WATER JOINT PROGRAMMING INITIATIVE WATER CHALLENGES FOR A CHANGING WORLD 2018 JOINT CALL Closing the Water Cycle Gap To Ally Technology, Nature and Society for integrated urban water management ATENAS

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Part C

WATER JOINT PROGRAMMING INITIATIVE

WATER CHALLENGES FOR A CHANGING WORLD

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1. EXCELLENCE

1.1. Introduction

The access to good quality water resources worldwide and increasing stress on water resources due to climate change and resource overuse, have become important drivers for setting SDG tackling water issues (SDGs 3, 11, 13 & 14). Cities are increasingly in the focus of water related challenges because a number of their inhabitants rapidly increases in many regions, and the pressure on land is high, due to people aspirations, environment misuse and poor planning both spatial and socio-economic. Additionally, aging of urban population, poverty of proportion of society, and high accumulation of assets, make cities vulnerable to many aspects of water cycle disruption, including flooding and droughts, urban heat island and its consequences. Decades of conventional urban water management targeted ultimately at water provision and draining led to decline of groundwater resource, deterioration of surface waters, drying out of headwaters and related ecosystems. Cities reached the state of land-water- climate nexus situation. Untangling the nexus requires innovative thinking within the field of technology and engineering, built upon flexible approaches and behavioural change among decision-makers and users. It also calls for resilient, self-adapting measures featured for synergistic provision of multiple benefits.

This project aims to contribute to closing the water cycle gap through securing water cycling and the quality of urban runoff and of CSOs by using Nature-Based Solutions (NBS), but also increasing the resilience of urban systems to dry periods. The ambition is to increase project's impact through triggering learning process among the water users. For that purpose it develops real scale demo-sites in a gradient of urban pressures and urban dynamics, to embrace a range of conditions for future applications.

1.2. State-of-the-art and relation to the work programme

Water scarcity affects at least 11% of the European population, to great extent due to climate change. However among the reasons, the European Commission mentions also leakages in the water supply infrastructure, the lack of appropriate water-saving technologies or simply good practices and will. Cities are places, where innovation and high technologies develop, but these hot-points of human and economic capital appear to be very inefficient in low impact land development, water harvesting and re-use, losing every day tonnes of blue and grey water, from the areas where the water is most needed. Considering related challenges such as: air pollution, health issues, need for housing, societal isolation, etc., there is a pressure to create spaces meeting needs of nature and society. The numerous international projects[1,2,3, 4,5] demonstrate that required knowledge and technology exist within the area of NBS. Also Report by European Commission on nature-based solutions (EC, 2015[6]) provides a number of exemplary application of NBS aimed at increasing flood and drought control, quality of water, air, soils and biodiversity, and food / materials production. However as pointed by the IHP Phase VIII Strategy[7] and the goals of the EU R&I policy agenda for NBS and Re-Naturing Cities, the most urgent scientific gaps that handicap NBS implementation are: incomplete understanding of hydrological processes linked with atmosphere/biosphere/human society, lack of data integration, scaling issues, predictive capabilities of hydrological interactions and feedbacks with socio-ecological systems, incomplete evidence and knowledge base for nature-based solutions, and uncertainty communication. Additionally both documents point the significant role of people and their behaviors for sustainable water resource use and development.

Considering the state of art, ATeNaS brings together institutions with broad experience in interdisciplinary research, ecological engineering and NBS implementations, knowledge co-creation, and living-labs approach to

[1] TRansitions to the Urban Water Services of Tomorrow (TRUST) - http://www.trust-i.net/index.php
[2] Managing Water for the City of Future (SWITCH) – http://www.switchurbanwater.eu
[3] Sustainable Water ActioN (SWAN) - http://swanproject.arizona.edu/
[4] Holistic Surface Water and Groundwater Management for Sustainable Cities (WATER4CITIES)- http://www.water4cities.eu
[5] Green Cities for Climate and Water Resilience, Sustainable Economic Growth, Healthy Citizens and Environments (GrowGreen) - http://growgreenproject.eu
[6] Towards an EU Research and Innovation policy agenda for Nature-Based Solutions & Re-Naturing Cities
[7] http://unesdoc.unesco.org/images/0021/002180/218061e.pdf

facilitate moving from local implementations to large scale impact following the principles of solving wicked problem.

1.3. Objectives and overview of the proposal

ATeNaS merges innovative approaches in the field of water storage and purification based on NBSs. This was pointed by EC (2015[6]) as the most promising area to generate green growth, followed by social inclusion and equity being the target of ERA. Considering that, urban water management nexus requires twofold, parallel action: (1) to strengthen adaptive capacity of cities by establishing innovative solutions linking technology with ecosystem services towards one system capable to evolve and adjust to changing conditions; (2) to make investment in education, information exchange and empowering of local leaders, who are able to mobilize people effort and attention locally, to produce global transformation.

ATeNaS sets three basic objectives:

1. To overview, select, co-design and re-design of NBS able to address two aspects of water gap – quantity and quality - in the context of city gradients (reflecting density of population and infrastructure)
2. To develop scenarios for implementation of NBS in partner demonstration sites, based on running pilot projects, and modelling their effect based on upscaling, diversification and replication;
3. To secure the continuation of the approach beyond ATeNaS lifetime by identifying, supporting and building the capacity of local leaders in mutual learning process.

The progress indicators refer to the following objectives:

1. The "cookbook" of tested NBS and a check-list of critical points with potential for application to other NBSs that will be develop after the project, in the frame of the web-platform. Critical points for implementation: stakeholder map, NBS pre-selection, local workshops (at least 2 per site) for NBS co-creation and re-design, training materials (2 brochures); participatory small NBS implementations (1-2 per site), link with local SMEs.
2. Analysis of biophysical context for NBS implementation in demo-sites with monitoring recommendations; conceptual model showing the cumulative impact of NBS application on water quantity and quality, using of available water quality indicators, this requires: data sets from each site, map of hot-spot areas, selected NBS meeting local needs;
3. Local leaders identified: at least 3 NBS and water management trainings in each demonstration site, guidelines for small scale NBS implementations; publications in local newspapers promoting low cost implementations for solving water quality and quantity problems; open access information to IHP Ecohydrology demonstration site (http://ecohydrology-ihp.org/demosites/), data publication with Oppla and LTER DEIMS portal.

