



Planning and delivering Nature-based Solutions in Mediterranean cities

First assessment of the IUCN NbS Global Standard in Mediterranean urban areas

Summary for policy-makers



INTERNATIONAL UNION FOR THE CONSERVATION OF NATURE



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About IUCN Centre for Mediterranean Cooperation:

IUCN, International Union for Conservation of Nature, is a membership Union composed of both government and civil society organisations. It harnesses the experience, resources and reach of its more than 1,300 Member organisations and the input of more than 18,000 experts. IUCN is the global authority on the status of the natural world and the measures needed to safeguard it. The IUCN Centre for Mediterranean Cooperation opened in Malaga (Spain) in October 2001 with the core support of the Spanish Ministry of Environment and the regional Government of Junta de Andalucía. The Centre's mission is to influence, encourage and assist Mediterranean societies to conserve and use sustainably the natural resources of the region and work with IUCN Members and cooperate with all other agencies that share the objectives of IUCN.

Planning and delivering Nature-based Solutions in Mediterranean cities

First assessment of the IUCN NbS Global Standard in Mediterranean urban areas

Summary for policy-makers

This document highlights key findings from the report *Planning and delivering Nature-based Solutions in Mediterranean cities. First assessment of the IUCN NbS Global Standard in Mediterranean urban areas*, and should be read in conjunction with the full report. References to research and reviews on which this report is based are listed in the full report. The full report can be downloaded at:

<https://www.iucn.org/regions/mediterranean/resources/thematic-documents>

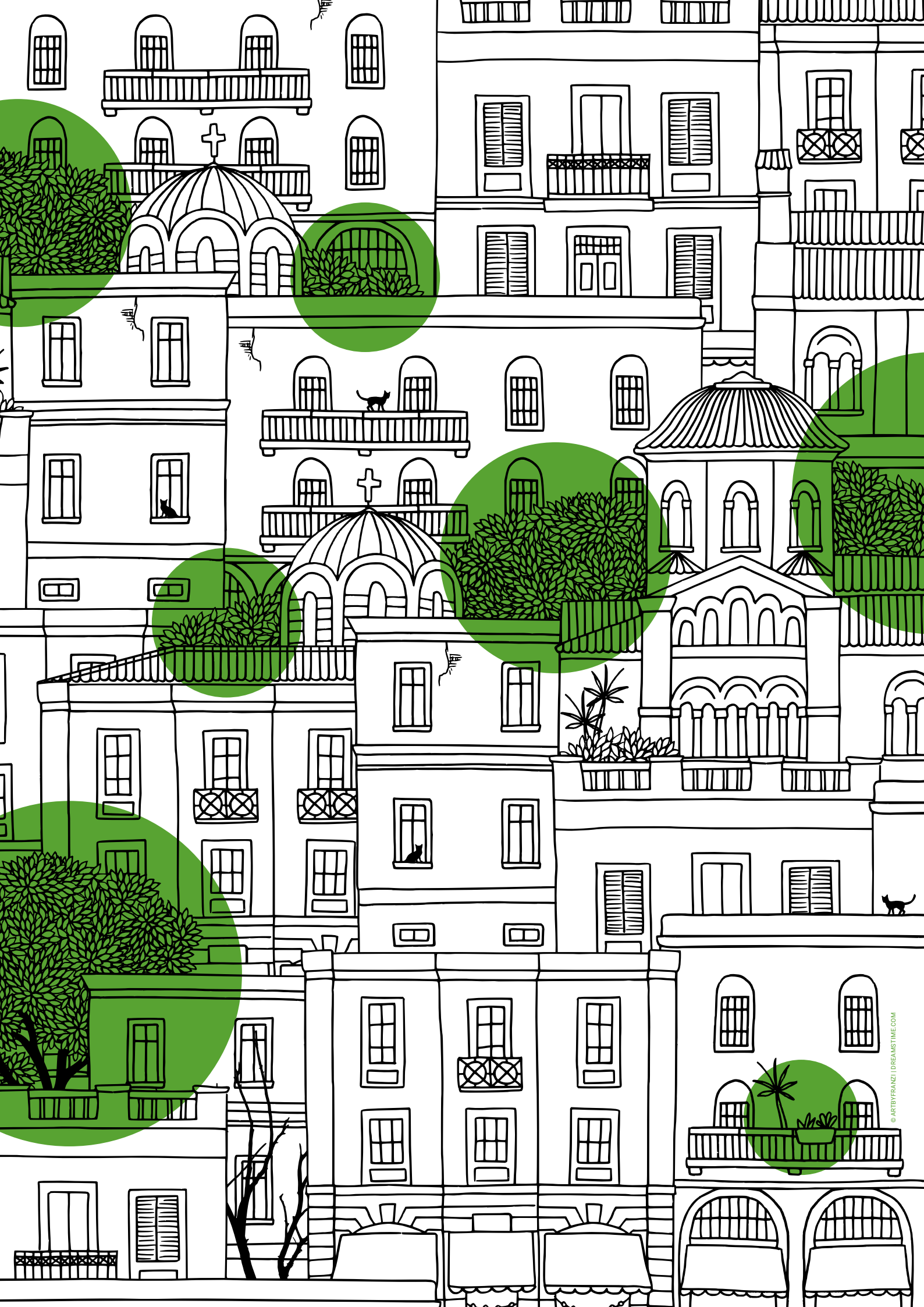


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Forward

Natural ecosystems in cities (green spaces and water bodies) provide an essential group of ecosystem services (e.g. water supply, local climate regulation, flood regulation, air purification, recreation) to human populations. Our knowledge and understanding of these ecosystem services increases year by year, alongside our understanding of the challenges faced by cities and how nature can be used in a positive way to tackle them through the integration of Nature-based Solutions (NbS) in planning and development.

Mediterranean cities and towns share many similar challenges related to climate, geography and culture. Many of these challenges stem from rapid population growth and urban expansion, mainly in coastal areas during the 20th Century. To add to these pressures, the impacts of climate change, such as changes in temperature and precipitation, are now putting extra stress on urban human well-being. As our understanding of the ecological, public health and economic consequences of this urbanisation grows, the case for 'greening' cities –redesigning them with NbS at their heart– becomes ever stronger.

The new global **IUCN global NbS Standard**, launched on July 2021, responds to the increasing focus on NbS in development planning and land management. The IUCN Centre for Mediterranean Cooperation (IUCN-Med) along with the IUCN Members in the region and key strategic partners are committing to promote Nature-based Solution (NbS) as approved in Resolution 34 "**The implementation of Nature-based Solutions in the Mediterranean Basin**" by the IUCN constituency in the framework of the World Conservation Congress 2020.

IUCN-Med is working to build capacity for design and implementation of NbS, with a special focus on Mediterranean cities. In 2020, TECNALIA was commissioned to support the assessment of good practices already identified in the publication "**Nature-based Solutions in Mediterranean cities**" (2019) against the criteria

The result of this exercise allowed the identification of both the NbS Standard's potential in Mediterranean cities, and challenges in its use that must be resolved.

of the IUCN global Standard on NbS in order to make the first practical assessment against real projects and strategies (already implemented or in the design stages) from Mediterranean cities.

The result of this exercise allowed the identification of both the Standard's potential in Mediterranean cities, and challenges in its use that must be resolved. The overall lessons learned from the assessment point to the need for continuing improvements in practices, especially the systematic evaluation of options, more inclusive public involvement, incorporating adaptive management, and establishing monitoring systems for better reporting on the potential benefits of NbS in urban contexts.

This report contributes to an evidence base on the benefits of NbS to cities in the Mediterranean region. However, we recognise that we are still at the early stages of developing sufficient knowledge to enable the development of city-specific NbS strategies at bigger scales. As an emerging area of policy, cities are therefore currently having to deliver bespoke local research and pilot projects to generate the evidence base they require for local policy development. From IUCN, we believe that a different urbanization –more sustainable and inclusive– is certainly possible, and we hope the IUCN Global Standard on NbS becomes a useful tool to guide urban planners, business and civil society to develop the evidence base of the economic, social and environmental benefits of Nature-based Solutions, and communicate success stories to inspire positive action for nature in urban areas in the Mediterranean and around the world.

1

Introduction. Mediterranean urban policy and Nature-based Solutions

The combined effects of long term structural changes (rapid and dispersed urbanisation, demographic change, environmental change) and the Covid-19 pandemic call for significant investment in the coming years to redesign cities - to overcome the negative effects of past deficiencies in planning and development, and to mitigate and adapt to climate change and biodiversity loss. In doing so cities have the opportunity to create new jobs and businesses, adapted to future needs, to reduce social and economic inequalities, and to promote social cohesion and wellbeing. These challenges are captured in the **UN Sustainable Development Goals (SDGs)**, in particular Goal 11 on urban

settlements, adopted by all the world's governments in 2015. This will require planners, developers and other landowners, and citizens to develop a new perspective on urban planning and development –a greener mindset– that recognises the positive contribution that nature can make to high quality, liveable cities.

Internationally, the concept of Nature-based Solutions (NbS) is taking hold, providing a genuine opportunity for cities to adapt to climate change and to improve sustainability. The IUCN defines NbS as “actions to protect, sustainably manage and restore natural or modified ecosystems that address societal



Figure 1: “Nature-based Solutions are actions to protect, sustainably manage and restore natural and modified ecosystems in ways that address societal challenges effectively and adaptively, to provide both human well-being and biodiversity benefits” (IUCN, 2016)

challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits". (NbS - see fig 1).

In recent years, this concept is emerging as a central tool in urban planning and development. For example, the EU's Horizon 2020 programme has developed a specific **research and innovation agenda**, funding many projects regarding the effective use of NbS to meet societal challenges in cities.

In parallel, the **Mediterranean Strategy for Sustainable Development** notes the multiple challenges facing cities in the region (Objective 3, Table 1): excessive land uptake; rapid degradation of architectural heritage; aquifer pollution; inefficient waste management;

atmospheric air pollution and noise; and the cumulative effect of all these factors on the environment and on human health. For those reasons, a new, sustainable and creative approach to planning and managing Mediterranean urban regions is urgently needed. NbS can play a crucial role in addressing these challenges, providing a multitude of positive environmental and socio-cultural functions: mitigating environmental pressures, improving aesthetics, reducing the urban heat island effect, mitigating flooding, and providing direct or indirect urban ecosystem services.

In response to this emerging body of policy and practice, IUCN has developed the first-ever **Global Standard for Nature-based Solutions** (IUCN, 2020) to help users design, implement and verify NbS

Table 1: The Mediterranean Strategy for Sustainable Development -MSSD- (2016-2025) is structured around six Objectives that feed into the Sustainable Development Goals -SDGs-

MSSD Objectives	SDGs		
1. Ensuring sustainable development in marine and coastal areas			
2. Promoting resource management, food production and food security through sustainable forms of rural development			
3. Planning and managing sustainable Mediterranean cities			
4. Addressing climate change as a priority			
5. Transition towards a green and blue economy			
6. Improving governance in support of sustainable development			

actions. This Standard, introduced in July 2020, provides clear parameters for defining NbS and a common framework to help benchmark progress. This complements the IUCN's global initiative named **IUCN Urban Alliance**, which aims to create greener, more liveable cities that will improve the health, well-being and prosperity of people living in urban areas, launched in 2018. This initiative will include development of a **City Nature Index**, providing a standardised way for cities to measure

the quality of their underlying stock of natural resources, known as 'natural capital'.

