

## NATURE BASED SOLUTIONS: AN URBAN DRIVER FOR CHANGE.

Fabiola Fratini<sup>1</sup>, Ambra Bernabò Silorata<sup>2</sup>, Michela Lisi<sup>3</sup>

### ABSTRACT

As urbanisation becomes a mega-trend (United Nations Department of Economic Affairs, 2019), overpopulation and connected increasing needs of natural resources, alongside with land use and climate change, are accountable as the primary drivers for loss of biodiversity and alteration of ecosystems (The Economics of Ecosystems and Biodiversity, 2010). Urban nature has the potential to address Climate Change pressures and to positively impact on human well-being leveraging on psychology, creativity and inspiration opportunities, education (Pauleit, et al., 2017) – the so called “Nature’s Contributions to People” (Diaz, et al., 2018). The experience in San Lorenzo neighbourhood reveals that cities can address societal challenges with NBS by considering people in the process and that active citizen is a fundamental enhancing factor of urban nature. The transitory dimension of *Tactical NBS* makes them suitable to leverage on that dilated time of the elaboration and implementation of an urban project, becoming its precursors.

### 1. Introduction

Today’s urban areas produce more than 70% of CO<sub>2</sub> emissions<sup>4</sup> and accommodate over 55% of the global population, showing peaks of 80% in Europe – a share which is expected to grow by 2050 (World Bank, 2018).

As urbanisation becomes a mega-trend (United Nations Department of Economic Affairs, 2019), overpopulation and connected increasing needs of natural resources, alongside with land use and climate change, are accountable as the primary drivers for loss of biodiversity and alteration of ecosystems (The Economics of Ecosystems and Biodiversity, 2010). While causing Climate Changes, urbanisation enhances their effects and threatens both human wellbeing and ecosystems, as a result of e.g. of the shrinkage of available

---

<sup>1</sup> Sapienza University of Rome, DICEA – Department of Civil, Building and Environmental Engineering, Rome, [fabiola.fratini@uniroma1.it](mailto:fabiola.fratini@uniroma1.it)

<sup>2</sup> Sapienza University of Rome, DICEA – Department of Civil, Building and Environmental Engineering, Rome, [ambra.bernabosilorata@uniroma1.it](mailto:ambra.bernabosilorata@uniroma1.it) (Corresponding Author)

<sup>3</sup> Sapienza University of Rome, DICEA – Department of Civil, Building and Environmental Engineering, Rome, [michela.lisi@uniroma1.it](mailto:michela.lisi@uniroma1.it)

<sup>4</sup> Cf. *Why Cities*, C40Cities, [www.c40.org/cities](http://www.c40.org/cities)

green spaces, due to increasing soil sealing and related to over-heating producing phenomena such as *urban heat island*.

Nevertheless, cities are hub for people, cultures, economies, interactions, information, knowledge production, innovation and creativity. They maximise social and economic exchanges, they are a *milieu de vie* (Rémy, et al., 1981). While grey-oriented perspective still dominates metropolis, this blending makes theirs a pivotal role in the fight against Climate Change effects through shared policies and concrete actions: the city is the cause but the driver for *green* change and shall be part of the solution (Sassen, 2010).

In this paper we will explore how greening concepts in urban settings have had the power to break the *path dependence* (Davies, et al., 2019) of a community towards collaborative and co-designed nature-inspired actions.

### 1.1 Frameworks for a green breakthrough

Urban nature has the potential to address Climate Change pressures and to positively impact on human well-being leveraging on psychology, creativity and inspiration opportunities, education (Pauleit, et al., 2017) – the so called “Nature’s Contributions to People” (Diaz, et al., 2018).

In the urban struggle to protect natural capital, European Union acknowledges socio-environmental objectives through collaborative strategies on biodiversity (European Commission, 2011), *green infrastructure* (European Commission, 2013) and *nature-based solutions* and the recently promoted *Green Deal* policy (European Commission, 2019). By stimulating an increasing awareness on societal challenges, since its first Framework Programmes for Research and Technological Development, EU policy has fostered the integration of multidisciplinary environmental research in actual policies. As the Horizon2020 call “The systemic integration of social, cultural, digital and natural innovation” (SC5-14-2019) suggests, a cross-sectoral design approach to public space enhances its *green potential* with associated equally distributed well-being and health benefits. Thanks to EU financed projects such as NATURVATION<sup>5</sup> or OPPLA<sup>6</sup> Europe is being crossed by a *fil vert* of experiences and best practices to be replicated from Malta to Rovaniemi, *mending* (Piano, 2014) cities and regions with healing droplets of resilience.

