BALTIC FLOWS

D6.1 Joint Action Plan and related business plans

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"Monitoring and management of flowing rain water in Baltic Sea catchment areas"

safe, liveable cities

for citizens in the Baltic Sea Region and throughout Europe

Joint Action Plan

"This Joint Action Plan has been developed as a living document and as such there is a commitment across the participating regions of the BalticFlows project and partners to review the plan on a regular basis, alongside the Smart Specialisation Strategies, to ensure that the actions are taken forward."

Produced by the BalticFlows Project, financed under European Commission FP7 Regions of Knowledge. Coordinated by the University of Turku, Finland. Project Officer: Pia Laurila, Policy Officer, Directorate-General Research and Innovation.

Safe, liveable cities

for citizens in the Baltic Sea Region and throughout Europe

Joint Action Plan for citizen engagement, liveable safe cities and competitive, inclusive regions in the Baltic Sea Region and throughout the European Union.

Brussels, Belgium, April 21, 2015

“If civilisation is to survive,

it must live on the interest,

not the capital, of nature.”

— Ronald Wright

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Executive summary

Globalisation is placing increasing pressure upon competitiveness in all sectors of European industry. At the same time, we must pay close attention to the well-being of our environment, and the liveability and safety of our cities and regions, as short-term financial gains may bear a heavy long-term cost.

New ideas and innovation are crucial to the future of Europe. We believe that every citizen has an idea that could benefit Europe, and a dream of turning that idea into reality. We need to build a **Citizen Union**.

To achieve this, we need an **Engagement and Inspiration Plan for Europe** to engage citizens, develop their ideas, bringing upon ownership towards their region, their nation and the European society. The Plan will construct the Citizen Union based upon three cornerstones:

- **Innovation Pillar.** Gathering, organising and processing the global pool of citizens' ideas, and finding the means to turn these to reality, thus contributing to European competitiveness;
- **Sustainability Pillar.** Advancing sustainability by bringing life cycle thinking and assessment into everyday decisions of citizens, empowering citizens in monitoring and preserving our environment, and promoting safe urban living via smart rainwater management and harvesting;
- **Engagement Pillar.** Learning the driving motivation for each contributing citizen and creating matching reward schemes, leading to ownership and commitment towards joint actions.

To bring the Citizen Union to reality, support from all European regions is essential. In the Baltic Sea Region, the regions of Hamburg, Riga, Tallinn, Turku and Uppsala will serve as pilot areas for implementation of the Engagement and Inspiration Plan, empowering their citizens in the fields of rainwater monitoring and management.

About this Joint Action Plan

In the European Union's 7th Framework Programme "Regions of Knowledge" theme, one main action area is to develop a Joint Action Plan at regional and European level to increase regional economic competitiveness through research, technological development activities and innovation. A Joint Action Plan also addresses mobilising financial and other support to exploit the synergies between regional, national and European Union programmes for research and economic development.

This Joint Action Plan was created in the "BalticFlows" Regions of Knowledge project. The main topics of BalticFlows are summarised in three top-level categories:

1. The Citizen Union – engaging and inspiring citizens:

- Section 1: Towards a sustainable Citizen Union;
- Section 3: Citizens and the environment;

2. Safe and liveable cities in the Baltic Sea Region and throughout Europe:

- Section 2: Liveable, loveable cities;
- Section 4: Sustainable planning evaluation tools;
- Section 5: Online, all the time;

3. Smart specialisation and synergies between regional development and research & innovation to enhance competitiveness:

- Section 6: Regional smart specialisation and citizens.

The BalticFlows project and the five participating European regions are briefly introduced in Section 7: BalticFlows.

“Saving the world requires saving democracy.

That requires well-informed citizens.”

— Carl Safina

Towards a sustainable Citizen Union

Europe is in the midst of transformation. Globalisation is placing increasing pressure upon competitiveness in all sectors of European industry. At the same time, we must pay close attention to the well-being of our environment, and the liveability and safety of our cities and regions, as short-term financial gains may bear a heavy long-term cost upon that most valuable to us.

Throughout our common history, the strength of Europe has been in our diversity. A plurality of cultures, views, skills and knowledge gives us the ability to adapt to changing circumstances, and time after time rise to face global economic and geopolitical challenges. While equally respecting and treasuring the idiosyncrasies of each region, culture, religion and language in our Union, and each citizen regardless of gender, age, ethnic origin or disabilities, we act as one, falling or prevailing together. This has always been the essence of our Union, and our common path into the coming decades.

Just as our challenges are transforming, Europe must as well. In the past, the issues we faced were fierce but comprehensible: famine, epidemics, wars, financial market crashes. Today we have overcome many of these plights – only to find more intricate, multifaceted problems to be solved.

We are now tested in our ability to transform. We cannot wage war against a deteriorating environment, we cannot force economies to prosper, and there is no single measure to raise European competitiveness beyond global competition. Not only are new solutions urgently needed, but also a new way of comprehending our environment and the fundamental mechanisms driving change.

In the Baltic Sea Region, we are committed to facing the challenge of transformation, to seek and discover our latent regional strengths, and build future prosperity upon these.

European innovation and the Investment Plan

What is innovation? We often see innovation as the art of refining ideas into products, services or processes superior to the state-of-the-art. For more than a decade, Europe has been lagging behind other global strongholds in terms of R&D investment. This is seen as lack of innovation or innovation-friendly conditions. The Annual Growth Survey of 2015 set forth three pillars for boosting economic conditions in Europe, most notably the Investment Plan for Europe with an expected impact of 315 billion euros upon the overall investment environment. This strengthens already existing access to European finances via the Horizon 2020 Workprogramme and Cohesion Policy, and supports the efforts of Europe 2020 Flagship Initiatives including:

- the Innovation Union, for more effectively turning ideas into innovations and tangible strengths;
- Youth on the Move and An Agenda for New Skills and Jobs, for broader inclusion;
- A Resource-Efficient Europe, aiming at long-term sustainability.

In recent years, the focus on social innovation has also gained a momentum and is supported by various initiatives of the European Commission, such as the “Social Innovation Europe” initiative. Other European initiatives are aimed at broader inclusion, such as the European Commission’s “Europe for Citizens” programme. In brief, Europe today provides access to a variety of means for boosting R&D investment and innovation, and we should thus not consider *lack of financial resources* the bottleneck holding back European innovation – we need to look deeper.

In the Baltic Sea Region, by including citizens in both environmental activities and development of regional strategies, we aim at strengthening citizen empowerment and the social innovation in our regions.

An idea and a dream

We believe that every European citizen has an idea; that every European – young or old; a woman or a man; from the north, south, east, west, or in between; of whichever ethnic or religious background – has an idea. An idea, and a dream of turning that idea into reality.

But every European does not wish to become an entrepreneur. A researcher may not be willing to enter into a lengthy patent filing process for creation of commercial value; he or she may simply prefer to publish research results for the benefit of mankind. Few inventors dare to draw out a personal mortgage and strive for commercial success without the security of a support network offered to regularly paid employees.

In Europe we have great ideas, unique inventions, and faith in our capabilities – but today the leap of faith, which one must take to turn his or her idea into reality, is still too long. And the leap does not necessarily even lead towards a direction desirable for the individual.

This complex, challenging competitive environment calls for a new way of thinking, by which we can fully benefit from the ingenuity, skills, experience and ambitions of each European citizen, empowering them to turn their ideas into reality. Effectively enabling the vast potential of all of our citizens will not only contribute to greater competitiveness of our economy, but also foster a sensation of collective success amongst the contributing population.

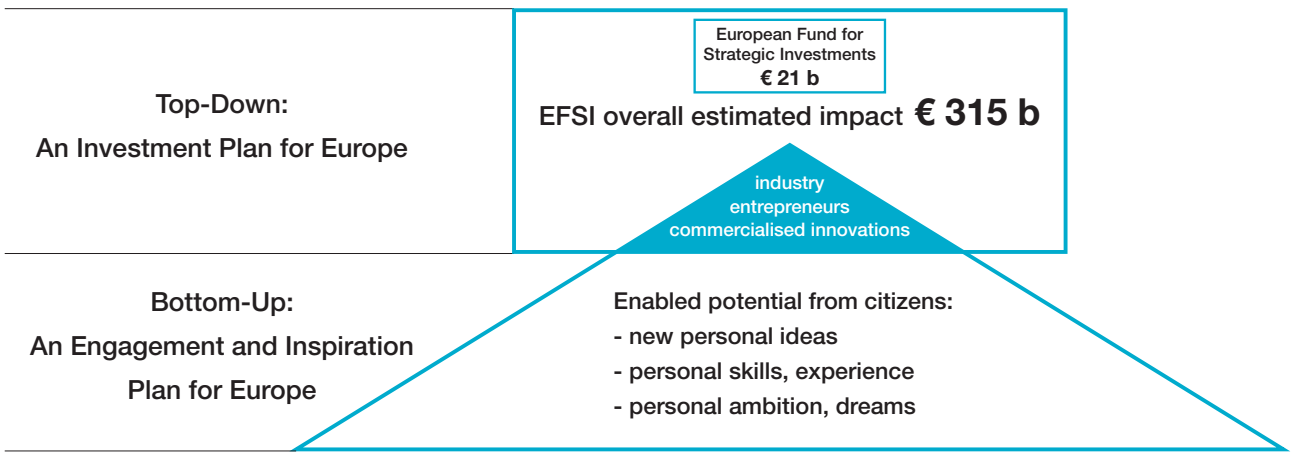


Figure 1. Complementarity of the Engagement and Inspiration Plan for Europe and the Investment Plan for Europe.

The Citizen Union

We need to build a Citizen Union. To achieve this, we need, in addition to the now launched Investment Plan for Europe, also an Engagement and Inspiration Plan for Europe to engage citizens, develop their ideas, bringing upon ownership towards their region, their nation and the European society. We need to encourage and empower all of our citizens to use their best potential for the benefit of our society and industry, and discover the most inspiring rewards for a job well done.

Figure 1 illustrates the complementarity of the Engagement and Inspiration Plan for Europe and the Investment Plan for Europe. The Investment Plan foremostly impacts industry, businesses and commercial-stage innovations, whereas the Engagement and Inspiration Plan aims at broadly accessing the hidden potential and ideas of citizens.

Wide reach and impact at little cost

In BalticFlows, we conducted a survey in the Baltic Sea Region amongst citizens with access to a river or stream. We asked respondents that – if they were to maintain a personal water monitoring device producing real-time water quality data for their community, what they would prefer in exchange. Less than one-fifth of the respondents selected money as a potential form of compensation, with “Cleaner river or stream”, “Information on the quality of water” and “Membership in a society or a club related to environmental issues” indicated as the most preferred types of reward.

Whilst the investment set forth to revive the European economy is in the order of tens of billions of euros, the Citizen Union could be spawned at a far lesser financial cost. The greatest asset of the Citizen Union will be human capital, and the endless momentum fuelled by motivated and inspired citizens and their countless ideas.