Societal challenges are reflected succinctly in the targets for SDG 11, for urban areas. This complements the more detailed descriptions of the societal challenges for which NbS are an effective response and upon which the IUCN Global NbS Standard focuses.

Make cities and human settlements inclusive, safe resilient and sustainable

Targets for UN Sustainable Development Goal 11 By 2030



- Ensure access for all to adequate, **safe and affordable housing** and basic services and upgrade slums.
- Provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in **vulnerable situations**, women, children, persons with disabilities and older persons.
- Enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable **human settlement planning** and management in all countries.
- Strengthen efforts to protect and safeguard the **world's cultural and natural heritage**
- Provide **universal access to safe**, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities.
- Support least developed countries, including through financial and technical assistance, in building **sustainable and resilient** buildings utilizing local materials.
- Significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, **including water-related disasters**, with a focus on protecting the poor and people in vulnerable situations.
- Support positive economic, social and environmental links between **urban, peri-urban and rural areas** by strengthening national and regional development planning.
- Substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, **resource efficiency, mitigation and adaptation to climate change, resilience to disasters**, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels.
- Reduce the adverse per capita** environmental impact of cities, including by paying special attention to air quality and municipal and other waste management.

IUCN Standard for Nature-based Solutions

The IUCN Global Standard aims to equip users with a robust framework for designing and verifying NbS that yield the outcomes desired, in solving one or several societal challenges. Based on the feedback of actual and potential NbS users, it has been developed to be flexible and adaptable, purposefully avoiding a rigid

normative framing with fixed, definitive thresholds of what NbS ought to achieve. Rather the Standard is designed to support users to apply, learn and continuously strengthen and improve the effectiveness, sustainability and adaptability of their NbS interventions.

What are Nature-based Solutions (NbS)?

NbS are defined by IUCN as "actions to address societal challenges through the protection, sustainable management and restoration of ecosystems, benefiting both biodiversity and human well-being." They use the power of nature and functioning ecosystems as infrastructure to provide natural services to benefit society and the environment.

NbS have prime potential to help address global challenges such as:

- climate change
- economic and social development
- human health
- food and water security
- disaster risk reduction
- ecosystem degradation
- biodiversity loss

NbS can provide long-term environmental, societal and economic benefits:

- adaptation to climate change
- green jobs
- community resilience
- health benefits
- healthy and accessible food
- clean air and water
- disaster risk reduction
- ecosystem integrity
- biodiversity not just

Examples of NbS application:

- Protection, restoration and sustainable use of forest landscapes:** Secures water supply, erosion control, and risk reduction.
- Protection or restoration of coastal ecosystems:** Brings community resilience, disaster risk reduction, economic development.
- Protection, restoration and management of wetlands:** Provides water storage, flood protection, food production.
- Providing space for rivers to naturally flow:** Enables flood protection, water security.
- Urban green and blue spaces:** Engenders climate regulation, better human health, social development, green jobs.
- Sustainable management of agroforestry systems:** Offers food security, water regulation, economic and social development.

Logos and Contact Info: IUCN, www.iucn.org/adapt, @theadaptproject, ADPPT, Sida.

The Standard consists of 8 Criteria and 28 Indicators
Summarised in Figure 2 and Table 2, (IUCN, 2020)



Figure 2: Illustrating the interconnections between the 8 criteria of the NbS Standard (IUCN, 2020)



8 Criteria that make up the IUCN Global Standard for NbS are all interconnected

Table 2: The assessment criteria of the IUCN Standard for NbS (content source: IUCN, 2020)

CRITERION	FOCUS
1. NbS effectively address societal challenges	The purpose of this Criterion is to ensure that the NbS is designed as a response to a societal challenge(s) that has been identified as a priority by those who are or will be directly affected by the challenge(s). All stakeholders, especially rights holders and beneficiaries of the NbS, must be involved in the decision-making process used for identifying the priority challenge(s) (Criterion 5).
2. Design of NbS is informed by scale	The purpose of this Criterion is to encourage NbS designs that recognise the complexity and uncertainty that occur in living dynamic land and seascapes. Scale applies not only to the biophysical or geographic perspective but also to the influence of economic systems, policy frameworks and the importance of cultural perspectives.
3. NbS result in a net gain to biodiversity and ecosystem integrity	NbS are derived as goods and services from ecosystems, and therefore strongly depend on the health of an ecosystem. Biodiversity loss and ecosystem change can have significant impacts on the functioning and integrity of the system. Therefore, NbS design and implementation must avoid undermining the integrity of the system and instead, proactively seek to enhance the functionality and connectivity of the ecosystem. Doing so can also ensure the long-term resilience and durability of the NbS.
4. NbS are economically viable	The return on investment, the efficiency and effectiveness of the intervention, and equity in the distribution of benefits and costs are key determinants of success for an NbS. This Criterion requires that sufficient consideration is given to the economic viability of the intervention, both at the design stage and through monitoring the implementation.
5. NbS are based on inclusive, transparent and empowering governance processes	This criterion requires that NbS acknowledge, involve and respond to the concerns of a variety of stakeholders, especially rights holders. Good governance arrangements are proven to not only reduce an intervention's sustainability risks, but also to enhance its social 'license to operate'. Conversely inadequate governance provision for otherwise well-intended actions can adversely affect the legitimacy of benefit and cost sharing arrangements.
6. NbS equitably balance trade-offs between achievement of their primary goal(s) and the continued provision of multiple benefits	Trade-offs in land and natural resource management is inevitable. Ecosystems provide a wealth of different benefits and not everyone values each of them in the same way. While tradeoffs cannot be avoided, they can be effectively and equitably managed. This Criterion requires that NbS proponents acknowledge these tradeoffs and follow a fair, transparent and inclusive process to balance and manage them over both time and geographic space. This involves a credible assessment, full disclosure and agreement among the most affected stakeholders on how the trade-offs should be addressed.
7. NbS are managed adaptively, based on evidence	This Criterion requires that NbS implementation plans include provisions to enable adaptive management as a response to uncertainty and as an option to effectively harness ecosystem resilience. A degree of uncertainty is inherent when managing most ecosystems due to their complex, dynamic and self-organising nature. This also means that ecosystems have greater resilience which confers a wider range of options to respond to unanticipated social, economic or climate events.
8. NbS are sustainable and mainstreamed within an appropriate jurisdictional context	This Criterion requires that NbS interventions are designed and managed with a view to long-term sustainability and that they take account of, work with and align with sectoral, national and other policy frameworks.

Assessment of the Standard in Mediterranean cities

This report summarises the results of a first assessment of a selection of practices in Mediterranean Cities against the IUCN Global Standard.

The IUCN Centre for Mediterranean Cooperation commissioned in 2020 TECNALIA to undertake an assessment of how the Standard could be put into practice by analysing 18 cases of Nature-based Solutions in Mediterranean cities.

The purpose of the analysis was to assess to what extent these interventions met the standard, and in this way to identify particular opportunities and challenges for applying the standard in urban areas throughout the Mediterranean region.

It is the first practical assessment of the Standard against real projects and strategies already implemented or in the design stages. It aimed to identify both the Standard's potential in Mediterranean cities, and challenges in its use that must be resolved.



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The practices were selected considering their even distribution across the Mediterranean geography, their representativeness within the Mediterranean climate region and its idiosyncrasies, climate risks, urban development, planning culture and systems, governance, etc, and at different scales from regional, city and district levels.

The analysis sought to:

- **Identify good practice examples** in different in Mediterranean cities in terms of the NbS benefits and their contribution to the societal challenges using the criteria and set of indicators suggested by the Standard.
- **Identify gaps** in practices and explore opportunities for improving and enhancing NbS interventions and the implementation process.
- **Identify lessons learned** for practical application and usability of the standard, and extract messages and elements that can be shared with other practices.
- **Give value to the adaptive capacity of the Standard** itself and how it could be reviewed and customized.

It is worth mentioning that the practices analysed have been assessed as Nature-based Solutions despite the fact that they may not have been designed as such in the first place.

IN THE SELECTED CASE, TWO DIFFERENT SPEEDS WERE DETECTED IN THE WAY CITIES ANALYSED WERE IMPLEMENTING NbS IN THE MEDITERRANEAN REGION:

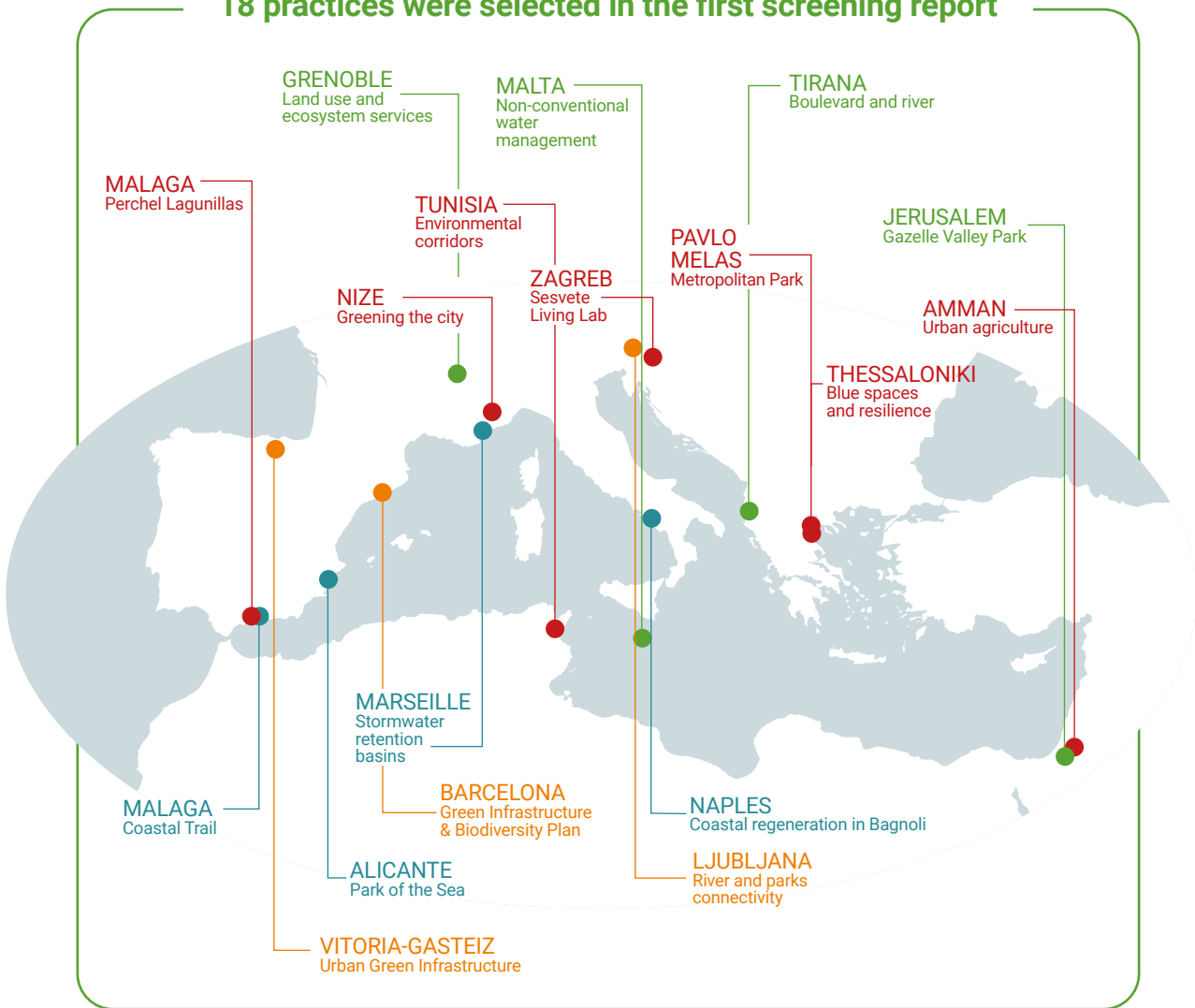


1- Good practice cases:

- Urban regeneration in a global change context
- Climate change and water resilience
- Coastal resilience under rising seas

2- Advanced and mature practices

18 practices were selected in the first screening report



Type 1:
URBAN REGENERATION
IN A GLOBAL CHANGE CONTEXT



Type 2:
CLIMATE CHANGE AND
WATER RESILIENCE



Type 3:
COASTAL RESILIENCE
UNDER RISING SEAS



Type 4:
MATURE
PROJECTS

The key findings of this assessment are:

- The results revealed that NbS are currently being used **explicitly to meet** a wide range of **societal challenges**, particularly regarding human health and wellbeing. However, there are challenges in applying some of the criteria in the Standard.

