency”, 8 May 2015, Brussels (available at: http://www.eeas.europa.eu/csdp/documents/pdf/report-ahead_european-defence-agency.pdf; last accessed on: 13 November 2015).

²⁹³ High Representative of the Union for Foreign Affairs and Security Policy/ Vice-President of the Commission, “Strategic Review - The European Union in a Changing Global Environment”, 25 June 2015, Brussels, p. 7 (available at: <https://europa.eu/globalstrategy/en/strategic-review-european-union-changing-global-environment>; last accessed on: 13 November 2015).

²⁹⁴ United Nations (2011), “Security Council, in Statement, Says ‘Contextual Information’ on Possible Security Implications of Climate Change Important When Climate Impacts Drive Conflict”, Security Council Meetings Coverage SC/10332, New York (available at: <http://www.un.org/press/en/2011/sc10332.doc.htm>; last accessed on: 13 November 2015).

²⁹⁵ For an overview, see for example: US Department of State, “Water Issues” (available at: <http://www.state.gov/e/oes/water/>; last accessed on: 13 November 2015), as well as key US policy documents such as: US Department of Defense (2014), “Quadrennial Defense Review 2014”, Department of Defense (available at: http://archive.defense.gov/pubs/2014_Quadrennial_Defense_Review.pdf; last accessed on: 18 November 2015).

²⁹⁶ European Commission and HR/VP (2013), “Joint Communication to the European Parliament and the Council: The EU’s Comprehensive Approach to External Conflict and Crises”, JOIN(2013) 30 final, 11 December 2014, Brussels (available at: http://www.eeas.europa.eu/statements/docs/2013/131211_03_en.pdf; last accessed on: 14 November 2015).

specific sector of disaster management), seem desirable and should be pursued in the near future.²⁹⁷ This has to build on the political *momentum* offered by the above-mentioned, ongoing preparations for an ‘EU Global Strategy’, given the complementary, and comparatively more visible, involvement of the EU and its member states in distinctively water diplomacy matters, which will be addressed in the next section.

6.2 WATER DIPLOMACY: A COMPREHENSIVE RESPONSE TO TRANSBOUNDARY WATER CHALLENGES?

6.2.1 Water diplomacy: a sketched conceptual introduction

Many of the above-mentioned water challenges acquire a distinctively politico-diplomatic dimension when they transcend state borders, thus impacting shared river and lake basins or groundwater aquifers. According to the United Nations, no fewer than 148 states have their territories falling in international river basins, with 21 countries lying entirely within one or more such watersheds.²⁹⁸

Shared waters thus tend to play a major role in politico-diplomatic relations and foreign policy, well beyond the state and human security aspects highlighted in the earlier sections of this chapter. Rather, issues of competition and cooperation over transboundary water basins can hardly be isolated from the often dense political, socio-economic, cultural and historic human contexts surrounding shared waters and thus need to be tackled, as much as possible, as part of a single ‘foreign policy equation’. This is even more urgent since many of the most crucial international river basins, spanning from the Nile to the Mekong, are situated in regions affected by considerable intra and inter-state tensions, or even with a past record of military conflicts (e.g., the Jordan or the Indus river basins). The diplomatic importance of sustainable and constructive transboundary water relations is likely to grow even further in the future, given the expectedly greater constraints on water supplies described earlier, not least due to climate change.²⁹⁹

Many factors tend to influence the potential of transboundary waters to promote cooperation, or to cause political or even military conflict among communities and states. These include, among others, the impact of shared water arrangements (or lack thereof) on the ultimate water users, geographic location, namely upstream ‘vs.’ downstream positions, issues of power distribution such as asymmetry in political and socio-economic conditions, a tradition of unfriendly relations between, or the adoption of unilateral or bilateral actions by, some of the actors involved, the overall size of the countries affected by transboundary water challenges (e.g., in terms of wealth, demography, resource endowment, etc.), the availability of sound scientific data on shared waters, the existence of water treaties, joint institutions and river basin organisations, and the very way in which negotiations on transboundary water management are conducted.³⁰⁰

²⁹⁷ See, in particular: Stang, G. (2014), “Climate Change and EU Security: When and How They Intersect”, Issue Brief No. 32/2014, European Union Institute for Security Studies (EUISS), November 2014, Paris (available at: http://www.iss.europa.eu/uploads/media/Brief_32_climate_change.pdf; last accessed on: 13 November 2015).

²⁹⁸ See, in particular: UN Water (2013), “Factsheet: Transboundary Waters” (available at: http://www.unwater.org/fileadmin/user_upload/unwater_new/docs/transboundary_waters.pdf; last accessed on: 15 November 2015).

²⁹⁹ Pohl, B. *et alia* (2014), *ibidem*, p. 1.

³⁰⁰ Heijs, M. (2014), Presentation on “The Role of Water Diplomacy in Preventing Water Conflicts”, in Water Diplomacy Consortium (2014), “Water as a Driver for International Cooperation and Trust Building: A Seminar on (International) Water Conflicts”, 4 December 2014, The Hague, pp. 10-12 (available at: <http://thehagueinstituteforglobaljustice.org/cp/uploads/downloads/bijagenda/Verslag%20Seminar-04122014%20-%20final%2026012015.pdf>; last accessed on: 15 November 2015).

All such considerations make ‘water diplomacy’ by riparian and/or external players a ‘non choice’ in many respects. Indeed, when politically empowered and adequately resourced, water diplomacy truly represents a key, multi-dimensional policy approach for attaining crucial foreign policy goals across space and time, including the containment and resolution of conflicts, equitable and sustainable management of shared water resources and the promotion of regional dialogue, and even integration, through solid water cooperation mechanisms.³⁰¹

“Water diplomacy means different things to different people”, as a senior EU official put it. It can be described as “all measures [which] can be undertaken to prevent or peacefully resolve conflicts related to water availability, allocation or use between and within states. [...] It could involve high-level diplomatic delegations [...] through formal discussions [...] or unofficial dialogue [...]. It could also involve individuals and private groups building people-to-people relationships at the grass-roots level”.³⁰² As such, it entails different actors and dimensions, in which the ‘classic’ interstate/inter-governmental level nonetheless retains a very significant, and often dominating, role.

This offers various, ‘classic’ diplomatic instruments for riparian states to tackle water-related disputes and help solve them, including negotiations, good offices, fact-finding, mediation, conciliation, arbitration and adjudication, as well as conclusion of treaties. Moreover, other policy options going beyond the narrow diplomatic dimensions also exist and need to be exploited for their ‘peace-making’ potential, encompassing the basic and deeply political process of trust-building, scientific cooperation, economic collaboration, as well as the (admittedly more ambitious) creation of joint institutions and wider regional integration mechanisms. If and when riparian states are incapable or unwilling to solve their water disputes constructively or peacefully, ‘track I’ diplomatic solutions can be offered by third states or international organisations, in the realms of conflict prevention (e.g., by promoting the advancement of international water law, development and technical assistance and capacity-building, including training) or conflict-resolution (e.g., again through good offices, mediation, fact-finding and conciliation).³⁰³

However, non-state actors are also becoming important players in water diplomacy efforts across the world. Local communities, non-governmental organisations (NGOs), civil society at large (including *academia* and think tanks), scientists and even engineers, among others, can all provide a key contribution to better mutual understanding and increased cooperation on transboundary waters in many regions of the world. This makes water diplomacy an increasingly multi-level and highly complex system, in turn posing the challenges of inter-linking and cross-sector coordination in the wider ‘water diplomatic system’.³⁰⁴

The following section aims at encapsulating some of the key political, institutional and legal aspects and challenges related to water diplomacy.

