ISSN 2599-8293

European Commission

CORDIS Results Pack on

nature-based solutions

A thematic collection of innovative EU-funded research results

September 2020

Unlocking nature's potential

Research and Innovation

Contents

Editorial

Unsustainable urbanisation, climate change, biodiversity loss and the degradation of ecosystem services are just some of the challenges societies across the globe are grappling with. This Results Pack showcases nine EU-funded projects that have developed important tools and expertise to address these challenges through nature-based solutions for building sustainable, resilient and prosperous societies.

Nature-based solutions (NBS) can offer cost-effective and locally attuned answers to many of the environmental, social and economic challenges facing modern societies. While technologies and mechanisms for creating jobs and economic growth abound, it has become paramount to consider the sustainability of modern-day innovation efforts.

Urban environments in focus

NBS are designed to bring more nature and natural processes to urban and non-urban environments. The idea is that working with nature, rather than against it, can lead to a more resource-efficient, greener and resilient economy and society in a way that enhances natural capital rather than depletes it, while supporting economic growth, creating jobs and improving our well-being.

Today, 70 % of European citizens live in cities, a number that is expected to increase to 80 % by 2050. In other words, a mere 30 years from now, 36 million new urban citizens will need housing, employment and care. At the same time, the unsustainable rate of urbanisation as it is taking place today, is endangering biodiversity and natural ecosystems, as well as human health and social cohesion.

Europe already has extensive pools of knowledge, scientific expertise, and technological capability relevant to NBS. What is needed is to enhance the evidence-base and rationale and to implement nature-based solutions at a greater speed and a wider scale.

Putting the EU on the map as an ambitious global leader

The nine EU-funded projects featured in this Results Pack feed into ongoing discussions about how to improve the framework conditions for NBS at the EU policy level and support the growing European research and innovation community in the field. While more evidence and knowledge is needed to develop, upscale and mainstream NBS in Europe and globally, the projects below provide a strong foundation for future research and implementation, putting the EU on the map as an ambitious global leader in building sustainable, resilient and prosperous societies.

The CONNECTING Nature and GROW GREEN projects both promote NBS for improving well-being and regeneration of urban areas through peer-to-peer learning and capacity building between cities.

While many NBS have been tried and tested already, their implementation is not a simple matter of replacing an existing and established way of doing things. In most cases, NBS require a whole new mind-set and governance approach as well as new business and financing models. The URBAN GreenUP project has developed a digital tool to assist authorities, urban planners and citizens in identifying the NBS that best fit a city's needs. In a similar vein, the NATURVATION project's Nature Based Solutions Navigator aims to support decision-makers in identifying which kinds of NBS contribute to specific sustainable development goals, while the team behind the UNALAB project has developed a toolkit based on experiences from three European cities to support cocreation in exploring, designing, implementing and evaluating specific NBS.

Another aspect to take into consideration, is how to engage multiple levels of society - from citizens and researchers to policymakers and industry leaders - in the discussions and efforts to bring NBS into urban as well as non-urban areas. The Nature4Cities project has created a web-based knowledge and decision platform to raise awareness about NBS and foster new collaborative models for their uptake, while ThinkNature's multi-stakeholder communication platform aims to promote NBS at local, regional, EU and international levels through dialogue and interaction.

Many actions are focused on urban environments, but there are several other aspects of NBS to consider. MERCES focuses on the marine environment and how ecosystem restoration of degraded marine environments in Europe can be restored through efficient and effective NBS. Finally, the NAIAD project looks at the protective value of nature and its ability to help society reduce human and economic risks associated with floods and drought.

Nature-based solutions: Benefits and opportunities

The benefits and opportunities achievable using nature-based solutions (NBS) to address global and societal challenges have never been more relevant, important or urgently needed than now.

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Civilisations throughout the ages and across the planet have attempted to harness and utilise the power of nature, often with some success (in the short- or long-term) but also in ways that have caused great social, economic and environmental harm. However, human-induced global warming, climate change, environmental degradation and biodiversity loss – caused by pollution, lost or damaged natural habitats and urban sprawl – have all placed greater emphasis still on how our societies modify ecosystems, how we access their benefits or utilise their services, and how we protect ourselves from natural threats and disasters.

The European Commission defines NBS as "solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience; such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions." It further emphasises that "nature-based solutions must benefit biodiversity and support the delivery of a range of ecosystem services."

Urban and rural communities alike rely heavily on 'conventional' infrastructures and systems for water supply, heating, lighting, drainage, cooling and other services such as places to meet or relax. The evidence is that these older systems and technologies may no longer be fit for this purpose in the light of global changes whose impacts are being felt with increasing severity and frequency.

The urgency of these issues is accompanied by the need for rapid changes to deeply embedded and often highly valuable cultural heritage, legal frameworks, governance systems and professional and personal norms which have developed gradually, i.e. over millennia. The networks and systems that have been built up are central to the ways in which we make agreements and handle disputes between people, communities, cities, regions and countries, or even continents. The scope for making mistakes is therefore huge, but the opportunities are also great, particularly if we innovate together and learn from one another.

NBS therefore offer a major chance for innovation, with possibilities to deliver lasting and tangible benefits across different social groups, in a range of environmental, economic and cultural settings, and in sharp contrast with the ways in which conventional, 'traditional' or 'grey' solutions are designed, constructed and managed over time.