The experience that will be exposed in chapter 3, outlines how *green* has become the driver for a wider interest in urban and spatial matters and a medium to test potential prefiguration and alternative possibilities of a place (Pasqui, 2018) in a programme-oriented urbanism, a *metaproject*.

## 2. Green concepts in urban settings

The contemporary environment is definitely shaped and challenged by human activities, in an ongoing and increasing process since 1950’s (Pauleit, et al., 2017), leading to politically recognize it in a debated geological era, the Anthropocene (Monastersky, 2015).

The present urge to address societal challenges produced by ongoing climate changes, led to the emergency of innovative approaches and policies to environmental restoration and integration, such as *Nature Based Solutions* (NBS) (European Commission, 2015) (Cohen-Shacham, et al., 2016). Nature having the multi-potential to deliver urban resilience and promote social cohesion as well as aesthetics (Raymond, et al., 2017), conserving and boosting its benefits are today’s and forthcoming challenges. Indeed, the International Union for Conservation of Nature (IUCN) substantiated the negotiation for the Paris Agreement at COP21 by emphasising the role of NBS in policies to tackle Climate Change and to foster well-being, in order to meet Sustainable Development Goals.

Since different approaches to reintegrate and value nature in city were drawn, we chose to examine those who are most referred to in academia and policy dialogues in the European context, in order to define the object of the present experience (NBS) and to better understand differences, similarities and superposition. We

---

<sup>5</sup> NATure-based URban innoVATION; <http://naturvation.eu>

<sup>6</sup> <http://oppla.eu/>

considered the following: *Ecosystem Services* (ESS), *Green Infrastructure* (GI), and *Nature Based Solutions* (NBS).

## 2.1 *Ecosystem Services*

Explored since the 1970's, when first emerged the term “service” referring to beneficial functions of ecosystems, ESS, where then developed by Ehrlich and Ehrlich in 1981 (Ehrlich, et al., 1981), as a common communication framework for multidisciplinary actors to value nature's outcomes and integrate ecological principles into political and economic decision making.

The MEA (MEA, 2005) defines ESS as “the functions and products of ecosystems that benefit humans, or yield welfare to society” and provide four categories of the contribution of nature to human wellbeing:

- Provisioning services;
- Regulating services;
- Cultural services;
- Supporting services.

The, often intangible, value of ESS is context-sensitive and depend on local physical, ecological and social assets. The Economics of Ecosystems and Biodiversity (TEEB) captured the need to assess the flow of ESS through their definition as a “dividend” provided to society by the natural capital (The Economics of Ecosystems and Biodiversity, 2010). The direct and indirect use value of nature is a driver for the recognition of the importance of the link nature-human and a step towards the conservation, restoration and sustainable use – other than increasing a sense of community. Demonstrating the value of ESS may lead to a broader acceptance of the concept in policy-making. On the wake of this, in 2012, the Inter-Governmental Platform on Biodiversity and Ecosystem Services (IPBES) was internationally founded.

Though valuing ESS does not imply the privatisation of nature, an economic-oriented approach poses ethical issues on the *commodification* of nature.

We point out that in 2018, Diaz et al. (Diaz, et al., 2018) introduced the notion of *Nature's Contribution to People* (NCP), stating to fill the gap of previous approaches by giving a central role to the human and cultural perspective of nature, thus defining the effective (beneficial or not) outcomes. Though the discussion on ESS and its possible shift through NCP is welcome and would benefit the scientific community enriching the approach by different perspective, the introduction of NCP has appeared to be divisive and confusing (Peterson, et al., 2018) (Braat, 2018).

## 2.2 *Green Infrastructure*

Though International Organisations are increasingly drafting *greening* policies to support urbanisation paths, the concept of introducing well-being-oriented nature in cities had already been explored, as show “Garden Cities” by Ebenezer Howard (Allmond, 2017) and Frederick Law Olmsted's park system of greenways and greenspaces (Ward Thompson, 2011).

The term GI, defined as an interconnection of green spaces delivering sustainable advantages to ecosystems and people, emerged first in 1990 within US greenway movement (Seiwert, et al., 2020). It was only by 2011 that Europe, through its Biodiversity Strategy (European Commission, 2011), set priorities to promote GI, defined having “a crucial role in adaptation in providing essential resources for social and economic purposes under extreme climatic conditions” (European Commission, 2009). By 2013, European Union defined GI as: “a strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services. It incorporates green spaces (or blue if aquatic ecosystems are concerned) and other physical features in terrestrial (including coastal) and marine areas. On land, GI is present in rural and urban settings.” (European Commission, 2013).

Multi-functionality, connectivity, scalability, integration, variety, strategy, social inclusion and trans-disciplinarity shape Green Infrastructure green planning and governance processes (Hansen, et al., 2014), defining a network of green innovation and social relationship potentially successful.

