



Nature-based Solutions in Latin American and European countries: Trends and perspectives

The conceptual development and practical implementation of Nature-based Solutions (NbS) has rapidly advanced in the European Union (EU) and Latin American (CELAC) cities. A 2000-2020 literature review on NbS and related concepts shows advances, gaps, and insights, generating a valuable reference on the opportunities and challenges that NbS offer to sustainable urbanization.

Today, 55% of the world's population can be considered urban, and in both the EU and CELAC, the urban population is about 80%. The expanding urban population in both regions arises from various opportunities and competitive advantages, such as improved access to education and healthcare services, contributing to overall well-being. Even so, there are regional peculiarities, with the EU having lower population densities, while CELAC cities conversely have high population densities.

Urbanization in the EU and CELAC has led to numerous societal challenges: mobility concerns, escalating house prices, heightened crime rates, informal settlements, and increased poverty and inequality, particularly in CELAC. These challenges are intensified by the loss and degradation of natural ecosystems and their ability to provide ecosystem services, which in turn often negatively affect the well-being of urban populations.

The ecological degradation linked to urbanization in EU and CELAC cities is a result of the reduction and transformation of natural land cover, giving rise to issues like heat islands, air pollution, and water stress. Both regions face increased vulnerability to natural hazards and climate change. In addition, inequality in access to green spaces and ecosystem services is a significant challenge, especially urgent in CELAC, due to high poverty levels. Unplanned urbanization has been exacerbating these environmental impacts and related risks for decades in both regions.

NbS concept use

To address these urban societal challenges, a growing number of cities in both regions are embracing concepts and practices that focus on advancing urban development by integrating nature and several types of green spaces. These concepts and practices include Urban Green Infrastructure (UGI) or Urban Forests

(UFO), along with emerging concepts like NbS. NbS emphasize the importance of protecting, restoring, and managing ecosystems and biodiversity in cities to address social demands related to food, water security, human health, disaster risk reduction, and climate change.

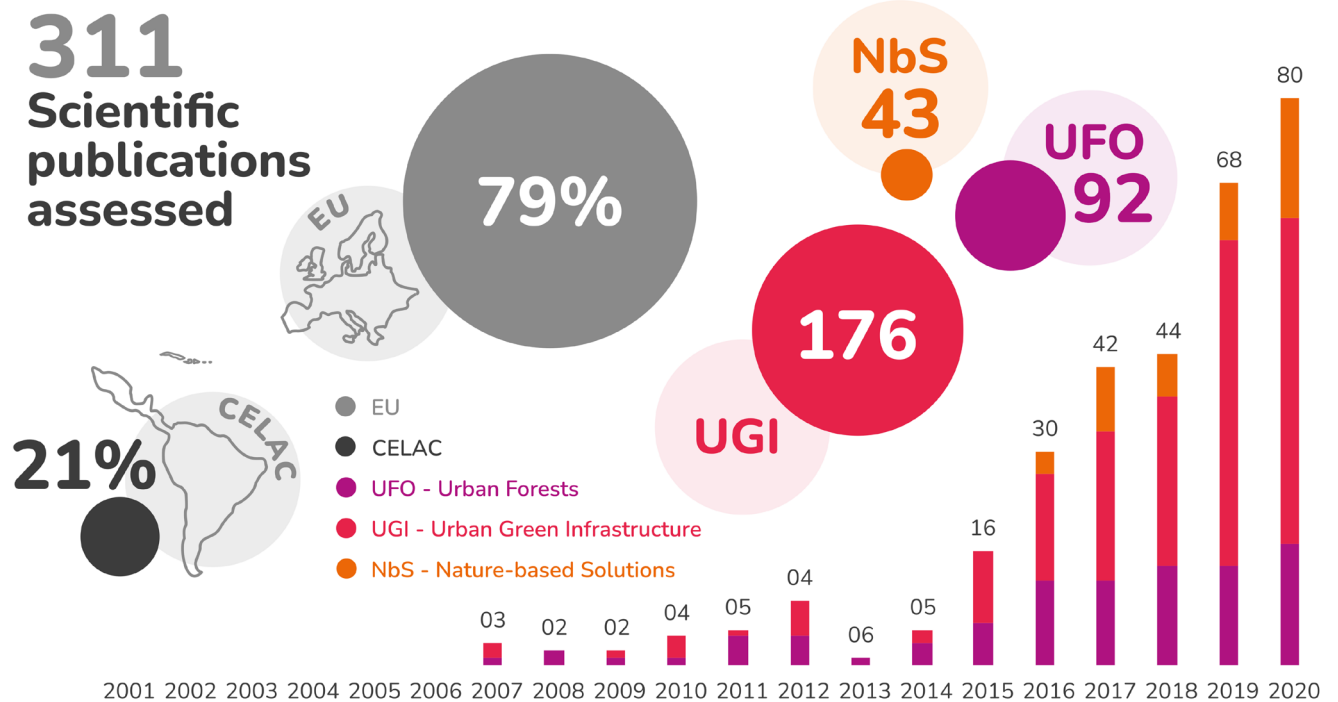
In recent times, NbS have been prominently featured in numerous scientific publications, national and regional reports, and other documents. This body of literature showcases the benefits of NbS for human well-being in cities. This increasing dissemination has facilitated their uptake and integration into governmental frameworks. Notably, the term is gradually being mainstreamed into public policies and urban planning, especially in EU countries. In contrast, CELAC is still in the early stages of this process, facing unique challenges related to diverse ecosystems, societal conditions, and economic factors. However, some initiatives and projects, like