However, many NBS remain relatively novel solutions, presenting important challenges and unknowns in terms of their (co) design, operation, maintenance and how we organise their implementation. The CORDIS Results Pack on Nature Based Solutions feeds into ingoing discussions about how to improve the framework conditions for NBS at the EU policy level and support the growing European research and innovation community in the field.

Source: Nature-based Solutions: State of the Art in EU-funded Projects' (Wild et al. (Eds.).

For background information, check the European Commission's Research and Innovation website for the policy topic area on NBS. Key developments in the EC's NBS research and innovation agenda are outlined in Faivre et al. (2017). A further useful summary of key developments is available online following a recent workshop entitled 'Mobilising up-scaling of NBS for climate change throughout 2020 and beyond'.

Collaborative solutions for more sustainable, resilient, greener and healthier cities

By adopting nature-based solutions (NBS), European cities will become more climate resilient, environmentally sustainable and socially cohesive, as well as much better places to live, work and play in. An EU project is promoting the implementation of NBS across cities while maximising the multiple benefits arising from them through innovations.

Scientific studies demonstrate the positive outcomes of the interplay between biodiversity, ecosystem services and urban green infrastructure. Therefore, NBS have emerged as the main policy driver for most transitioning cities because they can be used to create multifunctional arenas and fulfil multiple, simultaneous societal, economic and environmental objectives.

Implementing NBS in urban areas

The EU-funded CONNECTING Nature project is forming a community of cities that fosters peer-to-peer learning and capacity building among so-called frontrunner cities experienced in delivering NBS and fast follower cities wishing to implement such NBS but lacking expertise. The community will grow to include new members (multiplier cities) as knowledge and expertise increases.

In all, 11 cities in Belgium, Bosnia and Herzegovina, Bulgaria, Cyprus, Greece, Italy, Poland, Scotland and Spain are directly involved in planning NBS at differing spatial scales. "CONNECTING Nature will position Europe as a global leader in innovating and implementing urban NBS," notes coordinator Marcus Collier.

CONNECTING Nature is introducing and examining approaches using methods where NBS solutions are designed and created collaboratively. This will lead to resilient, environmentally friendly and healthy cities, and ultimately more sustainable living for citizens.

The consortium has co-devised an NBS reference framework that brings together cities, SMEs, academia and civic society, and reflexively monitors ongoing processes to break down barriers and silos. It's being used to co-create usable and actionable knowledge in all cities and involves a series of iterative and adaptive stages. This framework captures the diverse types of innovations emerging from NBS implementation and scaling, and facilitates learning and internal and external communication in each city. "It's a process initiation tool that helps other cities to discover and exploit their NBS experiences and thus mainstream NBS planning into practice," explains Collier.

We're consolidating the wide range of NBS experience, industrial innovation, practical scientific knowledge and governance models that exist within European cities into transferable processes that can integrate NBS on a global scale.

Project partners are developing and testing novel urban planning processes that co-produce NBS along with business and governance innovations with all the cities' communities. They are also testing how NBS might be used to address issues of cohesion in post-conflict environments like the fast follower city of Sarajevo.

The CONNECTING Nature team has created new models that identify funding and financing mechanisms establishing NBS as valid solutions for sustainable and resilient cities. Many of the cities have already succeeded in gaining financing for NBS.

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Stimulating the market for new innovation

A list of commercial and social enterprises active in producing NBS and products has been compiled. The intention is to hold the first global summit on nature-based innovation and nature-based enterprises in 2021.

The baseline indicators of NBS effectiveness have changed because of COVID-19, especially those involving health and well-being. CONNECTING Nature is learning to adapt. It will now capture the impacts of lockdowns and formulate a case for scaling NBS in cities with respect to pandemics and other lockdown situations.

"We're consolidating the wide range of NBS experience, industrial innovation, practical scientific knowledge and governance models that exist within European cities into transferable processes that can integrate NBS on a global scale," concludes Collier. "Unlocking a broader NBS roll-out has the added value of making urban areas more biodiverse, thus reconnecting citizens with nature and boosting habitat connectivity and heterogeneity to build increased ecological resilience in urban areas."

PROJECT
COproductioN with NaturE for City Transitioning, INnovation and Governance

COORDINATED BY
Trinity College Dublin in Ireland

FUNDED UNDER
H2020

CORDIS FACTSHEET
cordis.europa.eu/project/id/730222

Making space for nature in cities will make them healthier, more resilient and sustainable

Warming is global, but efforts at the local level could make the biggest difference. The EU-funded GROW GREEN project is helping cities to achieve long-lasting changes by integrating nature-based solutions into their planning, development, and management.

Today, the world population stands at almost 7.8 billion. In the next 30 years it is expected to grow by a further 2 billion. According to the latest UN projections, humanity is expected to have developed into an almost exclusively urban species: two out of every three people are likely to be living in cities or other urban centres by the middle of the century.

If urbanisation occurs at a massive scale, it could undermine the capacity of cities to be environmentally sustainable and economically successful.