## 2.3 Nature Based Solutions

International scientific and policy frameworks acknowledge the potential of Nature Based Solutions to deliver sustainable and flexible (in time and function) alternatives to the conventional city-making, providing a more liveable urban, supporting cities in addressing environmental and societal challenges through innovation. Indeed, NBS are *actions* which implement broader and theoretical green strategies adapting them to local conditions. Cohen-Shacham et al. (Cohen-Shacham, et al., 2019) consider NBS as the result of previous approaches to nature as a service-provider, shifting from a passive role to a more engaged and proactive one in the challenges of Climate Changes.

IUCN has a global perspective of NBS and refers to them as “actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits” (Cohen-Shacham, et al., 2016). The definition of European Union, instead, is significantly influenced by its urbanisation feature (Brussels region having peaks of 92%) and focuses more specifically on green innovation to foster human wellbeing in urban settings: “solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions” (European Commission). The previous approaches are clearly the policy ground on which NBS grows, as the research and innovation path to address societal challenges (European Commission, 2015) shows in the following priority actions:

1. Urban regeneration through nature-based solutions;
2. Nature-based solutions for improving well-being in urban areas;
3. Establishing nature-based solutions for coastal resilience;
4. Multi-functional nature-based watershed management and ecosystem restoration;
5. Nature-based solutions for increasing the sustainable use of matter and energy;
6. Nature-based solutions and the insurance value of ecosystems;
7. Increasing carbon sequestration through nature-based solutions.

Though the overarching goal of NBS is recognised both by IUCN and EU to meet Sustainable Development Goals, as (Davies, et al., 2019) highlight, past decision do condition present decision making, in a “path dependence” that may lead to *ad infinitum* repetition of *grey-errors*. This recurrent path could be break by filling the gaps on knowledge, communication and participation around NBS (Frantzeskakia, et al., 2020).

## 2.4 Participatory renaturing of cities

Taking into account the potential of green approaches to urban planning and the evidence of *path-dependence*, we set a participatory framework to co-design regeneration actions that are inspired to nature and shared by the community. In this process, we recognised a significant shift in the broad acceptance of greening concepts and urban redevelopment, generated by the introduction of NBS as an operative and federative approach to act change.

## 3. Background

The experimental research led in Rome, aimed at co-designing, co-creating and co-managing the city, beginning from the neighbourhood level. This proposed approach to *city-experiencing* relies on a “small step” process, providing for gradual implementing and testing the urban potentials, before the achievement of a top-down project. Such a transitional method has brought the community and later part of the administration to *begin* to commit to greening solutions to address g-local societal challenges.

### 3.1 Scientific Framework

The small step-green pilot has been developed through the "San Lorenzo Lab" (SLL) (Fratini, 2018), an informal city-lab of the Sapienza University of Rome, consisting in a fruitful milieu of multidisciplinary experimentation. It was elaborated within the cross-cutting University Research "Green Network – Municipio II"<sup>7</sup> addressing socio-environmental challenges and acting as a facilitating framework of stakeholders: Roma Capitale, Municipio II, Sapienza departments DICEA, SBAI, DIBA, National Research Council, Tiburtina Antica Comprehensive Institute, Ambassade de France, Université Paris 1 Sorbonne - Panthéon, Ferrovie dello Stato, Ex-Dogana and associations: Germogli di Rinascita Urbana - GRU (2017), the Comitato di Quartiere (District Committee) (2017 - 2019), Beba, HabiCura (2017 - 2019), the Libera Repubblica di San Lorenzo (2019).

### 3.2 The context of the experimentation

Overbuilding and sealing, demography, lack of green quality spaces, culture and vacant areas are the features that make us choose San Lorenzo as a test area where to experiment green concepts, strategies and actions.

*Overbuilding and sealing.* The neighbourhood developed as a dormitory, accommodating railway workers and craftsmen at a peak of flourishing urban development in the late 1880's. The nineteenth-century layout optimizes surfaces by prioritising volumes against the void. Despite the urgency of emptiness and greenery, in 2009 the *Piano Casa* allows for a further densification, which is still taking place. This produced an almost completely sealed surface. Biotope Area Factor (BAF) (Becker & Mohren, 1990), which is an ecological index to value the permeability of soils, shows an ecologically effective surface area amounting to 0.

*Demography.* Today, in the 50 hectares of San Lorenzo lives a sedentary population of about 90,000 residents to which temporary young people linked to the university headquarters of Sapienza are added. Though this creates a fruitful milieu of participation and innovation through tradition, the two different groups live and leave the district in different time of the day, of the week, of the year, leading to a local clash of interests which complex to handle by the authorities and by the change-makers.