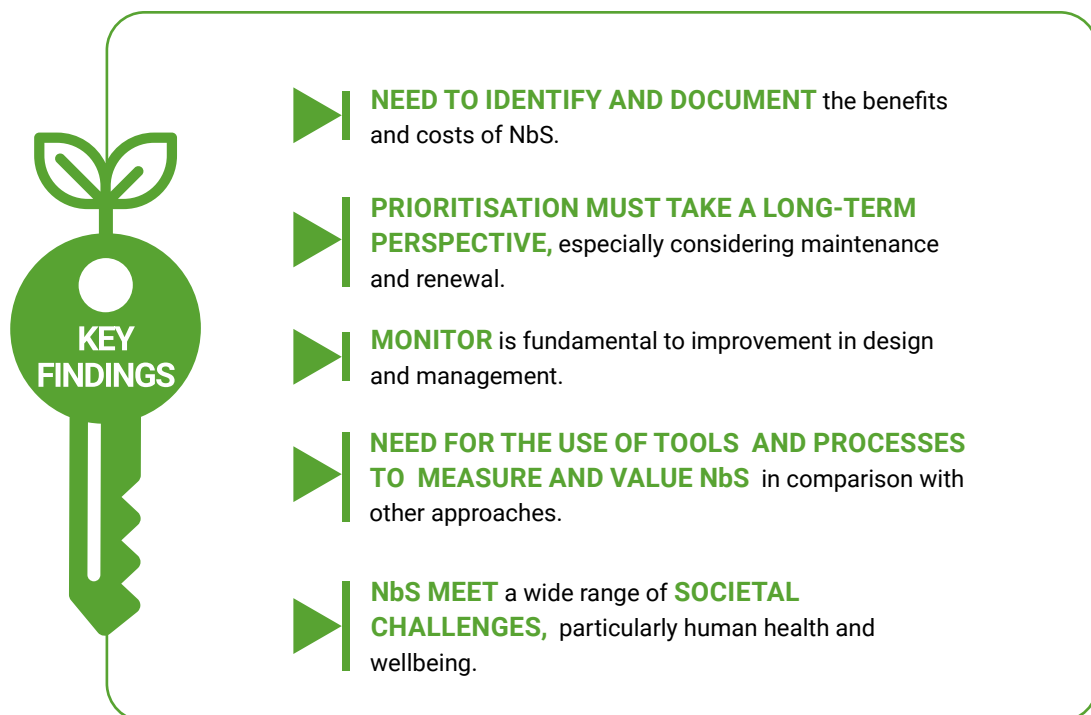
- What underlies these challenges is the **need for the use of tools and processes to measure and value NbS** and the benefits they deliver to allow comparison with other approaches so that effective prioritisation can be made.

- In particular, prioritisation must **take a long-term perspective**, especially considering maintenance and renewal (i.e. a 'whole-life-cost' approach) and considers the 'externalities' inherent in each option so that efficient trade-offs can be made.

- In the case of **adaptive management**, in addition to the use of these decision-making tools must be added the question of how to deal with the uncertainty of environmental change. Basing decision-making on a **robust 'theory of change'** is a helpful tool promoted by the Standard for navigating change over time.

- As with any auditing system, having rigorous procedures for **measuring and monitoring** is essential. This requirement is often seen as an extra burden. However, that is to overlook its strategic value. The ability to measure and monitor is fundamental to improvement in design and management and ultimately to securing a higher value of benefits for society.

For all these reasons the Standard stresses the importance of identifying and documenting the benefits and costs of NbS (and of other options, especially 'no change') and who receives and who pays them.

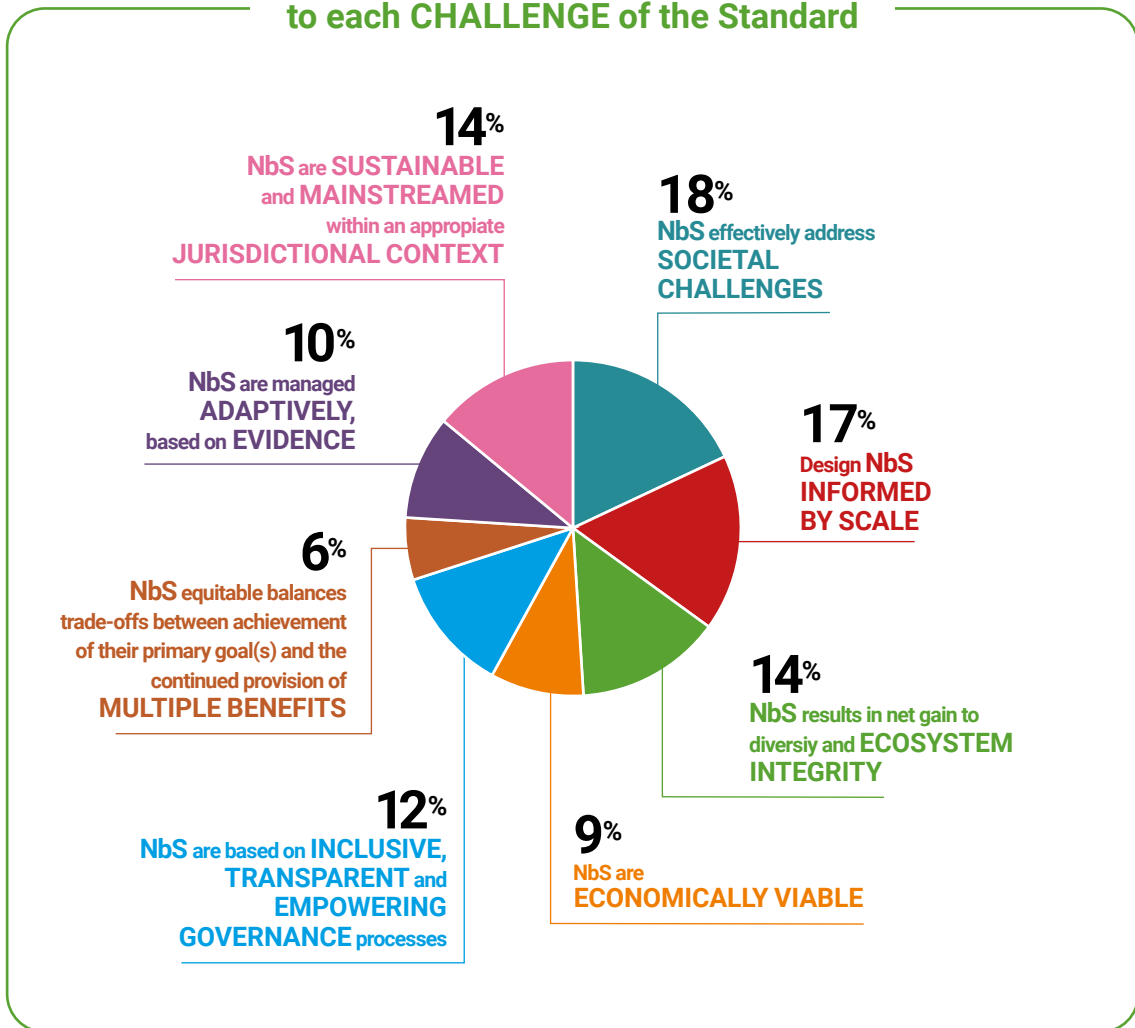


For the evaluation a total of 28 indicators were used, grouped in 8 categories and criteria based on the IUCN Standard. The answers obtained varied strongly according to the city and the indicator. The graphic is a summary of the availability of information for each challenge.

For criterion 1 and 2, sufficient information is available. On the other side, less information was found for challenges 4 and 7, while serious problems were encountered when trying to obtain evidence for challenge 6 (Figure 3).

Figure 3

Practices contribution to each CHALLENGE of the Standard



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Lessons learned from the Assessment

THE OVERALL LESSONS LEARNED FROM THE ASSESSMENT POINT TO THE NEED FOR CONTINUING IMPROVEMENTS IN THE PRACTICES EMPLOYED IN URBAN PLANNING AND IMPLEMENTATION, IN PARTICULAR:

- ▶ Better and more systematic evaluation of options (to allow assessment of **TRADE-OFFS AND ECONOMIC FEASIBILITY**) including quantitative and qualitative assessments of value (e.g. cost/benefit analysis, environmental impact assessment, public opinion survey etc).
- ▶ More inclusive **PUBLIC INVOLVEMENT**, and the incorporation into every-day practice of multilevel planning through stakeholder partnerships (both internal and external) at different scales.
- ▶ Incorporating **ADAPTIVE MANAGEMENT APPROACHES** into strategic and project planning.
- ▶ Establishing systems for gathering and **STORING BASELINE AND MONITORING DATA**, and periodic evaluation and reporting regarding interventions at all scales.

OTHER IMPORTANT CONSIDERATIONS REGARDING THE ASSESSMENT AGAINST THE STANDARD ARE:

- ▶ What is the **UNIT OF ASSESSMENT**, e.g. a park, a neighbourhood, a transport network? This must be clearly defined to allow assessment against available data. Having a clear definition will help to identify what indicators will be important for the assessment and to ensure the necessary data is gathered, or that an assessment can be made with the data that is already available.
- ▶ Regarding **ECONOMIC FEASIBILITY ASSESSMENT** there is a general lack of:
 - Monetized evaluation of the benefits of NbS, including both the core benefits (e.g. flood prevention) and additional benefits such as increasing resilience against climate change, improving environmental conditions, contribution to health and well-being etc.
 - Studies on the economic evaluation of the effectiveness against climate change. In this context, the comparison of the NbS with a traditional solution is considered essential.

The great opportunities presented by the IUCN Global Standard for Mediterranean cities, in the words of participants in the assessment, are to provide:



"It could be very useful, especially if used in the planning phase, which is over for us at the moment. I personally would like to revisit it from time to time, as it can provide new insight in every phase, but its main strength would be in the initial phases".

City of Zagreb

"It provides a consistent way in which practices can be analysed and reported easing the identification of opportunities and niches for improvement".