³⁰¹ Pohl, B. *et alia* (2014), *ibidem*, Executive Summary, p. ii.

³⁰² Van Schaik, H., Huntjens, P., de Man, R. and de Schutter, J. (2013), “The Case for Water Diplomacy”, in Water Diplomacy Consortium (2013), “Water Security and Peace Conference: Proceedings”, 14-15 November 2013, The Hague, pp. 2-3 (available at: <http://www.waterdiplomacyconsortium.org/wp-content/uploads/Water-and-Peace-Conference-LR-Final.pdf>; last accessed on: 15 November 2015).

³⁰³ Heijs, M. (2014), *ibidem*.

³⁰⁴ See in particular: de Man, R., van Schaik, H. and Havekes, H. (2013), “Working Group 3 – Multilevel Water Diplomacy: Creating the Links”, in Water Diplomacy Consortium (2013), *ibidem*, pp. 58-73.

6.2.2 Water diplomacy ‘at work’: some political, institutional and legal elements, challenges and lessons learnt

Given the specificities of water-related challenges, water diplomacy finds itself, in many respects, at a crossroads with different sectors. It can intersect regional political relations, socio-economic factors, development aid processes and environmental, technical and scientific work strands. As such, it needs to address a wide range of significant policy issues and related challenges, notably but not solely of political, institutional and legal nature.³⁰⁵

Clearly, a somewhat ambiguous and highly variable relationship between ‘low-level’ water cooperation and ‘high-level’ regional politics is observable. In many cases, water diplomacy has served as an ‘island of cooperation’ against the background of rising political conflicts, such as in the case of the Jordan, Senegal or Indus river basins. At the same time, political hurdles often constrain the ‘peace potential’ of water cooperation, either preventing it from fully developing, or impeding its potential spill-over effects to other policy areas, as in the case of Central Asia or, again, the Indus river basin. Therefore, political willingness to compromise over such issues remains a crucial precondition for tackling water challenges via international cooperation.³⁰⁶

By the same token, technical solutions as those envisaged by (often external) development aid officials or hydraulic engineers on water-sharing arrangements or water usages (e.g., hydropower generation, flood protection or irrigation) are not always sufficient to appease overarching political concerns, especially those coming from downstream riparians in the case of water infrastructure developments by upstream countries (such as in the case of the Nile), and thus need to be carefully balanced with political sensitivities and risks.³⁰⁷ Often, this also means putting in place subtle and inclusive diplomatic strategies based on a ‘do-not-harm’ philosophy and built on an accurate mapping of actors and interests on the ground, as well as on (relentless) diplomatic interaction with local players.

In order to achieve such a comprehensive understanding of the various issues at stake in a specific water diplomacy *dossier*, a ‘whole of government’, cross-sectoral approach needs to be developed by water diplomacy actors, notably external donors, in order to act on the basis of shared intelligence and, therefore, solid ‘pro-cooperation’ arguments *vis-à-vis* local parties. Again, the case of the Nile river basin tends to demonstrate how often different corners of the house, notably development aid agencies and ministries of foreign affairs, are not necessarily fully aligned on the ultimate goals of their respective actions on the ground.³⁰⁸

More generally, stronger interaction between development officials, technical experts and (fairly generalist) national and international diplomats from riparian states and external players, including via the creation of *ad hoc* platforms to share information, best practice and lessons learnt, is a crucial step in order to forge effective policy responses to transboundary water disputes. On a closely related note, overall policy coordination and coherence also remains a key objective to be achieved *between* water diplomacy actors (notably external players and donors) in several regions across the world, not least in order to avoid the risks of ‘forum shopping’ by (disputing) local actors, as partially

³⁰⁵ This section partially draws on the main findings of the Blue Gold Task Force Workshop on “Water: A Factor of Instability or an Opportunity for Cooperation?”, jointly organised by the EPC and the Brussels Office of the Konrad-Adenauer-Stiftung (KAS) in Brussels on 9 December 2014. The relevant event report is available at: <http://www.kas.de/mned-bruessel/en/publications/40966/> (last accessed on: 15 November 2015). Extensive references to Pohl, B. *et alia* (2014), *ibidem*, were also made, and are fully acknowledged in the text.

³⁰⁶ See in particular: Pohl, B. *et alia* (2014), *ibidem*, p. 1.

³⁰⁷ Pohl, B. *et alia* (2014), *ibidem*, p. 14.

³⁰⁸ Pohl, B. *et alia* (2014), *ibidem*, p. 15.

witnessed in the case of the Mekong river basin, to the partial detriment of the Mekong River Commission itself.³⁰⁹

The lack of strong institutionalisation of water cooperation is apparent in many regions affected by transboundary water issues, as well as at global level. On the one hand, it is worth noting that less than half of the transboundary basins around the world are subject to a legally-binding, resource-sharing agreement or possess a river basin organisation (RBO) in charge of crucial tasks such as practical cooperation, policy coordination, risk management and conflict resolution.³¹⁰ However, when river basin organisations are in place, such as in the cases of the Senegal, Jordan, Mekong and Indus river basins, among others, they have often been able to ensure at least a minimum level of transboundary water cooperation, even in cases of collapse in regional diplomatic dialogue. They have also played a game-changing role in other instances, e.g., in the case of the Danube and Rhine basins. A challenge for several RBOs is, however, presented by the absence of solid conflict-management mechanisms (e.g., for the Tigris-Euphrates), geographic comprehensiveness (e.g., in the Mekong), adaptability to changing circumstances, particularly climate change (e.g., in the case of the Indus), or changing power dynamics within the basin (e.g., in the Nile).³¹¹ The involvement of ‘hydro-hegemony’, with the most notable example of China in the cases of the Mekong and some Himalayan rivers, remains a long-term, inescapable need in virtually all cases of underperforming water cooperation, or simply lack thereof.³¹²

At a global level, the lack of a unitary actor able to comprehensively address the many dimensions entailed in water cooperation and governance is, in many respects, inevitable and perhaps even useful, as it allows greater flexibility for tailored local and regional cooperative solutions. However, it is also accompanied by a rather problematic proliferation of certainly valuable, but often disconnected, initiatives, both at the UN level (despite the current ‘streamlining’ efforts provided by the inter-agency coordination mechanism of ‘UN Water’) and beyond (e.g., by key regional organisations such as the Organisation for Economic Co-operation and Development (OECD) and crucial informal groupings such as the G7). This can complicate, to some extent, the ability of some leading actors of the international community to better tackle the globally-relevant challenges of water cooperation and governance, but also to properly coordinate both their water-related strategic discussions and concrete projects on the ground.³¹³

More generally, long-term engagement and political trust-building remain the key pillars of any successful and durable water diplomacy strategy towards the different regions and interlocutors affected by water challenges and disputes. As such, a step-by-step approach, based on a general, non-preaching attitude, close diplomatic interactions and the progressive identification of ‘change

³⁰⁹ Pohl, B. *et alia* (2014), *ibidem*, p. 23.

³¹⁰ For an in-depth analysis of RBOs, see in particular: Schmeier, S., Gerlak, A. K. and Schulze, S. (2013), “Who Governs Internationally Shared Watercourses? Clearing the Muddy Waters of International River Basin Organizations”, Earth System Governance Working Paper No. 28, Lund and Amsterdam, Earth System Governance Project, July 2013 (available at: http://www.earthsystemgovernance.org/sites/default/files/publications/files/ESG-WorkingPaper-28_Schmeier%20et%20al.pdf; last accessed on: 15 November 2015).