1.4. Research methodology and approach

The project merges together three approaches in order to create a new value and stimulate innovation process in three domains: societal, scientific and economic. The learning alliance approach, originating from area of water conflict resolution, opens a way for mutual learning among civilians, decision makers, engineers and academics, breaking the communication and value barriers and opening a deliberative process for envisioning of targets. Inspired by the IUCN BioBiz methodology[8] ATeNaS will also facilitate exchange of knowledge among civilians, decision makers and business partners focused on exploring options of NBS funding, nature stewardship and responsible business. The living lab approach allows the Alliance community to analyse the institutional, environmental, and societal contexts, define information gaps and sources and co-design the solutions, translating consensus into operation (taming the wicked problem).

The project is built around three demonstration sites, covering urban and periurban zones of Lodz (PL), Lyon (FR) and Vantaa/Helsinki (FIN) and sharing the challenge of enabling water to citizens and nature, both in terms of quality and quantity. The **collaborative actions including academia, SMEs, decision makers and citizens will focus on:**

[8] https://www.iucn.org/sites/dev/files/content/documents/iucn-biobiz-flyera5-hires.pdf

1/ **The upper catchment of the Lodka Riv.** (Lodz, Poland). Challenge: Permanent river turned into temporary stream due to limited urban runoff restitution amplified by geological conditions, pluvial flooding and drought, stewardship. Intervention: ATeNaS will support an analysis of options for increased water storage and infiltration in urban commons through participatory design and implementation of demonstrative NBS as community building action. It will help to promote idea of stormwater retention, to link citizens with SMEs and decision makers, to establish community of practice and strengthen local leaderships. ATeNaS is also to support development of Sustainable Drainage Scenario for the area considering multifunctional spaces and will be the first step towards setting up the whole city hydrological monitoring network and development of hydraulic model (foreseen in the City plan for 2022-25).

2/ **The City of Vantaa and Helsinki Region (Finland).** Challenge: Stormwater flood risks aggravated by climate change, increased soil sealing, runoff from traffic areas polluting brooks, modified channels of brooks and rivers decreasing ecological values. Intervention: ATeNaS develops tools that will help to analyse the impacts of land use changes, apply of green area factor, model surface flows and find acceptable targets for different areas. The project examines the reception and maintenance of recently implemented stormwater retention measures, gathers data on the experiences of their benefits, promotes collaborative action for the restoration of rivers and brooks, and analyses opportunities and challenges in mainstreaming NBS. The application of bio-filtration in the treatment of runoff waters is supported by developing ways to include it in street planning practices. Based on existing experiences, the project enhances local participation in NBS development through co-design approaches, applying experiences from urban activism, and helping to maintain continuous monitoring and feedback systems.

3 / **The West Lyon suburban basin (France)** is representative of the rapid urban expansion that is developing around large cities. Challenge: Degradation of ecosystem services such as self-purification provided by small rivers. Intervention: To maintain these services, they must be identified in the territory and propose new management strategies that are compatible with economic development, as well as the sociological, regulatory and cultural aspects. This involves training of decision-makers to understand the operation of NBS but also to benefit from their feedback on poorly managed NBS. The Lyon demonstration site develops the analysis of the self-purification capacity of the territory's rivers, lists the NBSs, develops partnership with stakeholders for the construction of three new NBS to amplify the self-purification capacity of small rivers, produces an educational video of this device from the design to the functional evaluation with stakeholders, contributes to the rehabilitation of a NBS dedicated to the treatment of runoff urban area.

Workpackage specific methodology:

WP1: The critical points of NBS application will be analysed by reviewing ongoing developments in different contexts, using data from recent inventories and in-depth study of case areas, to create basis for the selection and re-design of NBS. The review is based on published NBS studies and presentations, such as almost 1000 NBS examples from across 100 European cities collected in Urban Nature Atlas by Naturvation project and H2020 Connecting Nature. This data is accompanied with national inventories on NBS in sustainable water management and workshop discussions on critical success factors and barriers with stakeholders from case areas. We address different types of critical points in all phases of planning and implementation process and develop indicators for them. We consider technical, ecological, organisational, social and economic aspects and explore how different factors are interconnected. Through the analysis of local context-dependencies, we distinguish critical points for replication and up-scaling of NBS.

WP2: To meet already identified knowledge needs, and provide a basis for critical NBS overview ATeNaS will implement a nested models approach, with a simple model to develop diagnosis at a watershed scale. A mix conceptual-deterministic model will be used to simulate scenarios of cumulated and combined effect of NBS and temporal dynamic of a NBS system. Because NBS systems in cities are space constraint, they need to be of limited size and thus the impact can be generated only based on synergistic effect. Hence identification of catchments hot-spots for replication of co-designed NBS is to be an important task for WP2, taking into account possibility of amplification of natural processes with ecosystem engineering, and interaction of NBS. The basin scale approach will apply a simple GIS based model.

WP3: Capitalizing on the information about environmental context (WP2) and critical stakeholders (WP1/5) and engaging the business partner FPP Enviro, ATeNaS will carry an overview of both popular and site specific NBS, including ecohydrological NBS elaborated within UNESCO IHP Water Family. The selection will be verified and reduced during expert workshops, when only NBS of the highest usability and feasibility for the demonstration sites will be chosen. Those will be presented to stakeholders as a basis for co- and re-design workshops focused on meeting local needs, including multi-functionality, aesthetics, sense of place and education. The exemplary NBS implementations will be facilitated in all demo sites.

WP4: Based on identified hot-spots for water and nutrient regulation (WP2) in catchment scale, and considering opportunities/constraints of NBS implementation (WP1), ATeNaS will analyse together with local decision makers the upscaling options for NBS implementations in each demo site: their best locations in terms of land availability and interest of local communities, and areas of particular needs: water purification, water augmentation, arrangement of common spaces, education and risk management. Funding options and local expertise (e.g. dedicated SMEs) will also be considered. The proposal will be verified by models of WP2.

WP5: In science-policy-society dialogue ATeNaS follows a co-design and co-creation methodology currently being developed and tested at various projects at SYKE (e.g. EKLIPSE and BRO). The approach covers joint framing of challenges, contextual analysis, innovative integration of solutions and synthesis through a range of joint activities. The analysis will follow Multi-Criteria Decision Analysis (MCDA) approach that supports comprehensive and interactive assessment of alternatives. Collaboration is organised following the practical guidelines of The BiodivERsA Stakeholder Engagement Handbook (www.biodiversa.org/stakeholderengagement). The co-design approach will enable mutual learning, real time and ongoing feedback, cross-fertilization of ideas and NBS design to meet the needs of the end-users.