Málaga provincial authority



"It proposes a very valuable approach for the valuation of biodiversity in urban contexts". "It can contribute to improving the way of reporting to citizens and different agents with focus on the relevant involvement of the private sector in the NbS implementation".

Barcelona City Council



"It offers the opportunity for strategic view and thinking, although lack of time and resources are always a constraint for those responsible for the practices".

Barcelona City Council



"While the balance between economic variables and biodiversity and sustainability is difficult to achieve it is also seen as an opportunity to verify the need to consider all dimensions beyond the economic viability towards successful implementation".

Vitoria-Gasteiz City Council

"The assessment with the NbS criteria will allow us to implement the new Standard when designing, writing, implementing and monitoring our future projects. We will enrich our database of monitoring and evaluation measures of ecosystem services generated by our agroforestry projects with this methodology.

We hope to get to know and have more opportunities to collaborate with other projects and members of the civil society involved in the assessment of Standard and also to strengthen our chances of accessing more funding."

Association Les Amis de Capte Tunisie-Bizerte (Tunisia)



Spatial features of Mediterranean Cities and the need for NbS

Cities in the Mediterranean region are spatially diverse, ranging in size from small and medium sized towns and cities to megacities. Historically they followed a **compact form, largely in response to the Mediterranean climate, with high population density** and narrow streets interspersed with open squares. The form of cities is also influenced by landscape, with cities confined to a narrow coastal strip by mountains being a common feature. There are a large number of port cities, having an industrial core. Many of these areas are now being redeveloped for housing, as new port infrastructure is developed on the urban fringes.

From the 20th century many cities have expanded rapidly in a more dispersed model, comprising lower density development expanding outward along arterial transport corridors. This development is often **poorly planned**, with little consideration of open space and 'active' transport needs (walking and cycling). Coastal resort development represents a different type of urbanisation, often linear with a high density of **tourist accommodation on the shoreline** but also with large areas of open space adjacent to the sea (e.g. Boulevards, recreational parks etc).

These modern developments are **not adapted to climate** in the same way as the historic urban forms, and so require large amounts of energy for cooling, and large proportions of land devoted to transport infrastructure. Their transformation of the landscape has important consequences for water management, especially in the context of climate change. Water shortages and salinisation of coastal aquifers are already issues of concern. Similarly, biodiversity is depleted. Traditional food production systems such as olive and orange groves and small farms, often relatively high in biodiversity, are lost. Overall, ecosystem services once provided by natural and farmed landscapes are not replaced in urban forms of land use. **Nature-based Solutions should aim to address these losses.**

Cities must respond also to profound economic and social change, in particular in variable population growth rates, migration to urban centres, the need to create jobs for an expanding youth population, provision of affordable and good quality housing, changing lifestyles of a growing middle class, and economic opportunities and threats posed by globalisation. Many of these issues demand spatial responses –redevelopment and regeneration, or new development– providing **opportunities to redesign cities to meet these new challenges.**

Cities must respond also to profound economic and social change, in particular in variable population growth rates, migration to urban centres and the need to create jobs for an expanding youth population.



Contributing to the Mediterranean policy framework

These are well known challenges for Mediterranean cities. In 2011 the Union for the Mediterranean called for an **Urban Development Strategy for Mediterranean cities** – the resulting guidance framework sets out the main challenges and suggested responses for urban areas of 15-20,000 inhabitants or more. The **Mediterranean Strategy for Sustainable Development** (2016-2025) in the framework of the Barcelona Convention recognised the particular challenges represented by cities in the region, especially regarding energy use, waste management, food security, and overall resilience to human-made risks and hazards. The Integrated Coastal Zone Management (ICZM) and Land Based Sources of pollution (LBS) Protocols of the Barcelona Convention call for the protection of natural coastal zones, recognising the continuing impacts of urban areas on the natural environment of the Mediterranean.

The IUCN global NbS Standard provides a tool to support Mediterranean urban areas to meet the common challenges identified by the Union for the Mediterranean in its guidance framework for sustainable cities.

Local governments have a strong leadership role to play. Strategic spatial planning and urban development planning are powerful tools for guiding the renewal of Mediterranean urban areas to meet the challenges described. These processes, related stakeholder engagement and public participation, and the programming, monitoring and enforcement of implementation all fall to local governments for leadership.

Networks, such as **MedCities**, have been established to promote good practices and knowledge sharing amongst urban professionals in local governments around the Mediterranean.

The IUCN global NbS Standard provides a tool to support Mediterranean cities to meet the common challenges identified by the Union for the Mediterranean in its **guidance framework for sustainable cities**, and the urban objectives set out in the Mediterranean Strategy for Sustainable Development. These challenges are complex and interrelated, arising from profound demographic, environmental and economic change, and must be tackled in an integrated way. This is an approach to which NbS are well suited, delivering multiple benefits, and which the NbS Standard facilitates.

Given the status of NbS as a new approach, its potential must be established through well designed and implemented applications. The Standard provides a robust framework to do this, based on internationally agreed Principles.

This works at both design and verification stages:

- **Design:** using the standard to help assess the various options available to tackle the particular problem that needs to be solved
- **Verification:** confirming that a design adheres to NbS principles, which may be important for funders, political leaders, or the public.

Design and verification both take place at different scales, compare a city-wide green infrastructure strategy with the design of a public park for example, but nevertheless common standards can be applied to ensure quality and consistency in the planning and implementation of NbS.

How might the Standard BE USED IN PRACTICE TO ACHIEVE these goals?

The assessment for use of the NbS Standard in Mediterranean cities demonstrates its value as:

▶ A STRATEGIC PLANNING TOOL

The Standard can be used as a 'quick scan' diagnostic tool in the early stages of strategic planning, whether for a city-wide spatial strategy or a single neighbourhood or regeneration site, to ensure the multiple benefits of NbS are considered and integrated into policies. Later in the process the Standard can be used to evaluate the policy, prior to final review, and during implementation.

▶ A PROJECT DESIGN GUIDE

Again, the NbS Standard can be used at different stages in the design of specific interventions, such as the design of a new housing or industrial complex, or the renewal of a transport corridor. A quick scan early in the project ensures NbS are fully considered and integrated into the design. Later evaluations can ensure the final design meets its aims, and that implementation is delivering the desired outcomes.

▶ A VERIFICATION TOOL

At both design stage and following implementation, the NbS Standard provides an evaluation and assessment framework to measure outcomes across the seven societal challenges. In this way the Standard can be embedded as a learning process within urban planning and green infrastructure management.



Relevance of NbS Standard for urban authorities

As NbS enter into policy and are adopted by projects on the ground there is a pressing need for greater clarity and precision of what the concept entails and what is required for it to be deployed successfully. Without this, the application of NbS could result in inconsistent and ungrounded applications. The Standard provides a systematic learning framework so that lessons can improve the application of NbS, leading to greater confidence in NbS among decision makers and supporting further innovation. Similarly, in the absence of such a

Standard, NbS may remain a general concept, only marginally contributing to the pressing sustainability needs and not realising its full potential. Consequently, **the Standard provides an opportunity to create a global user community that helps guide implementation on the ground**, accelerates policy development, and creates a scientific evidence base on NbS. Through the Standard, NbS will be based on a common understanding of its interpretation and a shared vision for a just and sustainable world.

The IUCN Centre for Mediterranean Cooperation is committing to promote the NbS Standard in the Mediterranean, including capacity building in NbS with special focus on Mediterranean cities.

What BENEFITS does use of the Standard promise FOR LOCAL GOVERNMENTS?

As a **systematic design and evaluation tool** the NbS Standard provides many benefits, including:

- ▶ Contributing to the creation of **more liveable** urban environments, improving public **satisfaction** with the environment.
- ▶ Facilitating the embedding of NbS in strategic and operational plans.
- ▶ Providing a process for **co-creation** of green infrastructure with stakeholders to **better meet** their social and economic needs through urban renewal and NbS.
- ▶ **Diversifying** urban economies (e.g. urban agriculture; green infrastructure construction and maintenance services) and **creating** a more attractive environment to revitalise urban centres and **promote** inward investment.
- ▶ Reducing air and noise pollution and improving **public health**.
- ▶ Providing more cost **effective** surface water management.
- ▶ Improving **resilience** to environmental hazards, such as heat stress, flooding and sea level rise.
- ▶ Providing more sustainable **solutions** than hard infrastructures to adapt to and mitigate climate change.
- ▶ **Efficient** use of resources through the optimisation of **multiple benefits** from NbS investments.



Tackling societal challenges with NbS in the urban context

Increasingly a knowledge of societal challenges is used as the basis for prioritisation of governance and action at all scales. This is reflected in the UN Sustainable Development Goals and in European Union policy, for example. The following paragraphs provide an overview of the contribution that NbS can make to the specific societal challenges addressed by the [IUCN Global NbS Standard](#) (see also summary table 3 on page XX). More information can be found in the report '[Nature-based Solutions to address global societal challenges](#)'. And the IUCN report '[Nature based Solutions in the Mediterranean Cities](#)' provides 50 examples from the Mediterranean region.



Climate change mitigation and adaptation

The effects of climate change on urban areas are diverse. Increasing global temperatures will lead to more intense heatwaves and more extreme weather patterns. These effects call for more cooling (and potentially more carbon emissions as a result – the sort of feedbacks to be avoided) to reduce heat stress, and modifications to infrastructure to cope better with heavy rainfall, and storm surges on the coasts. Increased temperatures and sun intensity increase the negative effects of air pollution, especially from traffic. There are NbS to all of these effects. For example:

- **Low energy cooling - green infrastructure** provides shade and evaporative cooling (e.g. green roofs, green walls, trees). Water features also promote evaporative cooling (but the energy consumption of fountains or other pumped systems must be considered carefully).
- **Drought and flooding.** More extreme weather events require better urban water management. Promoting direct infiltration (e.g. soakaways) or temporary storage and evaporative loss (green roofs) keeps excess rainfall out of drains and recharges groundwater for use during periods of drought. Use of green infrastructure to slow surface water that cannot infiltrate (many options ranging from tree canopy storage, to rain gardens, to temporary storage ponds) is generally cheaper than installing bigger drains, and delivers multiple benefits that below-ground infrastructure cannot.
- **Stabilisation of soils.** Drought and flooding play a part in the destabilisation of land, especially steep slopes, through erosion and waterlogging of soils, producing landslips. Carefully planned planting binds soils with plant root systems, and helps to manage soil moisture content.
- **Coastal flooding and wave damage.** Coastal dune and beach systems and wetlands (including seagrass beds) provide natural defences against heavy wave action which can cause erosion of the shoreline and damage to property, and flooding by overtopping of sea defences. In parts of the world, securing this type of protection has led to reduced insurance costs for coastal properties such as hotels and other elements of tourist economies.
- **Urban food production** has a part to play in reducing carbon emissions: shortening supply chains and therefore transport emissions; recycling food waste as compost (also reducing carbon emissions from methane emitted as food decomposes); and helping to protect and enhance soil quality and its capacity to store water.

- **Carbon sequestration** is a vital part of our response to climate change. Urban trees can play an important role in capturing and storing carbon for decades, and so removing it from the atmosphere. Urban trees deliver a range of other benefits as well, and the concept of the ‘urban forest’ is gaining increasing attention as a NbS.
- **Air quality.** Higher temperatures and related changes in atmospheric conditions tends to decrease air quality. Plants are proven to be good at removing pollutants and improving air quality, by trapping particulate pollutants, performing as a physical barrier to the dispersal of pollutants (from highways for example) and by absorbing polluting gasses.