³¹¹ Pohl, B. *et alia* (2014), *ibidem*, p. 6.

³¹² Pohl, B. *et alia* (2014), *ibidem*, pp. 25-29.

³¹³ Pohl, B. *et alia* (2014), *ibidem*, p. 20. It is also worth mentioning that, on a limited scale, several international coordination and dialogue platforms exist, including the Shared Waters Partnership (SWP), a component of the UNDP’s Transboundary Waters Programme implemented by the UNDP Water Governance Facility at the Stockholm International Water Institute (SIWI) and the UNDP Bratislava Regional Centre. More information is available at: <http://www.siwi.org/programmes/sharedwaters/> (last accessed on: 15 November 2015).

actors' (including at the grass-roots level) in the political, economic and societal spheres, as well as the promotion of confidence-building measures among riparian countries, including in the crucial area of data and information-sharing, should represent some of the essential ingredients of successful water diplomacy.

In addition to the distinctively political and institutional dimension of transboundary water cooperation, 'international water law' can support transboundary water management in many respects, notably by providing guiding principles and 'rules of conduct' for riparian states to cooperate on shared waters and even offering, if and when the parties accept it, a means to peacefully resolve water-related disputes. In that regard, the key international legal framework of transboundary water cooperation includes the 1997 UN 'Convention on the Law of the Non-Navigational Uses of International Watercourses', in force since August 2014³¹⁴, and the 1992 United Nations Economic Commission for Europe (UNECE) 'Convention on the Protection and Use of Transboundary Watercourses and International Lakes', in force since October 1996³¹⁵. Both instruments have global reach and serve as framework conventions to inspire bilateral, basin or regional agreements by the signing parties. While the two conventions differ as to the very definition of watercourse, as well as in the degree of institutionalisation in the relations among the parties and in their binding effects on signatories when it comes to harmonising earlier treaties or entering into new agreements, both stress the principles of equitable and reasonable utilisation of transboundary waters and the conservation and restoration of ecosystems.

Challenges exist, however, for the states accessing the conventions both in the pre-ratification/promotion phase, due to lack of legal knowledge or political mistrust towards the very provisions of the instruments, and in the post-ratification/implementation period, due to the application of their provisions to past and/or future treaties (notably in the case of the UNECE Convention, but also due to the absence of institutional support in the case of the UN Convention). This therefore calls for stronger support to new or potential acceding states by external state and non-state players and international organisations, including in the form of diplomatic dialogue and 'reassurance' on the expected benefits of ratification, legal capacity-building, practical guidelines³¹⁶ and information and dissemination campaigns. Moreover, it is worth noting that, although it is strictly dependent on the willingness of the parties, international law can provide a means of arbitration and adjudication that can contribute to the solution of a water-related dispute, including via prominent institutions such as the Permanent Court of Arbitration and the International Court of Justice (ICJ).³¹⁷

Overall, water diplomacy requires a concerted and continued effort by all parties involved, in order to make full use of the benefits of water cooperation and governance at basin, national and global level. A number of actions should, therefore, be prioritised by the various actors involved in water diplomacy (notably, but not solely, non-riparian/external actors). These should include, among others, stronger capacity-building on the nexus between water management and conflict prevention and resolution, support for bilateral, regional and multilateral confidence-building measures in areas

³¹⁴ For more information, the text of the Convention is available at:

http://legal.un.org/ilc/texts/instruments/english/conventions/8_3_1997.pdf (last accessed on: 15 November 2015).

³¹⁵ For more information, see: <http://www.unece.org/env/water/> (last accessed on: 15 November 2015).

³¹⁶ In this regard, it is important to highlight the existence of an 'Online User's Guide to the UN Convention', managed by the Centre for Water Law, Policy and Science of the University of Dundee and available here: <http://www.unwatercoursesconvention.org/contact/> (last accessed on: 15 November 2015).

³¹⁷ For an overview of ICJ's activities in this area, see for example: Summary of the Speech by Sir Kenneth Keith on "Arbitration and Legal Processes Regarding Water-related Disputes" in Water Diplomacy Consortium (2013), *ibidem*, pp. 14-15.

such as information and data-sharing, as well as joint risk assessment and monitoring systems, a stronger focus on preventive action, including on transparency of water data and policies and conflict-mediation, and the strengthening of cooperation-based institutions and legal instruments³¹⁸, as well as multi-stakeholder engagement and greater outreach capacity.

6.2.3 Water diplomacy and the EU: an overview of key policy developments

Europe represents, in many respects, an extraordinary example of successful and incrementally ambitious transboundary water management, embodied by prominent and historically significant case studies, such as the Rhine, Danube and Iberian river basins, as well as other examples in Northern and Eastern Europe, among others. One could even argue that transboundary water cooperation and the wider process of European political and economic integration have reinforced each other in an unprecedented, and largely beneficial, virtual cycle. This also provides Europeans with a number of success stories, lessons learnt and best practice in terms of political processes and governance methods – but also in the form of significant technical and technological solutions – which could all be offered, with due local ‘declinations’, to third countries and regions affected by water challenges and lack of cooperative approaches.

Water diplomacy is not a necessarily a new frontier in the foreign policy of several EU *member states*. Instead, various historical experiences of domestic water management, participation in European river basin organisations and cooperative practices, or the salience of water challenges for regions and countries being traditionally on the ‘foreign policy radar’ of some national capitals, have led several EU member states to make water diplomacy a *niche* capacity of their own diplomatic action. This is the case in, among others, the Netherlands, Germany, Finland, Sweden, Hungary and, to a lesser extent, some Southern European countries, which have all contributed in the past few years to water diplomacy-related projects and *demarches* in a wide variety of bilateral, regional and multilateral (notably UN) contexts.

Partially due to the increasing awareness in European capitals of the benefits and challenges of water cooperation and governance, but also - and perhaps mostly - due to its own ambition to contribute to international peace and development through sector-specific actions, the EU itself has increasingly developed a clear policy interest in water diplomacy, cooperation and governance. Some precedents of the EU’s recent involvement in such matters are recognisable, among others, in the 2011 Joint Reflection Paper by the European External Action Service and the European Commission “Towards a Renewed and Strengthened EU Climate Diplomacy”³¹⁹, which clearly highlighted the need for stronger links between EU’s climate action and commitment to international security and diplomatic strategies, but also as a way to provide a stronger foreign policy component to the EU’s engagement in other water-related policy areas, including sector-specific (internal) environmental protection or (external) development aid.

A true ‘watershed’ in the EU’s profile as an actively engaged diplomatic actor in water matters occurred with the issuance of the already-mentioned ‘Water Diplomacy Conclusions’ by the EU Foreign Affairs Council in July 2013. Building on the realisation that “water diplomacy [has the

³¹⁸ Pohl, B. *et alia* (2014), *ibidem*, Conclusion, pp. 42-43.