The Citizen Union will be for all citizens regardless of their background. Naturally, world-class research forms the core of our technological know-how and competitiveness in terms of technical capabilities and performance. However, solutions for the Grand Societal Challenges are increasingly found in social innovations, based upon life experience and practical skills. Creating an inclusive Citizen Union, which every European citizen belongs to, and which every European citizen can contribute to, will grow into a decisive advantage for our long-term competitiveness.

Linking citizens to smart specialisation

Smart specialisation has become a focal point of conversation when considering the future competitiveness of European regions. The basic logic of smart specialisation is clear-cut: in each region, we need to identify our strongest potential for achieving global-level excellence, and focus our efforts and resources on developing this potential into competitiveness within existing or emerging sectors.

The concept of smart specialisation has made a considerable impact on European policies, and is also being implemented globally. The concept is a key element of the Europe 2020 strategy and its Innovation Union flagship initiative. It is also a major component of the Commission's Cohesion Policy as a prerequisite for research and innovation investments under the European Regional Development Fund in 2014–2020. Smart specialisation development also invites regions to take a strategic view of synergies between European Structural and Investment Funds and Horizon 2020.

In Europe, the smart specialisation strategies of regions are designed and decided upon in a decentralised manner, by individual regions or Member States. The process grants a great deal of autonomy to each region, on one hand empowering regions to decide upon and commit to a locally tailored plan, but on the other hand, may also result in difficulties when selecting regional priorities.

Smart specialisation aims at looking beyond the obvious, discovering sometimes hidden potential and growth opportunities, in terms of expertise, jobs and competitiveness. Existing industry and research marks a starting point for this analysis, but to access a broader vision of regional competences and potential, we need deep understanding of the capabilities and skills of *all of the region's citizens*. At worst, without knowledge on new, untapped growth potential and emerging opportunities, smart specialisation is reduced to an endless debate on the prioritisation of one existing sector above another.

Civil society – the crucial fourth element

BalticFlows is part of the 7th Framework Programme Regions of Knowledge theme, in which quadruple helixes including government, industry, academia and civil society, work together on common challenges.

Involving citizens in the innovation process is not a new idea. For example, the European Open Innovation 2.0 initiative emphasises the significance of user-driven innovation and that "the user has moved from being an object of research in the innovation process, to being a contributor, and on to being a co-creator of the innovative outcome."

Citizens are also active in non-governmental societies for sustainability and environmental preservation. Based upon studies in BalticFlows, voluntary environmental monitoring initiatives powered by citizens are excepted to become increasingly popular over the coming years, as smart phones and watches grow even smarter and equipped with an increasing variety of sensors.

There is a clear trend towards *collective individualism*, with citizens willing to take greater personal responsibility of the destiny of Europe. Today citizens can express

The Citizen Union

Motivation and global drivers:

- Globalisation places increasing pressure upon the competitiveness of European industry.
- We also need to focus on the well-being of our environment, and the liveability and safety of our cities, as short-term financial gains may bear a heavy long-term cost.
- European cultures are diverse and its citizens are educated. We believe that every European has an idea, and a dream of bringing the idea to reality.
- Most citizens are not aiming at entrepreneurship. We need a new mindset in order to benefit from the ideas and independent thinking of Europeans.

Objectives and benefits:

- Embrace European diversity and collective individualism, benefiting from a vast pool of citizens' ideas and inspiration, raising European competitiveness beyond global competition.
- A culture for sustainable decisions by well-informed citizens; safe, liveable smart cities, wide-scale citizen participation in environmental monitoring and preservation.

their views and contribute to society directly, such as in the roles of inventor, online influencer, or environmental observer.

To prosper as a leader in the evolving competitive landscape, as a continent with the world's cleanest and most sustainable cities, Europe needs to encourage and facilitate this trend, and provide a unified support framework for citizen engagement throughout Europe.

In the Baltic Sea Region, we will strive to include citizens in environmental monitoring and preservation, urban and stormwater management planning, as well as in the formulation of regional smart specialisation strategies. For this, BalticFlows serves as a starting point addressing, amongst other issues, the potential for a wide-scale realtime rainwater quality monitoring network established and maintained by citizens.

Joint action required: An Engagement and Inspiration Plan for Europe

The Engagement and Inspiration Plan for Europe will construct the Citizen Union based upon three cornerstones:

- The Innovation Pillar. Gathering, organising and processing the global pool of citizens' ideas, and finding the means to turn these to reality, thus contributing to European competitiveness;
- The Sustainability Pillar. Advancing sustainability by bringing life cycle thinking and assessment into everyday decisions of citizens, empowering citizens in monitoring and preserving our environment, and promoting safe urban living via smart rainwater management and harvesting;
- The Engagement Pillar. Learning the driving motivation for each contributing citizen and creating matching reward schemes, leading to ownership and commitment towards joint actions.

Today we propose joint action, not only in Hamburg, Riga, Tallinn, Turku and Uppsala, but also in every region throughout Europe. An Engagement and Inspiration Plan for Europe without support from each city and region – from the local government, academia and industry but before all from the citizens – remains only a plan. We need to make this happen together.

Endorsement, support and cooperation between European regions, Member States and key European institutions will be essential for successful implementation of the Engagement and Inspiration Plan for Europe, and to turn the sustainable Citizen Union into reality.

In the Baltic Sea Region, we have started work towards implementation of the Engagement and Inspiration Plan for Europe, seeking new means for engaging, inspiring and empowering our citizens. It is our goal to take and spread this momentum to all cities and regions in the European Union, leading to a stronger, competitive, sustainable Citizen Union by the year 2020.

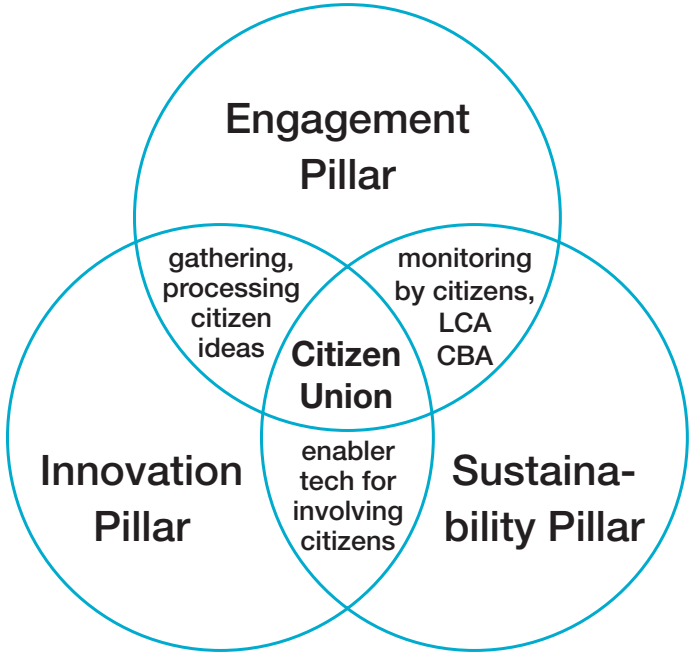


Figure 2. The Citizen Union and pillars of the Engagement and Inspiration Plan for Europe.

An Engagement and Inspiration Plan for Europe 2016–20

Towards a sustainable Citizen Union in 2020 via three pillars:

- **Innovation pillar.** Gathering, organising and processing the global pool of citizens' ideas, and finding the means to turn these to reality, thus contributing to European competitiveness;
- **Sustainability pillar.** Advancing sustainability by bringing life cycle thinking and assessment into everyday decisions of citizens, empowering citizens in monitoring and preserving our environment, and promoting safe urban living via smart rainwater management and harvesting; and
- **Engagement pillar.** Learning the driving motivation for each contributing citizen and creating matching reward schemes, leading to ownership and commitment towards joint actions.

“A proper management of stormwater is vital to Baltic cities, as it prevents damages to infrastructure and property.”

— Prof. Walter Leal, HAW Hamburg

Liveable, loveable cities

Globally, more people live in urban areas than in rural areas, with 54% of the world's population residing in urban areas in 2014. This trend is only going to accelerate: 30% of the world's population was urban in 1950, up to 66% of the world's population is expected to be urban by 2050. Europe is currently the 4th most urbanised region in the world with 73% of its population living in urban areas. Urbanisation is expressed by gradual increase of impervious surfaces – streets, buildings, parking lots are spreading to new areas. The rainwater that used to be taken up by the plants or filtered into the ground now rapidly flows on the sealed surfaces, flushing the chemical pollutants on the way and flooding into the receiving water bodies.

Partly due to global warming, there has been an increase in the frequency of heavy rains especially in summer time. In the northern Baltic Sea Region the duration of snow cover has decreased, and in the winter time precipitation falls more often as rain on frozen ground. These trends have led to an increased amount of stormwater runoff in urban areas, which increases the risk of flooding. Integrated efforts are thus required for sustainable urban stormwater management involving the participation of various stakeholders including policy makers, the private sector, the scientific community and citizens. If urban stormwater events are not adequately managed, they may exert a threat to the ecology, private property, infrastructure and the economy of European cities.

Planning tomorrow's liveable cities today

As the world continues to urbanise, sustainable development challenges will be increasingly concentrated in cities. Integrated policies to improve the lives of both urban and rural dwellers are required. As the concentration of population in cities and other urban areas grows, more citizens will be dependent on the same or inter-dependent water supplies.

Urban areas are not detached from their surroundings. Water consumed by urban citizens originates in broad catchment areas covering often very distant regions. Hence, policies and measures taken in distant rural regions, even in other countries, will have an impact on both the water quality available for a city, as well as upon the risk of urban flooding. For example, flood prevention measures taken in upstream regions often have a direct impact on the flood risk of subsequent downstream cities.