Human health

The natural environment, and more specifically ecosystems, the climate and biodiversity, are increasingly recognised as being influential determinants of human health, well-being and social cohesion. A 2016 report published by IUCN points to an established and diverse body of evidence detailing these complex linkages and their underlying mechanisms. The World Health Organisation estimates that 12-18% of all deaths in the WHO Europe region are linked to environmental factors. For example, according to the European Environment Agency, air pollution is the single largest environmental health risk in Europe. A range of chronic diseases (such as obesity, cardio-vascular disease, respiratory disease and diabetes) that place great burdens on health services are linked to environmental quality and access to nature.



Several studies have focused on how the benefits of green space 'encounters' (whether active or passive) can influence health and well-being. These include improvements in environmental quality, such as heat regulation and noise abatement, the promotion of physical activity and associated Body Mass Index improvements, enhanced social interaction, social cohesion and perceived safety, and opportunities for spiritual wellbeing experiences. The **WHO 'One Health'** initiative promotes integrated decision-making to protect public health from systemic threats - such as infectious pandemics, antibiotic resistance, and food safety - in the mitigation of which NbS can play a part especially in urban environments which house most of the world's populations.

Urban NbS for positive human health include public parks and gardens, the urban forest in its entirety (street trees, urban woodland etc), community gardens, and planted boulevards and other people-friendly transport corridors ('green links').



Food security

Food security is one facet of the large inequalities experienced in most urban communities.

As more of the world's population live in cities, price and availability of staple foods are increasingly dependent on long supply chains and international commodity markets. Access to a sufficiently varied diet to provide the full range of micronutrients needed for good health is limited by supply and cost - a challenge often leading to both obesity and malnutrition according to the UN Food and Agriculture Organisation.

NbS to urban food security include use of vacant land for food production, rooftop farming, and policies for allocation of land for food production in urban developments (e.g. community gardens). Food production can also be integrated with food waste management and wastewater management, reducing pollution and increasing the recycling of essential nutrients. These

actions help to discourage soil sealing (e.g. paving over gardens for other uses), to improve rainwater infiltration and temporary storage so reducing flash flood risk and effects of drought, to limit pollution, waste and associated carbon emissions, to support improvements in health and well-being and community cohesion, and help to reduce inequality.



Water security

Water management in cities has a number of dimensions. Urbanisation typically reduces the infiltration of rainwater into the soil, because so much of the surface is sealed – mostly with concrete and tarmac for example. This has a number of important effects:

- Rainfall collects on the surface and rapidly enters gullies, drains and water courses. During heavy rainfall, which we increasingly experience with climate change, this often causes localised flooding and pollution. Pollution comes from hydrocarbons and dust washed off surfaces, and from the flooding of foul sewers.
- Another important effect of sealed surfaces and the reduced infiltration of rainwater into the soils is the effect this has on the recharging of aquifers. In the past, most towns had little impact on recharge rates. However, with rapid urban expansion the area of cities has grown enormously. Their effect on aquifer recharge rates is therefore significant. Further, with urban expansion, the demand for water increases. With these two factors, coastal freshwater aquifers are severely depleted in many cases, leading to saltwater intrusion, harming their use for drinking water and food production.



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NbS for enhanced water security include: use of porous hard surfaces and green roofs to allow rain water management where it falls rather than relying on its transportation through expensive underground drains; wetlands (permanent or ephemeral) to slow the flow of water, provide storage against drought, and remove pollutants from runoff; planting of urban trees to slow rates of rainfall runoff; and many more.

Increasing attention is being paid in policy to the interlinkages between **water, food and energy, and the circular economy**, each of which provide different ways of thinking about NbS and what benefits they can deliver in an urban context.



Environmental degradation and biodiversity loss

The implementation of NbS to address the societal challenges above will help to prevent and reverse environmental degradation and biodiversity loss. This is important as research has shown the importance to the urban economy and society of the ecosystem services that are enjoyed as a result of healthy natural capital.

The strategic mechanisms to strengthen this urban **natural capital** fall broadly into two related categories:

- Improved urban planning – to plan strategically for urban re-naturing by creating new green space, connecting green spaces, ensuring new development contains sufficient green space for community health and well-being, protecting the use of green space to optimise ecosystem service flows.
- Practical re-naturing green, blue and grey infrastructure – restoring and enhancing the biodiversity and ecosystem functioning of green and blue infrastructure, and replacing or greening the grey infrastructure (roofs, streets and highways, paving, hard flood and erosion defences).



Disaster risk reduction

NbS improve resilience to natural hazards, in particular: flooding from heavy rainfall and overflowing rivers; sea flooding; coastal erosion; heat waves; erosion and landslips. The various mechanisms by which NbS provide benefits to disaster reduction are explained in other sections



Economic and social development





NbS can deliver benefits for economic and social development as well as improving the health of the population and environment. They:




- Improve attractiveness of the urban environment, especially the public realm and business districts, to attract inward investment. A high quality environment provides a competitive edge over other enterprise locations.
- Support population health and community cohesion by providing places for people to meet and undertake community activities, and provide tranquil spaces that have been demonstrated to improve mental health. Community gardens and urban farming can improve a range of physical health attributes, linked to a high quality diet.
- Provide direct employment and innovation potential (e.g. food system; urban greening products and services such as green roofs, green walls etc; nature-based drainage systems).
- Help reduce inequality by supporting individual and community health, wellbeing and prosperity.

New bridge over Guadalhorce river. Part of the Senda Litoral project in the province of Málaga.
Image source: <http://www.sendalitoral.es/es/>



Table 3: A summary of NbS, their benefits, and implementation challenges in relation to the seven societal challenges recognised by the IUCN global NbS Standard.

SOCIETAL CHALLENGE	EXAMPLES OF NbS	CO-BENEFITS	POSSIBLE CHALLENGES	SUGGESTED SOLUTIONS
 Climate change mitigation and adaptation	Green roofs and walls; planting street trees; urban agriculture; coastal wetlands; urban parks and gardens.	Low energy cooling; drought and flood mitigation; stabilisation and improvement of soils; coastal flood and erosion protection; water and air pollution removal; carbon sequestration; improved air quality.	Encouraging the private sector to invest; achieving climate change mitigation at scale; managing trade-offs between diverse priorities.	Effective development management; effective strategic planning; effective communication, environmental assessment, and stakeholder engagement.
 Human health	Urban parks and gardens; green transport routes; urban trees.	Reduction in chronic diseases (obesity; cardiovascular; respiratory; diabetes); improved mental health; reduction in heat stress.	Creation of space for green transport corridors; opposition to urban street trees, which can damage road and pavement surfaces, and block drains.	Development of robust transition plans for urban transportation; make use of tree planting technologies and best practices, and effectively communicate their benefits to the public.
 Food security	Community agriculture (market gardens, orchards, etc); industrial closed system food production.	Improved health and reduction in diet related illness; reduced food waste and associated carbon emissions; improved soils and water management; improved community cohesion.	Allocation of sufficient space for food growing.	Develop policy to enable space allocation in new developments; reclaim unused industrial land; support development and adoption of innovative business technologies.
 Water security	Green roofs; attenuation ponds; planted gullies and wetlands; permeable paving; urban tree canopy.	Reduced risk of flooding; mitigation of drought; increased recharging rate of aquifers; reduced water pollution; improved sewer capacity and reduced costs for sewage pumping; reduced pollution from sewer overflow events; evaporative cooling to reduce heat stress.	Retrofitting NbS for water management in existing urban environments.	Maximise opportunities to use public space for water management; ensure development policies support incorporation of nature based water management in site redevelopment plans; integrate planning between various water service providers and spatial planners.

SOCIETAL CHALLENGE	EXAMPLES OF NbS	CO-BENEFITS	POSSIBLE CHALLENGES	SUGGESTED SOLUTIONS
 <p>Environmental degradation and biodiversity loss</p>	Re-naturing urban spaces; creation of wildlife corridors and refugia; greening of grey infrastructure.	See other societal challenges for a wide range of co-benefits.	Differing perspectives on how urban green space should be managed; financing new green infrastructure investments.	Initiate a public debate regarding nature-friendly practices to support new operational policies; measure and take account of the values of ecosystem services; develop new financial instruments based on the monetisation of benefits from ecosystem services.
 <p>Disaster risk reduction</p>	Nature based urban drainage solutions; nature based coastal protection solutions; nature based soil stabilisation solutions; Nature based urban cooling solutions.	See other societal challenges for a wide range of co-benefits.	Ensuring these systemic issues are addressed at sufficient scale.	Ensure they are effectively addressed in urban spatial plans at a strategic level.
 <p>Economic and social development</p>	Planting public and private space to improve the attractiveness of the urban environment; installation of other Nature based Solutions.	Attracting inward investment; improving footfall and retail turnover in city centres; improved population health and wellbeing; promoting innovation and growth in nature based goods and services.	Making the investment case for NbS and green infrastructure.	Quantify and value ecosystem services.

Plan del Verde y de la Biodiversidad de Barcelona 2020.

Image source: https://ajuntament.barcelona.cat/ecologiaurbana/sites/default/files/PlanVerde_2020.pdf





Mediterranean CASE STUDIES

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In the following pages are presented eight case studies out of the **18 practices** from the assessment of the IUCN Standard against existing NbS in Mediterranean cities. They are necessarily summarised and do not provide the full detail that an assessment against the Standard would produce. For example, each case indicates a pass or fail against the Standard for each of the eight criteria. In reality, the Standard allows for a more nuanced assessment having four outcome categories (strong, adequate, partial and insufficient). For further detail of each assessment, please, review the full report: *First screening of the IUCN Global Standard for Nature-based Solutions in Mediterranean Cities*.

ALICANTE:

Parque del Mar/ Sea Park

BARCELONA:

Green Infrastructure & Biodiversity Plan

JERUSALEM:

Gazelle Valley Park

MÁLAGA:

Coastal Trail

NICE:

Nature at the heart

PAVLO MELAS:


Integrated regeneration and Metropolitan Park

TUNISIA:

Environmental corridors

ZAGREB:

Sesvete Living Lab



CASE STUDY:

Sea Park Parque del Mar, Alicante (Spain)

TYPE: 3  Coastal resilience under rising seas	SOCIETAL CHALLENGES  Climate Change  Water Security  Human Health  Environmental degradation and biodiversity loss	STATUS  FINALISED
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Case summary

Parque Del Mar is a public park designed to create a visual and acoustic buffer between the port and the city. The **Port Authority of Alicante** has built a green, attractive, high quality space, using native tree and bush species adapted to Alicante's climate, with a low level of maintenance and water consumption. It is a new space where citizens can spend their leisure time and enjoy cultural activities. Careful thought has gone into the design of the landscape, to provide topographic variety and visual strength and attractiveness through the planting scheme, guided by the principles of the European Landscape Convention. Its contribution to local biodiversity is high.

The park is constructed on port land, which has a high economic cost. However, the strategic benefit is to limit the impact on the city of continued port operations, helping to limit noise, air and visual pollution.

The second Phase of this intervention will include criteria for the selection of protected species (incorporating a nursery of local species) to further enhance biodiversity. Water efficiency in park management is another key concern.

Parque del Mar is designed to act as a buffer between port and city.

Image source: <http://www.ingenierospaisajistas.com/parque-del-mar>



How does the NbS meet the societal challenges?