*Lack of green quality spaces.* In the context of deterioration, overbuilding and conflictual demography, public spaces are rarefied, lighting is episodic, safety is trivial. They lack of any quality and happens to fully accommodate the car traffic and parking, at any time of the day. While the neighbourhood has some green point, they cannot serve the entire population and they still are underused, due to the lack of maintenance and attraction – and they are bounded at the limits of the district, at the edge of high traffic bypass and urban high speed roads. Side effects of lacking green interstitial spaces, permanent or contingent, in the fabric can influence health and wellbeing along with the vulnerability to extreme weather conditions.

*Culture.* La Sapienza, through its "branches", punctuates the neighbourhood together with the headquarters of associations, foundations, theatres, cinemas and artists. The cultural vocation is accompanied by the recent transformation of San Lorenzo as an entertainment hub and the consequent social and economic evolution of the district.

*Vacant areas.* While giving an alarming feedback on the actual condition, the BAF analysis shows a significant opportunity of resilience within the neighbourhood: vacant or underused spaces (namely a former railway yard, enormous sealed squares), courtyards and rooftop publicly owned which can turn in green the emeralds of a potential green network.

Problems and potentials lead to a green oriented regeneration strategy that can enhance the neighbourhood's socio-environmental role in the city through a nature-based grid. This set of multifunctional interventions, attentive to wellbeing and inclusion, shall be co-designed by public and private stakeholders, NGO's and community within a collaborative environment.

---

<sup>7</sup> The research is coordinated by prof. Fratini.

## 4. Methodology

### 4.1 A formal competition to revitalise San Lorenzo

In October 2018, the violent rape and murder of a girl, occurred at night in one of the many abandoned space of the neighbourhood, is the opportunity for the administration to take actions after decades of discontinuous political narratives on San Lorenzo renewal. A competition is thrown to compare preliminary masterplan, management and economic offers addressing the south-western area of the neighbourhood: *Borghetto dei Lucani*.

### 4.2 Building the community commitment. Sapienza University teams up with Libera Repubblica di San Lorenzo

Local *Libera Repubblica di San Lorenzo* (LRSL), gathering a significant share of the local NGO's and population, had been addressing major social and urban planning issues through collective and grassroots actions, also taking part to the latest definition of the formal Progetto Urbano San Lorenzo. That is the reason why LRSL decided to study a new proposal for the competition to regenerate *Borghetto dei Lucani*. Though LRSL has never focused on green issues, the tender highlights *green* and *sustainability* as key axis to drive the design of the area.

On the other hand, San Lorenzo Lab researchers<sup>8</sup> had long been working in the neighbourhood, disseminating *green* and shared urban components. From 2016 to 2020, several greening interventions, locally known as *Oases*<sup>9</sup> have been implemented as small actions within a long term strategy to enhance liveability, wellbeing and environmental awareness, while outlining patterns of resilience.

LRSL, acknowledging the long presence on the ground of SLL and its wider co-experimental intentions, chooses to fill its *urban-greening gaps* by inviting the researchers to take part into a dedicated “*green board*” and to completely focus on critical social plea and actions to attach to what they expected to be a mild design proposal.

The presence of SLL as facilitator lead to a more participated and experiential discussion on the topics of green and nature in the city as a driver to a holistic regeneration. The methodology, shared and elaborated in participation with several NGO's other than LRSL, proposed a dynamic method of *trial-and-error* on different NBS according to the city users' satisfaction, was possible by using adapting and context-customised tools of *mixed reality* to co-design the space (UN-Habitat, 2019). By introducing the concept of “*Tactical NBS*” as a more operational and context-sensitive approach to city-making and engaging people in a *learn-by-doing* (Dewey, 1916/1997) process we noticed a shift in the involvement of the community, producing a series of fertile think thanks and co-design workshops. In particular, SLL helped LRSL in creating a relationship network with social or innovative enterprises<sup>10</sup> in the and other active NGO's<sup>11</sup> in the region, in order to understand how each NBS could be concretised and what kind of ESS or which positive and negative externalities they would provide. The majority of participants agreed on a aquaponic greenhouse to be the new landmark of the neighbourhood, labelling it as *the social-green district* of Rome.

#### 4.2.1 The proposal

---

<sup>8</sup> The team of researcher was led by prof. Fratini.

<sup>9</sup> The metaphor of the “oases” stems from a Parisian experience aimed at greening schoolyards to be multiple use dots of fresh resilience within the city (Ville de Paris, 2019). The concept has been further explored and inspired the design of the H2020 proposal “G.R.I.D.O. - Green, Resilient, Inclusive, Digital Oasis for healthy cities”, signed by the cities of Moscow, Athens, Vejle, Rejkavík, Wrocław, Sarajevo, Rome and by the Paris la Défense district. The proposal aimed at a multicultural discussion to find adaptable solutions to the general demand for green and liveable spaces.

