

Are Nature-based solutions the answer to urban sustainability dilemma?

The case of CLEVER Cities CALs within the Milanese urban context.

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Abstract

In 2013, the European Commission passed out the EU Adaptation strategy to increase knowledge-based framework related to resilience impacts on climate change adaptation actions. This study addresses the implementation of Nature-based Solutions (NBS) in three urban living labs in Milan as an experimental co-creation process. The ideation is mainly based on co-designing and co-implementing the possible NBS interventions with multiplicity of local stakeholders and involving citizens. The planned interventions starting in June 2019, in urban living labs known as CLEVER Action Labs (CALs), are summarized as follows: (1) Public tender for promoting green roofs and green facades in private buildings, (2) Giambellino 129 public park, and (3) vertical green interventions on the new Tibaldi train stop ; these are subject to investigation based on scale of application, urban policies, and governance. The comparative analysis between the three CALs showed: (1) a great potential to incentivize greening alliances and tax bonds from the local governmental authority, (2) the place-based morphology influences the urban resilience of the overall space context. The preliminary results correlate the stimulation of the 2015 European Commission framework on “NBS implementation and Re-Naturing Cities” to help shape the major funds behind the local governmental authorities’ involvement; yet, the economic feasibility of the NBS interventions remains a critical point to tackle local stakeholders’ engagement. Another strong aspect refers to the existing greening initiatives in the local Milanese context such as ‘Milan 2030 vision’ and the resilience strategy put in place to adapt and mitigate the Milanese climate change challenges and address its urban sustainability issues.

Keywords: urban sustainability, shared governance, European policies.

1 | Introduction: What is the framework of cities to implement NBS and what is co-creation?

The Nature-based solutions (NBS) approach to resolve climate change challenges and reframe conventional environmental management methods evolved in the last years with the novelty of introducing the concept of co-creation into community-based governance models. NBS stand for «actions which are inspired by, supported by or copied from nature. Some involve using and enhancing existing natural solutions to challenges, while others are exploring more novel solutions.... Nature-based solutions use the features and complex system processes of nature, such as its ability to store carbon and regulate water flow, in order to achieve desired outcomes, such as reduced disaster risk, improved human well-being and socially inclusive green growth» (Cohen-Shacham et al., 2016: 5) These definitions developed originally from IUCN (2012) report on addressing societal challenges by providing human well-being and biodiversity benefits from actions of protection and restoration of natural ecosystems.

The roadmap to embed NBS in cities frameworks’ of urban policies and resilience strategies kicked-off by the European Commission in (2015: 4) are based on four goals whereas the improvement in risk management and resilience using NBS leads to greater benefits rather than conventional methods. Ever since, a noticeable growing focus on Re-Naturing urban areas by developing green solutions such as parks and forests in post-industrial cities also emerged as response to challenges of environmental urban sustainability and in line with attainment to urban resilience aims (Gulrsrud, Hertzog, & Shears, 2018; Lawrence, et al., 2013). Coupled with this upsurge of interest in ‘urban greening’ with its social, economic and environmental collateral benefits, emerges the complexity of processes, interactions, organisations and maintenance of such resources. By consequences, the governance methods denoted into this ‘greening’ framework are often a constraint within cities’ hierarchical structure and they require a substantial effort in breaking silos of operational local governments implementation procedures.

1.1 | Learning from NBS experiences

Frantzeskaki (2019) compared fifteen cases of NBS across eleven European cities paving the ground for a cross-cutting cases analysis between social and climate benefits. Implications from NBS experiments brought some lessons learned into urban policy, planning and governance such as NBS requiring a

collaborative governance approach throughout initiation and multiple actors' collaboration to be designed, implemented, linked to urban life and maintained. Pointedly, the Italian case study from Potenza, Italy, showed the importance of citizens stewarding the maintenance and restoration of NBS in an urban park to address social inclusion and supporting the public authorities shortages to raise the quality of urban public spaces, as well as overcoming the constraining possibility of citizens to modify public green areas structure (URBACT, 2018: 35). Likewise, Raymond et al. (2017) expanded on the proofs-of-concept and demonstration stages of NBS; by stressing the phases of design of NBS implementation process while frequently engage stakeholders and communicate co-benefits. Lately, Davies and Laforteza (2019) argued the need for a transitional pathway to cover the gap between the dominance of grey infrastructure as the main deliverance and management of services, and the foundation for nature-based solutions as a “well-performing spatially based green infrastructure”.