³¹⁹ EEAS and European Commission (2011), “Joint Reflection Paper: Towards a Renewed and Strengthened EU Climate Diplomacy”, Brussels, 9 July 2011 (available at: http://www.eeas.europa.eu/environment/docs/2011_joint_paper_euclimate_diplomacy_en.pdf; last accessed on: 15 November 2015). For more information on EU’s climate change diplomacy, see also: EEAS, “Climate Change Diplomacy”, available at: http://eeas.europa.eu/environment/index_en.htm; (last accessed on: 15 November 2015).

potential] to help safeguard security, development, prosperity and the human rights of water and sanitation”, the Council encouraged further EU commitment in this area via different work strands. These include the EU’s work on development and the environment, particularly development aid in the areas of water sanitation and health programmes in the wider context of the UN Millennium Development Goals (MDGs), and a proactive engagement in transboundary water security challenges via collaborative and sustainable water management and regional and international cooperation. In this latter sector, the Council highlighted the long tradition of cooperation and the key expertise gained in transboundary water management in Europe. The Council also encouraged the elaboration of action plans for water cooperation and the incorporation of water diplomacy considerations in EU and member state regional strategies and actions, as well as highlighting the need for more coherence and effectiveness in the EU’s water-related efforts across the external policy board, including via stronger intra-European coordination in international *fora* and third countries, and through better synergies with the private sector and the scientific network. EU foreign ministers also encouraged the promotion of international agreements on water cooperation, with a special regard to the UNECE and UN Conventions, including via systematic support by the EU’s external instruments.³²⁰

Importantly, as part of the wider intra-EU consultation process in preparing the FAC Conclusions, an ‘EU Water Security Mapping’ initiative was prepared, which provided an overview of the current diplomatic and technical engagement of the EU and its member states on transboundary security challenges around the world. The initiative gave a number of recommendations on how to frame a consistent EU water diplomacy, prioritising conflict prevention and water cooperation, and served as a useful knowledge basis for EU foreign ministers to highlight a number of priority ‘water hotspots’ around the world, particularly the Nile and Central Asia, but also the Middle East, the Mekong and the Sahel.³²¹

Among the immediate follow-up measures to help ensure concrete impact for the FAC Conclusions, EU institutions and bodies put in place a number of important initiatives. These included a stronger embedment of water diplomacy, cooperation and governance in the European Commission’s development aid planning and programming and stronger political emphasis by the EEAS services on water challenges in their diplomatic engagement with third countries and regions, particularly Central Asia (building on the relevant EU Strategy) and the Nile (including via active mediation efforts by the EU Special Representative for the Horn of Africa). A diplomatic *demarche* in summer 2014 *vis-à-vis* many third countries was also launched, in order to urge them to adhere to the UN and UNECE Conventions, while stronger networking with a number of important advocacy actors in the area of water cooperation and diplomacy, such as the World Wide Fund for Nature (WWF) and the Green Cross, was built. Further joint work between the EEAS and the European Commission on the various policy dimensions of transboundary water challenges has also been developed.

Overall, the EU can contribute to a better functioning and globally-connected system of water diplomacy, cooperation and governance via its manifold instruments of external engagement, as well as through its own, internal success stories. A number of overarching challenges nonetheless remain in order for the EU to fully grasp the ‘peace’ potential of water diplomacy and cooperation. These would include closer teamwork between and within EU institutions and bodies, diplomatic synergies with EU member states’ involvement on the ground, global networking with like-minded state and

³²⁰ Council of the European Union (2013), *ibidem*, points 3, 4, 6, 8 and 9.

³²¹ Council of the European Union (2013), *ibidem*, points 5 and 7.

non-state players, high-level political commitment in Brussels and national capitals alike, as well as appropriate and sometimes flexible funding capacities.

The following, final section aims to shed further light on some of these challenges and provides a number of recommendations on how the EU and its member states could make full use of present diplomatic and security policies, instruments and capacities to make sure that water challenges increasingly become an unprecedented, and progressively fruitful, opportunity for strengthened stability, international cooperation and shared governance across the world.

6.3 RECOMMENDATIONS

Making full use of EU diplomatic and security tools in addressing the water challenge

1. Factoring water diplomacy and security into EU global positioning

- A fully-fledged recognition of the specific features and the wider strategic implications of the water challenge needs to be included in the forthcoming 'EU Global Strategy for Foreign and Security Policy', to be released by June 2016, in order to guide EU action on this crucial and cross-cutting dossier in the next few years, while effectively preventing the implicit risks linked to the potential 'securitisation' of water issues.
- It is crucial that the EU continues to develop locally-specific diplomatic approaches that address water challenges in the wider (and often complex) context of regional politics. Appropriate emphasis on the role of water resources as a key factor influencing local political and economic dynamics and relations needs to be ensured when framing, developing and implementing EU regional strategies, such as those towards the Sahel, the Horn of Africa, Central Asia, or more generally towards the Middle East, North Africa and South and Eastern Asia.
- The EU needs to stand ready to respond effectively to a number of potential, future 'black swans' in some of the ongoing water crises and disputes across the world, notably but not solely in Europe's 'strategic neighbourhood', such as further humanitarian crises (including in their food security repercussions and migratory impacts) or inter-state diplomatic and even military escalations. A strong early warning and crisis-response mechanism must be developed by the EU and its member states in order to respond to unexpected and urgent developments on the ground and by deploying the EU's multi-dimensional crisis-management toolbox, in cooperation with other international, regional and non-state actors. In addition to the instruments already in place, ways could be explored to further develop the 'EU Water Security Mapping' initiative as the possible basis for a regular, agile and flexible consultation mechanism between EU institutions and member states on the state of play and potential evolution of key water 'hotspots' around the globe, as well as for the further establishment of longer-term 'de-confliction' approaches and cooperation-based diplomatic and technical solutions.

2. Further implementing the EU water diplomacy approach and streamlining it into the EU Common Foreign and Security Policy (CFSP)

- A water perspective needs to be strongly embedded in the longer-term adaptation of the EU's crisis management processes, structures and tools (such as the EU Emergency Response Coordination Centre, or even actions in the framework of the Common Defence and Security Policy, only if and when the role of militaries in crisis response becomes necessary). This is crucial

given the growing humanitarian and security impacts of water scarcity, notably in the wider context of the climate change-development-security nexus, and in order to build on the opportunities offered by the ongoing implementation of the EU's 'comprehensive approach'. Given their growing centrality for the EU's foreign and security policy agenda, the southern neighbourhood and the Sahel can offer an ideal test case for the progressive adjustment of those policies to the water challenge at large.

- At the same time, the EU's role in water-related peace-making and conflict-mediation and transformation efforts should be further strengthened, in full synergy with EU member state and third party diplomacies, building on the success story of the negotiating support offered by the EU Special Representative for the Horn of Africa in the harshest phase of the Egypt-Ethiopia dispute over the Nile basin, including, for example, by exploring ways to expand this role in regions such as the Middle East and Central Asia. The establishment of *ad hoc* water negotiation teams, e.g., by 'pooling and sharing' *niche* water diplomacy expertise among EU member states, or via the further development of existing rosters at international level (e.g., those compiled by the World Bank), or via the newly-established European Institute of Peace (EIP), could also be explored as a further way to support third countries, either within or outside an EU institutional context.
- Given the success story of several European regional basin organisations (RBOs), particularly but not solely in the Danube region, institutional capacity-building represents an area where EU water diplomacy can capitalise and develop further niche competences, to be offered to interlocutors in the many regions affected by lack of joint bodies and cooperative mechanisms for transboundary water management.
- In order to promote an increasingly ambitious process of 'institutionalisation' of water cooperation, the EU should also further direct its cooperation efforts in supporting basin-wide confidence-building measures, such as information-sharing, joint data collection or monitoring mechanisms for water quantity and quality, complementing existing initiatives by EU member states in those areas.
- Options should be explored to assess how the EU can further support the strengthening of domestic water institutions across the whole policy board (from agricultural irrigation to water infrastructure development) in third countries and local communities. This is a significant policy area, since effective water management truly 'starts at home' and ineffective or inefficient domestic management structures and processes in one or more riparian countries can generate considerable impacts on other parties, often straining basin or sub-basin relations, as demonstrated by cases such as the Southern Asian rivers and the Mekong.
- The EU and its member states should further encourage the ratification and implementation (via basin and sub-basin agreements) of the 1997 UN and 1992 UNECE Conventions by third countries, which represent the undeniably founding pillars of a multilateral and rule-based approach to transboundary water management, as well as key steps in the codification and further development of universally applicable principles of customary 'international water law'. Such action can be taken both via relevant, diplomatic *demarches* and through additional funding for supporting initiatives (e.g., information campaigns or training modules for diplomatic and legal experts) for potentially acceding parties, such as those carried out by other international bodies, *academia* and non-governmental actors, with a priority focus on the least developed countries.