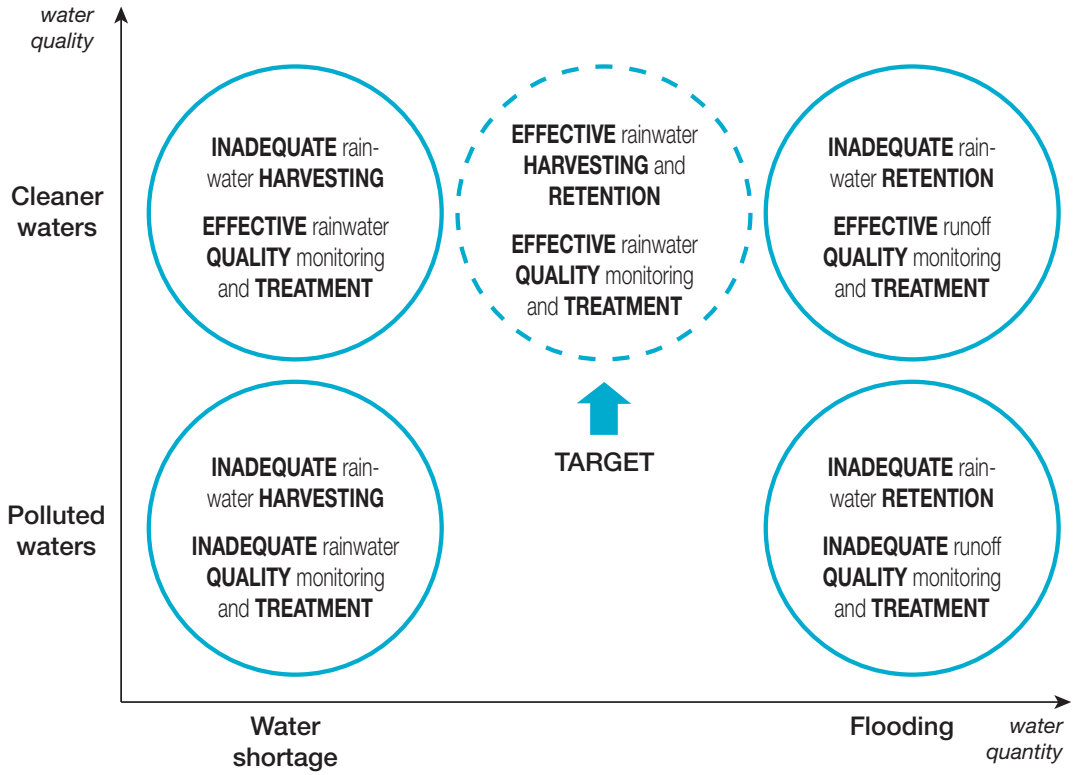
General framework for rainwater challenges

For a citizen of modern and future cities, the adequacy of our rainwater management policies and the effectiveness of their implementation materialises in several areas:

- safety of water supply, for direct consumption or with indirect impact e.g. via food production;
- preservation and management of biodiversity, ecology and safety of waters used by citizens e.g. for recreational purposes;
- avoidance of damages caused by excessive rainwater, i.e. flooding, and
- avoidance of challenges due to water shortage, e.g. due to drought.

These areas are in many ways interrelated. The quality of our raw waters is influenced by many factors, including farmland erosion and urban runoff due to heavy

Figure 3. General framework for rainwater challenges and measures.



In the Citizen Union

Motivation and global drivers:

- Liveability is affected by the pace of urbanisation growth in European cities.
- Rapidly increasing European urban population.
- Public safety is a concern for European cities, increasingly vulnerable to flooding.
- Need to integrate effective water resource management into strategic urban planning.

Potential and objectives in the Citizen Union:

- Identifying innovative best management practices and incentives for end users that create ecological, social, and economic linkages.
- Stronger public involvement in water management and quality monitoring.
- Involving citizens in designing and testing aesthetically attractive habitats and multifunctional spaces, e.g. green recreational areas.
- Citizens personally contributing to the amount of permeable surfaces, e.g. via selection of surface materials in yards.

rainfall. Rural runoff typically comprises fertilisers resulting in diffuse load pollution in seas or lakes; this again results in algae bloom preventing recreational use.

On the other hand, via smart rainwater harvesting we can convert stormwater – often a problem – into an asset used in ponds or channels of cities, for irrigation of urban green areas, or even as “grey” water in households, i.e. water suitable for sanitation but not directly for drinking. This in turn can reduce pressure from the water purification process of cities and thereby alleviate water shortages in areas of water scarcity, as many water-related needs can be managed directly with rainwater.

Figure 3 illustrates potential measures concerning rainwater harvesting, stormwater retention and management, and monitoring rainwater and runoff quality. Rainwater quantity relates to the amount and intensity of rainfall. Certain geographic areas suffer from water shortage while others suffer flooding; at worst, a region may have both at different times of the year. Without interfering with natural hydrological processes, we should plan our cities to cope with scarce or excess rainwater. Rainwater quality refers to the state of our waters, considering both nutrients and chemical pollution.

Stormwater and urban flooding

In many European cities, streets and buildings generally cover more than 50% of the urban surfaces. As the building infrastructure contributes significantly to the increase of impervious surfaces and water runoff, on-site methods that consider the reuse of rainwater, present tangible solutions. A successful stormwater management plan should take into account the characteristics of the urban fabric and implement solutions to minimise water pollution while in the meantime, compensating for the environmental impacts caused by development.

For example, strategies such as green roofs, offer a number of solutions for rainwater management through a decentralised system of water collection at the roof

level. Green roofs present multiple benefits, reducing the volume of rainwater runoff, delaying and reducing peak stormwater flow rates, and reducing pollutants carried to water bodies through urban runoff. The implementation of green roofs makes the case for the efficient utilisation of unused space in dense urban areas where land availability is minimal. They provide ecosystem services and contribute to urban liveability by increasing the amount of green space accessible for health and recreation.

Financial incentives for implementation of on-site stormwater management systems may be applied: e.g. a system for split wastewater fees, where owners pay a reduced stormwater management fee if they can demonstrate that they manage the stormwater generated from their property on-site. Governments and regional authorities should support implementation of decentralised urban stormwater management practices for environmentally beneficial design decisions, such as green roofs or porous asphalt.

Clean, safe water for citizens

Water quality is influenced by natural factors, such as seasonal floods or heavy rains, in addition to other factors, such as land use, urbanisation, industrial actors and farming – all resulting in nutrient load into rivers and streams. Despite of improved technologies of wastewater treatment and the decrease of point loading from other sources, diffuse loading causes still serious problems in water quality. Diffuse load, such as nutrients and solids from agricultural sources, causes eutrophication in many coastal areas, being the major cause for poor quality affecting biodiversity and the recreational use of these water bodies.

In recent years several water protection methods for reducing erosion and agricultural loading to water bodies have been introduced. Protection zones, sedimentation basins, direct sowing, wetlands, and submerged weirs, are used to stop solid substances flowing along with water. Water quality monitoring has a key role in effective implementation and follow-up of these techniques.

In the Engagement and Inspiration Plan

Towards a sustainable Citizen Union in 2020 with safe, liveable cities with active citizen involvement:

- **Innovation pillar.** Gathering and processing new ideas from citizens on how to aesthetically increase the amount of permeable surfaces in urban habitats, potentially leading to new social innovations.
- **Sustainability pillar.** Providing information to citizens on the environmental impact and aesthetic significance of alternatives when making choices during building design, yard planning, stormwater system planning, surface material selection, etc.
- **Engagement pillar.** Identifying the key driving motivation and relevant incentives for each citizen, aiming at active citizen involvement in improving urban environments.

Image courtesy of Latvian Tourism Development Agency

“With the next wave of sensors,
citizen participation will grow automated:
citizens concerned with water quality
can easily install miniature water monitors
into nearby rivers and streams”

— From the vision of BalticFlows

Citizens and the environment

The importance of citizen participation in environmental decision-making is emphasised in several international agreements, such as the 2002 World Summit on Sustainable Development Implementation, the 1998 Aarhus Convention and the 1992 Rio Declaration on Environment and Development.

Public participation and citizen input tend to drive environmental decisions towards better outcomes and greater acceptability in the eyes of the public. In 2010 the European Environmental Bureau outlined transparent and publicly owned water management as a foremost priority, transparency being essential for the public to understand and see the logic behind decisions regarding their living environment.

Involvement of the general public in the planning phase of river management plans is an important objective of the Water Framework Directive. However, there are challenges: for example, in a 2014 European Environment Agency report, methods for realizing the public participation were studied and it was recognised that involvement of the general public often requires a lot of work from the authorities.

In the Citizen Union

Motivation and global drivers:

- Public participation drives environmental decisions towards better outcomes and greater acceptability.
- Important objective of already existing legislation, e.g. Water Framework Directive.
- Greater transparency of the water protection and monitoring programs.
- Need to develop a personal sense of ownership amongst citizens towards their waters.

Potential and objectives in the Citizen Union:

- Engagement of general public, NGOs, and school students and seniors in the collection of water quality observations.
- Collection of water quality data frequently and from much larger areas than when sampled by public authorities alone.
- Engagement of citizens in the planning and execution of water protection measures.
- Empowering citizens by increased knowledge on environmental conditions and providing opportunities to make a difference.

Citizens and environmental monitoring

Citizens could take a more active role spontaneously if they were provided with attractive means of getting involved not only in the planning phase of the water management, but also in the follow-up of the changes in the water quality. The water quality data should be openly available to the public in a visually attractive form and the citizens should be encouraged to submit their own observations to complement the official monitoring information. This would advance the transparency of the water protection and monitoring programs and develop the feeling of water stewardship in concerned citizens.

Traditional environmental information gathering is costly and labour intensive and the monitoring network is limited by the availability of financial resources. Engagement of the general public, non-governmental organisations, school groups and e.g. senior societies in the collection of water quality observations has the potential to gather large amounts of data to support long-term environmental monitoring programs and scientific research projects. Moreover, citizens that are active in water monitoring are more likely to participate also in the planning and execution of water protection measures.

Environmental monitoring offers the wider public the opportunity to be involved in shaping their society, scientific research and data collection in a meaningful way. At best, citizens who participate in monitoring initiatives shall feel empowered by their increased knowledge of environmental conditions and their ability to assist and make a difference.

Public participation in environmental monitoring can be achieved via different models, which may range from allowing an access to official data to collecting data as well as defining the system and logic behind the data collections. The first step in involving citizens in environmental monitoring is to provide information, such as the

official statistics or measurement data to the public. Once data collection and public participation moves beyond this point, a plurality of legitimate perspectives need to be considered. The applicability of the data originating from unverified sources is a key question for both scientists and authorities.

When large numbers of the public are involved in this type of data collection, automated, integrated and structured ways of engaging the public are necessary. In addition, new and attractive means of collecting and reporting the observations are needed in order to attract a large number of citizens to participate in water quality monitoring. For example, The European Life+ Programme has co-funded the development of a “Lake and Sea Wiki” water quality information platform in Finland, into which citizens can submit personal water quality observations.

A broader funding framework that supports citizen initiatives and their integration in environmental decision-making is currently missing. Of Europe 2020 flagship initiatives, the Eco-innovation Action Plan of the Innovation Union supports the development of market-oriented solutions, products and services, such as green technologies, but without a particular focus on citizen involvement. Likewise, the Resource-efficient Europe initiative concerns many aspects of importance to the environment, but does not particularly focus on integrating citizens into environmental monitoring and preservation activities.

To enable wide-scale European water monitoring via citizen participation, we need all stakeholders to combine forces, knowledge and activities under a coordinated environmental framework fueled by participation of empowered citizens. Such participation is accommodated by the Sustainability Pillar of the Engagement and Inspiration Plan for Europe.

In the Engagement and Inspiration Plan

Towards a sustainable Citizen Union in 2020 with citizens actively participating in monitoring and preserving the environment:

- **Innovation pillar.** Gathering and processing new ideas from citizens on potential tools and methods for non-expert measurement of water quality, as well as open services for viewing and exploiting the data, potentially leading to new technological and social innovations.
- **Sustainability pillar.** European support for regional water preservation groups and societies, national and European-level coordination of citizen-driven water initiatives, and joint platform for sharing best practices and results.
- **Engagement pillar.** Providing wide visibility and opportunities for citizens to monitor their local waters, and identifying the key driving motivation and relevant incentives for each citizen.

“We can use

Life Cycle Assessment and Cost-Benefit Analysis

as guiding tools for achieving

truly sustainable

stormwater management solutions.”