GROW GREEN is working to address these challenges and the opportunities urban areas face. It intends to showcase the benefits that high-quality green spaces and waterways could bring to urban landscapes. "GROW GREEN will provide evidence that cities which embed nature-based solutions into their infrastructure are more resilient to the negative impact of climate change. They are also happier, healthier, wealthier and socially cohesive places to live and will help biodiversity to flourish," notes project coordinator Michelle Oddy.

The project is testing this hypothesis in three European 'frontrunner cities': Manchester, Valencia and Wrocław. Each city is then paired with a 'follower city' that will learn from the implementation strategies and business models adopted by the frontrunners.

GROW GREEN will provide evidence that cities which embed nature-based solutions into their infrastructure are more resilient to the negative impact of climate change. They are also happier, healthier, wealthier and socially cohesive places to live.

Pilot projects show how nature and cities could thrive together

The green solutions under development are expected to deliver measurable improvements in climate and water resilience, and in social, environmental and economic performance.

Through GROW GREEN, residents in West Gorton in Manchester (UK) are supported to transform their area into an exemplar green neighbourhood, with trees, shrubs, community planting (bio-retention tree pits that remove storm water run-off), permeable pavement (which infiltrates storm water run-off), and small streams. A new park will become a focal point for the community, providing the much-needed high-quality green space for residents and visitors to relax, play sports and enjoy.

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Valencia (Spain) will see a big change with the project. The city council has installed a vertical garden in one of the public schools to improve temperature regulation and sound isolation. Wastewater from sinks and showers is collected in a tank at the bottom of the 'green' wall and reused to irrigate the school garden.

A small sustainable forest that will offset CO_2 emissions and act as a habitat for local fauna will also be created. Additionally, a new green pedestrian corridor (pergolas, shade trees, fountains, etc.) will enhance the connections between green spaces in the neighbourhood. The corridor and special permeable pavements for footpaths in the forest will allow rainwater to reduce the rate at which water flows into the sewer.

Furthermore, a detailed monitoring of a newly installed green roof in Valencia will determine how it has contributed to reduced internal temperatures and subsequently to reduced energy use.

In Wroclaw (Poland), unsightly and underused courtyards have been transformed into community gardens for the surrounding blocks of residential flats.

Once GROW GREEN completes the demonstration projects, it will start working on a post-construction monitoring plan. Furthermore, it plans to roll out the Green Cities Framework that will help other cities globally to develop and implement nature-based strategies and easily replicate successful approaches.

Working on nature-based solutions requires partnerships and collaborations across the many municipal departments and external stakeholders involved. To this end, Grow Green is engaging municipal departments.

Grow Green has released a compendium of nature-based and grey solutions to common challenges related to climate and water management in cities.

In collaboration with other H2020 projects working on nature-based solutions, the project has also developed a report with an overview of financing approaches that are used to deliver green infrastructure and nature-based solutions for water and climate adaptation in cities.

PROJECT
Green Cities for Climate and Water Resilience, Sustainable Economic Growth, Healthy Citizens and Environments

COORDINATED BY
Manchester City Council in the United Kingdom

FUNDED UNDER
H2020

CORDIS FACTSHEET
cordis.europa.eu/project/id/730283

Getting down to the business of marine ecosystem restoration in European seas and beyond

When seen from a satellite, the 'blue' of our blue planet reminds us of the abundant water unique to our terrestrial home. Multiregional, multi-habitat pilot actions, outreach and a Business Club will support adoption of nature-based solutions (NBS) that keep our seas and oceans healthy.

The clearly detrimental impacts of human activity on terrestrial ecosystems have spawned flourishing research, outreach and policymaking related to their preservation and restoration. Marine ecosystems and their degradation are much less obvious to the average person. However, European marine ecosystems are being lost and degraded at an alarming rate due to a combination of over-exploitation, pollution, invasive species and physical damage together with a changing climate.

Ecosystem restoration, when combined with a reduction of pressures, can be an efficient and effective NBS to the problem. The EU-funded MERCES project has energised the nascent field of NBS for marine ecosystem resilience, the focus of numerous international and European initiatives such as the United Nations Development Programme's Sustainable Development Goals and the new EU Biodiversity Strategy for 2030.

No two are quite the same

Marine ecosystems, like their terrestrial counterparts, reveal a tremendous diversity. MERCES has explored the potential of restoration actions in shallow soft and hard bottoms, including

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More than 20 restoration protocols have been tested in this first-of-its-kind multiregional, multi-habitat approach aiming to support upscaling of marine restoration across Europe.

mesophotic habitats and deep-sea habitats across Europe from Norway to Turkey. According to project coordinator Roberto Danovaro and scientific project manager Cristina Gambi: "We have focused on the most fragile and vulnerable European habitats, including seagrass meadows, macroalgal beds and kelp forests, coralligenous outcrops and cold-water corals, canyons, seamounts and fjords in 25 different pilot areas. More than 20 restoration protocols have been tested in this first-of-its-kind multiregional, multi-habitat approach aiming to support upscaling of marine restoration across Europe."

Good for the environment, societies and businesses

Actions promoting and inspiring policy initiatives and providing legal frameworks should help put restoration business on the biodiversity and NBS agenda. Danovaro states: "MERCES involved public, private and industrial stakeholders in new blue growth opportunities. The MERCES Business Club boasts more than 350 members representing all relevant stakeholders, highlighting the growing interest in NBS for marine ecosystem restoration. It provides tools like industry-focused newsletters and webinar series highlighting the economic and business opportunities of marine restoration." The MERCES Business webinars attracted more than 900 views worldwide in March 2020 alone and have been included in the webinar repository of the Society for Ecological Restoration.