- At the same time, in-depth diplomatic discussions and stronger coordination between the EU and its member states should be conducted, in order to provide further political impulse to the strengthening of a comprehensive, effective and coherent UN-coordinated policy approach to the manifold challenges of transboundary water management. This could be achieved by promoting further discussions on the implementation of the Conventions' provisions (particularly the 1997 UN Convention), the long-term development of further substantial and procedural principles of international water law via the UN International Law Commission, as well as possible options for further streamlining and better coordinating the work of international bodies and institutions dealing with water security, cooperation and governance, notably but not solely at the UN level, among others.
- In parallel to a multilateral process involving like-minded international organisations such as the Organisation for Economic Co-operation and Development (OECD) or the Organisation for Security and Co-operation in Europe (OSCE), further 'coalition-making' should also be pursued by the EU and its member states, in order to promote stronger consensus in this policy area with traditional and emerging regional and global players. While further options for common thematic and geographic work-strands should be explored with a traditional foreign policy partner such as the United States, the EU and member states should also explore ways to address water challenges with a number of EU strategic partners playing a role as 'hydro-hegemony' in their respective regions, particularly China and India, but also South Africa and Brazil. The use of brand-new EU financial instruments specifically designed to address global challenges with such emerging players, namely the Partnership Instrument, should be prioritised in order to deliver concrete and joint actions in the areas of water cooperation and governance. Despite the current political stalemate due to the Ukrainian crisis, further collaboration with Russia could be sought, given the success stories of such sectoral cooperation in Northern Europe, with a special emphasis on Central Asia.

3. Promoting an effective, trust-based and multi-level 'European water diplomacy system'

- Given the considerable significance of transboundary water challenges, effective EU policy responses need to be sustained by appropriate 'buy-in' at the highest political level, both within the EU's membership and in the EU's relations with third countries. The 2013 FAC "Conclusions on Water Diplomacy" clearly showed the importance of a strong political mandate to deliver subsequent EU action in such complex policy domain: therefore, in order to make water diplomacy and security a solid component of EU foreign policy and external relations, there is a need to keep water as a recurring theme of the EU politico-diplomatic agenda, in the context of a wider, high-level reflection on the growing salience of the resource nexus in the current and future global environment.
- While an appropriate emphasis on such issues in the current preparation of the 'EU Global Strategy' would already provide a useful 'entry point' for water matters in the EU's top-level policy agenda, the possibility of (fairly) regular discussions on those themes, not only among EU Ministers of Foreign Affairs, but also on the occasion of European Council meetings, due to the increasingly direct role of EU Heads of State or Government in foreign policy matters, would provide EU policy makers with a stronger awareness and, potentially, greater incentives to secure a visible and influential role for the EU and its member states in promoting water governance and cooperation across the world. Likewise, 'talking water' on the occasion of bilateral Summits between the EU and key international interlocutors, particularly but not solely strategic partners, would represent another occasion to boost the EU's contribution to international peace and security in water-related topics.

- Due to the obvious cross-sector features of the issues at stake, and partially also as a reflection of the wider lack (or fragmentation) of agency at international level, the consolidation of an effective and coherent (yet still embryonic) 'European water diplomacy system' needs to ensure political consensus and operational coordination across various levels within the EU. This requires, first of all, a strong diplomatic coordination between the EU and its member states, particularly those (e.g., the Netherlands, Germany, Finland, Sweden and Hungary, among others) which have developed key political intelligence, technical expertise and diplomatic networking in water diplomacy and security, both at Brussels and (especially) at local level. It also means making full use of the various innovations of the 2009 Lisbon Treaty in the areas of foreign and security policy, among which the creation and possible 'policy empowerment' of EU Delegations to third countries and international organisations certainly play a prominent role. Secondly, among EU institutions, fuller synergies need to be ensured between the diplomatic initiatives coordinated by the European External Action Service (EEAS) and the technical work strands of the European Commission via its development aid and humanitarian assistance projects, but also, given the external impacts of the Commission's policies in domains as diverse as climate change adaptation and diplomacy, in areas such as environmental protection, agriculture and food, energy and raw materials, or even in the migratory domain (not least given the presumed, partial 'water roots' of the Syrian crisis).
- As an immediate priority, given the EU's financial leverage as a leading development donor, coordination between the technical and diplomatic dimensions of the EU's involvement in transboundary water cooperation (particularly, but certainly not solely, as regards funding for water infrastructure development in international water basins), should be further ensured, maximising the opportunities of the on-going implementation phase of the 2013 FAC Conclusions.
- Looking beyond the strictly institutional dimension, the EU should also invest further efforts in forging innovative partnerships with non-state, sector-specific European actors involved in water cooperation with third countries. This might entail stronger working synergies with, and further support to, European non-governmental organisations (NGOs), the scientific community and civil society at large, in areas as diverse as development cooperation, conflict prevention and mediation, legal and institutional capacity-building, education and training for local officials and experts, and sector-specific scientific cooperation and research. Moreover, and despite diversity in the *modus operandi* and ultimate goals, stronger synergies should be explored, whenever possible, between the institutional, diplomatic and technical efforts by the EU and its member states, to encourage sustainable transboundary management and the technical and technological solutions offered to third countries by the European private sector, in areas such as flood control, water-efficient irrigation, pollution monitoring and sustainable hydropower generation, among others.

4. Sharing best practice and lessons learnt from Europe's water diplomacy and governance with governments and public opinions in third countries

- While the EU and its member states should rightly refrain from a counter-productive 'preaching attitude' towards third countries, they should nonetheless strive to (humbly) present the key political and policy ingredients allowing many success stories of transboundary water cooperation 'from home', such as the Rhine, the Danube, the Iberian rivers and the past and current cooperation between EU and non-EU member states on international river basins in Northern and Eastern Europe.

- Based on such an underlying policy attitude, the EU and its member states should also invest further funding in supporting a number of informal, experience-sharing exercises such as seminars, study trips and other educational and training activities in Europe for officials and experts from third countries, in full synergy with some of the above-mentioned, non-institutional European partners.
- In parallel, and as a useful complement to its diplomatic and technical commitment to the water *dossier*, the EU should also plan ahead for a sector-targeted, culturally-tailored and politically-sensitive public diplomacy approach towards developing and emerging third countries, in order to inform policy makers and public opinion about the manifold benefits of transboundary water cooperation and governance, with the aim of supporting local authorities in gaining the internal political and citizen consensus needed to engage in relevant, deal-making negotiations at a bilateral, basin and/or multilateral level.