NATURVATION, INTERLACE, and CONEXUS, demonstrate ongoing efforts to develop NbS knowledge adapted to local contexts in CELAC.

EU and CELAC overview

The review shows a substantial increase in publications on NbS in both regions, particularly over the last decade. These studies touch on both the conceptual and practical use of NbS, yet predominantly focus on UGI (56.6%). Those on NbS have gained steady momentum (13.8%), especially after 2016. The proportion of studies in EU cities is three times higher than that reported in CELAC cities, with the latter only beginning to be addressed since 2018.

Similarly, the distribution of studies across countries and cities shows varying levels of engagement. From the review, 78% of EU countries have been integrating conceptual and practical nature-based



approaches, led by Italy, Germany, the UK, and Spain. The explicit use of only the concept of NbS could be registered in studies in Italy, Portugal, Poland, Sweden, and Germany. However, there is little information from East European countries. In CELAC, only 36% of countries are involved in studies on NbS and related concepts, with Brazil, Argentina, Colombia, Mexico, and Chile accounting for over 80% of studies. This shows a significant information gap in Central American countries and the Caribbean Islands.

Consequently, it is important to take a nuanced approach to NbS uptake in each region. While CELAC cities would benefit from building local NbS knowledge and expanding implementation, EU cities ought to prioritize NbS assessment and endeavor to address identified regional barriers and gaps. Bridging these regional gaps in NbS use and knowledge demands sustained collaborative efforts involving various stakeholders. This requires comprehensive planning to prevent undesirable effects, considering the larger

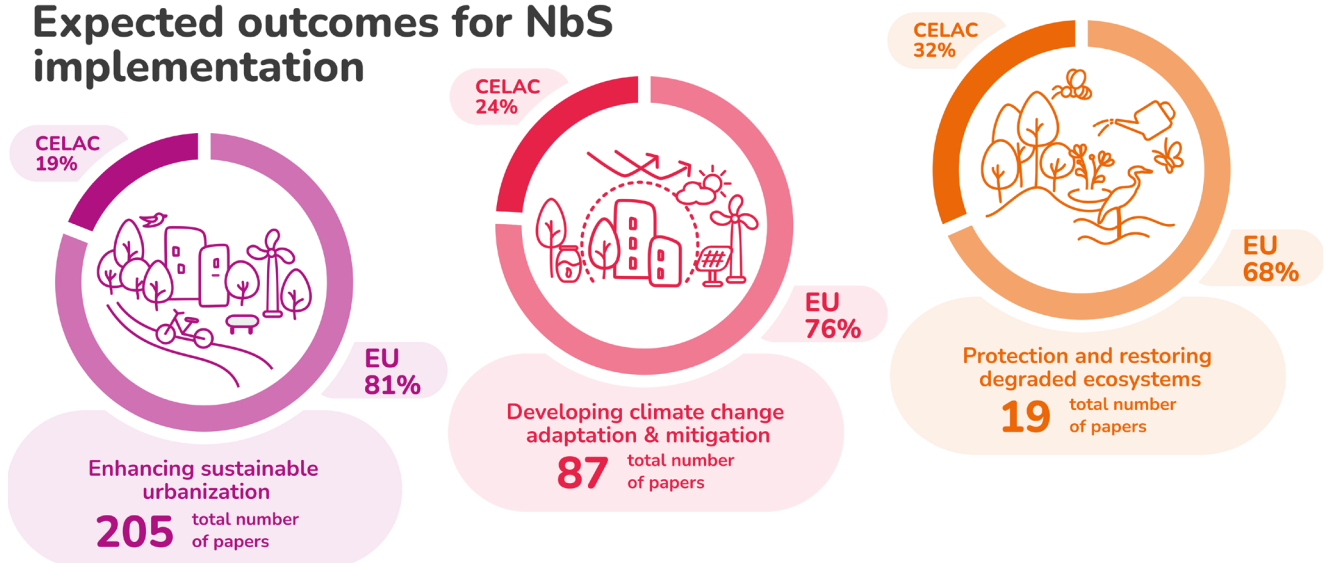
scale and wide community engagement. Despite the challenges, it also presents an opportunity for collaborative learning, fostering sustainable development, and enriching NbS knowledge with diverse perspectives.