Public engagement has been a MERCES priority. Gambi continues: "In addition to workshops and European Researchers' Nights, we have conducted citizen science and ocean literacy events for young students, and training and summer schools to test different restoration protocols." The consortium has produced more than 60 publications so far, including papers in world-class journals such as *Science* and *Nature Ecology & Evolution*, which foster discussion of the multiple implications of marine restoration in terms of policy, economy and well-being.

Moving forward under the sea

MERCES has proved that marine ecological restoration is not only feasible but should be encouraged in the context of policies, economic incentives and new job opportunities, and it has clearly identified the methodologies for developing a restoration business. Outcomes support the European Green Deal and its new Biodiversity Strategy. Globally, they contribute to the United Nations' initiatives Decade on Ecosystem Restoration and Decade of Ocean Science for Sustainable Development, both beginning in 2021. Danovaro and Gambi conclude: "The MERCES project has opened new frontiers for ecological restoration of marine ecosystems in Europe and beyond to help and support the transition of our societies to a sustainable future." A story map including beautiful underwater photos should inspire us all to get on board the important challenge of restoration of ecosystems under the sea.

PROJECT
Marine Ecosystem Restoration in Changing European Seas

COORDINATED BY
Polytechnic University of Marche in Italy

FUNDED UNDER
H2020

CORDIS FACTSHEET
cordis.europa.eu/project/id/689518

A comprehensive toolkit to support the natural mitigation of water risks

Increasing populations, urbanisation and land use change in the face of climate change are accelerating the frequency and intensity of extreme events. Focusing on the assurance value of nature will help stakeholders harness the socioeconomic and financial benefits afforded by nature-based solutions (NBS) to mitigate flood and drought risks.

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The EU-funded NAIAD project has enhanced knowledge on NBS by providing concrete and replicable methodologies to improve the management and mitigation of flood and drought risks to cities and catchments.

Natural assurance schemes identify the assurance and insurance value of nature and its additional co-benefits to transform these into viable schemes to provide climate adaptation services. Elena López Gunn, NAIAD scientific coordinator and Director of ICATALIST, explains: "NAIAD focused on helping society become better prepared and more resilient to natural hazards, looking at the value of prevention (protective value of nature) in terms of damage avoided and additional benefits."

Evidence-based tools on NBS effectiveness

In a 4-year effort and with the collaboration of 24 partners, NAIAD developed and operationalised the concept of the assurance value of nature through a series of biophysical, social, and economic and financing tools and methods that help to assess the effectiveness of NBS to mitigate water risks. It also included tools to help integrate all the information to design natural assurance schemes. The process was co-designed with stakeholders including governments, cities, catchments, insurers, scientists and NGOs, and it was tested in nine demo cases.

In terms of biophysical assessment, the EcoActuary toolkit was developed as a group of open-access web-based tools, including a decision support tool, an investment planner and a series of Internet of Things monitoring devices. The set of tools can map global flood risk, predict loss mitigation effects of natural flood management interventions and shed light on required natural capital investment. On the other hand, the Smart: river system leverages real-time open-source environmental data logging via low-cost DIY FreeStations for continuous monitoring and short-term forecasting. According to Mark Mulligan of partner organisation King's College, London, "demonstrations showed that regenerative agriculture for example has significant co-benefits, including water storage from reduced ploughing and increasing soil biodiversity and organic matter." This large-scale modelling set of tools and methods is complemented by a CAT model tool for modelling hazards and loss damage assessment

developed by CCR, the French re-insurance company, as well as a rapid assessment tool to evaluate the cost-efficacy of flood mitigation strategies developed by INRAE.

NBS fit for purpose, co-design with stakeholders to capture all benefits

In terms of social assessment, participation and adaptive planning, a series of methods and tools were developed and tested in project demos together with the stakeholders. The first is a tool to consider the portfolio of NBS with different criteria for their selection, the second is a participatory modelling tool by CNR-IRSA to involve stakeholders in an inclusive and equitable design process, and third is a structured modular stakeholder engagement protocol to guide the whole process. Finally, an integrated collaborative modelling tool allows to co-design solutions based on an adaptive planning approach, as tested in the Medina aquifer with the Duero River Basin Agency as end user.

In terms of economic assessment, the project developed an integrated cost-benefit framework that incorporates avoided damages. Phillipe Le Coent of project partner BRGM, the French geological survey, comments: "Demonstrations showed that NBS implementation costs are lower than those of grey solutions. However, investment and maintenance costs are not recouped with flood damage reduction. Therefore, co-benefits are critical for the funding and financing of NBS." Thus, the Financing Framework for Water Security tool developed by DELTARES can help by supporting the infrastructure financing community and NBS proponents to develop tailor-made finance arrangements for green-grey projects.