RECOGNISING THE VALUE OF WATER – ACTION PLAN FOR THE EU AND NATIONAL POLICY MAKERS

1. BUILDING AWARENESS OF WATER AS A COMMON ASSET, AND KNOWLEDGE ON THE WATER CHALLENGE AND THE NEEDED MEASURES

- Getting European citizens, farmers and businesses to understand the local and global water challenge, with its economic, social, environmental and security implications, and their role in managing it requires education, public awareness and communication. Seeing the water challenge through the filter of climate, energy and food security would strengthen the message. Citizens need to be explained why a change in attitudes and behaviour is needed, and what the combined water, environmental and climate footprint of individual choices is. More open discussion is needed e.g. on the impact of diets on water resources. Farmers and industry need to be educated on their role and responsibilities in saving water and reducing pollution, as well as on the benefits of action. Overall, dialogue with stakeholders should aim to encourage a more sustainable use of water and make the best use of innovative solutions.
- The disastrous implications of climate change for water resources and the water sector's role in mitigation and adaptation efforts should be highlighted on all levels of society. The global climate framework and financing, political and security dialogues and development strategies must consider these water-related problems, and aim to mitigate and adapt to these challenges.
- Policies and decisions on investments should be based on scientific evidence and gathered data. At the same time, a better understanding of the water challenge and the required actions is needed across the EU in order to design effective policies and guide the development of innovative solutions. This includes improving the assessment of the impact of climate change on water resources, how quality and/or quantity of water affects and is affected by the environment, food production and energy sources. Research on how much water is available and the cost of climate change adaptation is needed. In order to ensure sustainable water management at all times, relevant policy and investment decisions should also incorporate adaptation to climate change with risk prevention and management.
- The EU should use its internal and external policies to encourage training and increase its know-how of water management. For example, while both the public and private sectors in EU member states have know-how and expertise in water innovations, more training and skilled

workers are needed in areas such as the recycling and reusing of water. The EU's development policy should place a particular emphasis on capacity-building of local actors, which would enable them to take ownership of their own water and sanitation management – paramount for the successful implementation of projects. Successful water diplomacy also requires capacity-building on transboundary water management.

2. CROSS-SECTORAL, CROSS-POLICY APPROACH AND MULTI-STAKEHOLDER COOPERATION IS NEEDED

- Sustainable management of water demands a multi-disciplinary approach. The challenges and possibilities of tackling the water challenge must be seen in the broad context of building a resource-efficient, low-carbon, sustainable European economy. As the EU works on a vision and a strategy for a circular economy, water must form an integral part of the package: the EU must encourage the rational use, recycling and reuse of water resources, and recovery of materials from wastewater. Managing the water challenge and considerations on water quantity and quality must be fully integrated in the design and implementation of all relevant EU policies, not just environmental policy. Policies must consider the role of and give responsibility to every major user of water: agriculture, industry, energy producers, public suppliers, transport sector and tourism industry – at all stages of the value chains.
- In order to reduce pollutants in water, much more attention needs to be paid to their source. Clearer EU obligations are needed in sectors like agriculture and pharmaceuticals to significantly reduce pollution, waste treatment costs and negative externalities. The full implementation of a 'polluter pays' principle is needed. Preventing the problem requires that the polluting is controlled during the authorisation, production, consumption and disposal of pollutants.
- New approaches to cooperation are needed in and outside the EU. This includes encouraging innovation across sectors. Multi-stakeholder cooperation and exchange of best practices at all levels, including between cities and local stakeholders is key. This requires finding and exploiting synergies: for example, when public and private objectives are aligned, be it in increasing water efficiency or reusing water, policy makers should encourage public-private partnerships with joint burden-sharing and investments. This collaborative approach should be reflected in the EU's development policy as well: the European Commission should stimulate innovative approaches to development assistance such as partnerships between water operators and public-public partnerships. Likewise, an effective and multi-layered European water diplomacy should aim at involving all the relevant players involved in transboundary water cooperation.

3. IMPROVING REGULATION, GOVERNANCE AND IMPLEMENTATION OF WATER POLICIES

- Implementation of the existing EU legislation, namely the *Water Framework Directive*, is needed. The objective of sustainable water management should be better reflected across legislation, policies and programmes and associated funding, be it on agriculture, fisheries, energy or regions.
- Evaluating and communicating the economic, social and environmental benefits of action is needed to enhance implementation and the cooperation of EU member states and regions, public and private sectors. Voluntary incentives such as water stewardships can help businesses to understand the risks posed by water scarcity and pollution, and give them additional tools to contribute to the sustainable management of the resource.

- The EU should explore whether it needs new policy tools or legislation to improve water quality, increase water efficiency and protect ecosystems, and the environmental services they provide. This includes considering whether the EU's Common Agricultural Policy (CAP) must be reviewed and made more precise in order to improve the quality of water resources.
- Improving governance – the political, legal, social, economic and administrative systems that influence the use and management of water – is essential. In accordance with the OECD's principles on water governance: 1) it is important to define clear sustainable water policy goals and targets at all levels of government, to implement those policy goals, and to meet expected targets; 2) better governance should aim to maximise the benefits of sustainable water management and welfare at the least cost to society and; 3) in the process, the objective should be to build public confidence and ensure democratic legitimacy and fairness for society at large.
- Better monitoring of water resources is needed across the EU member states. This includes closely monitoring freshwater abstraction in order to stop illegal abstraction and to promote water efficiency. It requires transparency of the quality of used water, the levels of pollution and whether the recycled water resources are fit for purpose, be it for industrial, agricultural or human consumption.
- In the development field, it is necessary to learn from the shortcomings of the Millennium Development Goals and strengthen data and indicators as well as good governance and accountability. The EU should encourage improved data collection standards in order to ensure an efficient monitoring of water- and sanitation-related Sustainable Development Goals. The criteria for a definition of drinking water should be more stringent: sources that are very likely polluted should not fit into this category. Good governance indicators and strong reporting mechanisms should be set up to ensure the continuing commitment of countries, as well as to measure progress on meeting the Sustainable Development Goals.

4. USING ECONOMIC INSTRUMENTS TO PROMOTE BETTER ALLOCATION AND MORE EFFICIENT USE OF WATER

- A better understanding of the functioning, impacts and cost-effectiveness of different economic instruments is needed. Member states and water operators should be encouraged to share experiences on implementing cost recovery and the 'polluter pays' principle.
- A clearer definition and understanding of full cost recovery, and of what externalities must be internalised and how, is needed. The EU should provide guidance on how to account for environmental and resource costs.
- Water pricing and the use of economic instruments must be aligned with equity considerations, ensuring that everyone has access to safe water and sanitation. The costs must be shared as fairly as possible. When needed, public authorities together with water operators must explore the possibilities of using social measures and solidarity financing solutions to assist people who cannot pay their water bills.
- Benchmarking performance of water and sanitation services is needed, and should start with comparing and exchanging best practices on benchmarking. In the long term, the EU should

define general principles and identify performance indicators in areas such as pricing, and water and service quality.

5. ENCOURAGING INNOVATION AND UPTAKE OF NEW SOLUTIONS

- EU policies and instruments must be used to promote the development and deployment of new solutions that can contribute to managing the water challenge. This requires using research and innovation policies but also taking a wider multi-disciplinary approach to tackle the multitude of water-related challenges and their implications. The European Innovation Partnership (EIP) on Water remains an important forum for stimulating innovation and encouraging collaboration across EU member states between public and private actors, and must be revitalised.
- Removing market barriers is essential. For example, product approval processes remain complex. Certifying products in multiple countries limits new technologies' access to the single market, preventing large-scale use.
- The EU should build on the potential of reusing water. A step-by-step approach to reusing water should start with exploring the possibilities of industrial and agricultural purposes. As the EU works on a policy framework on the recycling and reuse of water, this must be flexible enough to encourage the use of these technologies while ensuring that safety and environmental considerations are taken into account. The EU would need a binding framework on the reuse of water, with treatment standards and water quality benchmarks for different uses, and harmonised end of waste criteria. Reuse of water should be an integral part of the EU's transition to a more circular economy.
- The EU should promote smarter wastewater management: provide guidelines for energy recovery and help to stimulate the recovery of critical materials from wastewater. Upcoming revision of the *Fertilizers Regulation* should contribute to building a stable regulatory framework for recovery and reuse of materials from wastewater, such as phosphorous.
- A continuing dialogue between the European public and private sector on providing innovative solutions to third countries and regions affected by the water challenge should be encouraged so as to identify win-win solutions tailored to local needs.