— From the vision of BalticFlows

Sustainable planning evaluation tools

Successful planning and implementation of best management practices in urban stormwater management requires the inclusion of effective evaluation tools in order to guarantee sustainable results. To identify best solutions, a combination of environmental and economic driven assessment methods can ensure a holistic integration of these two major influencers in project development. That is, cost-effectiveness and the consideration of environmental benefits, risks, impacts, and externalities. Cost-Benefit Analysis (CBA) and Life Cycle Assessment (LCA) are among some of the most effective evaluation methods considering the above mentioned aspects.

Efficient management of natural resources requires proper planning tools and a focus on the nexus that exist between sectors involved in the design, construction, and maintenance of urban stormwater infrastructure. Sustainable implementation of practices is currently a challenge for municipalities trying to establish an appropriate framework for implementation while utilising tools and methods that can bring end users and private sector stakeholders into action.

Life cycle assessment ensures ecological choices

Life Cycle Thinking (LCT) is an essential approach for becoming mindful about the impacts that stormwater management could have on the environment. Thus, Life Cycle Thinking considers stormwater management technologies comprehensively as

In the Citizen Union

Motivation and global drivers:

- Efficient management of natural resources requires proper planning tools capable of taking into account the design, construction, and maintenance of infrastructure.
- Life Cycle Thinking is an essential approach for understanding impacts that new infrastructure, e.g. for managing stormwater, could have on the environment.
- Life Cycle Assessment (LCA) and Cost-Benefit Analysis (CBA) are effective methods for making both environmentally and economically sound decisions, but are currently lengthy and costly processes.

Potential and objectives in the Citizen Union:

- LCA broadly used for evaluation of environmental consequences and potential impacts associated with various alternative materials or approaches, e.g. for urban stormwater management.
- Development of a “light-weight” LCA and CBA toolbox more accessible to citizens in every-day decisions.

it goes beyond the traditional focus by including most of the environmental and economic impacts over the entire life cycle. When all life cycle stages of a technology are addressed, burden shifting is avoided. This means reducing the environmental impacts at one stage while preventing further impacts elsewhere.

Life Cycle Assessment is a suitable tool for implementing Life Cycle Thinking into the evaluation of environmental consequences and potential impacts associated with the performance of various urban stormwater management technologies. An Life Cycle Assessment ensures that all processes throughout the supply chain, from extraction of raw materials until the material’s end-of-life, are included.

A comparative Life Cycle Assessment for urban stormwater management technologies needs to be highly case specific to enable informed decisions on the most environmentally friendly option that meets both the ability to effectively protect citizens against stormwater and the environment against negative impacts.

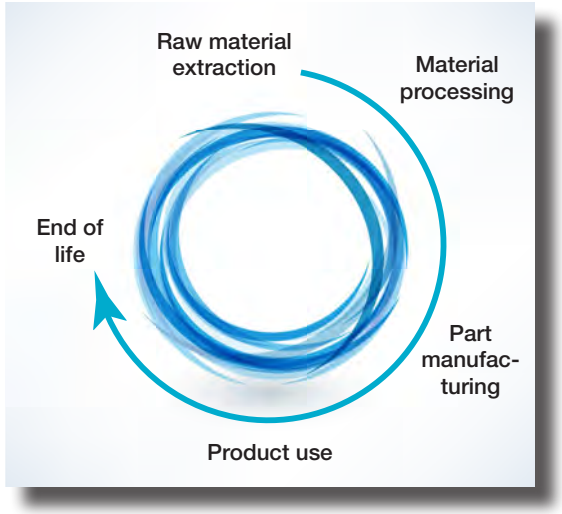


Figure 4. General life cycle from cradle to grave.

Cost-benefit analysis ensures cost-efficient choices

The main purpose of a stormwater management technology is to protect people and areas from expected damages caused by stormwater and flooding. In most cases more than one technology is technically feasible and able to provide sufficient protection. So from an economic perspective, more criteria than the ability to protect the public have to be taken into consideration in order to make an optimal choice. Economic evaluation methods such as Cost-Benefit Analysis serve as tools to identify the best possible solution out of all options.

Cost-Benefit Analysis compares the cost and monetised benefits of potential technologies. Costs of technologies primarily comprise costs for design and construction, and operations and maintenance. In several cases, a complementary technology might be required, entailing additional expenses. Opposing the costs are the benefits which are primarily the avoided damages due to stormwater that would occur in the absence of the implementation of the technology. In addition several technologies could offer co-benefits like aesthetic amenities or environmental improvements which should be considered as well.

Cost-Benefit Analyses should be performed before the implementation of any stormwater technology. It ensures that the most cost-efficient option is chosen and impedes the implementation of disadvantageous alternatives. Therefore, Cost-Benefit Analysis promotes economic development by avoiding unnecessary high costs and a potential waste of public funds. However, carrying out a Cost-Benefit Analysis is a complex process due to the fact that costs and benefits are case-specific and vary strongly among the various applications. It is hardly possible to make general recommendations regarding which technologies might be superior. Thus a detailed analysis is necessary for every specific case.

In the Engagement and Inspiration Plan

Towards a sustainable Citizen Union in 2020 enabling citizens to make environmentally and economically sound every-day decisions:

- **Innovation pillar.** Initiating dialogue and collaboration between LCA/CBA experts and the broader public, in which citizens can bring forth common problematic scenarios, aiming at developing new practical LCA/CBA tools for citizen use.
- **Sustainability pillar.** Promoting Life Cycle Thinking in the everyday life of citizens.
- **Engagement pillar.** Raising awareness towards the potential of LCA/CBA and the opportunity to develop new practical tools together with LCA/CBA experts, and how such tools can be used to both save money and environment.

“Small streams join to form greater streams,

these converge into rivers,

pouring into our common seas.”

“We should learn to avoid mistakes

and prevent local pollution

from spreading into wider waters.”

— From the vision of BalticFlows

Online, all the time!

The water supply of our cities and other urban areas, as well as recreational waters enjoyed by their citizens, depends heavily on the pollution load in broad catchments areas, spanning distant regions often hundreds or even thousands of kilometres from the end user. Hence, in order to secure and enhance the water quality in urban areas, we need to consider overall water quality in our vast intertangled networks of lakes, rivers and streams.

The pollution load in our water bodies is the result of water flowing every minute of the year from all streams, ditches, drains and rivers. However, for example in the Baltic Sea, it is estimated that 90% of the total nutrient load comes during short peak flows, whereas chemical loads typically come from often unidentified point sources. Once in the sea, it is impossible to say where the pollution came from.

Current water monitoring programs are based on analyses of periodically taken samples, which do not reveal the whole spectrum of variations in water quality. Run-off peaks during floods or heavy rain, or accidental industrial leakages, may end up in the sea undetected and without alarm. To meet with the Water Framework Directive's water quality monitoring requirements, measuring techniques are in need of profound institutional, technical and methodical improvements, and new measuring techniques should be developed.

In the Citizen Union

Motivation and global drivers:

- Urban water supply depends heavily on the pollution load in broad catchments areas.
- In the Baltic Sea, 90% of the total nutrient load comes during short peak flows, and chemical loads often originate from unidentified point sources.
- For comprehensive information on water pollution volumes, types and sources, an extensive network of continuous sensors is required.

Potential and objectives in the Citizen Union:

- Wide-scale early warning system based upon modelling and forecasting contributing to prevention and detection of peak pollution loads.
- Enabling technology: low-cost, self-sufficient and maintenance-free monitoring equipment, which can be distributed in a large scale and maintained by non-experts.
- Empowering citizens to monitor water quality of local streams and rivers, each contributing to the wide-scale early warning system.

In order to catch real information on pollution volumes, types and sources, an extensive network of continuous sensors is needed, monitoring water quality and quantity every moment of the year, in as many locations as possible. Continuous monitoring of water quality and quantity provides means for better understanding of the hydrology and pollution dynamics in rivers and streams. Thus, it supports modelling and forecasting, and acts as an early warning, contributing to prevention and detection of peak pollution loads. Real-time transfer of digital water quality data from autonomous field devices and open databases would not only increase the environmental knowledge of authorities, but also the public awareness towards the status of water bodies.

A need for better, low-cost sensors

There is an obvious global demand for low-cost, self-sufficient and maintenance-free monitoring equipment that may be distributed in a large scale to increase the number of measurement points and consequently improve the resolution of water quality data.

Sensor technologies have been developing rapidly in recent years. New automated, low cost devices for monitoring different targets, such as indoor air quality and physiological body parameters have been brought to the big markets. However, the development of sensors and technologies used in continuous in situ water quality monitoring has been slower. The reasons for this are partly related to limited financial resources for water monitoring purposes and to the lack of links between high-end sensor technology experts and water monitoring experts. However, there are also some technical challenges, specially affecting measurements in the context of rivers, streams and ditches that would need to be resolved.

Flowing water is a challenging environment to measure. The device must work despite of mechanical stress and temperature variations (including frost) and it should not get fooled. In addition, it would need to be able to harvest its own energy from the environment in order to operate for extended periods without maintenance.

As an example, the regions participating in BalticFlows have diverse expertise in the development and use of continuous monitoring technologies and they have potential to develop into a joint testing and development laboratory of continuous water monitoring methods. Integration of technologies from different fields into water monitoring applications could result in new products, such as mobile apps, monitoring gadgets, wireless "social" sensor networks, and online games, which in turn, would have high potential for advancing citizen activity.

In order to better understand the multiple sources polluting our natural waters, we should support the development of low-cost water quality measurement technologies that can autonomously measure and communicate over large areas and long periods of time. For new cutting-edge sensing solutions, we should strengthen funding for multidisciplinary research and commercial R&D in the crossroads of several areas of expertise: environmental science, electronics, information technology, cleantech, biotechnology and chemistry.

> "The water supplies and recreational waters of our cities are affected by water pollution up to thousands of kilometres away."

In the Engagement and Inspiration Plan

Towards a sustainable Citizen Union in 2020 secured by a wide-scale water pollution early warning system:

- **Innovation pillar.** Gathering and processing new ideas from citizens on the water monitoring tools, as well as feedback on the use scenarios, e.g. measurement frequency, complexity and connectivity.
- **Sustainability pillar.** National and European support for a pan-European water monitoring network and early warning system, aiming at a significant reduction in water pollution.
- **Engagement pillar.** Promoting the concept of personal water monitoring to the general public, providing means for citizens to effectively monitor their local waters, and identifying the key driving motivation and relevant incentives for each citizen.

“We seek great synergies between our diverse regional know-how and world-class research, to turn our waters clearer and foster competitive industry.”

— Tuomas Valtonen, BalticFlows Coordinator

Regional smart specialisation and citizens

Smart specialisation enables the differentiation of innovation patterns according to the potentials and needs of a specific territory. It is crucial to mobilise internal assets and resources in fields where a country or a region is has strong potential.

Figure 5 illustrates a traditional triple-helix model for innovation, funding and collaboration in research-driven clusters. In this model, research organisations, business entities and regional authorities form the core of the cluster. These are supported by various funding entities at regional, national and European levels.