<sup>10</sup> e.g. *Agriculture 2.0* designs and builds aquaponics systems, with a strategic interest in starting an “urban farming” production activity in a central context, such as that of San Lorenzo.

<sup>11</sup> e.g. Zappata Romana, born in 2010 by mapping existing shared gardens in Rome, now researches on gardening collective actions of appropriation of public space as well as innovative environmental, economic and social practices. Zappata Romana also fosters experimental environments to promote social inclusion.



In this context local knowledge and people's desires for a better neighbourhood emerged and informed "Cantieri del Possibile", a conscious and shared urban proposal in 3 design scenarios elaborated on the basic concept of renaturing the city to provide ESS to the local community.

The NBS-oriented approach is clear in the definition of the invariants shared by each of the 3 scenarios:

- *Tree-garden*, the gateway to San Lorenzo *green enclave*. This urban forest placed right near to the *Mura Aureliane* and the railways, hosting a modular wooden element for outdoor sports, would have the potential to provide carbon sequestration and to regenerate the historical yet neglected promenade, providing evapotranspiration effects, shading, quality. The *Tree-garden* is conceived as the start-up phase of the process, in order to let regeneration begin even before the project, making it an inspiration common good education and eco-sustainable practices.
- *Aquaponics Greenhouse*, the landmark in the form of a modern but smaller *Crystal Palace*. Supposed to be a 1000 sqm hub for *green* innovation and environmental training in a Municipality parcel, it would be the driver for a more extensive green shift at a socio-economical level, attracting new activities and providing for new jobs for the most vulnerable groups and for a more responsible consumption, delivering a "km 0" food production clean from pollutants and heavy metals;
- *Sensory and Botanical Gardens*, with environmental educational and leisure purposes;
- *Urban gardens* as a driver for social interaction and more aware food production;

The proposal has been submitted and the City Councilor to Town Planning is formalising the verdict after a 3-months complete shutdown of the Department due to covid-19 emergency.