Most directly this NbS addresses:

- Environmental degradation and biodiversity loss through the transformation of derelict industrial land, and
- Human health through the mitigation of air, noise and visual pollution.

As the Park is developed further progress is made (Phase 2) in relation to water security, climate change mitigation co-benefits, and co-benefits from improving community infrastructure.

Indirectly this NbS contributes to socio-economic development by helping to mitigate the impacts of port operations on the surrounding community and so managing strategic risks for port management.

How well does the NbS meet the Standard's criteria and what challenges were encountered?

CRITERIA		COMMENTARY
1. NbS effectively address societal challenges		The societal challenges that addressed are water security, climate change in terms of its co-benefits (green space, habitats and biodiversity, environmental quality including air quality and waste management). There is explicit reference to human health, linked to some environmental benefits and also aligned with social justice, cohesion and equity. In these terms also social development is considered. Finally, economic development is one of the goals of the intervention.
2. Design of NbS is informed by scale		This intervention is informed by scale: that of the port in relation to the city, and the scale of the task to mitigate the impact of port activities. The port and city administrations have worked together to integrate various strategies and so maximise the benefits of the intervention.
3. NbS result in a net gain to biodiversity and ecosystem integrity		Phase 1 of the park implementation tackles the environmental degradation of industrial land directly, through the landscaping of the park. In a second phase more attention is paid to biodiversity gains and water security.
4. NbS are economically viable		A cost benefit analysis is not available for assessment, and indeed in purely economic terms would be unfavourable. However, the port authority recognises the strategic benefits (which are difficult to value) for social and ecological sustainability.
5. NbS are based on inclusive, transparent and empowering governance processes		Stakeholders are identified, nevertheless their involvement in the process in terms of participation and decision making are not explained. The approach for decision making is based on co-governance or hybrid governance (mix of responsibilities between government and non-government actors). No citizenship or community involvement is identified, rather their interests have been represented by the city authorities.
6. NbS equitably balances trade-offs between achievement of their primary goal(s) and the continued provision of multiple benefits		Whilst the intervention represents an inherent trade-off between commerce and public well-being, this has not been explicitly assessed.
7. NbS are managed adaptively, based on evidence	 partial	Regular monitoring for air quality and noise is in place (formal monitoring system and presence of monitoring/evaluation reports), but a more comprehensive monitoring and evaluation framework is lacking.
8. NbS are sustainable and mainstreamed within an appropriate jurisdictional context		NbS practice has been included in the Strategic Plan of the Port of Alicante

Further information:

<https://naturvation.eu/nbs/alicantealacant/vegetable-barriers-port-alicante>

<http://www.ingenierospaisajistas.com/parque-del-mar>

CASE STUDY:

Green infrastructure and biodiversity plan, Barcelona (Spain)



Case summary

The Green Infrastructure and Biodiversity Plan in Barcelona is a holistic strategic initiative that consolidates several plans, programs and projects that are relevant to providing ecosystem services and integrating nature in the city to improve its resilience.

The New Plan (2021-30) reflects an important change with respect to the previous phase, regarding the classification and management of green spaces, and it places a particular focus on Biodiversity as a main goal in response to the EU Biodiversity Strategy approach and requirements. The purpose of the Plan is to present the technical and legal documentation (policy, operational goals etc), and to identify the urban transformation projects. Biodiversity issues have been placed within the department of legal services and urban planning for the development of this Plan – a notable achievement with significant benefits for the integration of biodiversity into city planning.

The political basis for this plan is the City Council objective of “achieving a green infrastructure that offers the maximum ecosystem services in a city where nature and city interact and are empowered.” It also responds to municipal commitments such as the Citizen Commitment to Sustainability 2012-22, which promotes the “renaturation of the city”, and the Barcelona Commitment to Climate, which sets the objective of “increasing urban green by 1 m² for each current inhabitant in 2030, to generate a greater adaptation of the city to the possible effects of climate change.”

Representation of the green corridors in the eastern part of the city. Plan del Verde y de la Biodiversidad de Barcelona 2020
Image source: https://ajuntament.barcelona.cat/ecologiaurbana/sites/default/files/PlanVerde_2020.pdf











How does the NbS meet the societal challenges?

This plan responds to specific goals of the City, which are supported by a strong evidence base and widespread public and political support. It has undertaken systematic surveys, at neighbourhood level, of all urban spaces and biodiversity. It has engaged with diverse stakeholders and consulted widely on priorities and options to address them.

The Plan performs the challenging task of integrating a diverse range of sectoral and thematic plans and programmes so as to maximise the benefits of natural capital for the city and its residents. It has elevated the status of biodiversity in city planning and management, and in the minds of the public. This provides a strong policy basis for the systematic adoption of NbS to address societal challenges.

How well does the NbS meet the Standard's criteria and what challenges were encountered?

CRITERIA		COMMENTARY
1. NbS effectively address societal challenges		The main goals are explicit and well detailed in the documents regarding the Plan and its implementation programme. During the First Phase of the Plan a specific study was developed to analyse the provision of ecosystem services by the green areas of the city including: climate change adaptation (thermal regulation for instance), wellbeing (social interaction and nature contact), and environmental co-benefits in terms of acoustic and air quality improvements and biodiversity. Finally, positive economic impacts were reported..
2. Design of NbS is informed by scale		The Plan and implementation programmes have a holistic approach of Socio-ecological Systems where interactions between natural ecosystem and society are reported and analysed. The Plan acts as an umbrella for a number of initiatives and plans which are aligned and work towards a common vision of the City. Green infrastructure becomes an integrating element across different urban plans and policies, including risks from climate change.
3. NbS result in a net gain to biodiversity and ecosystem integrity		The Plan is based on a detailed assessment of the green spaces of the City and their biodiversity. The Digital Atlas of Biodiversity provides a snapshot of the city's trees, green-space plants, birds, butterflies and vertebrate animals among others. It is meant to be updated every 5-10 years. Opportunities to enhance ecosystem integrity and connectivity are explicitly recognised in the plan.
4. NbS are economically viable	 partial	A full cost benefit analysis has not been undertaken. However, this is being done for some specific elements of the plan, such as for parks management options
5. NbS are based on inclusive, transparent and empowering governance processes		A participatory approach is used for the definition of the Plan. This process enriches the results and also increases the public awareness and maintenance of green infrastructure. Participants included multi-level government representatives, researchers and social, environmental and private institutions, direct and indirect stakeholders and civil society organisations.
6. NbS equitably balances trade-offs between achievement of their primary goal(s) and the continued provision of multiple benefits		No evidence found in the assessment. At the strategic scale of this Plan assessment of trade-offs is highly complex.
7. NbS are managed adaptively, based on evidence	 partial	A complex mix of activities, linked to individual elements of the plan, contribute to the evidence base and its monitoring. An overall monitoring and evaluation plan is in place, contributing to an adaptive management approach.
8. NbS are sustainable and mainstreamed within an appropriate jurisdictional context		The City is aware of lessons learned in the first phase of the plan and these are incorporated into phase 2, as appropriate. Through this plan green infrastructure and biodiversity is becoming a driver for urban policies regarding planning, public health, sustainability, social rights and culture.

Further information:

Web Barcelona City Council - Department of Ecology, Urbanism, Infrastructure and Movility (in Catalan) <https://ajuntament.barcelona.cat/ecologiaurbana/ca>

Plan del Verde y de la Biodiversidad de Barcelona 2020. https://ajuntament.barcelona.cat/ecologiaurbana/sites/default/files/PlanVerde_2020.pdf

CASE STUDY:

Gazelle Valley Urban Nature Park, Jerusalem (Israel)



Case summary

This initiative was established in the context of Jerusalem`s LAB legacy project for the International Decade of Biodiversity. The main goal is to protect the rapidly declining native Mountain-Gazelle population, in an urban nature park, combining both wildlife preservation, local recreation and education.

The Gazelle Valley, the foremost urban nature site in Israel, opened to the public in 2015 after a decade-long public campaign to save the inner-city greenspace from development. It replicates natural habitat. The main purpose of the initiative is adapting the park by means of:

- Maintaining a breeding population of Mountain Gazelles (*Gazella gazella*) in the park, in order to reintroduce members of this endangered species into the wild.
- Creating a functioning urban ecosystem, promoting biodiversity for over 500 species of plant life, many of which were reintroduced in an effort to recreate the original flora that existed in the Jerusalem hills prior to the 20th century.
- Raising civil awareness of the importance of natural ecosystems through specific events and providing facilities for social gathering in urban nature (picnic spots and outdoor classrooms). It is conceptualized as a social hub.
- The whole park acts as a storm water filter collecting rainwater from dry river valleys. An extensive meadow at the lowest point allows the collected water to seep into the aquifer.
- An innovative water circulation system connects a series of ponds with the main lake. Collected rainwater is pumped back upstream and is recirculated through the valley. The water is ecologically cleansed by plants to make it safe.

Gazelle Valley map

Image source: <https://www.gazelle-valley.com/>



How does the NbS meet the societal challenges?

Enhancing ecosystem services is the main driver, but climate change adaptation is also important, specifically in terms of the water management system designed for the park. Finally, social interaction and education activities are very much a part of the key goals, which are mainly devoted to increasing awareness of biodiversity, wildlife protection, climate change and ecosystem management.

How well does the NbS meet the Standard's criteria and what challenges were encountered?

CRITERIA		COMMENTARY
1. NbS effectively address societal challenges	✓	Biodiversity and the conservation of wildlife is one of the key drivers of the intervention. In this sense, creating a natural urban ecosystem is the main goal of the practise. This specific goal is related to climate change and disaster risk which was the ethos behind the water management system. Social development is part of the societal challenges addressed in this case, since it is devoted to offering a social hub for social gathering and development of educational activities aligned with the goals of the park.
2. Design of NbS is informed by scale	✓	The Park is managed jointly by the Municipality of Jerusalem and SPNI, a nature NGO. The park works in close cooperation with the Jerusalem Bird Observatory. Tours, seminars and conventions are regularly held in the park, hosting companies and decision makers from across the country.
3. NbS result in a net gain to biodiversity and ecosystem integrity	✓	A comprehensive survey of flora and fauna was conducted before the Park's formal establishment, which influenced the infrastructure planning for the park and the botanic enrichment program to rehabilitate the site's ecosystem and endangered flora.
4. NbS are economically viable	✗	No evidence found during the evaluation of economic assessments. However, the management of the Park is re-procured periodically, providing a market mechanism to establish fair management costs.
5. NbS are based on inclusive, transparent and empowering governance processes	✓	The Gazelle Valley Park was established in its current form following years of public participation in the planning process. A resident's convention from the adjacent neighbourhoods gave the public the opportunity to voice their opinions and eventually voted for their preferred design for the park, which was subsequently implemented.
6. NbS equitably balances trade-offs between achievement of their primary goal(s) and the continued provision of multiple benefits	✓	The stakeholders in this case are acknowledged as the Mountain Gazelles. Two-thirds of the park is set aside for their use only. The public may visit the other third. This is a new concept to many of the visitors and is often a test of self-restraint. The control of storm water management was the driving force behind the support by the local water authority for the infrastructure of the Park. Since the copious amounts of rainwater have been collected by the natural filtration systems, there has been no local flooding. Seasonal flooding of the area had been damaging to road infrastructure as well as personal property. This has now ceased because of NbS.
7. NbS are managed adaptively, based on evidence	✓	The Park staff and management apply established policies regarding the Mountain Gazelles, the water circulation system, the botanic enrichment and endangered flora conservation programs. Any intervention only takes place after considering their possible repercussions and with regards to crucial time periods for the ecosystem such as breeding periods, the dry and wet seasons, and the various annual cycles of the plant life.
8. NbS are sustainable and mainstreamed within an appropriate jurisdictional context	✓	The Gazelle Valley Urban Nature Park is used as a successful example of NbS for other projects both within Jerusalem and Nationwide. The park's master plan, as well as documents containing specific information about the flora and fauna, are publicly available on the park's website and available to inform other developments.