Research organisations represent the engine of the cluster. In a healthy cluster, research collaborates seamlessly with the business sector at a practical, grass-root level. This entails joint research projects, in which medium-to-long term research objectives provide real-world support to short-to-medium term R&D goals of business entities.

Regional authorities support research-business relations by various means, such as providing high-quality basic education, building infrastructure and providing financial support when necessary and possible. Authorities can create an inspiring, innovative and encouraging environment in which innovative persons and groups may thrive. Input from the research community and business sector is essential for guiding regional policies and support measures along a productive route.

In the Citizen Union

Motivation and global drivers:

- Globalisation and intensifying competition are placing increased pressure on the competitiveness of European industry.
- Smart specialisation enables differentiation of innovation patterns according to the potentials and needs of a specific region.
- The clear regional strategy help focus efforts and limited resources in a common direction beneficial for the entire region.

Potential and objectives in the Citizen Union:

- Regional smart specialisation strategies (RIS3) can serve as a focal point for activities of the entire regional quadruple helix.
- The RIS3 can act as a formal channel for exchange of opinions and ideas between citizens and other entities of the quadruple helix.
- The “hidden” potential and ideas of citizen could strongly complement the RIS3 formulation process, opening opportunities towards new sectors, or strengthening existing industry.

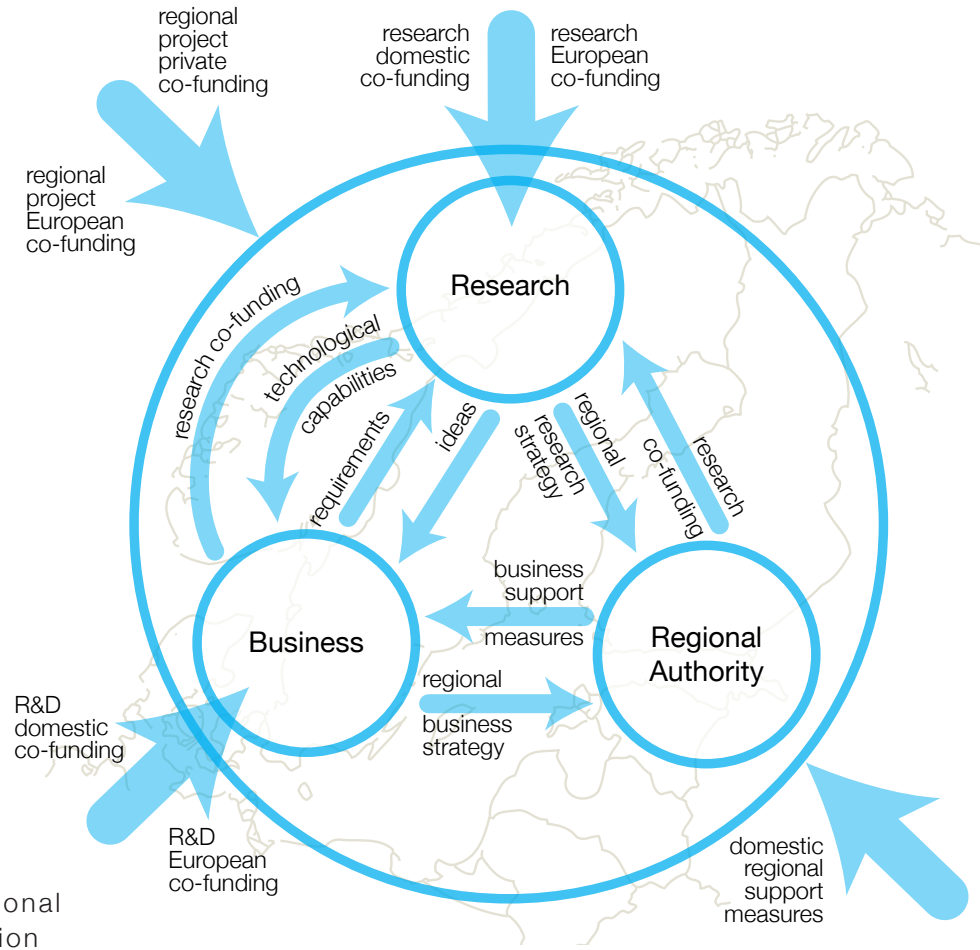


Figure 5. Traditional regional innovation model based upon triple helix partnership.

Research and business entities are also eligible for various financial support instruments, typically in the form of project co-funding. Research organisations may apply for partial funding from domestic or European funding programmes; often such projects are partially co-funded by business entities. Likewise, businesses may receive domestic or European co-funding for R&D projects. The region as a whole may also receive domestic support, or European level support via Cohesion Policy.

For successful smart specialisation, include the citizens

In 2012, Ernest J. Wilson III asserted that in order to achieve sustainable serial innovation, innovation must be embedded within long-lived social institutions and networks. Four different sectors must be linked together: government, business, civil society, and academia, hereafter constituting the "quadruple helix".

The ideas and actions of creative, capable citizens is the fuel for a creative society. In part, this can be captured by the traditional innovation process: turning ideas into patents, artistic sketches into product design, common sense into business models. But the potential of our citizens goes further, and ideas may lead to intangible benefits, contributing to quality of life, a better living environment, or a sensation of inclusion or success.

In many regions, smart specialisation strategies are planned by regional leaders and experts from the government, academia and industry with the "entrepreneurial or innovation discovery" in centre of the focus. However, in order to understand the latent potential in our regions, and create truly smart specialisation strategies that go beyond existing, known areas of strength, we need to more closely understand the know-how, experience and ideas of our citizens. We need to learn to motivate each citizen to engage with his or her society, to contribute to its smart specialisation strategy – and we need the will and means to listen and understand.

In the Engagement and Inspiration Plan

Towards a sustainable Citizen Union in 2020 based upon clearly defined regional strengths:

- **Innovation pillar.** Gathering and processing new ideas from citizens, discovering "hidden" potential of the region based upon the skills, experience and ideas of all citizens in the region.
- **Sustainability pillar.** Seeking strong commitment towards RIS3 from all regional actors of the quadruple helix, including the citizens, enabling sustainably justifiable decisions in all areas of society.
- **Engagement pillar.** Granting citizens a special opportunity to influence the direction towards which their region will be steered. Promoting the concept of RIS3 to the general public, providing equal access to the process – both online and face-to-face – to all citizens of the region.

“Pollution knows no borders,

and ultimately we all

bathe and fish in the same seas.

In Northern Europe, the

Baltic Sea is our common concern.”

— From the vision of BalticFlows

BalticFlows

BalticFlows brings together a partnership of 17 organisations in five European regions – Hamburg, Riga, Tallinn, Turku and Uppsala – and one project partner from the UK specialised in the Chinese environmental sector. Within the consortium there are six research organisations, six SMEs and five public sector representatives constituting a triple helix structure in each of the participating regions.

Active citizenship is a valuable component of the BalticFlows project, as the project is in search of means to bring the citizens a step closer in cooperation with the regional authorities, researchers and business entities to result in safer, liveable cities in the Baltic Sea Region.

By concentrating on existing strengths and regional characteristics, the consortium works together to bring the economic sector, the citizens, the authorities and the research institutions in close contact with each other to develop the research driven clusters in each region to enhance the capacities in diffuse load monitoring and urban stormwater management, leading to new business opportunities in the global market for water monitoring and management know-how and solutions.

Since 2013 the BalticFlows consortium has together studied the topics of rainwater monitoring and management, as well as citizen engagement in these. Following the lines of this Joint Action Plan, participating regions and partners will continue work of these issues, seeking synergies from inter-regional collaboration and contributing to smart specialisation in their regions. Common strengths will be used to jointly seek financing for research and innovation the fields of rainwater monitoring and management – from private, national and European funding sources.

Hamburg region

The metropolitan region of Hamburg is formed by the cooperation of the city of Hamburg and other nineteen administrative districts and district-free cities. The metropolitan region has a population of five million. Hamburg has an oceanic temperate climate characterised by warm dry summer and cool winter.

The city of Hamburg faces an increase in the amount of sealed surface areas. In Hamburg, 8% of the city area consists of surface water, 40% is covered by green areas and the remaining 52% covered by roads or streets used for traffic, and settlement areas. These features, combined with rainfall variability and extreme weather events, have created a likelihood of increased stormwater runoff and risk of flooding.

Existing regional smart specialisation strategies do not always include urban stormwater management as one component. Thus, regional know-how and technological advancements need to be identified in order to understand the capacities. It would be then necessary to include a discussion with the responsible parties for the necessary policy framework. Access to funding sources is key in order to finance individual projects. In this context regulatory incentives could successfully pave the way to a sustainable urban stormwater management strategy.

Strategies that focus on linking sustainable development and stormwater management, such as Hamburg Green Roof Strategy, are used to integrate urban development and water resource utilisation. Integration of rainwater management into urban landscape planning and efficient technologies in the field of rainwater management are the areas of know-how transferable to other Baltic regions.

Riga planning region

Riga planning region is located in the central part of Latvia. It consists of the capital city Riga and 29 other municipalities. The total population of the region is more than 1 million people, which is 50% of the total population of Latvia. The climate in Riga region is influenced by the proximity of the Gulf of Riga. As a result summers are relatively cool and cloudy but winters – relatively mild with frequent periods of thaw.

In recent years due to more frequent occurrence of extreme rain event the issue has been discussed more, as evidenced by numerous research and best practice projects related to rainwater management.

As maintenance of the rainwater management infrastructure is mainly ensured by local municipalities or municipal water management companies, local municipalities, regional actors and research institutions have been studying and adapting best international practices in the field of rainwater management, as well as developing their own innovative and cost-efficient approaches.

Thanks to financial allocations within the framework of the EU funding, rainwater sewer infrastructure is being improved and measures to mitigate climate change impact are being carried out.

Combining the available resources, funding and cluster initiatives, there is a feasible opportunity that sustainable rainwater management will comply with smart specialisation in Riga planning region.

Tallinn region

Tallinn City is the capital of Estonia and located in Northern-Estonia on the bank of the Finnish Gulf. It is the largest city in Estonia, with a third of the country's population – approximately 400,000 people residing in 156.3 km^2. The city's administrative area also covers two lakes and the island of Aegna.

As the city is located by the Gulf of Finland, the maritime climate offers frequent and in recent years, ever more intense rainfall, which in combination with increasing urban development creates a necessity for effective rain and stormwater management. An important challenge for Tallinn is the increasing amount of impervious runoff areas and the pollutants gathered by stormwater.

Rainwater management is in the jurisdiction of the city. Municipal Engineering Services Department is responsible for designing, constructing and operating of rainwater drainage systems. The Environmental Department monitors, analyses runoff and develops strategies and action plans regarding rain and stormwater management. Strategic goals for 2030 include diminishing runoff pollution, using rainwater as a resource and eliminating flooding caused by stormwater.

With the Baltic Flows project and other initiatives there is a strong commitment to improve rainwater management processes, technologies and monitoring possibilities. Increasing the effectiveness of diffuse load and stormwater monitoring is one of the most important goals for Tallinn area.