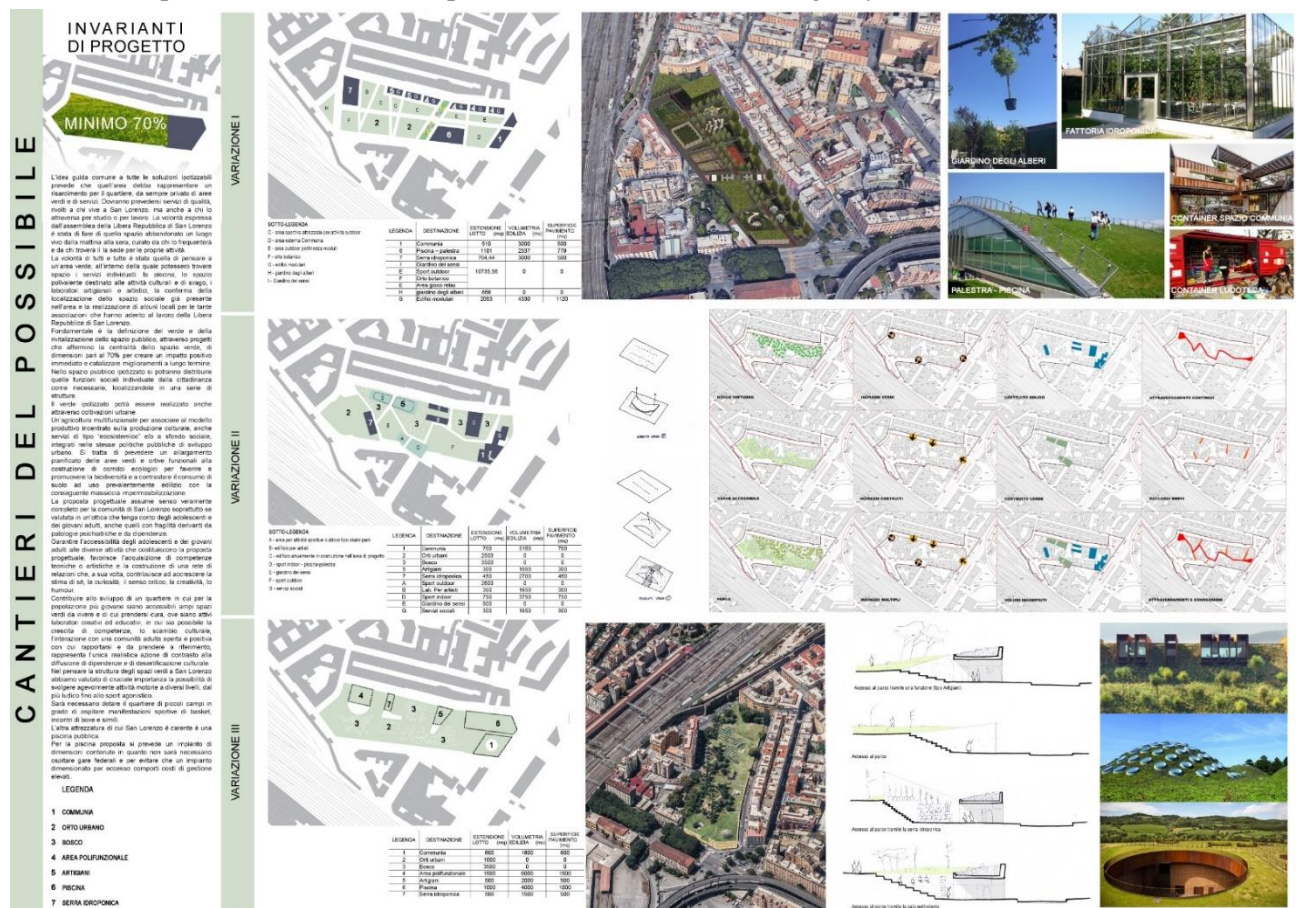


Fig.1 – 3-scenario proposal based on the invariants, delivered to the Municipality of Rome by LRSL and designed on the basis of think-tank process by San Lorenzo Lab, Sapienza University of Rome.

### 4.3 Results and collateral

Using NBS as punctual, small, low cost interventions, with an urban acupuncture (Casagrande, 2014) approach to city-making, allows for a dynamic and appropriate naturalisation of the urban centres - and to do

it in small steps, over time. The transitory dimension of these alternative elements makes them suitable to leverage on that dilated time of the elaboration and implementation of an urban project, becoming its precursors. NBS can be catalysts of regenerative processes and re-appropriation of vacant or underused spaces - fighting, further, the phenomenon of soil consumption through the recycling of the existing, benefitting the community.

“Tactical NBS” as both, a method and a concept, at the end of a complex negotiating process, gained consensus among the community redirecting the local active citizenship on public space co-design planning and initiatives. The *green board* spontaneously became steady within the weekly discussion and revealed to continuously produce proactive and bottom-up solutions for San Lorenzo, including those to address covid-19 pandemic urban challenges. Thanks to their renewed care for public space – often squat-oriented – LRSL and their network made use of students<sup>12</sup> creativity and technical skills to co-design<sup>13</sup> a grid of *green parklets* and *oases* to recommend the Town Planning Department with.

A brand new Municipal plan addressing pandemic challenges for children day-care during summer, and focused on public spaces for outdoor collective activities does exist. LRSL easily found and try to meet the local demand for accessible public space, especially a safe one for children’s learning and playing in the coming covid-19-expected-to-be autumn. Grassroots and informal actions are taking place in the buffer space of a district school.

## 5. Discussion

### 5.1 *Process-oriented rather than project-oriented approach*

During this testing experience, active citizenship proved to foster and enhance awareness on urban ecosystems and nature. The green shift introduced by the concepts of NBS and Tactical Urbanism (TU) (Lydon, et al., 2015) was underpinned by social interaction and experimentation which led to collective change in the perception of solutions, producing more attention to diversified aspects of urban challenges. This alteration to the community’s path-dependence is produced in a sometime high-tension environment. Our presence as facilitator actors worked as enabler for a gradual sharing of different perspectives, fostering informal training. Though the atmosphere was never completely comfortable for any of the actors, this *trial* context, working in a dynamic process of explore-think-design-test-measure-learn, might have been the key to success. LRSL might have accepted, by the time, a *Tactical NBS* approach, not just because of its conflictual and outside-the-box features. In fact, a propelling factor seemed to be the opportunity to read these actions in an evolving framework, which becomes factual and positive by negotiating solutions with the administration. This transition from a non-collaborative to a potentially constructive perspective, which generates in a broader collaborative environment, gathering several and varied knowledge, might have been a determinant agent for change in the delivery of a shared and cared proposal.

After a long and troubled *Green Table*, the most radicalised group, though not actively taking part in the discussion, agreed that sustainability issues could provide answers to most pivotal social issues: exercise their right to the city by participating in policy-making while expressing their political perspectives. Regardless, there still is a gap between those group and the academia researchers, due to mistrust and suspicion over the real goals of a technical team.