2 | Challenges of NBS in urban spaces

This study identifies three major challenges related to urban greening, i.e. the governance, the financial and the spatial challenges. One of the touch-ground challenges in NBS deployment in cities' urban context is the governance and management of the process by bridging the gap between the selection of related actions to NBS implementation by local government and transfer/upscaling of NBS in-space. Moreover, contemporary cities face some other challenges in adapting NBS in their urban contexts: amongst, financial challenges of urban greening are raising the question of who pays for the construction and maintenance of green adaptation measures? Business models in this sense are not developed enough to pour return of investment into a closed loop of a shared 'green' economy. Another prominent issue is the spatial challenge; it is hard to put NBS in-place. Noticeably, the process of employing NBS in an urban context requires a spatial readiness, most probably this happens in the upfront ready-to-implement urban regeneration projects. In addition, NBS apply at different scales with different capillarity or density: all this makes the range of implementation devices very complex and heterogeneous.

3 | Hypothesis

In this research, the focus acclaimed rests on investigating how a shared governance approach supports reflexive decision-making and co-creation of NBS. In fact, effective co-creation process enables the visioning, co-design and co-implementation of NBS through engagement and participation of stakeholders during different stages. In this sense, a shared governance process fosters placemaking by re-focusing climate change adaptation and resilience strategies to better match community-based decision making (Frantzeskaki, 2019; Frantzeskaki & Kabisch, 2015). In other words, co-creation of NBS requires multiple disciplines for the co-design, a diversity of settings for co-implementation as well as collaborative governance of co-monitoring and co-development in recognition of the place-based transformative potential of NBS as a starting point to foster urban resilience.

Specifically, the research project CLEVER Cities hypothesizes that the usage of a shared governance approach for implementing NBS in the urban regeneration projects using the 16 steps pathway of co-creation guidance (Morello, Mahmoud, & Gulyurtlu, 2018) helps create better outcomes in terms of urban sustainability and maintenance of NBS interventions. Referring to the engagement of stakeholders and bringing citizens on board of decision-making goes beyond just co-designing the NBS in place; it represents the main vertebral criteria to a complete co-creation process.

4 | Methodological Approach

In this paper, we evaluate the co-creation pathway implementation process of the CLEVER Cities project in three urban living labs, named CLEVER Action labs (CALs), within the context of the city of Milan, Italy. The pathway of co-creation process, based on a scientific review and as a recent concept in urban planning, comes-in from the world of economics that brings in the users experience into the design of prototypes; henceforth, closing the gap between the local government as service provider of NBS and citizens as the beneficiaries. The same approach was adopted in the 16 Steps Guidance of Co-creation of NBS for CLEVER Cities¹. The process envisions five major phases, according to a complete co-creation approach that covers from ideation, construction and management of the envisioned interventions, namely: (1) Establishment of Urban Innovation Partnership (UIP), (2) Co-creation planning, (3) Co-design, (4) Co-implementation, and (5) Co-development of NBS.

Each of these phases encompasses several steps, that could be flexibly adapted to different city contexts; some of them are fundamental to ensure a process integrity and comparability, others are either recommended or optional to maintain a certain continuity in cities implementation. A toolkit is provided in each phase as well to accompany cities from the ideation process till realisation. Each step could consist

¹ See <https://clevercitiesguidance.wordpress.com/>

on one or more tools to reach the targeted objectives. The whole guidance incorporates communication and dissemination tools as well in order to bridge the gap between knowledge and agendas of different actors on the ground.

In sum, throughout the proposed complete co-creation process, CLEVER Cities are recommended to follow the pathway and adhere with some deliverables in merit. The first phase of the establishment of the urban innovation partnership was concluded in December 2018 with three cities (London, Hamburg and Milan). A step-by-step report was filled out from each city's responsible on the process development, stakeholders mapping and engagement (Cantergiani, Garcia, Menny, Murphy-Evans, & Casagrande, 2018).