NbS typologies

Most studies on NbS, UGI, and UFO, in EU and CELAC cities have primarily embraced a practical approach (52%). This involves implementing tangible solutions, such as green infrastructure plans outlining ecological corridors and Sustainable Urban Drainage Systems (SUDS), or transformative actions like installing green roofs, green facades, rainwater harvesting systems or building climate resilient infrastructures. These studies usually identify specific local needs, formulate action plans, and assess the impact of these interventions on the well-being of local communities and urban nature.

Conversely, the remaining studies (48%) have taken a conceptual and theoretical approach. They utilize modeling, analytical

Expected outcomes for NbS implementation





methods, and comparative approaches to assess the potential effects of interventions. These studies aim to inform strategic planning, policies, decision-making, and future research endeavors. For example, this may involve developing theoretical models to predict outcomes and guide planning processes.

NbS challenges addressed

Notable differences exist in the challenges faced by the two regions. In the EU, the primary challenge is people's limited access to green spaces, whereas in CELAC, the most urgent concern is addressing natural hazards (e.g. runoff, floods, and storm water). NbS implementation in the EU predominantly addresses urban sustainability and well-being, while in CELAC, the focus is more on ecosystem restoration rather than climate change adaptation or sustainable urbanization. In this sense, the inconsistency in these results indicates that CELAC cities should intensify their efforts to address the local

challenges by focusing more on adaptation to climate change and addressing flood risk areas.

Nevertheless, highlighting sustainable urbanization is also essential. Despite its complexity, the interdisciplinary character of sustainable urbanization provides a foundation for collaboration of a broader range of stakeholders and regional and interinstitutional cooperation, while addressing larger-scale multiple benefits to people's well-being.

In contrast, goals like climate change adaptation and urban ecosystem restoration face limited stakeholder interest, financing, and management mechanisms. Moreover, they are often associated with NbS actions encompassing local practices and neighborhood-scale interventions instead of regional approaches. Thus, this oversight underscores the need for region-specific strategies that are tailored to the challenges addressed and their context. As NbS are multifunctional, such

strategies would help decision-makers to optimize NbS and deliver the relevant and desired benefits.