1.5. Originality and innovative aspects of the research (ambition)

Nature Base Solutions for increasing water and climate resilience of urban areas is an innovative approach itself as the concept is novel. Despite of NBS being claimed by IUCN (2012)[9] and EC (2015)[10] as low-cost, high technologies enhancing the insurance value of ecosystems and making possible both urban regeneration, and multi-functional watershed management, there is still little knowledge on critical factors enabling NBS, the thresholds for their efficiency, and hardly any evidence on integrated, NBS-based water management in practice.

The innovation and originality of ATeNaS is:

- In the field of research and technical innovation – pooling knowledge from already funded RDI in the area of NBS for enabling the process of critical analysis of available NBS options, and their adjustability learning from North-South and urban-suburban gradients;
- In the field of enabling science to society – checking and demonstrating the possibilities of impact of NBS on risk mitigation, and cities resilience, through relevant modelling techniques, and co-design of small scale, exemplary NBS as stimuli for bottom-up movement and NBS as business options;
- From perspective of social innovation – establishing new governance, business and organisational models for managing greenery and water through knowledge accelerators, which translates diversity of stakeholders education, occupation, functional background and experiences into SMART vision.

1.6. Clarity and quality of transfer of knowledge for the development of the consortium partners in light of the proposal objectives

ATeNaS will bring a new dimension to the collaboration of the partners under umbrella networks. It will:

- Bring together and capitalize on an unique expertise of partners, namely ERCE's experiences in development of learning alliances, research and innovation in the area of ecohydrological NBS,

[9] IUCN, 2012. The IUCN Programme 2013–2016. IUCN, Gland, p. 30.

[10] European Commission, 2015c. In: Innovation, D.-G.F.R.A. (Ed.), Towards an EU Research and Innovation Policy Agenda for Nature-based Solutions & Re-naturing Cities - Final Report of the Horizon 2020 Expert Group. European Commission, Directorate- General for Research and Innovation, Brussels, p. 74.

collaboration with industry, SYKE's experience in citizen science, ecosystem service research, and decision-making support, IRSTEA's leadership in experimental field studies, hydraulic modelling and environmental diagnosis tools, and finally FPP Enviro expertise in implementation of small and large scale ecosystem engineering projects focused on sustainable water use and climate adaptation.

- Enable translation of interdisciplinary research being core activity of the partners into innovative practical solutions and approaches.
- Allow exchange and cross-pollination of ideas, and synergy of actions across sites, communities and research teams, as well as continuous learning through study and monitoring visits, all being believed as both prerequisite of learning and an important condition of novelty and innovation[11].
- Create environment enabling citizens, academics, decision makers and other stakeholders locally to benefit from the interactions, through fostering dialogue over critical issues, common understanding, co-design of solutions, thus through creating the sense of place, and ownership of the approaches[12] what stimulates stewardship attitudes and enable societal transitions towards more sustainable lifestyle and behaviours.
- Allow providing a feedback on applied approaches and know-how to the networks, which the partners are part of.
- Allow analysis, testing, improvement, broader implementation of tools, pilot solutions, known NBS and thus advancements in the field of research, technology and innovation.
- Provide seed funding to initiate new plans, analyse new NBS implementation options, dissemination of ideas within and between demonstration sites.
- Allow understanding of barriers to NBS implementation and analyse options of overcoming them using human and social capital of the consortium partners and demo sites to better streamline research, education and collaboration.

1.7. Quality of the consortium partners and collaborative arrangements. Capacity of the consortium to reinforce a position of leadership in the proposed research field

All the partners have strong track record in research, innovation and implementation of NBS as well as in international and local / regional collaboration, including transdisciplinary activities and living lab approach.

ERCE PAS will bring to the consortium well established learning alliance, being since 2005 a fully operational multi-stakeholder platform strongly focused on sustainable water management, ecosystem services, river rehabilitation and integrated revitalization of the City of Lodz (societal, ecological and economic, based on use and transfer of new technologies and blue-green solutions), its long-term experience in collaboration with the City offices and Regional Board for Water Management, as well as methodology related to deliberative processes, living lab approach, SMART visioning, knowledge accelerators. ERCE will contribute also with data on implementations of ecohydrological NBS for improved water quality and quantity, and whenever applicable its patented solutions at TRL 7 and 8 serving water infiltration and purification. Projects: SWITCH (www.switchurbanwater.eu), EH-REK Life + (http://www.arturowek.pl/), EKOROB Life + (http://www.ekorob.pl/); ENVEUROPE Life + (www.enveurope.eu); AMBER (http://amber.international), NAIAD (http://naiad2020.eu), ENABLE (http://projectenable.eu).

SYKE brings expertise on the development of nature-based solutions, mapping of ecosystem services, analyses on land use management practices, application of high resolution GIS data, modelling of surface flows and floods, sustainability assessments, ways to improve science-society-policy interface, co-design approaches, methods for evaluating acceptability, benefits and cost-efficiency of a project, and multi-criteria decision analysis and support systems; methodologies and background information highly relevant to the ATeNaS project. Projects: OpenNESS (www.openness-project.eu/), EKLIPSE (www.Eklipse-mechanism.eu/), Esmeralda (http://www.esmeralda-project.eu/), Enjustess (www.syke.fi/projects/enjustess), IMPERIA (http://www.ymparisto.fi/en-US/Sea) and BRO http://www.syke.fi/en-US/Research).

[11] Fine, G. A., & Deegan, J. G. (1996). Three principles of Serendipity: Insight, chance, and discovery in qualitative research. Qualitative Studies in Education, *9*(4), 434–447.

[12] Garard, J., Kowarsch, M., 2017. Objectives for Stakeholder Engagement in Global Environmental Assessments. Sustainability 9: 1571

IRSTEA brings to the consortium its competence in modelling hydrological processes at different scales, in particular, the modelling of intense runoff in the form of production and the transfer and accumulation maps at the watershed scale[13]. Their functionalities open the possibility for detection of hot spots of metabolism (like humid zones) modulated by water circulations and add a new layer of knowledge to a landscape management balancing the natural carrying capacity with human pressures, as describe in the principle of the Ecohydrological management[14,15]. Irstea has also conducted local scale experiments on possibilities to amplify little rivers self-purification capacity by hydromorphological development[16]. Irstea will also contribute with know-how on the enhancement of urban rivers, including physical, biological, sociological and reglementation aspects. Projects: URBEM (http://www.urbem.net/theproject.html); OpenNESS (www.openness-project.eu/). All these skills allow Irstea to povide an ecohydrological modeling approach to the scaling of in river NBS systems. Irstea shares with partners the experience in assessing the value and the ecosystem services management[17].