5 | The Milanese NBS context (setting the ground)

The municipality of Milan launched CLEVER Cities to the public in November 2018. The establishment of the Urban Innovation Partnership (UIP) consisted on a challenging stakeholder mapping and engagement process (Mahmoud & Morello, 2019). Following the co-creation pathway, the UIP establishment consists the first step towards the setting-up of an active stakeholder engagement and local actors' participation in co-creation urban living labs, the so-called CLEVER Action Labs (CALs). The UIP establishment in Milan was deeply influenced by the specific interventions distributed along a railroad and flagged NBS in buildings aiming to 'Re-greening Milan' (see Table I).

Noteworthy, the preliminary resilience assessment identified in Milan's urban context – launched in November 28th, 2018 – considers the greening initiatives and NBS integration in the urban ecosystems as one of the most efficient tools to combat against urban heat island and air quality problems. The notion is that the strategy of 'Cool Milano' will help the Milanese territorial functions to get better organized from an urban sustainability aspect by augmenting biodiversity, economic competitions and prosperity, and creating socially enjoyable public spaces (Direzione Urbanistica, 2018).

The first constellation planning positioned the project's scope within the multitude of governmental urban greening initiatives and grassroots movements and a city-wider resilience strategy. That resulted from a two-days' workshops bringing experts from local government authorities, academia, environmental agencies, experts from the NBS fields and RFI with Italferr as partners in one of the CALs. A second launch event followed in February 2019 with a wider circle of local stakeholders allowing the touch-ground with other initiatives and syndicates of engineers, architects, ecologists and urban planners to get informed on the CLEVER Cities initiative.

Table I | Comparative table of information for the three CLEVER Action Labs of Milan.

	CAL 1: "Rinverdiamo Milano"	CAL 2: "Giambellino 129"	CAL 3: "Tibaldi Train Stop"
Description	The Milan's area selected is characterized by a high density of population and a mix of residential buildings. About 1/3 of these buildings show a flat covering, the same as most of modern built city. The main challenge is to improve the climate change adaptation's ability of buildings and neighbourhoods, both facing the heat islands and as flash floods phenomena, through greening intervention over buildings (roofs and walls), raising people's awareness and perception, improving the social cohesion and creating new job opportunities.	Social distressed district with large project for Social Housing Rehab in course, funded by ERDF. Green area is abandoned. Reclaim in progress. After the process, the area will become a community garden with self-farming facilities. Community will be involved both in design and the management of the garden. Connection and mitigation of annoyances because of the railway, strengthen biodiversity in the garden.	CAL3 includes interventions to strengthen biodiversity corridors and mitigate environmental impacts of the new Tibaldi RFI railway station. In CAL3 (with RFI, ITALFERR, CDM, AMAT, ELI), the local partners will develop new types of noise and accident safe barriers using different greening types. The area consists on a station of 250 meters long and 40 meters width in the public space. From one side, it will be designed a pedestrian walkway and a cycling pathway underway the rail station to connect with the tramway on the crossing. On the other side, a public space of 40 * 60 meters will be co-designed with local community open participation process.
Urban spatial Scale	Jurisdiction of Municipality 6, but replicable city-wide.	Jurisdiction of Municipality 6.	Jurisdiction of Municipality 5.
Type of NBS intervention	Spots of green roofs and green facades on private buildings.	Mainly community gardens and rain gardens.	Green noise barriers and vertical green walls on the train station entrances.
Environmental Challenge	Urban heat island, sustainable urban drainage and run-off,	NBS in space, governance issues, social inclusion.	Environmental issues, the cost of the green noise barrier, the