Further information:
<https://www.gazelle-valley.com/>
<https://www.gazelle-valley.com/eng/>

CASE STUDY:

Coastal trail of Málaga (Spain)

<p>TYPE: 3</p>  <p>Coastal resilience under rising seas</p>	<p>SOCIETAL CHALLENGES</p>  <p>Socio-Economic development</p>	<p>STATUS</p> 
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Case summary

This case study comprises a 180 km corridor, The Senda Litoral, along the coastal margin, connecting towns and cities, visitor attractions and the natural coastal habitats. As well as providing important mobility infrastructure for a tourism-based economy, it affords opportunities for ecological restoration as a biodiversity corridor.

It is led by the Provincial Council of Malaga with the collaboration of the 14Over 80% of Malaga's coastline is already passable, through multiple infrastructures. This is a challenging long-term project to complete the remaining 20%. It will take five years to be developed and involves the more complicated coastal sections comprising mobile structures (boardwalks etc) and new links.

The project is driven by economic development priorities, particularly to enhance the province's tourism infrastructure. It's role as a NbS to enhance biodiversity is a secondary factor. Consequently, this retrospective assessment highlights a number of aspects for which application of the NbS Standard would have improved design and monitoring in respect of the ecosystem service benefits of the project.

Section of Senda Littoral trail.
Image source: <https://static.malaga.es>











How does the NbS meet the societal challenges?

This project, in the context of the NbS Standard, primarily responds to socio-economic challenges. However, in doing so, it recognises the value of a high quality natural environment. Hence, environmental restoration is integral to the design of individual interventions in this strategic programme.

The overall programme responds to the interactions between the economy, society and ecosystems at varying scales. Biodiversity is addressed in the project, identifying different species and linking them to the main hazards that have an impact on them (e.g. overexploitation of fishing grounds, uncontrolled waste dumping, and mass tourism). Climate change is also integrated.

How well does the NbS meet the Standard's criteria and what challenges were encountered?

CRITERIA		COMMENTARY
1. NbS effectively address societal challenges	 partial	The intervention is mainly driven by economic development, generating social development indirectly. It is mainly focused on the improvement of the area for touristic purposes, including public spaces and natural areas. However, only tourism benefits are documented in detail. There is no specific information regarding the enjoyment of natural and cultural heritage as a contribution to human wellbeing.
2. Design of NbS is informed by scale	 partial	The project recognises interactions between increasing connectivity, improving tourist attractiveness, improving of economy, and improving heritage and environmental value. The project responds to differing scales, of institutions and intervention areas. Consideration of risks is limited to engineering aspects of connectivity.
3. NbS result in a net gain to biodiversity and ecosystem integrity	 partial	Biodiversity is addressed in the project detailing the different species and linking them to the main hazards that have an impact on them, but no evidence was available for assessment regarding the setting and monitoring of biodiversity outcomes. Opportunities to enhance ecosystem integrity and connectivity were secondary benefits, rather than integral to the concept.
4. NbS are economically viable	 partial	An economic analysis specifies costs and benefits. In relation to natural capital, it is limited to the cultural services of the landscape, primarily through increased accessibility for visitors to key natural attractions. Other aspects of co-benefits of NbS were not addressed. No evidence was available to demonstrate that alternative options for NbS were developed and evaluated.
5. NbS are based on inclusive, transparent and empowering governance processes	 partial	The project involves a large number of local governments and agencies in an integrated plan. However, evidence of direct stakeholder engagement was not available.
6. NbS equitably balances trade-offs between achievement of their primary goal(s) and the continued provision of multiple benefits		No evidence found during the evaluation.
7. NbS are managed adaptively, based on evidence		No evidence found during the evaluation.
8. NbS are sustainable and mainstreamed within an appropriate jurisdictional context		The Coastal Path will help to conceive of the Costa del Sol as a single product that covers the entire coast of the province, from east to west. It is a sister project of the Gran Senda de Málaga (GSM), the circular route throughout the province through roads and trails, which has already become a national reference for active tourism. Some of its sections will be common. These trails are important for the regional tourism economy.

Further information:
<http://www.sendalitoral.es/es/>

CASE STUDY:

La Nature au coeur de Nice Nature at the heart of Nice (France)



Case summary

The metropolitan territory constitutes a biodiversity hotspot, having many protected species and habitats. This must be reflected in local development policy and projects, hence the City is drawing up a new Plan for reclaiming nature and biodiversity, aiming to halt biodiversity loss, to renature landscapes to benefit wildlife and citizens, and to improve knowledge of an engagement with nature. Nature based solutions are central to the plan to develop, renovate, and build (green roofs, passage for wildlife, etc.).

A flagship project is to make the city centre greener. Six kilometres of green arteries will be created from the disappearance of the bus lanes thanks to the arrival of the tram. The tramline itself will be set in grass, and its margins planted with 2,400 trees. 10,296 trees will be planted in the city as a whole.

Nice

Image source: <http://www.nice.fr/fr/actualites/la-nature-au-coeur-de-nice/mairie?type=articles&parent=root>



How does the NbS meet the societal challenges?

This strategic plan is strongly driven by the political commitment to address climate change, through a model of sustainable development that reconciles growth, jobs and respect for our planet. Nature and biodiversity is at the core of this development model. The plan not only protects biodiversity, but is using NbS to improve city life by creating new green spaces, such as in the old bus lanes, and designing in multiple benefits such as protection from heat stress and flooding.

The Plan aims to halt biodiversity loss and make the territory more functional for species by maintaining or restoring movement corridors for species and reservoirs of biodiversity, restoration of land and water corridors (green and blue grid), and reducing animal collisions and light pollution in connection with road infrastructures.

The plan is supported by a programme of training, such as workshops for elected officials and technicians whose goal is to create a common culture around nature in the city and its role in the fight against climate change. This will help to mainstream the creation or the protection of urban green spaces in development projects. A metropolitan atlas of biodiversity will improve the use of data and information in decision-making.

How well does the NbS meet the Standard's criteria and what challenges were encountered?

CRITERIA		COMMENTARY
1. NbS effectively address societal challenges	✓	The plan is led by the challenges of environmental degradation and biodiversity loss, and climate change. In taking action on these issues the NbS deployed help to address other societal challenges. New green corridors will have positive health benefits for example, and help reduce risks from flooding and heat stress. A more attractive city environment can have economic benefits too.
2. Design of NbS is informed by scale	✓	The plan is developed at metropolitan scale with a strategic view. It seeks the complementarity of interventions, using biodiversity enhancement to improve city permeability so that the inhabitants benefit from the beneficial effects of nature.
3. NbS result in a net gain to biodiversity and ecosystem integrity	✓	The Plan identified specific actions on biodiversity. These include: preservation of movement corridors for species, and protection of reservoirs of biodiversity as well as individual species; restoration of land and water corridors (green and blue grid); action to reduce animal collisions and light pollution in connection with road infrastructures; a marine plan; species preservation strategy (local ocellated lizard plan in particular).
4. NbS are economically viable	✗	No evidence found during the evaluation.
5. NbS are based on inclusive, transparent and empowering governance processes	✓	The Plan places great emphasis on environmental education, to raise awareness at all levels of society and administration and to mainstream successes.
6. NbS equitably balances trade-offs between achievement of their primary goal(s) and the continued provision of multiple benefits	✗	No evidence found during the evaluation.
7. NbS are managed adaptively, based on evidence	✓	A monitoring strategy covers different environmental and socio-economic aspects. The monitoring schemes includes installation of sensors for air quality / temperature / hydrometric parameters. The City has developed a unit of biodiversity experts (6 people) to support development and infrastructure project leaders, carrying out studies, providing advice on taking biodiversity into account - from the design phase to site monitoring.
8. NbS are sustainable and mainstreamed within an appropriate jurisdictional context	✓	The aim is to incorporate green and blue infrastructure into urban planning. The creation of a metropolitan atlas of biodiversity will improve knowledge and support integration of NbS in development planning and implementation.

Further information:

<http://www.nice.fr/fr/actualites/la-nature-au-coeur-de-nice/mairie?type=articles&parent=root>

CASE STUDY:

Metropolitan Pavlos Melas Park (Greece)



Case summary

Pavlos Melas, near Thessaloniki in northern Greece, has one of the highest levels of unemployment in Greece. Efforts to regenerate the city include a strategy to incorporate knowledge on ecology and urban planning into the design of green areas to create new parks and ecosystems. These new environmental features of Pavlos Melas are not only designed with biodiversity enhancement in mind but also as a way to provide opportunities for businesses, creating jobs and economic welfare.

The flagship project concerns the transition of a former military camp in the city centre into a Metropolitan Park. Largely abandoned since 2006, nowadays it represents an 'Urban Gap' contributing to the deprivation of the area. To reverse the situation, the municipality has focused on a strategic regeneration plan based on different steps and procedures, with increased dialogue and cooperation of key stakeholders.

The area corresponds to 332,104 m² and comprises 63 buildings of 24,000 m². The Municipality is embarking on the restoration of the park across a number of phases. Phase 1 will concentrate on the restoration of the Park's green spaces with the sustainable reuse of the many buildings being the focus of the Phase 2 restoration.

Pavlos Melas

Image source: https://pavlosmelas.gr/mppm_2020/



How does the NbS meet the societal challenges?

This NbS addresses the societal challenges as follows:

- **Climate change, biodiversity and water security:** water management (water supply, sewerage and irrigation infrastructure improvement) to cope better with heavy rainfall and drought; new planting of approximately 3,600 new trees and 3,800 new shrubs to manage thermal stress (including the new plantings especially of trees and the development of pergolas) and improving biodiversity.
- **Disaster risk:** reducing the risk of forest fire through land improvement, cutting of dry and dangerous trees, maintenance (pruning of existing greenery can reduce fire risk). Water management reduces risks from flooding.
- **Human health:** the creation of the park will contribute to health and wellbeing through better access to high quality green space. Prevention of flooding has human health benefits.
- **Economic and social development:** The upgrading of the urban realm and provision of new social facilities make significant contributions toward resolution of economic and social challenges. These include the construction of three refreshment rooms, breweries, park equipment, pergolas, playgrounds, etc. configuration of sports facilities, and general improvement of basic infrastructures (sewerage, electricity).

How well does the NbS meet the Standard's criteria and what challenges were encountered?