6. MAKING EXTERNAL ACTION MORE COHERENT, AMBITIOUS AND COMPREHENSIVE

- Water is essential to human life, dignity and economic activities and as such is a crucial element for the realisation of other sustainable development goals such as food security, health lives and poverty eradication at global level. As a result, the implementation of Goal 6 of the 2030 Agenda for Sustainable Development to “ensure availability and sustainable development of water and sanitation for all” should be at the forefront of the European Commission's and EU member states' development agendas.
- Further strategic development and on-site implementation of EU's 'water diplomacy' as a key component of a renewed EU agenda for 21st-century global politics is needed. This should start with a stronger embedment of the 'resource challenge', including water, in the on-going preparation of the EU Global Strategy for Foreign and Security Policy and in the overall strategic planning of EU foreign policy. Further 'coalition-making' should also be pursued by the EU and

its member states so to promote stronger consensus in this policy area with traditional and emerging regional and global players.

- Further 'streamlining' of water diplomacy into the Common Foreign and Security Policy (CFSP), including in crisis response, conflict prevention and mediation would be required. The EU should aim to achieve an open and trust-based European 'water diplomacy system' made up of EU actors (notably the EEAS and the Commission), EU member states and the wider policy community. Additional EU support to the ratification and implementation of the UN and UNECE Water Conventions by third countries, as well as contribution to the further development and evolution of 'international water law' in the relevant multilateral *fora*, should be ensured.
- The EU should also build on its own achievements in the area of trans-boundary water cooperation and share its 'lessons learnt' and the benefits of joint action and common institutions at basin or sub-basin level with priority regions such as the Nile, Central Asia, the Mekong, Northern Africa and the Middle East, and the Sahel.
- A culturally sensitive and politically palatable public diplomacy strategy should be developed by the EU Delegations in third countries, notably but not solely 'water-thirsty' developing countries and emerging economies, in order to make local leaderships and public opinions increasingly aware of the benefits of a non-confrontational approach to the water challenge.
- The water footprint of imports to the EU, ranging from food to textiles, which have required large amounts of water resources for their production should be acknowledged. The potential and limitations with water footprint methodologies as a way to assess impacts of EU consumption should be explored further. Water footprint assessments could be used to raise awareness amongst consumers but also to guide, for example, development projects.
- A stronger linkage between EU water diplomacy, development aid in all water-relevant areas (from sanitation to the funding of water infrastructure) and the external dimensions of EU's climate and environmental policies, is needed in order to ensure coherent action by the EU and its member states on the global scene.

7. MAKING THE SINGLE LARGEST USER OF WATER, THE AGRICULTURAL SECTOR, SUSTAINABLE

- Farmers must be educated about more efficient use of water, cost savings, and their role in mitigating and adapting to climate change through training and exchange of information and best practices. While available water resources will have a significant impact on the prospects for the agricultural sector and the farmers must prepare for these challenges, they must also become more responsible users of water resources.
- Incentive schemes must change, so that they provide a clear signal for farmers to use water efficiently and to reduce pollution. 1) Direct agricultural subsidies to farmers under the CAP must be stopped and replaced with more outcome-oriented financing via rural development. 2) The agricultural sector should be made to pay the true cost of its use of water. This starts with charging them with the volume of water used. In addition, a stronger enforcement of the 'polluter pays' principle is needed.
- Policies and incentive schemes should encourage innovation in production processes in order to make them more sustainable. This should include making irrigation more efficient by using drip

technologies and reusing water for irrigation. Using crops that require less water would make sense environmentally and economically. Reducing pesticides would improve water quality and could be done without an impact on profitability or productivity.

- Promoting sustainable food production and consumption also requires combining regulation with voluntary approaches, promoting new partnerships between farmers, the scientific community, the civil society and businesses, and encouraging people to reduce their consumption of meat, which requires more water for its production than other agricultural products.

Annex I: List of the EPC Blue Gold Task Force meetings in 2013-2015

- **23 September 2013**
'Water cycle challenges in and beyond the EU – How big a problem?'
- **2 December 2013**
'Thirsty world: linkages and inter-dependencies between water and energy, agriculture and environment'
- **16-19 February 2014**
Blue Gold study trip to Israel
Kindly supported by Keren Kayemeth Lelsrael- Jewish National Fund (KKL-JNF)
- **25 March 2014**
'Water as a human right'
Kindly supported by SUEZ and WaterAid
- **29 October 2014**
'The economics of water matter - From theory to practice'
Kindly supported by SUEZ
- **9 December 2014**
'Water: A factor of instability or an opportunity for cooperation?'
Kindly supported by the European Office of the Konrad-Adenauer-Stiftung
- **10 March 2015**
'Innovative partnerships and financing mechanisms: a means to deliver better access to drinking water and sanitation in developing countries'
Organised in collaboration with the European Commission

Annex II: Speakers at Blue Gold Task Force meetings in 2013-2015

Dagmar Behrendt Kaljarikova, Policy Officer, Unit for Water, DG Environment, European Commission

Marc Bierkens, Professor of Hydrology, Utrecht University, The Netherlands

Jonathan Chenoweth, Senior Lecturer & MSc Programme, Director, Centre for Environmental Strategy

Paolo Ciccarelli, Head of Unit, Water, Energy, Infrastructures, DG Development, European Commission

Delphine Clavreul, Junior Policy Analyst, Organisation for Economic Co-operation and Development

Arnaud Courtecuisse, Head of the International Affairs Department, Artois-Picardie Water Agency and Solidarity Water Europe

Pedro Cunha Serra, Member of the Portuguese Water Resources Association

Stathis Dalamangas, Head of Sector Water, DG for Development and Cooperation - EuropeAid, European Commission

Jacques Delsalle, Policy Officer, DG Environment, European Commission

Didier D'hont, Director Groundwater Management, VMM, Belgium

Neil Dhot, Head of Corporate Affairs, Water UK

Ivan Draganic, Programme Specialist, ART Initiative - Global Water Solidarity, UNDP

Faraj El Awar, Programme Manager, Global Water Operators Partnerships Alliance

Milo Fiasconaro, Executive Director, Aqua Publica Europea

John Garrett, Senior Policy Analyst on Development Finance, WaterAid UK

Jenny Grönwall, Programme Manager, Stockholm International Water Institute

Dirk Halet, Strategic Coordinator, VLAKWA – Flanders Knowledge Center Water

Geoffrey Hamilton, Chief of the PPP Programme, UNECE

Peter Handley, Head of Unit for Resource Efficiency, General Secretariat, European Commission

Tony Harrington, Director of Environment, Welsh Water and Water UK

Maarten Hofstra, Senior Advisor Policy Analysis and Water Governance, UNESCO Institute for Water Education and Water Governance Centre

Michael Jacobsen, Lead Water Supply and Sanitation Specialist, World Bank

Sonja Koepfel, Environmental Affairs Officer, Secretariat of the Convention on the Protection and Use of Transboundary Watercourses and International Lakes

Pirjo-Liisa Koskimaki, Adviser, Directorate-General for Energy, European Commission