FPP Enviro will contribute experience in conceptualising, design and construction of blue-green infrastructure for onsite stormwater retention in cities. The company is the first one on the Polish market practically linking together stormwater retention with biodiversity maintenance and climate adaptation. It transfers experiences from the Danish market through its sister company AmphiConsult (www.amphi.de), as well as designs and implement own innovative products. Projects: Life+ Best for Biodiversity (http://www.bestpractice-life.pl/), Life+ RadomKlima (http://life.radom.pl); CLIMCITIES, EEA Financial Mechanism - Bilateral Cooperation Fund, „Wczujmy się w klimat!" - Development of Urban Adaptation Plans for cities for one of the 44 cities taking part in the project; H2020 RECONNECT (https://cordis.europa.eu/project/rcn/216089_en.html).

The strength of the consortium emerges not only from individual achievements but also lasting cooperation under the umbrella of big networks: European Long-Term Ecosystem Research Network (Lodz and Helsinki are the LTSER platforms; http://www.lter-europe.net), UNESCO IHP Ecohydrological Programme (Lodz and Lyon are EH demonstration sites; http://ecohydrology-ihp.org/demosites), and ALTER-Net Network of Excellence (http://alter-net.info).

2. IMPACT

2.1. Impact of the proposal

1. Improved use of scarce human and financial resources in the area of water research and innovation and reduced fragmentation of water research and innovation.

ATeNaS wants to capitalize on knowledge on NBS and NBS related innovation funded nationally and internationally within RDI framework, and make it accessible to non-professionals; it aims at triggering citizen science, making equal use of common and expert knowledge to create new values and water best-management practices; partners membership in big networks– LTER Europe and UNESCO IHP, secures pooling and dissemination of research and innovation, as well as continued networking and knowledge sharing.

2. Synergy, coordination and coherence between national and EU funding in the relevant research fields through transnational collaboration;

ATeNaS builds upon established long-term collaboration among stakeholders and embeds its actions in local needs and investments aimed at meeting EU regulations (WFD, Nitrogen, Habitat), international commitments – COP21, SDG, and EU strategies – cohesion policy. It contributes to national strategies of sustainable development and climate adaptation. The exchange of knowledge and research mobility is to be secured with joint meetings in demonstration sites, links with other projects of similar scope, and international networks.

[13] http://www.sciencedirect.com/science/article/pii/S002216941630316X

[14] Zalewski, M., Janauer, G. A. & Jolankai, G. (1997) Ecohydrology. a new paradigm for the sustainable use of aquatic resources. UNESCO IHP Tech. Document in Hydrology no. 7, IHP-V Projects 2.3/2.4, UNESCO, Paris, France.

[15] Zalewski, ML (2000) Ecohydrology. The scientific background to use ecosystem properties as management tools toward sustainability of water resources. Guest Editorial. Ecol. Engng 16, 1-8.

[16] https://link.springer.com/book/10.1007%2F978-3-319-70548-4 P145:147

[17] http://dx.doi.org/10.1016/j.ecohyd.2017.02.001

3. Improved implementation of research and innovation programmes

Experimental NBS implementations based on co-design and living-lab approach, subcontracting of local SMEs for implementations for: dissemination of best practices among citizens, SMEs and decision makers, learning about business options related to NBS; extensive trainings to support local leadership, and trigger citizen projects; toolbox for modelling of synergistic NBS effect on water management and society

4. Strengthened international leadership of European research; Contribution to the implementation of the objectives of the JPI on Water;

Tested measures and means in the field of implementation, analysis of boundary conditions for NBS in cities, attracting of citizen attention and knowledge sharing, as well as models developed within ATeNaSwill be effectively promoted as outcomes of Water JPI and European Research Area within global UNESCO and LTER networks, and will be incorporated into Pan-European efforts for establishing demand driven research infrastructure.

5. Implementation of the Sustainable Development Goals (SDGs) as well as the conclusions of the COP21 Paris Agreement27

Combining measures for improving quantity and quality of water in urban areas with development of green infrastructure and multifunctional spaces, in collaborative, participatory way, makes water resources more accessible to all city inhabitants, promote social inclusion, healthy lifestyle, and also contribute to lowering carbon and water footprint, as NBS promote low impact and self-regulating measures;

6. Strengthening the competitiveness and growth of companies by developing innovations meeting the needs of European and global markets; Delivering innovations to the public and private markets, including public administrators (public executive bodies) and civil society organisations

Establishing of mutual learning process with number of actors including local companies; subcontracting local companies for implementations allowing public participation; supporting citizen learning- providing trainings on NBS design and implementation; supporting decision makers in awareness building, serving know-how for implementation on NBS for climate adaptation and water regulation

The foreseen added value includes: aligning with national and international funding priorities, capitalizing on research already funded, access and contribution to RDI nationally and internationally, building awareness of availability of NBS at TRL above 6 and contribution to assessment of their social and economic acceptability.
Additionally ATheNaS will keep close contact with EIP Water, learning from the task studies e.g. on barriers and bottlenecks for Innovation in the Water Sector and Best Practices on Urban Water Cycle Services, and sharing experiences related to collaboration with business (green business options in Poland, Finland and France differing culturally and demand-wise considering NBS) and participatory implementations as the life beyond the project approach.

2.3. Expected outputs

The general project outputs include:

1. Reports (8) summarizing subsequent steps in barrier overcoming, co-design, planning for and implementation of NBS, translated into short brochures for local communities use.
2. The model of biophysical context of each demo site and model-based overview of critical biophysical conditions for NBS implementation in demo-sites (maps of local hot-spot areas for special management purposes and NBS, technologies, ecosystem engineering implementations;
3. Provision of a free plugin of the Model for "NBS suitability" to help in the decision process
4. Five peer reviewed publications summarizing outcomes of workpackages;
5. Established local multi-stakeholder platforms / learning alliances (in each demo site), and identified local project leaders or activists for beyond project collaboration and dissemination of NBS knowledge;
6. Meetings of learning alliances / stakeholder platforms (at least 2 in each demo site);
7. Project presentation at conferences (3);
8. Locally co-designed projects of NBS, with overview of co-benefits and life-cost estimation, and demo site plans serving for NBS replication and upscaling as education tool serving beyond project lifespan;

9. Educational / dissemination events in each demo site presenting outcomes of the projects and know-how on NBS applied in Europe
10. NBS cook book – guideline on how to co-design and design small NBS, implement them and plan for upscaling for reaching the synergistic effect;
11. 2-3 movies presenting NBS implementation.