In addition, the Nature Assurance Schemes canvas developed by ICATALIST can help identify feasible business models to demonstrate that this set of related benefits could justify investments, and also where smart regulation (including of the insurance sector) can mobilise collective action for risk mitigation through NBS. López Gunn concludes: "Through financially viable and technically sound natural assurance schemes, NAIAD captures the value of healthy and fully functioning ecosystems, contributing to the mitigation of water risks while helping to increase the resilience of society in a context of climate change, thus helping to increase the resilience and response capacity to water-related hazards through NBS".

NAIAD focused on helping society become better prepared and more resilient to natural hazards, looking at the value of prevention (protective value of nature) in terms of damage avoided and additional benefits.

PROJECT
NAture Insurance value: Assessment and Demonstration

COORDINATED BY
Duero River Basin Agency in Spain

FUNDED UNDER
H2020

CORDIS FACTSHEET
cordis.europa.eu/project/id/730497

Solutions, methods and tools empower people in making cities greener

It's becoming increasingly evident that nature can provide solutions to help address societal and environmental challenges. An EU project is raising awareness about such nature-based solutions (NBS) and fostering new collaborative models for their uptake by developing an online knowledge and decision support platform.

There's a pressing need to bring nature back into innovation, planning and implementation-driven thinking. "This new technical and governance approach implies collaborative models driven by citizens, researchers, policymakers and industry leaders who rely on participative processes and sharing of best practices," says Stéphanie Decker, project manager of the EU-funded Nature4Cities project. "For this, cities need practical support in fostering their projects to renature cities."

There are many barriers to widespread deployment of NBS related to both lack of knowledge about them and the use of conventional urban planning tools and processes. "Most NBS can't be thought of as simple replacements for established solutions, they require an original whole governance approach," explains Decker. "Integrating NBS into urban planning requires a change of mindset by multiple stakeholders, new governance, business and financing models, and new integrated assessment capabilities."

One-stop shop for spreading NBS knowledge

Project partners began with detailed mapping of urban challenges and relevant NBS to face them. On the basis of this output, they are developing complementary and interactive tools to raise awareness about NBS and foster novel collaborative models for their uptake.

The N4C platform represents a unique opportunity to support value chain companies involved in renaturing cities by providing tools and methods to define NBS scenarios and integrate them into urban planning, assess environmental and economic life-cycle impacts, measure corresponding environmental and financial risks, and disseminate NBS advantages.

The Nature4Cities team plans to bring all these resources under a one-stop shop by creating a web-based knowledge and decision support platform. It will contain knowledge repositories like databases and guidelines, tools to assess benefits, co-benefits and costs of NBS projects, and other tools to manage stakeholder participation processes. The N4C platform tools will be demonstrated in Alcalá de Henares (Spain), Milan (Italy), Szeged (Hungary) and Ankara (Turkey).

Solutions for NBS impact assessment, valorisation and follow-up

Several tools have already been delivered and integrated into the N4C platform. The NBS catalogue explorer is an app to visualise the connection between NBS and urban challenges, and to gain knowledge by accessing the NBS database. The preselection tool assists in selecting the most appropriate NBS together with the local cultural, social, economic and regulatory conditions and requirements for successful implementation. A step-by-step guide is a practical tool for practitioners who plan,

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implement, monitor and maintain inclusive and participatory NBS interventions. It presents citizen and stakeholder engagement strategies and solutions for implementing NBS.

The researchers evaluated and assessed the factors of social acceptance for NBS implementation. Urban planners and decision-makers can assess and manage the social acceptability of any type of NBS by community, public or market. The valuation scale is an operational tool to assess NBS benefits on environmental quality of life. Test versions of most tools are currently in development ahead of user-friendliness and functionality testing.

"Nature4Cities will be very useful for urban planners, municipalities, researchers, policymakers, industry leaders, infrastructure enterprises, technological SMEs and citizens – regardless of their expertise," concludes Decker. "The N4C platform represents a unique opportunity to support value chain companies involved in renaturing cities by providing tools and methods to define NBS scenarios and integrate them into urban planning, assess environmental and economic life-cycle impacts, measure corresponding environmental and financial risks, and disseminate NBS benefits."

PROJECT
Nature Based Solutions for re-naturing cities: knowledge diffusion and decision support platform through new collaborative models

COORDINATED BY
NOBATEK/INEF4 in France

FUNDED UNDER
H2020

CORDIS FACTSHEET
cordis.europa.eu/project/id/730468

Online platform promotes nature itself in confronting big global challenges

Humanity urgently needs to identify promising alternatives that address challenges linked to climate change, sustainable energy, food security, and economic and social development. The EU is promoting the uptake of nature-based solutions (NBS) identified as alternatives with great potential in tackling such universal concerns.

NBS are actions designed to bring more nature and natural features and processes to cities, landscapes and seascapes. These innovative solutions also support economic growth, create jobs and improve our well-being.

The EU-funded ThinkNature project created a multi-stakeholder communication platform to support the understanding and promotion of NBS at local, regional, EU and international levels. "Through dialogue uptake, facilitation and steering mechanisms,

© Book on a Tree

as well as knowledge capacity building, the platform brought together multidisciplinary scientific expertise, policy, business, society and citizens," says coordinator Nikolaos Nikolaidis. A list of 126 international partners and organisations has been compiled to foster NBS dialogue and create market synergies for Europe.