CRITERIA		COMMENTARY
1. NbS effectively address societal challenges	✓	In addition to the commentary above, it should be said that this is a large site offering many opportunities to deliver multiple benefits. The design attempts to optimise the value of these social, economic and environmental benefits.
2. Design of NbS is informed by scale	✓	The design responds strongly to the history and cultural heritage of this site and is integrated with the long-term Strategic Action Plan for Thessaloniki. It takes account of risk factors inherent to this region (wildfires).
3. NbS result in a net gain to biodiversity and ecosystem integrity	✓	The design is informed by a detailed technical report on environmental aspects, and data is gathered and reported regarding 'new vegetation'. However, no evidence was found of a specific benchmarking exercise for the project.
4. NbS are economically viable	✓	Decision making was supported by an economic feasibility assessment, which included investment and operating costs. The economic assessment was made in the context of the long-term strategic plan.
5. NbS are based on inclusive, transparent and empowering governance processes	✓	With the support of the OSMOS platform (for the local based economy), workshops were organised in order to involve key city actors and stakeholders. However, no evidence was available regarding the fundamental principles underpinning consultation (such as free prior and informed consent).
6. NbS equitably balances trade-offs between achievement of their primary goal(s) and the continued provision of multiple benefits	✗	No evidence found during the evaluation.
7. NbS are managed adaptively, based on evidence	✗	No evidence found during the evaluation.
8. NbS are sustainable and mainstreamed within an appropriate jurisdictional context	✓	The intervention integrates not only the lessons learnt from previous projects (Prodomos Nikiforidis and Bernard Cuoro) but also makes use of this knowledge integrating it in a future project. However, there was no evidence that this is a systematic practice. The jurisdictional context is provided by the Strategic Planning process.

Further information:

Connecting Nature Project. Municipality of Pavlos Melas: <https://connectingnature.eu/pavlos-melas>

Pavlos Melas Municipality news: https://pavlosmelas.gr/mppm_2020/

<https://pavlosmelas.gr/epiasan-douleia-gia-tous-mouseiakou-xorous-sto-mitropolitiko-parko-paylou-mela/>

CASE STUDY:

Environmental corridors around Oued Tine valley area (Tunisia)



Case summary

This case has been included for its relevance to the urban fringes, where agricultural and natural ecosystems are progressively degraded by urban expansion. Given ongoing and rapid urbanisation, the urban fringes are continually expanding in area and now amount collectively to a significant and growing proportion of land in the Mediterranean Region. Further, they are dynamic environments subject to rapid and often unplanned change. A more strategic consideration of urban expansion and its relationship to remnant agricultural and natural ecosystems is needed, especially in the contexts of biodiversity protection, and water and food security.

The Oued Tine valley project concerns the creation of environmental corridors to build resilience to climate change. The environmental corridors ensure and restore the flow of species which are vital for the survival of the local agro-ecosystem but are also vital to the maintenance of the region's animal and plant biodiversity in general. The project promotes the use of environmental corridors to increase connectivity between biotopes, allowing species to move and survive in a degraded and fragmented landscape, and ultimately contribute to the sustainability of the unique agro-systems widely represented in the project area.

The project involves raising awareness of farmers and other stakeholders regarding the importance of biodiversity and NbS, and training in resilient farming practices. Agro-forestry systems in particular, such as olive and carob orchards, are promoted along with soil and water conservation practices.

Alternatives durables pour l'irrigation par en agroforesteries in Oued Tine, Tunisia

Image source: https://explorer.land/x/project/corridors_oued_tine/post/Fwg2xf/



How does the NbS meet the societal challenges?

The project recognises that to achieve the sustainable creation of environmental corridors into the agricultural landscape, they must be beneficial to farmers, helping them to adapt to climate change and to sustain their livelihoods. These rural populations face an increasing precariousness of income linked to various factors: soil degradation, pollution and salinization of water and soil, the decline of biodiversity, the lack of livestock grazing areas etc. These threats to the ecosystems are associated with significant climatic changes (longer heat waves, decreasing rainfall). The introduction of agro-forestry practices and environmental corridors aim to:

- Improve the population's perception of the importance of biodiversity and its state of degradation.
- Improve access to the appropriation of good environmental and agronomic practices by farmers and their families.
- Contribute to the resilience of farms and agro-systems by increasing the availability of new resources and by increasing the sustainability of cropping systems through agroforestry systems.
- Increase beneficial interactions between farmers and stakeholders.
- Conservation of natural resources such as water.

How well does the NbS meet the Standard's criteria and what challenges were encountered?

CRITERIA		COMMENTARY
1. NbS effectively address societal challenges	✓	The project responds to specific, well-defined challenges. It has a clear strategy to address the threats to biodiversity and livelihoods that it has identified, and has a credible monitoring plan.
2. Design of NbS is informed by scale	✓	This project is an excellent example of a micro-project with excellent scalability potential and a huge potential impact. It is embedded in existing institutions (NGOs, partnerships etc), enabling the leverage of results to create impact at scale, and is complementary to other initiatives.
3. NbS result in a net gain to biodiversity and ecosystem integrity	✓	Ecosystem connectivity through the creation of ecological corridors for enhancement of biodiversity is at the core of this project. Indicators for local biodiversity evaluation have been defined, and a survey programme planned. A training programme aims to improve the status of biodiversity in the agro-ecological system.
4. NbS are economically viable	✗	Partial. The planting of trees and the establishment of agroforestry systems will contribute to improving the resilience of farms to climate change and the restoration of agro-ecosystems. Whilst there was no evidence of assessment of the cost effectiveness of different options, this project takes a co-creation approach to enable option development and adaptive management.
5. NbS are based on inclusive, transparent and empowering governance processes	✓	A steering committee has been established, made up of experts, partners and representatives of the beneficiary population, to ensure the technical quality of the actions implemented. Training provision is based on a needs assessment of the population. Gender-based representation is ensured. Partners involved represent diverse interests.
6. NbS equitably balances trade-offs between achievement of their primary goal(s) and the continued provision of multiple benefits	✓	The potentially negative consequences of the project have been identified and documented- for example tensions between open access grazing and forestry. There is a process for stakeholders to contribute to deciding trade-offs.
7. NbS are managed adaptively, based on evidence	✓	A steering committee that has been established, made up of experts, partners and representatives of the beneficiary population will ensure the technical quality of the implemented actions. Progress will be measured against clearly defined outcomes within a monitoring framework. Stakeholders will be involved in developing scenarios to climate change adaptation, supported by local NGOs and technical experts from sector agencies. Adaptive capacities will be improved through training.
8. NbS are sustainable and mainstreamed within an appropriate jurisdictional context	✓	The Friends of Capte Tunisia association, supported by SAS Capte, expect this project to create momentum in the region and allow new plantations to be created with neighbouring farmers wishing to change their practice. Training will strengthen adaptative capacities amongst farmers and others and mainstream new practices. The project contributes to Tunisian targets for reducing carbon emissions from agriculture.

Further information:

https://explorer.land/x/project/corridors_oued_tine/about

CASE STUDY:

Post-industrial urban regeneration: The Living Lab at Sesevete, Zagreb (Croatia)



Case summary

Croatia's capital Zagreb is the country's largest and most economically significant city. The Living Lab is within the Sesevete district in the East of Zagreb at the foothills of the Medvednica mountain. With its 70,000 inhabitants, Sesevete has the youngest population in Croatia, and a strong community and entrepreneurial spirit. Located on various key European traffic routes, Sesevete has an industrial past and present, with a particularly active automotive and construction industry. Distinctive, tall silo buildings form part of Sesevete's skyline and industrial heritage. In particular, the site of the former meat-processing factory, Sljeme, is the core of the Living Lab, with green plans in place for the silo buildings themselves and the surrounding areas.

A number of NbS will be implemented and tested in the living lab:

- Community-based urban farms and gardens. Repurposing unused post-industrial land.
- Aquaponics. Closed system urban agriculture, producing fish and vegetables, and creating employment.
- Green walls and roofs. Retrofitting industrial buildings to adapt to climate change, improve biodiversity, and create a stimulating environment for a business innovation centre.
- Accessible green corridors. Revitalising the river corridor for recreation and active transport.
- Local environmental compensation processes. Understanding how to integrate nature-based solutions into planning procedures and policy development at local level.

As a living lab for NbS, results will be measured and evaluated and successes replicated elsewhere in the city.

Sesevete living lab

Image source: <https://progireg.eu/zagreb/>











How does the NbS meet the societal challenges?

The project has the objective of demonstrating the integration of NbS into business models that are economically self-sustaining and provide multiple benefits for the economic, ecological and social regeneration of deprived urban areas suffering from the consequences of deindustrialisation.

Economic innovation is one key aspect of the project. Therefore, market-ready business models for productive Green Infrastructure are explored, where the direct and indirect benefit and costs associated with the NbS, who pays and who benefits will be evaluated.

The Living Lab will implement different nature-based solutions, co-created with local stakeholders and citizens, that will create productive green infrastructure that not only helps improve living conditions and reduce vulnerability to climate change, but also provides measurable economic benefits to citizens and entrepreneurs in post-industrial urban districts. The choice and design of NbS are informed by a comprehensive spatial analysis covering the topics of socio-cultural inclusiveness, human health and wellbeing, ecological and environmental restoration, and the economic and labour market situation.

How well does the NbS meet the Standard's criteria and what challenges were encountered?

CRITERIA		COMMENTARY
1. NbS effectively address societal challenges		The spatial scale of this project provides opportunities for a variety of NbS to be implemented, which address a wide range of societal challenges. The objective of creating business opportunity based directly in NbS is of particular interest.
2. Design of NbS is informed by scale		This project is informed by a comprehensive spatial analysis of a post-industrial urban district and specific development sites, set within the context of the city spatial plan and other policies.
3. NbS result in a net gain to biodiversity and ecosystem integrity		This is particularly relevant for the green corridors that will connect the Living Lab to the Sava river, the ecosystems of the forest in the North with the river in the South, and the different parts of Sesevete being redeveloped.
4. NbS are economically viable		Economic benefits of the NbS are evaluated through indicators for economics and labour market. Beyond that, market-ready business models for productive Green Infrastructure are explored, where the direct and indirect benefit and costs associated with the NbS, who pays and who benefits will be evaluated. Comprehensive data collection and analysis using a system of indicators will enable economic evaluation and calculation of direct and indirect benefits of the different NbS options.
5. NbS are based on inclusive, transparent and empowering governance processes		Co-design was based on 6 principles to guide planning and decision-making processes, and involved a three step process using workshops to bring together local stakeholders. Key activities included participants sharing their visions for Sesevete in 2030, and in-depth stakeholder mapping of the area. Partners also presented their initial co-design ideas, which included launching an architectural competition in the area, offering a 'Walk around Sljeme' for students, a museum exhibition on the meat industry and history of Sljeme, and introductions to aquaponics, urban farming and the concept of an inclusive 'therapy garden', which uses horticultural therapy to integrate minorities and people with disabilities.
6. NbS equitably balances trade-offs between achievement of their primary goal(s) and the continued provision of multiple benefits		No evidence found during the evaluation.
7. NbS are managed adaptively, based on evidence		A spatial analysis constitutes the baseline for the NbS strategy in the living lab and the monitoring and evaluation plan. A Monitoring & Assessment Plan will be developed for the living lab, describing the procedure and indicators to be used to monitor and assess benefits of NbS. The monitoring and evaluation plan are configured as a collaborative action involving local authorities, the civic sector, SMEs, and research institutes, with the aim of providing a significant and comprehensive evaluation of NbS.
8. NbS are sustainable and mainstreamed within an appropriate jurisdictional context		Zagreb will monitor and evaluate the environmental and social benefits of the nature-based solutions implemented and, if successful, integrate nature-based solutions into planning procedures and policy development at local level.

Further information: <https://progireg.eu/zagreb/>

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