Site specific outputs:

Lodz - Lodka River	Lyon - Yzeron river	Finland - Vantaa / Helsinki
- Participatory implementations 1-3 small NBS using innovative ecohydrological biotechnologies; - Overview of local / regional companies engaged in green business: small „who is who“ guideline available to citizens and decision makers - Translated guideline on NBS role and implementation - Report: Needs and possibilities to apply NBS in the upper Lodka catchment for improved water cycling; - Overview of needs and options for setting up an integrated monitoring system for water resources as a contribution to LTER-Eu Ri ESFRI project to set up monitoring master sites across Europe;	- Construction of 3 new NBS with innovative principles adapted to intermittent rivers; - Report on co-building method with stakeholders and private companies with capacity for replication; - At least one national and one international conference (co-organisation of EcoHydroEco 2020, Faro, Portugal) where to issue experience gained and decision support guidelines; - Definition of indicators and monitoring of new constructed NBS efficiency;	- A basis for a planning tool to reconcile infill development targets and with sustainable water management, based on forecasted: land use, soil sealing, surface flows and floods; - Model for mainstreaming stormwater retention measures and other NBS in urban planning; - Guidelines for how to integrate bio-filtration of runoff waters in street planning practices; - Organized events and web publications focusing on river and brook restoration and multiple benefits received; - Online publication on new social innovations for NBS use, e.g. new practices to take advantage of restored water ecosystems by different users, such as elderly inhabitants or immigrants;

2.3. Exploitation and communication activities (measures to maximise impact)

ATeNaS will ensure aligning outcomes with national and international funding priorities, capitalizing on research already funded, access and contribution to RDI nationally and internationally, building awareness of availability of NBS at TRL above 6, also among SMEs, and contribution to assessment of their social and economic acceptability. ATeNaS will serve knowledge and established NBS as pilot, monitoring and demonstration infrastructure to the pan-European eLTER Research Infrastructure (eLTER RI), which has been included on the ESFRI 2018 roadmap (http://www.lter-europe.net/news/elter-on-esfri-2018-roadmap), focusing particularly on securing implementation of site common and expert knowledge, recommendations for environmental monitoring systems with respect to NBS, accessibility of sites for trainings and educational purposes. All the results will be also advertised: across 400 LTER Europe sites and its 70 socio-ecological platforms (LTSER) located in 24 European countries, and national networks of LTER worldwide, on the UNESCO IHP Ecohydrology platform focused on implementation of best practices in ecohydrological NBS, and UNESCO Chairs and Centres, through ThinkNature platform, and OZCAR - a French network (http://www.ozcar-ri.org/), which Lyon demo site belongs to.

Additionally ATeNaS will keep close contact with EIP Water, learning from the task studies e.g. on barriers and bottlenecks for Innovation in the Water Sector and Best Practices on Urban Water Cycle Services, and sharing experiences related to collaboration with business (green business options in Poland, Finland and France differing culturally and demand-wise considering NBS) and participatory implementations as the life beyond the project approach.
ATeNaS will produce scientific papers, brochures in national languages, training materials which will disseminate knowledge among scientists, civilians, local and national practitioners. It will produce short documentary videos of

expert interviews and case areas, guide maps presenting NBS demonstration sites as well as carry organised walks and events in the case areas. It will also link up with NGOs of international character, focused on ecosystem services, NBS, and citizen science, e.g. Sendzimir Foundation to ensure advertisement of generated best-practices and knowledge on partner's websites, and use knowledge and data platforms like Oppla, Urban Nature Atlas, the data base of LTER-Eu – DEIMS.

2.4. Market knowledge and economic advantages/return of investment

In principle no commercialisation is foreseen as the project is to use public money to develop local economic, social and ecological capacities. All the products will be freely available to communities and researchers willing to learn about NBS and implement them; ATeNaS will establish the website, as stakeholder forum, will link to websites of NGOs and educational institutions to enable broader dissemination of knowledge. The number of flyers, newsletters, booklets with technical information, posters, publications in local media will be produced. Also educational programmes for schools, students and civilian trainees will be developed. Knowledge generated by ATeNaS will be published on Oppla, made globally available within UNESCO Water Family and ILTER network and data will be stored on DEIMS data base of LTER-Europe.
However ATeNaS will guarantee the return of investment in threefold way:

1. Application of models in different contexts (WP2) will allow their testing and improvement towards better decision support and thus will increase the TRL;
2. Living lab and BioBiz approach (WP3-5) will provide space for innovative thinking about existing and possible NBS structures and implementations, and wherever applicable the new idea will be translated into new projects and/or prototypes/pilot studies (TRL 1-3);
3. A holistic approach including: analysis of institutional and contextual barriers, implementation of knowledge accelerators, and collaborative work on the SMART visions for demonstration sites, will contribute know-how to two global networks focused on R&D and socio-ecological studies: ILTER and UNESCO IHP Ecohydrology Demonstration Sites, advancing their interdisciplinary and cross-sectoral methodologies.

3. IMPLEMENTATION

3.1. Overall coherence and effectiveness of the work plan

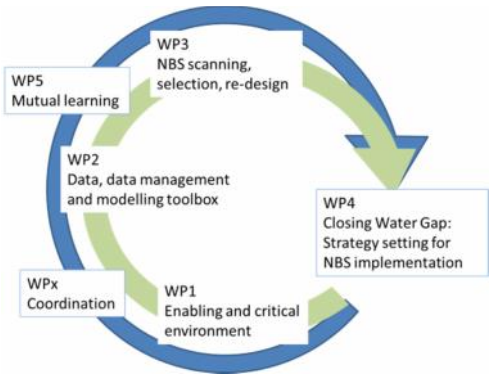
WP Number	WP Title	Duration (months)	Starting Month	End Month
WPX	**Coordination & management**	**36**	**1**	**36**
WPX description	WPX will set up a project management office to ensure a productive and smooth interaction and collaboration among project partners and monitor progress with milestones and deliverables. It will facilitate exchanges between partners through arranging meetings, researcher and key stakeholders mobility. It is also dedicated to project reporting and functions as contact point for JPI-Water.			
WPX deliverables	D.X.1 Setting the ATeNaS project website (month 2) D.X.2 Periodic summaries on project progress (months: 4, 8, 12, 16, 20, 24, 28, 32) D.X.3 Mid-term consolidating study meetings in demonstration sites (months: 10, 15, 19) D.X.4 Final report of the project to JPI Water (month 35)			
WPX milestones	M.X.1 Setting up the office (month 1) M.X.2 Kick off meeting (month 1) M.X.3 Informative brochure in local languages (month 2) M.X.4 Launching meetings for local stakeholders meeting in demo sites (months 3-4) M.X.5 Annual reporting to funding agencies (months: 12, 24, 36) M.X.6 Annual and final meetings (months: 10, 19, 34)			
WP1	**Enabling & critical environment**	**18**	**1**	**18**
WP1 description	WP1 will explore the performance of past and ongoing NBS developments and identify critical factors (legal, societal, physical, organizational) for their success and success replication in different contexts. The potential barriers to implementing and mainstreaming NBS, as well as recommendations for overcoming these challenges, will be summarized in factsheets. The WP will also monitor and experiment with critical			