Digital space to promote NBS innovation

The platform is an integrated web-based solution that stimulates dialogue and interaction on NBS through discussion forums and debates. These are aimed at identifying regulatory, economic and technical barriers, and communicating and promoting successful NBS. Available to all, the Knowledge Hub includes NBS project sites and platforms, best practice NBS case studies worldwide and a repository for online resources on NBS state-of-the-art activity.

Over 730 registered users on the platform's private area can share documents, tasks and events. They can also participate in online brainstorming forums and discussions to build up their knowledge on NBS.

Stakeholder engagement for all NBS domains

The ThinkNature team established four regional think-and-do tanks and respective networks of local representatives that cover the Mediterranean, oceanic, temperate continental and northern temperate regions. The aim is to influence policy ideas and decisions concerning NBS and provide new ideas on how to deal with regional problems.

The researchers organised two brainstorming forums that engaged over 300 stakeholders in NBS uptake at regional and local levels. On the basis of questionnaires, interviews, literature reviews and information exchange at the forums and on the platform, they performed technical, market, legislative and policy landscape assessments to identify factors that discourage large-scale NBS deployment.

Capacity building

The platform contains a portfolio of 112 case studies with a methodology to evaluate the degree of documentation completeness. A handbook gathers and promotes state-of-the-art knowledge on NBS and boosts public awareness. It includes a comprehensive guide for all relevant actors.

Several short video interviews with a broad range of experts offer various perspectives on and insights into the present and future of NBS. Four webinars attracted 366 people to raise awareness about and understanding of the NBS concept, and to support and promote knowledge on multiple aspects of NBS design and implementation. Forty participants from nineteen countries attended a week-long, hands-on summer school focused on NBS.

ThinkNature has demonstrated that NBS are cost effective and provide environmental, social and economic benefits while achieving more sustainable and resilient societies.

A game app introduces different NBS and how each can contribute to a city's support and protection. Players use nature to confront issues involving an imaginary city's unsustainable growth.

"ThinkNature has demonstrated that NBS are cost effective, and they provide environmental, social and economic benefits while achieving more sustainable and resilient societies," concludes Nikolaidis. "Let's bring nature back into our cities." Ultimately, the project will contribute to the European Commission's double goal of economic growth and sustainability.

PROJECT
Development of a multi-stakeholder dialogue platform and Think tank to promote innovation with Nature based solutions

COORDINATED BY
Technical University of Crete in Greece

FUNDED UNDER
H2020

CORDIS FACTSHEET
cordis.europa.eu/project/id/730338

ICT tools, methodologies and models to improve cities' climate and water resilience

Selecting and integrating natural elements into the built environment can enhance a city's resilience to climate change. An EU initiative is contributing to the development of smarter, more inclusive and sustainable cities by implementing nature-based solutions (NBS) that engage local stakeholders and citizens.

Cities face significant challenges due to climate change. Inspired and supported by nature, NBS are cost-effective, provide environmental, social and economic benefits, and make cities more resilient to climate change.

To address the challenges, the EU-funded UNALAB project is implementing and demonstrating innovative, replicable and tailored NBS like green spaces, wetlands, storm water retention ponds, green walls and roofs in Eindhoven (the Netherlands), Genova (Italy) and Tampere (Finland). In these cities, companies, research institutions, the public sector and citizens all work together to carry out NBS. "The overall ambition of UNALAB is to achieve significant and measurable improvements in the urban living environment and to enhance urban resilience to changes in the global climate," says coordinator Laura Wendling.

Smart business and finance models, decision support tools

The UNALAB team is developing a suite of market-ready, user-friendly solutions. A broad range of tools, methodologies, models and technologies has already been delivered.

A toolkit contains a wide variety of tools and methods used in the three cities to support cocreation in exploring, designing, implementing and evaluating NBS that are helping them tackle specific climate and water-related challenges. The technical handbook is a living document that provides accurate, detailed information on the full range of potentially applicable NBS in support of urban climate and water resilience. Municipal governance guidelines explore various governance-related barriers that obstruct the effective integration of NBS in cities and highlight actions to help overcome these barriers. Business models and financing strategies provide city planners with business model examples for selected NBS, as well as potential financing strategies that could support NBS implementation and operation efforts. A value model establishes links between identified NBS, associated beneficiaries and their individual benefits, as well as available financing options.

Thanks to nature-based innovation jointly created with stakeholders – by and for people – UNALAB will support the creation of healthier, greener European cities resilient enough to confront climate change challenges.

The project has produced several reports. The UNALAB ULL report presents an Urban Living Labs scientific framework for cities to use. The NBS Performance and Impact Monitoring report summarises the classification and mode of action of NBS, a selection of key indicators for NBS performance and impact, and design of an NBS monitoring scheme and baseline, together with a set

of measurement/monitoring methods for key indicators and metrics. The Value Chain Analysis report analyses the value chain, the replicability and the upscaling potential of selected NBS in three cities.

A set of online tools has also been produced. The Open Nature Innovation Arena for city authorities lists relevant NBS challenges and offers participating stakeholders like citizens the opportunity to share ideas in resolving these challenges. The City Performance Monitor used by the cities increases stakeholder and citizen awareness of urban conditions through a representation of the effectiveness of NBS implemented in a given city using social, environmental and economic performance indicators. The NBS Simulation Visualisation Tool makes it possible to evaluate and discuss how much NBS could impact urban change adaptation, simulating the effects on social, economic and environmental domains.