Turku region

Turku is a city at the Southwest Coast of Finland, at the mouth of Aura River. Southwest Finland is the third biggest region in Finland with a population of approximately 471,000 inhabitants. The region is characterised by cold and wet winter climate which affects the rainfall infiltration and the variation in rain and snow during winter season. Combined to the climate change it makes the stormwater management challenging.

Water quality fluctuates from season to season. Spring floods and heavy downpours result in peak loads, and mainly because of agricultural runoff to the Archipelago Sea, Southwest Finland is the only hotspot area of the Helsinki Commission in Finland. This is a big motivator for the region to search for new and innovative solutions to tackle the challenge. This is strived for at all levels, involving the entire quadruple helix and aiming at sustainable growth. Southwest Finland is committed to aim at becoming a model region in the recycling of nutrients and a pilot region for cleantech and circular economy. In addition to traditional nature protection measures and as part of our region's smart specialisation process, better water quality is seen to be reached through sustainable business opportunities and better involvement of citizens and consumers.

Finnish methods and solutions for data collection, open regional databases, analysis, data visualisation, summarisation and dissemination are usable for other regions and actors. What is more, the region has a lot of potential and enthusiasm to develop new solutions for diffuse load monitoring and especially miniaturised sensors.

Uppsala region

Uppsala is one of the largest cities in Sweden with more than 200 000 citizens. It is located in one of the fastest growing regions in Sweden, near the big lake Mälaren. Situated on the fertile Uppsala flatlands of muddy soil, the city features the river Fyrisån flowing through the landscape surrounded by lush vegetation. Parallel to the river runs the glacial ridge of Uppsalaåsen, which is supplying Uppsala with drinking water.

Stormwater management and flooding are challenges in Uppsala. The region is characterised by cold climate which affects the rainfall infiltration and the variation in rain and snow during winter season. Uppsala is one of the 18 cities in Sweden at highest risk for flooding and hence injuries in buildings and environment. The ongoing urbanization results in a physical growth and change of the inner city. The change risks increasing the degree of hard surfaces and the volume of stormwater. Planning issues and stormwater management are some of the challenges within the city. The glacial ridge is very sensitive to stormwater pollution, since the drinking water is also running in the ridge. The water quality of the River Fyrisån is highly affected by stormwater and wastewater. The river does not achieve good ecological or chemical status in the part running through Uppsala city.

The muddy soils of Uppsala flatlands, with intensive agriculture areas, are also leaching phosphorous to the streams and lakes, particularly in flood situations. Swedish knowledge in stormwater management, rainwater harvesting and measures in agriculture areas could contribute to other countries. Uppsala has two universities which in different ways contribute to know-how within the areas of diffuse pollution and sustainable cities.

Produced by the BalticFlows Project, financed under European Commission FP7 Regions of Knowledge. Coordinated by the University of Turku, Finland. Project Officer: Pia Laurila, Policy Officer, Directorate-General Research and Innovation.

Safe, liveable cities

for citizens in the Baltic Sea Region and throughout Europe

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- City of Tallinn, Estonia
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- Turku Science Park Ltd., Finland
- Turku University of Applied Sciences, Finland
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- Uppsala County Administrative Board, Sweden
- Uppsala University, Sweden
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Joint Action Plan – Next Steps of the BalticFlows

- with Regional Strengths and BalticFlows Initiatives

Appendix to BalticFlows Joint Action Plan published in Brussels 21 April 2015

Index

1 Introduction

The BalticFlows project funded by the European Commission 7th Framework Programme Regions of Knowledge theme concerns urban stormwater management and water quality monitoring in Baltic Sea catchment areas. The interest in environmental values and safety is growing along with the economic development and increased awareness of citizens. In addition to the guaranteed water supply and appropriate wastewater treatment, the prevention of urban flooding and decreasing pollution of our water bodies are now seen important for us all.

The BalticFlows project was designed to bring forth the technological and economic vision by enhancing the effectiveness of research-driven clusters in participating regions with global competitiveness as a priority. The project aims to compile current expertise and best practices, to develop new capacities and policies for effective management and quality monitoring of stormwater flowing to the Baltic Sea, and to create innovative clusters in each region.

This Appendix for the Joint Action Plan was done in the halfway of the project and it is based on the reports generated by regional organizations. Reports cover the range of expertise and technologies, as well as challenges and business opportunities of the participating regions for the water management and monitoring field.

2 Regional strengths in water technology

One of the goals of the project is to recognise the water-related strengths of each participating region. At this point of the project, altogether 162 individual technologies, products, services and areas of expertise have been described as cluster offering technologies by the organisations in the regions.

All participating regions share a high-education profile and public interest in environmental protection. The regions have expertise in water technology and urban planning, and mentoring potential for consulting and building clusters.

The areas of expertise, the challenges and demand in the regions have been studied to create new policies and cooperation. Descriptions of more specified regional strengths of stormwater management, diffuse load monitoring and citizen participation are listed in next chapters.

2.1 Regional strengths in urban stormwater management

Hamburg region

Overall expertise

- Retention and infiltration technologies for rainwater management
- Integration of methods into urban landscape design. Planning of a stormwater management approach through the development of multi-functional spaces integrated into the existing urban conditions of sidewalks and street infrastructure

Areas of particular strength

- Green roof technologies
- Implementation of instruments and incentives, e.g. green roof programme, split-tariff stormwater management scheme
- Street and green space stormwater infrastructure including porous pavements, bioretention, bioswales
- Water collection/cisterns
- Experience of LCA (Life Cycle Analysis)

Riga region

Overall expertise

- River basin management
- Precipitation, urban runoff monitoring and forecasting
- Tehnical design of cost-effective stormwater management system
- Flooding modeling program and forecasting by using satellite imagines

Areas of particular strength

- Meteorological observations and meteorological data monitoring system

Tallinn region

Overall expertise

- Urban planning of stormwater management
- Designing stormwater management systems

Areas of particular strength

- Discharging stormwater to coastal sea according to marine water level (management and design of technical solutions)

Turku region

Overall expertise

- Urban planning tools and methods
- Flooding modelling and prognoses

Areas of particular strength

- Design of storm water management structures (wetlands)
- Use of geographical information and map services
- Interactive visualisation and simulation of flooding scenarios
- Sensors and GPRS loggers on the field to visualise rainwater management
- Maintenance of sensor networks with cloud based software
- Continuous water quality monitoring - use of modern continuous sensors applicable for stormwater quality and quantity monitoring
- Filtration materials and technologies

Uppsala region

Overall expertise

- Stormwater management
- Integration of rainwater management to urban landscape planning
- Flooding modelling and prognoses
- Disaster risk reduction

Areas of particular expertise

- Stormwater collecting and purifying ponds
- Green and permeable surfaces
- Green roof technology
- Runoff generation processes
- Design of storm water management structures (wetlands)
- Use of geographical information and map services
- Interactive visualisation and simulation of flooding scenarios
- Sensors and GPRS loggers on the field to visualise rainwater management
- Maintenance of sensor networks with cloud based software

2.2 Regional strengths in diffuse load monitoring

Hamburg region

Overall expertise

- Precipitation, runoff and load monitoring
- Design of water monitoring strategies/programs

Areas of particular strength

- Continuous diffuse load monitoring - methodology (strategies, reliability, maintenance, adaption procedures)
- Continuous diffuse load monitoring - technology/ development of continuous water quality monitoring sensors

Riga planning region

Overall expertise

- Surface and ground water quality monitoring and modelling
- Design of water monitoring strategies/programs

Areas of particular strength

- Modelling and assessment of diffuse loading (erosion etc.)
- Developed environmental databases (precipitation, hydrological, water quality and water pressures databases)

Tallinn region

Overall expertise

- Design of water monitoring strategies/programs
- Monitoring network with continuous hydrological and hydrochemical measurement stations
- Continuous diffuse load monitoring - methodology (strategies, reliability, maintenance, adaption procedures)
- Natural wetlands monitoring
- Modelling of stormwater quantity and quality

Areas of particular strength

- Measurement of nutrient load in stormwater and surface water affecting coastal waters, assessment of eutrophication
- Modelling and assessment of coastal erosion depending from storm- and seawater
- Data loggers and water monitoring sensors

Turku region

Overall expertise

- Water quality monitoring technologies
- Design of water monitoring strategies/programs

Areas of particular strength

- Continuous diffuse load monitoring - methodology (strategies, reliability, maintenance, adaption procedures
- Solutions for data handling and storage
- Database systems and user-friendly interface and data reporting
- Methodology for data handling, data surveillance and post-calibration, emergent sensor development, adaptation of existent monitoring solutions (dataloggers/platforms)
- Modelling and assessment of diffuse loading (erosion etc.)
- Other continuous in-situ monitoring solutions
- Development of smaller devices to be used by non-professionals and identifying biological components (bacteria)
- Sensors know-how for water quality analysis
- Solutions for stormwater quality monitoring (sensor technology; pollutants, oil detection)

Uppsala region

Overall expertise

- Design of water monitoring strategies/programs
- Monitoring programmes by public authorities
- Well established and tested monitoring methods
- Source apportionment modelling

Areas of particular strength

- Monitoring methods and technology
- Solutions for data handling and storage
- Monitoring of small agricultural streams and catchment areas
- Maintenance of sensor networks with cloud based software
- Continuous water quality monitoring - use of modern continuous sensors applicable for stormwater quality and quantity monitoring
- Mitigation measures for reducing nitrogen and phosphorus loading

2.3 Activities in citizen participation

Hamburg region

- Citizen participation in re-naturalisation of canal

- Active NGOs in re-naturalisation, awareness raising, capacity building, in water management

Riga region

- Public involvement in water management
- Awareness rising by organising environmental campaigns
- Environmental education - youth participation in different Interest education clubs, rising interest in nature, environment research.
- Eco-Schools programs

Tallinn region

- Participation of citizens in planning process combining different channels including e-solutions
- Planning and delivering of environmental education in stormwater area involving schools.

Turku region

- Promotion of water environment protection and citizen participation in decision making
- Support for participation of different stakeholders in the official strategies of the region
- Participation by citizens and engaging the citizens to research activities
- In universities , participation of students and NGO's in the ongoing activities
- Research lines are developing smaller devices to be used also by non-professionals
- Dissemination of information with databank and media follow-up

Uppsala region

- Citizen participation in water monitoring in Lake Mälaren basin
- Smart City oriented green sensors (air, water) to be launched – environment sensors managed by citizens and IoT infrastructure

2.4 Smart specialisation strategies

The status of the smart specialisation strategies varies a lot between the regions and countries. BalticFlows can contribute to this process by paying attention to the focus of the water-related smart specialisation of the regions and guiding for them to be upgraded and sharpened during the project. The current focuses of the water-related specialisation of the regions are presented here:

- Hamburg region: Urban stormwater management methods and strategies, building and city planning for integrated best management practice and decentralised urban rainwater harvesting solutions

- Riga planning region: Utilisation of renewable energy resources (e.g. hydropower) to enable wide-scale distributed sensor networks for water quality monitoring
- Tallinn region: Water quality sensor technology and data handling. Stormwater management and planning related consulting.
- Turku region: Water monitoring and sensor technology and expertise, involvement of citizens in water monitoring and developing nutrient flows towards circular economy
- Uppsala region: Upstream headwater quality modelling, water monitoring expertise, distributed wireless sensor networks

3 BalticFlows Initiatives

The BalticFlows project has been fruitful in the sense that many initiatives have been developed during the international and regional meetings with stakeholders and partners from inside and outside the consortium. Although most of the initiatives are directly related to the Project outcomes and goals, some have a different focus. All of the following initiatives have had the BalticFlows project as their main catalyst. Many initiatives were set and developed during the projects workshops and several of them have already submitted for funding.