#### 5.1.1 Trade-offs

We noticed that even the most devotees to the green cause would not take any responsibility to cater and maintain the common NBS (regardless to dimension) after its potential deliver. This approach might stem by the general attitude of the community before the emergence of the *green board*, which appeared to be more negative and reactive than collaborative and proactive in discussing alternative solutions. We argue it is a

---

<sup>12</sup> Students attending Urban Planning lectures and laboratories of Prof. Fratini and Prof. Cappuccitti, at DICEA, Sapienza University of Rome.

<sup>13</sup> With the digital tool of mixed reality “Unlimited Cities”, an *open source* app developed by 7 Billion Urbanists.



political position that still refers to a path-dependence which we are not allowed to break, defining it the deep-rooted identity of the community.

Besides, green issues are not considered a priority among social and urban contingent urgencies, such as illegal construction, dominance of strong stakeholders with the power to distort the neighbourhood asset. Actually, they were considered minor and fancy whims of bourgeoning neighbours arrived in the recent years.

To avoid, as possible, carelessness on environmental issues, participation should be the key of the process (Cohen-Shacham, et al., 2019).

## 5.2 Mainstreaming NBS as a driver for change into urban planning

The experience led in San Lorenzo isn't but a test. It triggered part of the neighbourhood dwellers and some of the councillors. The next step should be that of learning by the potential of the context and the collective intelligence of the neighbours and translate the unconventional in conventional. We argue the necessity to integrate the bottom-up initiative in a dynamic but formalised process-oriented and participated approach to urban planning. Such a stewardship model is defined by (Buijs, et al., 2016) as "Mosaic Governance", a context-sensitive approach acknowledging sense of a place of each community, already existing self-organised entities, chronological use of spaces, behavioural and sharing patterns, and specific local relationships between nature and humans. By recognising variations, mosaic model can adapt faster and cheaper to physiological changes. This means that researchers and policy-makers cannot deliver a "one-size fits all" programme (Buijs, et al., 2016) and the approach should be contextualised through intensive participation of a differentiated range of stakeholders. Based on our constant work on the ground<sup>14</sup> (Fratini, 2020) (Bernabò Silorata, 2018), the continuous experimentations our SSL carries out with students, and a new research proposal<sup>15</sup> in line with Raymond et al. (Raymond, et al., 2017), we suggest to consider the following steps in assembling a context-sensitive approach to NBS:

- Identify the network of stakeholders and tools to guide the process.
  - Stakeholders should include association, entrepreneurs and institutions willing to share and engage in transformation issues.
  - Tools could include social media, mobile sensors, digital open source platforms, PPGIS, prototypes.
- Map the neighbourhood condition through the following diagnosis:
  - a local literature review;
  - perceptual analysis of public space by overlapping the Kevin Lynch's (Lynch, 1960) and Jan Gehl's (Gehl, et al., 2013) approaches;
  - environmental, functional and chronological analysis of the neighbourhood;
- Map the renaturing potential of the neighbourhood, that is identifying vacant spaces or grey infrastructures that could be colonised by nature and deliver a "green grid" of *oases* (Fratini, 2020) (places) and *rays* (Kipar, et al., 2014) (paths);
- Testing oases and rays by co-designing and co-constructing *tactical NBS* with local communities.
- Low-cost prototyping one oasis to test the real impact of the claimed proposals. This actions should involve local business actors and city users.
- Monitor and evaluate co-benefits of the process in a *build-measure-learn* logic (Lydon, et al., 2015).
- Share experiences and best practices to upscale NBS;

---

<sup>14</sup> Cf. M. Lisi's doctoral research on *Public Participation Geographic Information Systems* (PPGIS) (Brown, 2005) with a specific experience in San Lorenzo in 2017-2020

<sup>15</sup> "For a sustainable City. Oases in San Lorenzo: tactical, participated and low-cost regeneration", led by Prof. Fratini, involving A. Bernabò Silorata, M. Lisi, A. Spinosa. The research would be financed in 2021 for 24 months by Sapienza University.

In this step-by-step approach we highlight, again, the importance to constantly engage stakeholders in the design-implementation-monitoring phase in order both, to empower them and to deliver clearer and context-sensitive solutions as well as information.