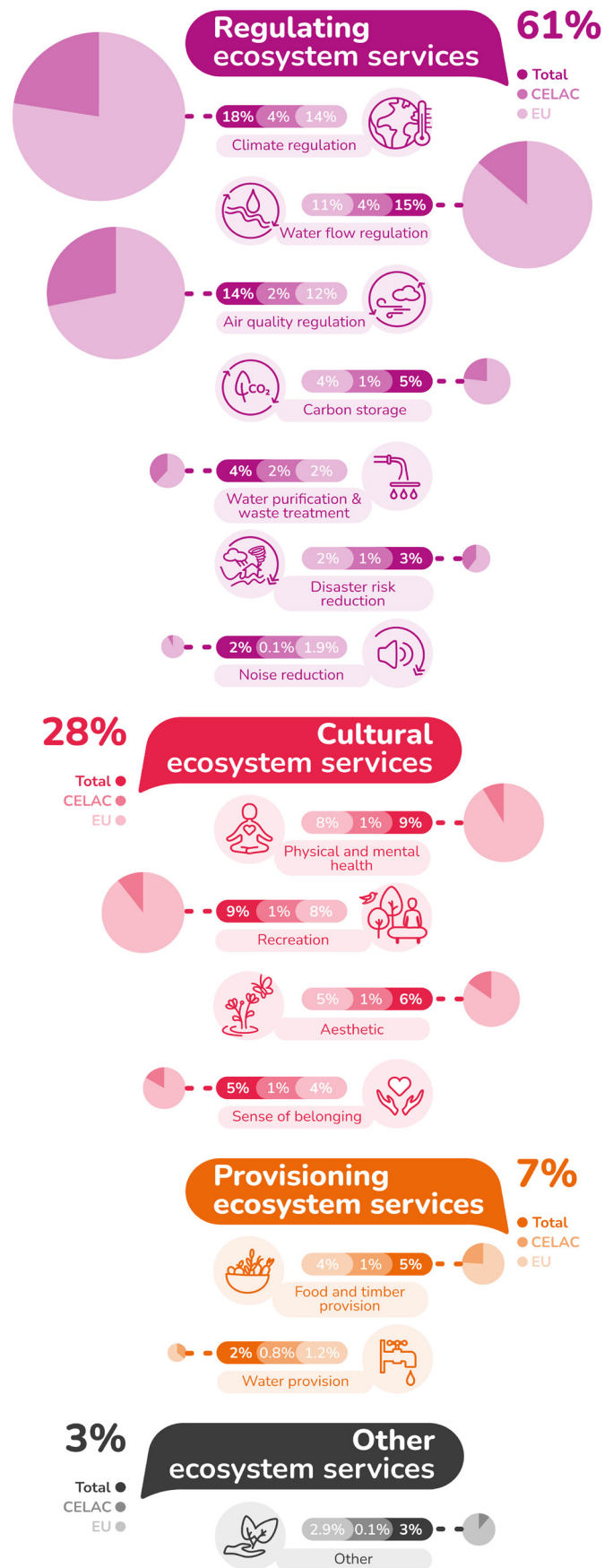
Regarding the challenges the NbS are meant to address, across the published studies, there is a focus on urban heat island (16.6%), low access of people to green spaces and its benefits (15.6%), air pollution (14.1%), reduced area covered by green spaces available for human contact with nature (14.1%) as well as the control of runoff, floods, and stormwater (13.4%). Other studies have sought to understand and manage challenges related to the degradation of ecosystems and ecosystem services, climate change, food security, and ecosystem disservices (e.g. allergies or damage to infrastructure resulting from vegetation).

The results further suggest that there is a greater interest in addressing city-wide public health issues than ecological or locally specific challenges. Also, the decision to address certain challenges could be related to a preference for the visibility of associated NbS actions (e.g. green roofs, living fences, gardens, and forestation), since these interventions tend to get a more positive reception from the public. In contrast, interventions related to less visible or hard-to-access areas, like runoff management and wetland ecosystem restoration, may receive comparatively less attention.

Overcoming barriers

Lastly, recent literature within the NbS framework, including related concepts like UGI and UFO, sheds light on barriers to

Ecosystem services evidenced in approaches used for NbS implementation



their widespread implementation. These hurdles include challenges in evaluating NbS impact, a notable societal lack of understanding about NbS benefits (especially pronounced in the EU), and obstacles related to the long-term maintenance of interventions. These challenges are exacerbated by negative perceptions and limited visibility, posing a threat to the

sustainability of NbS. In CELAC, a substantial impediment arises from insufficient data gathering, exacerbated by contradictory policies aimed at promoting NbS uptake. However, this barrier also presents a shared opportunity to develop novel measuring tools and methods for assessing NbS long-term impact, fostering efficient solutions in both regions.

Lessons learned



1. NbS integration must be accelerated to help build resilient futures in cities, especially in CELAC.
2. Regional approaches could enhance urban NbS knowledge and uptake for underrepresented challenges.
3. CELAC cities need to realign NbS implementation goals with their main local challenges.
4. Raising awareness of NbS benefits can boost public acceptance and stakeholder engagement in cities.

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