	factors by developing indicators which can be adjusted to account for different circumstances and stages of NBS implementation and functioning.			
WP1 deliverables	D.1.1.Report on critical factors and indicators in NBS planning, implementation, maintenance (month 14) D.1.2 Factsheets on barriers and ways to overcome them (month 16)			
WP1 milestones	M.1.1. Collection of case descriptions and inventories (month 6) M.1.2. Interviews / workshop discussions of case area representatives on critical factors (month 10) M.1.3 Presentation of results gathered in the report and factsheets to stakeholders in the demos (month 15)			
WP2	**Modelling for the best NBS management options**	**34**	**1**	**34**
WP2 description	WP2 will provide stakeholders decision supports maps illustrating, where the potential for the required services (e.g. water infiltration, retention, self-purification) is naturally high and where it should be amplified with NBS to compensate disturbances caused by human pressures and urban drainage systems. It will also formulate recommendations for location of new and maintenance of all the selected NBS types.			
WP2 deliverables	D.2.1 Report describing implementation and results of the "Model for NBS suitability" in the form of decision maps (month 12) D.2.2 Report describing design, implementation, construction phases and monitoring strategy of performances for the new build NBS (month 20). D.2.3 GIS plugin achievement allowing to run the model for NBS suitability mapping (month 34)			
WP2 milestones	M.2.1 Review of data imported in an open and shared GIS tool for the "large scale" modelling of the basic layers at each demo site catchment (month 3) M.2.2 Expert pre-selection of NBS and re-design options (where applicable), that correspond to hot-spot management needs – national workshops (month 13) M.2.3. Completion of D.2.2 with monitoring results (month 28)			
WP3	**NBS scanning, selection, re-design**	**25**	**10**	**35**
WP3 description	WP3 will introduce civilians into NBS planning process through workshops on NBS visioning and co-design. It will harvest from WP1 and WP2 in terms of the ready-to-go applications serving NBS implementations, and local environmental economic and community challenges. It will provide NBSs principles derived from research carried out on public funds. All the knowledge gathered during the collaborative meetings will serve the manual – "NBS cookbook" and will be implemented in exemplary NBS construction.			
WP3 deliverables	D.3.1 The NBS "cookbook" (month 34) D.3.2 The "cookbook" publication on Oppla platform (month 35)			
WP3 milestones	M.3.1 Demo site workshop on NBS co-benefits, selection and co-design for local implementations (in common with M2.2) (month 13) M.3.2 First draft of the "cookbook" to be used for M.3.1 (month 15) M.3.3 Testing the NBS "cookbook" on the Oppla platform (month 21) M.3.4 Presentation of "cookbook" and its Oppla version to stakeholders – national workshops (month 30)			
WP4	**Closing Water Gap – strategy setting for NBS implementation**	**20**	**17**	**36**
WP4 description	WP4 will take responsibility for analysing options of NBS upscaling and networking, as well as relevant governance, business and organisational schemes for managing greenery and water. It will apply knowledge accelerators, which facilitate translation of diversity of stakeholders education, occupation, functional background and experiences into SMART (Specific, Measurable, Acceptable, Realistic, and Timebound) vision. It will harvest from the co-designed solutions (WP3) responding to environmental (WP2), institutional and social settings (WP1) to serve decision making process aimed at maximizing the cumulative effects of NBSs on water, and societal engagement in implementation process.			
WP4 deliverables	D.4.1 Report on SMART visions in demo sites (month 27). D.4.2 Final report on upscaling possibilities and cumulative effect of NBS in demo sites (month 35)			
WP4 milestones	M.4.1 Pooling and review of the results of WP1-3 for analysing (month 18) M.4.2 Accomplished stakeholder workshops in demo sites focused on NBS upscaling needs and options (month 25) M.4.3 Final information and data analysis (month 32)			
WP5	**Mutual learning**	**32**	**4**	**36**
WP5 description	WP5 will arrange activities that enable mutual learning, sharing of knowledge and showcasing good practices: co-design workshops, online discussions, virtual and real courses and training for experts,			

	decision-makers and other stakeholders. Oppla platform (itself home to over 1500 users with an active interest in NBS) will be used as a main communications channel. WP will also organise assessment of project outcomes with end-users of the final outputs and facilitate international cooperation.
WP5 deliverables	D.5.1 Identification of stakeholders and ways to engage them in co-design actions (month 8) D.5.2 Online events, courses and guidance materials, such as videos (months:12, 18, 24,30) D.5.3 Publication and commenting of descriptions of demonstrations in Oppla portal (month 21) D.5.4 Presentations and discussions on project outcomes in the events organised by the project or the stakeholders, connecting particularly to companies and universities (month 27) D.5.5. Report on stakeholder assessments of project outcomes (month 33) D.5.6. Long-term plan to use project results in cities, companies and research networks (ALTER-Net, PEER; EurAqua, ESP, LTER-Europe etc.) (month 35)
WP5 milestones	M.5.1 Stakeholder mapping and organisation of networking between representatives of different cases, disciplines and sectors of administration (month 7) M.5.2 Plan for training and dissemination (month 9) M.5.3 Selections of case material to be published in Oppla Portal and other media (month 27) M.5.4. Gathering of feedback on project outcomes and impacts (month 30) M.5.5 Identification of processes and opportunities to continue them beyond the project in demo sites and cities (month 32) M.5.6. Planning of ways to bring the project outcomes to scientific discussion through existing networks (month 35)

3.2. Appropriateness of the management structure and procedures, including quality management

The project is built around a small consortium of dedicated partners with track record in international and local collaboration, proven with both a number of project and papers and well established and long lasting collaboration with national and local stakeholders. In the organization and management structure ATeNaS follows its core idea of mutual learning and co-design. The division of tasks foresees involvement of all the consortium partners in all the tasks, however the selection of the leads reflects the strongest competences of each partner. Each partner simultaneously represents a demonstration site (the city) and is committed to deliver to the city the products required locally for more efficient water management (see letters of support). The circular structure of ATeNaS reflects the information flow, and learning process, in which the products of subsequent actions feed the cycle of adjustment and improvement of outcomes, throughout the milestone structure. There are three WPs responsible for gathering and analysis of data and provide a basis for current and future implementations, with information flow as follows: WP1 providing legal / administrative/societal context for NBS implementation, WP2 complementing it with biophysical background and indication of implementation hot-spots, WP3 engaging experts and stakeholders in co-design of individual / exemplary NBS, WP4 upscaling those NBS together with stakeholders towards a desired network. WPS X and 5 are focused on facilitation of internal and external operation of the project, quality management (in terms of data, equity and transparency of actions, and the final products), and subsequent co-creation and dissemination of products through deliberative processes, engagement of civilians, city officers experts at relevant product readiness level. The management structure and procedures are flexible enough to encompass local diversity of actors, emerging needs and opportunities, and challenges.