Innovative, socially engaged, citizen-driven paradigm

"Thanks to nature-based innovation jointly created with stakeholders – by and for people – UNALAB will support the creation of healthier, greener European cities, resilient enough to confront climate change challenges," concludes Wendling. "The vision is better living conditions for all, increased green infrastructure and biodiversity, improved air and water quality, reduced noise and lower health costs, enhanced mobility conditions and greater social cohesion."

PROJECT
Urban Nature Labs

COORDINATED BY
The VTT Technical Research Centre of Finland in Finland

FUNDED UNDER
H2020

CORDIS FACTSHEET
cordis.europa.eu/project/id/730052

Emerald cities: Green solutions to make nature thrive in the urban concrete jungle

Smart urban planning in big cities can serve people and nature. The EU-funded URBAN GreenUP project demonstrates green solutions that help reshape urban areas and increase their sustainability, liveability and resilience to climate change.

The total area covered by cities around the world is set to dramatically increase over the next decades, wiping out cultivated land and bringing many negative consequences for residents and the environment. Poor air quality, floods, drought, heat waves, biodiversity loss and the urban heat island effect are just some prominent consequences of urban sprawl. A promising approach is to implement nature-based solutions (NBS) – interventions inspired by nature and designed to deal with societal and environmental problems.

The EU-funded URBAN GreenUP project aims to tackle these challenges. Under the coordination of the CARTIF Technology Centre, 25 partners from 9 countries are working together to develop a new strategy for integrating more nature into city planning. "Renaturing urban planning is the new keyword, offering a green transformation in cities through the implementation of NBS," notes project coordinator Raúl Sánchez.

Green solutions tailored to cities' needs

URBAN GreenUP has developed a digital tool that can assist authorities, urban planners and citizens in identifying the NBS that best fit a city's needs. The tool is freely available on the URBAN GreenUP website.

The tool recommends NBS for cities based on the challenges and capabilities of the city itself. It first asks users to nominate the city challenges in up to three urban areas (suburbs, neighbourhoods, watersheds) and then asks a series of questions that help determine the city's greening capabilities. As a result, it provides a list of possible NBS interventions that correspond to the city's nominated urban problems, as well as the city's 'success factors' for urban greening, to make sure that feasible solutions are suggested.

Renaturing urban planning is the new keyword, offering a green transformation in cities through the implementation of NBS.

The tool is in its final stages of development. "The tool is designed to give suggestions that should help authorities and citizens choose the right NBS, based on both the city's capabilities and the desired outcomes. It can also help them figure out how to build the capacity to deliver NBS and communicate to leaders what it'll take to realise NBS in the city," explains Sánchez.

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Released catalogues

The NBS Selection Tool is based on the solutions collected in the URBAN GreenUP NBS Catalogue. It aims to foster global uptake of the URBAN GreenUP approach by providing cities worldwide with robust indicators on how to embrace urban challenges using nature.

So far, the project has released two relevant catalogues: the NBS Catalogue, presenting the disparate technical interventions being implemented by frontrunner cities, and the Climate Change Challenges Catalogue that helps cities examine challenges and their impacts.

Project demonstrations

Project activities are carried out in the three frontrunner cities of Valladolid (Spain), Liverpool (United Kingdom) and Izmir (Turkey). The five follower cities - Mantova (Italy), Ludwigsburg (Germany), Medellin (Colombia), Chengdu (China) and Binh Dinh-Quy Nhon (Vietnam) - will directly learn from these experiences and set up their own renaturing urban plans.

URBAN GreenUP's NBS are grouped into four classes: renaturing urbanisation, singular green infrastructures, water interventions, and non-technical interventions. The project plans to implement more than 100 NBS in the three frontrunner cities. Examples include green bicycle and pedestrian routes, floating gardens, floodable parks, sustainable drainage systems, green roofs and façades, pollinator roofs, green shady structures and urban catchment forestry.

In 2018, URBAN GreenUP promoted development of the Nature-Based Solutions Cooperation Manifesto that aims at renaturing cities through the cooperation and support of the European Commission Nature-Based Solutions Projects. The project is scheduled to run until 2022.

PROJECT
New Strategy for Re-Naturing Cities through Nature-Based Solutions

COORDINATED BY
CARTIF Technology Centre in Spain

FUNDED UNDER
H2020

CORDIS FACTSHEET
cordis.europa.eu/project/id/730426

NATURVATION: Reconciling urbanisation with nature

What if the parts of cities where nature thrives could become the norm? Worried about the consequences of unsustainable urbanisation across Europe, the NATURVATION project has been clearing the path towards the more effective implementation of nature-based solutions in urban environments.

As COVID-19 hit our societies in full force, we began to look at the city we live in from behind closed doors or through the spectrum of brief walks around the nearest park. Air pollution has dramatically decreased across Europe. Nature got to catch its breath for a while. We received an opportunity to witness its wake under a different light and, last but not least, we received a reminder of the challenges ahead for densely populated cities.

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The loss of biodiversity is one such challenge, along with others such as climate change, water quality and healthcare. Nature-based solutions (NBS) are one way to face it, but in truth, their potential has been largely overlooked so far.