Jacques Labre, Leader of the Working Group on Economics, EurEau (European Federation of National Associations of Water Services)

Lukasz Latala, Policy Officer, Unit for Water, DG Environment, European Commission

Xavier Leflaive, Head of the Water Unit, Environment Department, Organisation for Economic Co-operation and Development

Juan Mateos, Water Projects Manager, Suez Environnement

Sergiy Moroz, Policy Director, European Water Partnership

Issa Nafo, Advisor in Strategic Affairs, Emschergenossenschaft

Valerie Ndaruzaniye, President, Global Water Institute

Hannah Neumeier, Head of Human Rights Team, WASH United

Céline Noblot, Communication Manager, Programme Solidarité Eau (pS-Eau)

Anne-Marie Perret, President, European Federation of Public Service Unions

Marjukka Porvari, Director, Clean Sea projects, John Nurminen Foundation

Gareth Porvari, Senior Research Fellow, Asia Programme, Chatham House

Juha Pyykkö, Director of the Unit for International Environment Policy, Ministry of Foreign Affairs of Finland

Jon Rathjen, Team Leader, Water Industry Team, Scottish Government

Sameer Safaya, Project officer, Water Footprint Network, Executive Director, Water Footprint Network

Henry Saint Bris, Senior Vice President Marketing and Institutional Relations, Suez Environnement

Maria Salvetti, Projector Manager at Sorbonne Business School

Pablo Sanchez Centellas, Policy Staff - Officer, Communications, Public Relations, Liaison with the EP and Youth, EPSU

Daniela Scheetz, Policy Officer, Ministry of Foreign Affairs of Germany

Susanne Schmeier, Coordinator, Transboundary Water Management, Deutsche Gesellschaft für internationale Zusammenarbeit

Christophe Scius, European Public Affairs Manager, Suez Environnement

Zaki Shubber, Lecturer in Law and Water Diplomacy UNESCO Institute for Water Education

Therese Sjömander Magnusson, Director of the Transboundary Water Management Team, Stockholm International Water Institute

Patrick ten Brink, Senior Fellow, Head of Brussels office & Environmental Economics Programme, Institute for European Environmental Policy

Dick van Ginhoven, Senior Advisor Water and Sanitation, Ministry of Foreign Affairs, The Netherlands

Kurt Vandenberghe, Director for Environment in DG Research & Innovation, European Commission

Alexander Verbeek, Strategic Policy Advisor for Global Issues at the Climate, Energy, Environment and Water Department, at the Ministry of Foreign Affairs of the Netherlands; Yale World Fellow; Associate at the Stockholm Environment Institute

Ambika Vishwanath, Senior Program Manager, Strategic Foresight Group

Niels Vlaanderen, Senior Policy Adviser, Ministry of Infrastructure and the Environment of the Netherlands

Christina von Westernhagen, Director for EU Government Affairs and Public Policy, The Dow Chemical Company-Europe

Alexandros Yannis, Senior Expert/Energy and Water Diplomacy, European External Action Service

Maria Giovanna Zamburlini, Project Assistant in Environmental Policy, Cefic (European Chemical Industry Council)

Annex III: Participating Organisations in Blue Gold Task Force meetings

APCO Worldwide	Dutch Ministry of Foreign Affairs	EU-Russia Centre
Aqua Publica Europea	Dutch Permanent Representation to the EU	Food & Water Europe
AquaFed – The International Federation of Private Water Operators	EFPIA	Foreign Trade Association
BBO	EGMONT - Royal Institute for International Relations	FTI Consulting
Bell Pottinger	Embassy of Ethiopia in Brussels	Global Water Institute
BEPA	Embassy of Mexico to Belgium and Luxembourg	Government of Scotland
Burson-Marsteller	Emschergenossenschaft	Helsinki EU Office
Cabinet DN	EPSU	Hydro
Caravan Cultura Art Agency	EU Mission of Morocco	IMA - Europe
Caritas Europa	EurEau	Institute for European Environmental Policy
Cefic	European Academy of Yuste Foundation	Institute of Environmental Science and Technologies
Central Denmark EU Office	European Chemical Industry Council	International Water and Sanitation Centre (IRC)
Centre for Environmental Strategy	European Climate Foundation	Jesuit European Social Centre
Chatham House	European Commission	Jewish National Fund
City of Vienna – Liaison Office	European Dairy Association	John Nurminen Foundation
Concawe	European Environment Agency	KKL-JNF
Confederation of British Industry	European External Action Service	Konrad-Adenauer-Stiftung
Council of the EU	European Federation of Public Service Unions	Madariaga Foundation
Danish Agriculture & Food Council	European Water Partnership	Ministry of Foreign Affairs of Germany
Deutsche Gesellschaft für internationale Zusammenarbeit		Ministry of Foreign Affairs of Slovakia
Dow AgroSciences		Ministry of Foreign Affairs of the Kingdom of Belgium
		Ministry of Foreign Affairs of the Netherlands

Ministry of Infrastructure and the Environment of the Netherlands	Permanent Representation of Hungary to the EU	UNESCO-IHE Institute for Water Education
Mission of Bosnia and Herzegovina to the EU	Permanent Representation of Slovakia to the EU	United Nations Development Programme
Mission of Brazil to the EU	Permanent Representation of the Czech Republic to the EU	University of Bologna
Mission of Mexico to the EU	Permanent Representation of Turkey to the EU	Utrecht University, The Netherlands
Mission of Norway to the EU	Procter and Gamble	Verband der Chemischen Industrie e.V.
Mission of Russia to the EU	Representation of the Free State of Bavaria to the EU	Verband Kommunalen Unternehmen
Mission of the Hashemite Kingdom of Jordan to the EU	Representation of the Government of Catalonia to the EU	Vitens Evides International
Mission of the Philippines to the European Union	Representation Office of Carinthia	VLAQWA – Flanders Knowledge Centre Water
Mission of the Republic of Serbia to the EU	Scottish Government	VMM, Belgium
Mission of the Republic of Uzbekistan to the European Communities	Skåne European Office	WASH United
Nestlé SA	Slovak Academy of Sciences	Water Footprint Network
Office of Commercial Affairs, Thai Embassy	Sorbonne Business School	Water Governance Centre
ORGALIME	Steiermark Representative Office to the EU	Water Industry Commission for Scotland
Organisation for Economic Cooperation and Development	Stockholm International Water Institute	Water UK
Permanent Mission of Montenegro to the EU	Suez Environnement/SUEZ	WaterAid
Permanent Representation of Austria to the EU	The Brussels Office	Welsh Government
Permanent Representation of Finland to the EU	The Dow Chemical Company	Welsh Water
Permanent Representation of Greece to the EU	The International Association of Oil & Gas Producers	WHO
	TURKU-Southwest Finland European Office	World Bank
	UNECE Water Convention	WWF European Policy Office
		Ynnovate
		Zealand Denmark EU Office

MISSION STATEMENT

The European Policy Centre (EPC) is an independent, not-for-profit think tank dedicated to fostering European integration through analysis and debate, supporting and challenging European decision-makers at all levels to make informed decisions based on evidence and analysis, and providing a platform for engaging partners, stakeholders and citizens in EU policymaking and in the debate about the future of Europe.



European Policy Centre
14-16 Rue du Trône/Troonstraat
B-1000 Brussels
Belgium

Tel : +32 (0) 2 231 03 40 Fax : +32 (0) 2 231 07 04
Email : info@epc.eu
Twitter : [@epc_eu](https://twitter.com/epc_eu)
www.epc.eu