The monitoring of the progress will be carried by ERCE along the list of milestones / deliverables and outputs serving as a progress indicators.

The mobility scheme is to serve as a management quality control and risk management tool, and contributes to progress tracking. It involves on-sites trainings which engage all consortium partners when needed (WP5), mid-term consolidating meetings (WPX), focused stakeholders workshops which will also serve as partner meetings whenever applicable.

Month/ Description	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
WPX Management MILESTONES	X. 1/ 2	X. 3		X. 4							X. 6	X. 5							X. 6					X. 5									X. 5		X. 6
DELIVERABLES		X. 1		X. 2				X. 2		X. 3		X. 2			X. 3	X. 2			X. 3	X. 2				X. 2				X. 2				X. 2				
Progress Monitoring																																				
Risk Management																																				
WP1 Enabling and critical environment MILESTONES						1. 1				1. 2.					1. 3																					
DELIVERABLES														1. 1.		1. 2.																				
WP2- Modelling for management of NBS MILESTONES			2. 1										2. 2															2. 3								
DELIVERABLES												2. 1								2. 2													2. 3			
WP3 NBS scanning, selection and re-design MILESTONES													3. 1		3. 2						3. 3									3. 4						
DELIVERABLES																																		3. 1	3. 2	
WP4 Closing Water Gap MILESTONES																		4. 1							4. 2							4. 3				
DELIVERABLES																											4. 1								4. 2	
WP5 Mutual learning MILESTONES							5. 1		5. 2																		5. 3			5. 4		5. 5			5. 6	
DELIVERABLES								5. 1				5. 2						5. 2			5. 3.			5. 2			5. 4.			5. 2			5. 5		5. 6	
Mobility Schemes																																				
Others																																				

3.3. Risk management

The obstacles may emerge from lack of local community leaders and no interest of local communities in co-creation of space and associated well-being; low interest or lack of local SMEs interested in green products and green economy; despite of general agreements with local authorities - reluctance of politicians and decision makers to contribute to scenario analysis and modelling for upscaling NBS use; no political will in follow up steps in implementations including adoption of NBS indicated in scenarios and models. The strategy to overcome obstacles is based on broad promotion of project actions, collaboration with local activists and professional educators, and established demonstration and feedback process for each step of project realization.
Internal risk management foresees frequent communication via skype (monthly), with general summarizing meetings scheduled every 4 months, with mid-term (in between teleconferences) short progress summaries and at least three joint monitoring/site seeing visits to demonstration sites in the second year of the project. Additionally each partner is obliged to report progress annually to its funding body, and to follow legislation related to ERA Net, national and institutional funding, those will determine financial management strategy of each consortium partner.

The aims of the project have been formulated in a modest way, taking into account possible risks, among which the highest uncertainty is related to engagement of local citizens. However the general goal of ATeNaS is to understand the cause of local water gaps and through analysis of threats and opportunities to sustainable water management initiate the transition, with innovation within any of the three areas: technological, science-citizen interaction and societal. Taking into account variety of foreseen project products and outcomes, meeting the goal can be secured.

3.4. Potential and commitment of the consortium to realise the project

The consortium partners have been selected taking into account:

1. Track record in societal innovation, facilitation of multi-stakeholder platform activities, interdisciplinary science: all three sites are registered as Long-term socio-ecological research platforms (LTSER) of LTER-Eu, with data and activities documented in DEIMS (https://deims.org), being acknowledged by EUDAT
2. The partners are long-term members of three Pan-European / Global networks of ALTER-Net, ILTER and UNESCO IHP Ecohydrology, with proved experience and excellence in translating high level scientific knowledge into policy, management and ecosystem engineering, as well as international programmes (UNESCO IHP Strategy VIII) with clear focus on SDG, social justice and ethics;
3. The partners have been already awarded for excellence in science/technology/development: i) FPP has got the “Best of the Best LIFE project in Biodiversity” award in 2015, for implementation of LIFE08 NAT/PL/000510: "Protection of the lesser spotted eagle in selected Natura 2000 areas”; ii) ERCE’s EKOROB Life + Project (constructed ecotones for control of diffuse water pollution) received in 2018 award as the Best Life+, and collaborative project Life+ EHREK (ecohydrological rehabilitation of urban reservoirs) received the Best of the Best Life+ award in 2018; Irstea’s experiments on influence of hydromorphological development of intermittent little rivers on its natural self-purification capacity, and reduction of the impact of polluted urban waters, has been transferred into practice in the frame of a collaborative R&D action with Egypt; the pilot implementations of ERCE’s sequential biofilter for purification of stormwaters has been implemented in Ethiopia under the umbrella of the Polish Aid Programme of the Ministry of Foreign Affairs;
4. Partners have already experience in collaboration with business and industry, and are involved in technological innovation in the area of NBS, therefore are determined to develop, test and prototype new solutions, and develop patents, e.g. BIOKER - light expanded clay-biopolymer aggregate for water purification which won a gold prize in Concours Lepine 2018 (ERCE); Climapond for stormwater retention P.419910, 21/12/2016 (FPP Enviro); Denitrification barrier for reduction of non-point pollution in agricultural catchment area P. 404407 (ERCE), Organic plate (for reduction of point pollution from storage manure in farms) P. 418169 (ERCE); Modular Organic Plate (for reduction of point pollution from storage manure in farms) P. 426506 (ERCE).