Interestingly, the effect of the BalticFlows project has been greater than initially perceived. Actors from outside the consortium have found each other in BalticFlows events and initiatives started independently.

The initiatives have been placed in the table below and their main objectives and involved partners described later on in more detail.

Name of the initiative	Budget	Status and current plans
1. SENSor NETwork for Sewage Monitoring - SENSNET	1 540 000 €	Will be reapplied to Central Baltic in October 2015
2. Automated Nitrogen Load Monitoring From Nonpoint Sources for the Baltic Sea Region		Concept Idea
3. Water Monitoring System - WMS		Concept Idea
4. Sustainable Urban Drainage System - SUDS Baltic	1 076 000 €	Will be reapplied to Central Baltic in October 2015
5. Platform of Total Stormwater Sewage Network		Concept Idea

6. Platform – Test Field of Technologies, certification		Concept Idea
7. Cleaning and Using mining and Industrial Waters		Concept Idea
8. Developing Sensors for the Detection of Phosphorus		Concept Idea
9. Sustainable Water SWAM	5 035 040 €	Entered the 2nd round in BSR
10. Update Legislation		Concept Idea
11. Rainwater Tariff System Development		Concept Idea
12. Lighting BSR	2 330 000 €	Entered the 2nd round in BSR
13. Electric Mobility BSR	4 685 156 €	Entered the 2nd round in BSR
14. Sustainable Water Solutions in Urban Environment		Will be applied to H2020
15. New Resource-efficient Water Management Solutions for Agriculture - AGRIwaters		Concept Idea
16. Urban city sensor network for sustainable city development – Green IoT		Swedish regional initiative, funding granted

3.1 SENSor NETwork for sewage monitoring

SENSor NETwork for sewage monitoring is an initiative, which aims to reduce to number of pollutants entering the Baltic Sea by improving the performance of Wastewater Treatment Plants. Currently, when polluted wastewater enters the Wastewater Treatment Plants, the active sludge bacteria responsible for cleaning the wastewater, are destroyed. When the process of biological treatment is inhibited, untreated wastewater is released into the environment with all of the eutrophic nutrients, hazardous and toxic substances it carries, and finally enters the Baltic Sea.

To prevent the before mentioned release of untreated waters, the initiative proposes integrating early warning sensors into the sewage network which activate precautionary countermeasures. The initiative suggests pilot projects in wastewater treatment plants around the Baltic Sea Region.

Project partners:

1. Tartu University	Estonia
2. Åbo Akademi	Finland
3. FlyDog Solutions	Estonia
4. IVL Svenska Miljöinstitutet	Sweden
5. Porvoon Vesi	Finland

6. Syvab	Sweden
7. Cleantech Estonia NPO	Estonia
8. Tartu Waterworks	Estonia

3.2 Automated Nitrogen Load Monitoring From Nonpoint Sources for the Baltic Sea Region

While the compounds found in the rainwater are measured by automated stations, running water samples are still being collected manually on a regular basis. The measurements are taken by the public authorities or private companies and the results of the chemical analysis presented in reports. The problem with the self-monitoring done by the private companies and with regular measurements overall is the lack of continuous flow and impartiality of the data.

The initiative proposes to use automated monitoring of nonpoint sources in order to have a real understanding on the amount of pollutants and to detect anomalies in the water quality. In addition, the automated system is impartial and will represent the actual data about water quality.

Project partners:

1. Tallinn University of Technology	Estonia
2. University of Latvia	Latvia
3. Flydog	Estonia
4. Masinotek	Finland
5. Luode Consulting OY	Finland

3.3 WMS – Water Monitoring System

WMS – Water monitoring system initiative aims to create a pilot site for a fully functioning off-the-shelf water monitoring system.

Due to the rapid economic development, increasing population and changes in the climate conditions, information about water quality is becoming ever more important for public safety. Accidental pollutions occur frequently and in most cases are not identified because water quality is measured between regular intervals, not continuously. This also means that necessary countermeasures cannot be taken in a timely manner.

The initiative aims to develop a real-time autonomous stormwater monitoring system with a wide coverage to provide water monitoring with minimal human interaction. The system will alert the end-user of hazards and allows timely countermeasures to be taken.

Project partners:

1. Cleantech Estonia NPO	Estonia
2. Rakvere City	Estonia
3. Tallinn University of Technology	Estonia
4. ELKE Sensor OÜ	Estonia
5. University of Tartu	Estonia
6. Flydog Solutions OÜ	Estonia

3.4 SUDS Baltic – Implementation of Sustainable Urban Drainage Systems in the Baltic region

SUDS Baltic is in initiative to use sustainable urban drainage systems in urban areas for storm-water management. SUDS use natural infiltration, retention and storage systems for the management of stormwater and are environmentally friendlier, and in many cases cheaper, then conventional solutions.

The main goal of the initiative is to promote the use of these systems in the Baltic States. SUDS are and have been used in some Central European and Scandinavian countries, and have shown very promising results. There is a lack of knowledge and case studies about the systems effectiveness and efficiency in the Baltic States and the project's objective is to transfer the know-how from Denmark and Finland to Estonia and Latvia. It also proposes to build experimental pilots in order to test different urban stormwater management solutions and work out a design criteria for the Baltic conditions. The output from the initiative is a working and tested SUDS design and increased know-how among the field's experts, decision makers, water engineering students and the public.

Project partners:

1. Estonian University of Life Sciences	Estonia
2. Turku University of Applied Sciences	Finland
3. Latvian Environmental Investment Fund	Latvia
4. Cleantech Estonia NPO	Estonia
5. Tallinn University of Technology	Estonia

3.5 Platform of Total Stormwater Sewage Network

The initiative aims to create a database for market ready rainwater management and monitoring technologies, depreciation periods, products, services and solutions. The database will gather specific knowledge about the technologies and, together with the appropriate communication activities, will help the decision makers to find the best solution for their problems.

Project partners:

1. Latvian Environment, Geology and Meteorology Centre	Latvia
2. TP Riga/LAR Municipalities	Latvia
3. Sigulda municipality	Latvia
4. Ltd.3C	Latvia
5. Centre for Sustainable Development	Sweden
6. Tallinn University of Technology	Estonia

3.6 Platform – Test Field of Technologies, certification

An important part of creating innovative technologies and solutions is the testing done in real life conditions. There is a strong need for a site, where technologies under development can be tested and get certifications for their output. The testing site offers an otherwise unique opportunity to compare technologies which have been working under the same conditions. The initiative aims to increase the number of innovative technologies being developed and most of all, the number of innovative technologies being implemented in everyday life. It would also support the organizations using the testing site in acquiring patents, exporting their solutions and building brand awareness.

Project partners:

1. TP Riga/LAR Municipalities	Latvia
2. Latvian Agricultural University	Latvia
3. BIRCO – Peter Wingenbach	Germany
4. Mälaren Water Association – David Liderfelt	Sweden
5. Eskilstuna Municipality - Lars-Erik Dahlin	Sweden
6. Tallinn University of Technology	Estonia
7. Laser Diagnostic Instruments AS	Estonia
8. Marine Systems Institute	Estonia

3.7 Cleaning and Using Mining and Industrial Waters

Abandoned mines and dewatering active mines are sources of significant heavy metals and acidifying compounds contamination.

The initiatives objectives are:

- Determining groundwater quality and quantity, pointing out changes associated with mine dewatering operations;
- Assessing mine water impact to surface water, risk assessment, existing treatment technologies, their compliance to water quality standards and need for improvement;
- Water quality changes along rivers in catchment area;
- Investigation of monitoring systems to provide early detection of changes in surface and groundwater quality;
- Introducing on-line monitoring technology (water level, conductivity, turbidity, etc) for mining waters monitoring;
- Harmonization of assessment methods and water pollution treatment technologies of wastewater streams from oil shale processing;
- Development of mining wastewater treatment technologies according to stricter environmental requirements;
- Creating innovative solutions for possible reuse of mine waters (groundwater recharge, cooling waters and etc.)

Project partners:

1. Tallinn Municipal Services Department	Estonia
2. Tallinn University of Technology	Estonia

3.8 Developing Sensors for the Detection of Phosphorus

There is an urgent need for continuous monitoring systems which are able to distinguish abnormal changes from normal variations, especially in wastewater and agricultural non-point pollution load monitoring. Automated cost-effective solution to measure nutrients, especially nitrates and phosphorous (phosphates) as well as water turbidity is needed. At the same time, when rapidly forming events, such as stormwater events or algal blooms are concerned, timely water-quality information is urgently required. The initiative's idea is test various real-time sensors capabilities and maintenance requirements in different pollution conditions.

Project partners:

1. Tallinn Municipal Services Department	Estonia
2. Tallinn University of Technology	Estonia
3. Luode Consulting	Finland
4. Turku University of Applied Sciences	Finland

3.9 Storm Water Management – Methods and Incentives for Sustainable City Planning – SWAM

SWAM is one of the initiatives submitted for funding under the Interreg Baltic Sea Region programme Priority 2: Effective Management of Natural Resources. The initiative was deemed relevant and demonstrated good potential for project implementation. The concept was accepted to participate in the second round of the programme application.

The priority focus of the initiative is on the effective implementation of measures and strategies that integrate stormwater management into city planning. The initiative has a concentration on the legislative environment surrounding the stormwater management including potential financial mechanisms, legal instruments, and systems that are needed to guide the implementation process. Under this scope, test sites set up at various Baltic Sea Region (BSR) countries are proposed in order to assist private sector, public authorities and research institutions in developing a vision and innovative solutions for strategic planning.

Another aspect of the initiative includes the development of an effective communication platform between test sites and cities, with a series of joint workshops to tackle the issues raised in the cities and regions; improve the city planning process; establish improved legal instruments e.g. tariffs; and investigate additional funding mechanisms for the design, construction, and long term planning of stormwater management.

The outcome from the project will be a regional Baltic Strategy and action plan with regulatory measures and incentives to help guide City authorities on how to integrate sustainable city planning and urban stormwater management, all leading to increasing innovation capacity in the regions and sectors, improving national and regional legislations, and promoting a transnational joint regional strategy with guidelines and examples of best practices.