"Our Urban Nature Atlas records 1 000 examples of NBS in just 100 cities – but often these initiatives are small scale. They are not seen as effective 'mainstream' solutions to urban sustainability challenges and are being undertaken largely in an experimental mode, as diverse public, private and community actors try them out to tackle local issues," explains Harriet Bulkeley, Professor of Geography at Durham University.

Whilst there is little doubt that a greener, biodiversity-friendly urban environment could only benefit us all, there is surprisingly little evidence of NBS effectiveness. And even for the diverse actors who see tangible advantages, the question of who should pay the bill has proven to be quite complex. The NATURVATION project, coordinated by Bulkeley, has been working on a solution to support decision-making and optimise its benefits.

It's about bringing together business models that can reduce risks, improve health and generate climate benefits while allowing for non-financial returns on investment such as improved biodiversity.

"We now have a prototype of our Nature-Based Solutions Navigator which we hope to release later in 2020. It will support decision-makers in identifying which kinds of NBS contribute towards which sustainable development goals," she says. Unlike existing evaluation tools focusing on one solution or one sustainability challenge, NATURVATION brings the best available evidence together to create a multi-criteria evaluation framework. The latter can be used in different processes of consultation and deliberation with communities and stakeholders, to help them in their choices.

To tackle investment-related issues, the project has also been developing new business models and financing mechanisms through which NBS can be supported. As Bulkeley explains: "We focus on how different business models or financing options can be 'stacked' to generate a sufficiently robust case. It's about bringing together business models that can reduce risks, improve health and generate climate benefits while allowing for non-financial returns on investment such as improved biodiversity."

Biodiversity should be more than a side effect

One of the project's most important findings with regards to biodiversity lies in its lack of consideration in existing projects. Although a significant number of NBS initiatives specifically address it, the project team demonstrates the emergence of what they call 'opportunity gaps', with NBS not being designed to realise their full potential.

Although the project has successfully identified best practices that can inspire future decision-making, one of the main lessons learned from its research relates to the number of such missed opportunities.

By the time it ends in October 2020, NATURVATION will have provided new pathways to successful NBS implementation as well as unique assessment tools. The project team is already working with CitiesWithNature – an initiative created by ICLEI – to develop a platform where cities can report their action towards global goals for biodiversity. They are also collaborating with organisations at national and international level to develop the policy and financial conditions within which NBS can flourish. This will certainly prove to be a comforting perspective for citizens wary of the sustainable future of their city.

PROJECT
Nature Based Urban Innovation

COORDINATED BY
University of Durham in the United Kingdom

FUNDED UNDER
H2020

CORDIS FACTSHEET
cordis.europa.eu/project/id/730243

Ongoing NBS projects funded under H2020

proGIreg
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CLEVER Cities
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The Edible Cities Network

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Phusicos
'According to nature' - solutions to reduce risk in mountain landscapes

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OPERANDUM
OPEn-air laboRAtories for Nature baseD solUtions to Manage hydro-meteo risks

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RECONECT
Regenarating ECOsystems with Nature-based solutions for hydro-meteorological risk rEduCTion

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REGREEN
Fostering nature-based solutions for equitable, green and healthy urban transitions in Europe and China

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INTERLACE
International Cooperation to Restore and Connect Urban Environments in Latin America and Europe

CORDIS FACTSHEET
cordis.europa.eu/project/id/869324

NetworkNature
Advancing nature-based solutions together

CORDIS FACTSHEET
cordis.europa.eu/project/id/887396

Check out the EU Repository of Nature-Based Solutions, **Oppla**. It provides a knowledge marketplace where the latest thinking on natural capital, ecosystem services and NBS is brought together.

Oppla is an open platform and membership is free. The platform features a **Case Studies finder**, a crowd-sourced enquiry service (**Ask Oppla**), as well as an online **Marketplace** and **Community**.

CORDIS Results Pack

Available online in 7 language versions: cordis.europa.eu/article/id/421853

Published
on behalf of the European Commission by CORDIS at the
Publications Office of the European Union
2, rue Mercier
2985 Luxembourg
LUXEMBOURG

cordis@publications.europa.eu

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This Results Pack is a collaboration between CORDIS, the Directorate-General for Research and Innovation (DG RTD) and the Executive Agency for Small and Medium-sized Enterprises (EASME).

Print	ISBN 978-92-78-42283-7	ISSN 2599-8285	doi:10.2830/705860	ZZ-AK-20-016-EN-C
HTML	ISBN 978-92-78-42285-1	ISSN 2599-8293	doi:10.2830/506337	ZZ-AK-20-016-EN-Q
PDF	ISBN 978-92-78-42282-0	ISSN 2599-8293	doi:10.2830/40286	ZZ-AK-20-016-EN-N

Luxembourg: Publications Office of the European Union, 2020

RESEARCH*EU MAGAZINE ISSUE 92

Biodiversity: A New Deal for Nature

Biodiversity makes life possible. It nurtures us, provides multiple health benefits and even offers many opportunities for jobs and economic growth (tourism, green technologies, conservation efforts etc.). This issue of Research*eu features seven projects that are dedicated to developing new solutions that will help humanity reach a new deal with biodiversity.

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