4. DESCRIPTION OF THE PARTICIPATING RESEARCHERS

Partner Number, according to Part A	Research Team Members (for personnel include name, position and affiliation)	General Description
Partner 1 (Kinga Krauze)	Maciej Zalewski, Director, ERCE PAS Chairman of the Scientific Advisory Committee/UNESCO IHP "Ecohydrology"	Expertise: use of ecosystem processes in river basins for human impact reduction, restoration of water and ecosystem resources in urban spaces, biotechnological innovation; Patents: 4 patents, including sequential biofilters for water purification; Publications: over 120 int. papers; e.g. Zalewski et al. 2012. Blue-Green City for compensating Global Climate Change. The Parliament Magazine - Politics, Policy and People, 350: 2-3;
	Anita Waack-Zając, Head of Department of Municipal Management, City of Lodz	Expertise: city stormwater management and infrastructure development (reservoirs, retention ponds, restoration, e.g. FP6 SWITCH), city pocket parks, system of water retention for upper Lodka River (technical project approved). Publications: several national and int.; e.g Wagner, I, et al. 2014. The tools for planning and strategic water management in urban space. in: Bergier,T. et al.(eds.): Sust. Dev. Appl. J.1/2014;
Partner 2 (Pascal Breil)	Philippe NAMOUR, researcher, Irstea-Riverly research unit	Expertise: analysis and modeling of biological systems; building and coordinating metrological and methodological projects involving: geomorphology, hydrology, electronics, biology; Namour, Ph.; Breil P. et al.(2012) The Water Framework Directive requires new tools for a better water quality monitoring. E-WAter, n°1, 12p.)
	Mickael LAGOUY, field monitoring technician, Irstea-Riverly research unit	Expertise: implementation of experimental field works, storing data facilities and data validation; monitoring strategies using up-to-date technologies; implementing; Braud, I. et al.(2013). Evidence of the impact of urbanization on the hydrological regime of a medium-sized periurban catchment in France. Journal of Hydrology ,Vol 485: 5-23. Journal of Hydrology, 485, 5-23)
Partner 3 (Eeva Furman)	Mika Marttunen, Head of Unit, Water Management and Governance, Finnish Environment Institute	Expertise: interactive multi-criteria decision analysis in the collaborative management of watercourses; Publications: 25 international papers; e.g. Recent articles: Söderholm K, et al. (2018). Collaborative planning in adaptive flood risk management under climate change. Water Res. Mngmt. 32 (4): 1383-1397.
	Antti Rehunen, Senior research scientist, Land Use Management, Finnish Environment Institute	Expertise: spatial analysis of built environment, land use changes and urban form; sustainability assessment methods for land use planning, and urbanisation trajectories; extensive co-operation with cities, regions and other stakeholders. Publications: 50 national publications, e.g. Rehunen et al (2018). Overview of the development of urban form in Finland 1990–2016. SYKE reports 13/2018 (In Finnish).
	Mikko Sane, Development Engineer, Water Mngmt&Gov., Finnish Environment Institute	Expertise: modelling surface flows and flood risks based on detailed GIS-data; integrating modelling to climate change adaptation measures and NBS in urban areas. Publications: 15 publications and products, e.g. Flood Map Service and current hydrological information: www.environment.fi/floods, Pluvial Flood Maps for all urban areas in Finland.
Partner 4 (Iwona Wagner)	Lars Briggs FPP Enviro President	Expertise: Biodiversity, R&D, habitat restoration, small retention, development NBS in cities; Patents: 3 patents, e.g. Climapond for stormwater retention; Publications: 10 internat. papers, e.g. Rannap, R.et al. (2012): Northern natterjack toads (Bufo calamita) select breeding habitats that promote rapid development. Behavior, 149: 737-754.
	Michał Maniakowski Biologist	Expertise: Biodiversity, monitoring, habitat restitution and re-establishing small retention; Publications: 6 international papers, e.g. MacDonald,M.A.,et al. 2012. Effects of agri-environment management for stone curlews on other biodiversity. Biol. Conserv. (148):1,134-145

5. CAPACITY OF THE CONSORTIUM ORGANISATIONS

Partner Number (Organisation Name)		General Description
Partner 1 (ERCE)	Role and main responsibilities in the project	Lead WPX: Coordination & management, WP4: Closing Water Gap – strategy setting for NBS implementation, and Demo site: the Upper Lodka River (Łódź, PL)
	Key research facilities, infrastructure, equipment	Two laboratories for water analysis, field sampling equipment, experimental sites for testing ecohydrological and biotechnological NBS, demonstration sites with water retention and purification systems in Łódź and Sulejow, field station
	Relevant publications and/or research/innovation products	Innovation: EU awards for best LIFE environmental projects – EKOROB (constructed ecotones for pollution control), EHREK (Ecohydrological rehabilitation of city river & recreational reservoirs); 3 patents, one at TRL8
Partner 2 (IRSTEA)	Role and main responsibilities in the project	Lead WP2 & WP3 and their links – modelling tools to recommend NBS and their functionalities. Represents Lyon demonstration site and links the project and local stakeholders.
	Key research facilities, infrastructure, equipment	Water chemistry laboratory for water quality survey; set of outdoor sensors; indoor hydraulic laboratory to test physical NBSs models; metrology monitoring facilities, web database management facilities (https://bdoh.irstea.fr/).
	Relevant publications and/or research/innovation products	Breil P. et al (2018) Biodegradation of Urban Stromwater Pollution in a Sequence of Constructed Porous Riffles in a Mediterranean Creek. in: Recent Advances in Environmental Science from the Euro-Mediterranean and Surrounding Regions. P 145:147; Breil P. (2017) Measuring, Modeling and Managing of the natural processes related to water flows - Social values of linked ecosystem services. Ecohydrology & Hydrobiology, 17(1): 1–3;
Partner 3 (SYKE)	Role and main responsibilities in the project	Lead WP1 & WP5, organising mutual learning activities and demo site the City of Vantaa and Helsinki Region (Finland).
	Key research facilities, infrastructure, equipment	Decision support systems, assessment methods, models, know-how on experimental research, mapping and public participatory GIS tools, environmental information systems, geographic information systems and datasets covering both built and natural environment. SYKE is ISO 9001:2015 certified.
	Relevant publications and/or research/innovation products	OpenNESS (2015). Integrating nature-based solutions in urban planning. OpenNESS brief no. 3. www.OpenNESS-project.eu Nesshöver C, et al. (2018). The science, policy and practice of nature-based solutions: An interdisciplinary perspective. Science of the Total Environment 579: 1215–1227. Flood Map Service and current hydrological information: www.environment.fi/floods; Pluvial Flood Maps for all urban areas in Finland; Liiteri information service for built environment
Partner 4 (FPP Enviro)	Role and main responsibilities in the project	Analysis of market potential and barriers for NBS enabling (WP1); scanning of NBS operating on the market (WP2); NBS demonstrative constructions (WP4)
	Key research facilities, infrastructure, equipment	Equipment for NBS construction and monitoring;
	Relevant publications and/or research/innovation products	4 patents on stormwater and biodiversity; 3 new NBS products developed and implemented on a market; 3 international and 2 national NBS research and implementation projects. Over 20 publications on the topic.