Project partners:

1. Upplands Väsby Municipality	Sweden
2. Lake Mälaren Water association	Sweden
3. Nyköping Municipality	Sweden
4. Eskilstuna municipality	Sweden
5. Hamburg University of Applied Sciences	Germany
6. Latvian Environmental Investment Fund	Latvia
7. Riga Planning Region	Latvia
8. Roslagsvatten AB	Sweden
9. Grupa93 Ltd.	Latvia
10. Luleå University of Technology	Sweden
11. Turku University of Applied Sciences	Finland
12. Rezekne higher education institution	Latvia
13. Cleantech Estonia NPO	Estonia
14. Viimsi Muncipality	Estonia
15. Rakvere City	Estonia
16. Estonian University of Life Sciences	Estonia
17. Sigulda Municipality	Latvia

3.10 Update Legislation

Due to recent changes in the climate, the amount of precipitation has been increasing. The methodologies used to calculate the current rainfall are in some cases over 50 years old and are in desperate need of updating. The initiative focuses on updating the construction standards in order for it to comply with the changed climate conditions. Outcomes from the initiative are new rainfall calculations from corresponding experts, transference of know-how from other countries and the introduction of a new national legislation standard.

Project partners:

1. Latvian Environment, Geology and Meteorology Centre	Latvia
2. Ltd. 3C	Latvia
3. Latvian Agricultural University	Latvia
4. Ministry of Economics	Latvia
5. Ministry of regional development and environmental protection	Latvia
6. Tallinn Municipal Services Department	Estonia
7. Tallinn University of Technology	Estonia

3.11 Rainwater Tariff System Development

Rainwater management is the obligation of the municipalities but as maintaining and investing in the rainwater management and monitoring systems are costly activities, there is a necessity to find long-term sustainable measures. The rainwater tariff system initiative is one of the measures for implementing sustainable urban planning. The tariff system would ensure systematic investments to the sewage management systems and give a strong incentive for developing and implementing innovative cost-effective solutions. At the moment there is a project in development where 3 municipalities in different geographical positions are planning to use the tariff system.

Project partners:

1. Latvian Agricultural University	Latvia
2. Latvian Environment, Geology and Meteorology Centre	Latvia
3. Ltd. 3C	Latvia
4. Ltd. TP Riga/LAR	Latvia
5. Centre for Sustainable Development Uppsala	Sweden
6. Ltd. Aqua Brambis	Latvia
7. Ltd. LŪKA	Latvia
8. Tallinn Municipal Services Department	Estonia
9. Tallinn University of Technology	Estonia

3.12 Lighting the Baltic Sea Region – Cities Accelerate the Deployment of Energy Efficient and Smart Lighting Solutions – Lighting BSR

The initiative is not directly align with the BalticFlows project goals, but the BalticFlows meetings and events have been the catalyst which gave the push for the initiative. The project has been submitted for Baltic Sea Region and accepted for the second round. The consortium overlaps greatly with the BalticFlows partners and in some aspects, the activities help the same cause.

The Lighting BSR brings together the cities with specific development and planning needs, as well as actors relevant to define and test technology at the pilot sites and enhance their competence to develop a clear and efficient urban lighting plan. The smart lighting, which will be developed and piloted with the project, will also create an infrastructure for monitoring rain- and storm-water in urban areas.

Project partners:

1. University of Turku	Finland
2. Cleantech Estonia NPO	Estonia
3. Tallinn University of Technology	Estonia
4. City of Tallinn	Estonia
5. City Government of Rakvere	Estonia
6. Riga Planning Region	Latvia
7. Jurmala City Council	Latvia
8. Hamburg University of Applied Sciences	Germany
9. City of Hamburg	Germany

3.13 Enhancing e-mobility in the Baltic Sea Region – BSR Electric

BSR Electric is another project submitted for funding at Baltic Sea Region and accepted to the second round, and as the previous initiative, is not directly align with the BalticFlows project goals. Again, the BalticFlows network is involved with the project and it has acted as a catalyst.

The initiatives main goal is to reduce the amount of CO2 emissions and improve the urban living conditions. It will guide the public authorities and partners in the process of integrating e-mobility concepts into urban transport strategies.

Project partners:

1. Hamburg University of Applied Sciences	Germany
2. Free and Hanseatic City of Hamburg, Senate Chancellery	Germany
3. ATI Küste GmbH	Germany
4. Hoje-Taastrup Municipality	Denmark
5. Lindholmen Science Park AB	Sweden
6. Turku University of Applied Sciences	Finland
7. Green Net Finland	Finland
8. Cleantech Estonia NPO	Estonia
9. City Government of Rakvere	Estonia
10.Ardenis Ltd.	Latvia
11. Vilnius Transport /Smart Vilnius	Lithuania
12. City of Gdansk	Poland
13. Electrotechnical Institute Gdansk Branch	Poland
14. Zero Emission Resource Organisation	Norway

3.14 Sustainable Water Solutions in Urban Environment – Water Sustain

The demand for water resources increases with the global population and creates a strong demand for innovative and effective water solutions. On the other hand, flooding and surface water management is still a problem for millions of Europeans. Existing solutions are far from ideal and the initiative proposes a wide scale demonstration project to provide objective validation to innovative solutions. The project plans to measure the cost effectiveness and functionality of innovative water management methods and technologies to support and aid in the market uptake of innovative products and services. Also, another aspect is to support regional authorities by reducing water management facilities loads during high peaks of stormwater. The initiative was submitted for funding to Horizon 2020.

Project partners:

1. University of Turku	Finland
2. Turku University of Applied Sciences	Finland
3. HAW Hamburg	Germany
4. P.S.G Environmental Geo-Exploration Ltd.	Greece
5. University of Sheffield	UK
6. Abertay University	UK
7. University of Cape Town	South Africa
8. Manchester Metropolitan University	UK
9. Geological Survey of Norway	Norway
10.MVH Consult Ltd.	Netherlands
11.Hanze University of Applied Sciences	Netherlands
12.BWB Consulting Ltd.	UK
13.Masiotek Ltd.	Finland
14.City of Turku	Finland
15.IFU Ltd.	Germany
16.American College of Greece	Greece
17.Indymo Ltd.	Netherlands
18.City of Oslo	Norway
19.Nimbus Engineering Ltd.	UK

3.15 New Resource-Efficient Water Management Solutions for Agriculture - AGRIwaters

Water monitoring is a fundamental part of assessing the environmental status and water quality. Since the fluxes of nutrients and sediments from land to water are highly variable, continuous

monitoring is essential for accurate data. Agriculture is a key priority area for achieving the objectives laid with the Water Framework Directive. The initiative's main objectives are:

• Implementing measures to showcase, exchange, test and transfer water management solutions to end-users in the agricultural sector in view of improving efficient and quality improving solutions.

• Contributing to a thematic network on water in agriculture with the involvement of practitioners and other stakeholders throughout Europe to disseminate information and develop solutions.

• To support the integration of water related issues in the EIP on "Agricultural Productivity and Sustainability", including linking up with EIP operational groups and actions.

Project partners:

1. University of Turku	Finland
2. Luode Consulting Ltd.	Finland
3. Masinotek Ltd.	Finland
4. Swedish University of Agricultural Sciences	Sweden
5. Upwis Ltd.	Sweden
6. University of Natural Resources and Life Sciences, Vienna	Austria
7. Vienna University of Technology	Austria
8. Complutense University of Madrid	Spain
9. WWF Spain NGO	Spain
10. Ardenis Ltd.	Latvia
11.Flydog Solutions Ltd.	Estonia
12.Cleantech Estonia NPO	Estonia

3.16 Urban city sensor network for sustainable city development – Green IoT

Many cities experience serious air pollution and greenhouse gas emissions, which are made worse by increasing traffic congestion and later contribute to total pollution. There are efforts being made to monitor the air quality in order to set in countermeasures when and where needed, for instance, to clean the streets from dust to reduce the amount of toxic and harmful contents in air and water.

The project will result in an integrated solution for an environmental sensing system and application platform for the public sector, enabling green and sustainable growth of society targeting an improved environment and economical growth. The proposed Green IoT platform will create opportunities for actors to develop new sensing products, and to innovate applications, e.g. for

smart cities, based on the sensor data generated. The project will also make our IoT solution available as a general testbed for citizens and organizations to develop new green ICT applications and create business opportunities worldwide. Green IoT can be seen as a vehicle for making large amounts of sensor data available through advanced tools for professional decision making (e.g. for city planning) as well as through smart apps for that can be used by citizens to make green decisions in their daily life.

Project partners:

1. Uppsala University	Uppsala
2. Uppsala Municipality (contributing partner)	Uppsala
3. UPWIS AB	Uppsala
4. 4Dialog	Uppsala
5. SenseAir	Delsbo
6. SICS	Stockholm
7. KTH (Royal Institute of Technology)	Stockholm
8. Ericsson (supporting partner)	
9. IBM (supporting partner)	

4 In the halfway - looking forward

The project is still ongoing, but it is expected that by the end of it, the networks and cooperation develop further and result in a basis for concrete measurements, more initiatives and innovations. Partners will promote research and technology development and share their knowledge and networks in all the communication, both inside the consortium and in and between the regional clusters to provide support for the new ideas and actions.

BalticFlows project has created new clusters and fed the activity of already existing ones, since the cluster work is a natural way to combine the actors from research, business and other sectors. Clusters act as an important tool when setting base for the cooperation and planning initiatives in and between the regions, as established clusters open opportunities for new innovations by bringing together different areas of expertise and ambitions. In Turku region, for instance, the partners have opened discussion about preparing joint promotion material for the local cluster and the possible benefits of combining actors of diagnostic sector with environmental side to support the development of sensor technology.

Some of the regions already have an extensive expertise in stormwater management and urban planning. This expertise and long-term experience in preventing flooding in sealed, urban areas is a commercial advantage. It can also benefit other regions directly or it may be utilised by developing the technologies further, for instance by applying them suitable for different climate conditions or connecting them with other technologies, like sustainable methods for water purification or nutrient recycling.

One further example of concrete ideas is testing areas for device for monitoring of water quality: Main sources for diffuse load in streams and rivers are the same in every region in Europe; industry, wastewater treatment and agriculture. Cost-effective, sustainable and reliable solutions are needed for water protection; to observe the quality of water and to diminish the possible harms caused by sudden incidents. Continuous water quality monitoring technologies with multi-parameter sensors, data apps and easy usability still require further development and cooperation between municipalities, scientists, enterprises and clusters. BalticFlows partners could support the research and development phase not only with its own expertise but also by networking the actors with other biotechnology experts and by planning or setting up pilot areas for testing and evaluating the new innovations.

The knowledge recognized and evolved during BalticFlows project can later be commercialised widely around the world, not only in stormwater issues, but also in countries challenged with water pollution or areas needing help for planning better water management programs. As an example, the rapidly growing cleantech markets in developing countries; China, Southeast Asia and African continent offer an opportunity for business based on expertise and networks of the regions. Thus, the contacts and networks of the consortium can have a remarkable impact in matchmaking the actors and the markets of the field in the future.

Finding the true strengths, business opportunities and needs for further development contributes also the focusing process of the smart specialisation strategies of the regions. The focuses of the regional strategies need then to be taken in consideration when planning national and EU-level strategies and programs. It is also noticeable, that verifying synergies between regional, national and EU funding instruments promotes innovations and economic growth. It is obvious that a deeper cooperation of actors of all the levels and all the roles must be set as a goal when making decisions for the future prosperity.