	governance model.		introduction of NBS in tenders related to train infrastructure.
Governance Challenges	<ul style="list-style-type: none"> • Sharing the tender vision and communication among the different city departments. • Directing a public tender to a single area of the city risks generating inequalities. 	<ul style="list-style-type: none"> • Governing co-creation and financing NBS in a socially deprived area where priorities are different. • Governing co-design projects, balancing expectations and feasibility of solutions. • Coping the different decision-making timing of long co-design processes and rapid public work tenders. • New governance models for co-management of public spaces are needed. • Internalizing co-creation expertise in public administration. 	<ul style="list-style-type: none"> • Opening decision-making to citizens through a co-creation process is novel and complex for a train company responsible for a strict timeline of works with risks of delays and extra costs. • Finding new ways for organizing public tenders that include co-creation beside the technical design for physical construction alone. • New governance models for co-management of train company owned spaces are needed.
Financial Challenges	<ul style="list-style-type: none"> • Funding the tender beyond the little incentive given by CLEVER Cities. 	<ul style="list-style-type: none"> • Limited budget for interventions in terms of construction and especially maintenance. 	<ul style="list-style-type: none"> • Funding NBS in tenders for a mobility infrastructure with limited budget is difficult, as it is perceived as non-priority compared to other aspects (accessibility, safety, security).
Spatial Challenges	<ul style="list-style-type: none"> • Small size of private residential roofs. • Competing solutions for roofs (e.g. PV panels, walkable roofs). • Roofs are invisible from street level are not a strong marketing device for companies. 	<ul style="list-style-type: none"> • The size of the park is big if referred to the appropriation of this space by citizens: assessing how can people occupy and densify the use of space through NBS. 	<ul style="list-style-type: none"> • The interface of the infrastructure to the city (public and private spaces) poses questions of acceptance and compatibility, which might put NBS to the background.

6| Discussion

Resulting from this uptake on lessons learned from NBS co-creation in Milan (see Table 1), we summarize the main suggestions for CLEVER Cities challenges for addressing sustainability from an urban planning perspective, on one hand, as follows:

- **Governmental:** the road to integration of NBS in planning tools and adopting planning laws and update procedures and tenders of public works to support NBS proliferation is still long. As well as the political support to rely on citizen-led initiatives to realize NBS in order to overcome the short-term political decision-making cycles (Schmalzbauer, 2018). While NBS are relevant for various departments in parallel, that requires clear responsibilities and coordination across offices and overcoming knowledge gaps on NBS design features. Moreover, co-creation expertise needs to be internalized in public administration and become the common rule of decision-making concerning urban regeneration interventions.
- **Financial:** the implementation and mainstreaming of NBS to address challenges is highly influenced both on the value and the ways in which the investment is secured and could be maintained over the long-term (Perrin, 2018a, 2018b) attracting private actors and demonstrating the return of investment of adaptation measures remains a big challenge.
- **Spatial:** NBS should not be considered as new interventions alone, but also as tools to properly maintain existing green, grey and blue infrastructures. It is essential to balance trade-offs while delivering multiple NBS and applying targeted participation programmes to engage vulnerable residents. The variety of NBS typologies, extension and localization criteria, makes the overall spatial challenge hard to deal with generally valid rules.

On the other hand, citizen involvement and engagement represent major hinge points towards creating socially inclusive NBS in place. Adaptation strategies necessarily need the active involvement of a wide variety of actors in decision-making processes, strong motivation, engagement and joint responsibility. In this line of thought, the involvement of both citizens and professional stakeholders will only be improved

if their climate change risk perception and awareness is substantially increased. Awareness raising campaigns about potential risks associated with extreme events are of great importance.

7| Conclusions and recommendations:

The scientific evidence on NBS ensures the urge of using a transitional path towards overcoming the urban challenges cities face nowadays. In this research, by analysing the ongoing experience of the three CALs in Milan, we discern that urban planners should have an open approach to collaborative governance of NBS and find the right tools to enable the innovation of practices. The operational form of co-creation processes allows learning with and about new appealing designs, perceptions and images from different urban actors. It allows as well forming of new entities working for operating and maintaining NBS to ensure inclusivity, livability and resilience.

The case of Milan is constrained by hierarchical silos and consolidated practices that favour traditional grey solutions, yet the ambition of the three CALs are grounded towards inclusive and ambitious urban regeneration. The co-creation pathway followed up by the city of Milan authorities and stakeholders (CDM, Eliante, AmbienteItalia, RFI, Italferr, FPM, POLIMI) shows a prospective to bring stakeholders on a working table to collaboratively work on the challenges that the city of Milan face nowadays to address its urban sustainability dilemma.

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9| Contributions:

This article is an original contribution and all authors contributed equally.

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