Per una città accogliente, resiliente e sostenibile  
Oasi verdi a San Lorenzo - Borghetto dei Lucani

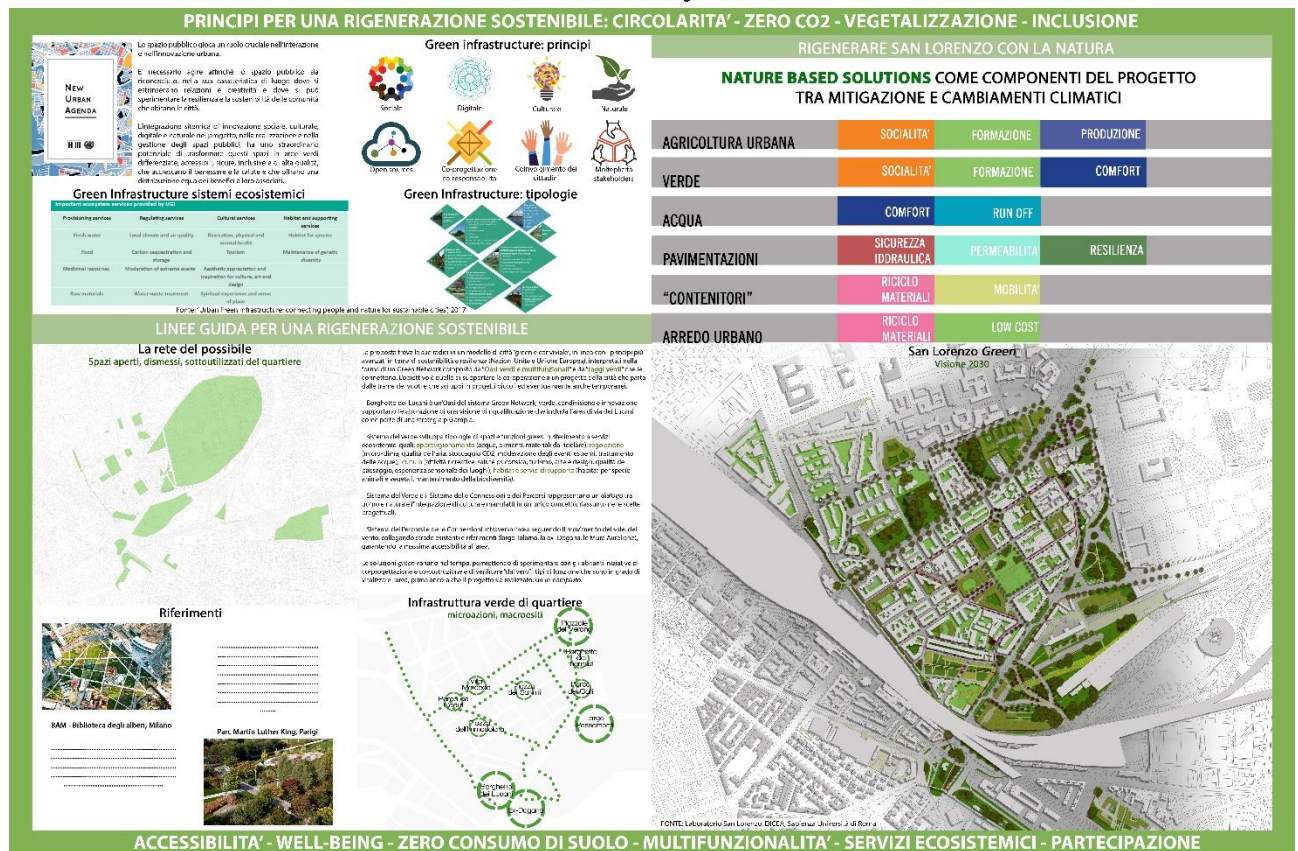


Fig.2 – Principles for the sustainable regeneration of San Lorenzo, delivered to the Municipality of Rome by LRSI and designed on the basis of think-tank process by San Lorenzo Lab, Sapienza University of Rome.

### 5.2.1 A need for indicators

We acknowledge the potential of sharing knowledge between different experiences as a driver to upscale NBS and deliver larger co-benefits which may amplify in a network. In order to make exchange effective, the solutions should be comparable and valued both in the making of and in the process of delivering ESS. We acknowledge (Kabisch, et al., 2016)'s work on defining the following potential indicators to systemically evaluate NBS and adapt process and projects on the run, in an iterative project of trial-and-errors. In particular, in dense and historical urban settings:

- *Integrated environmental performances*, by assessing ecosystem regulation and downsides, biodiversity changes, share of renatured vacant or dysfunctional areas;
- *Health and Wellbeing*, by assessing the increases accessibility to green spaces and related gentrification phenomena, changes in quality of life, employment levels, and alteration in epidemiological path (decrease of non-communicable diseases rate);
- *Transferability and monitoring*, by studying the level of participation and cross-sectoral governance integration, by monitoring the changes in shares of city budgets for green actions, and their longevity as well as potential of practices dissemination;
- *Citizens' involvement*, by valuing the number of involved citizens, their level of empowerment in taking care and diffusing NBS practices.

By assessing NBS and their related ESS, it is possible to share information that can be broadly understandable and get to the table of policy-makers to influence decisions by possibly breaking dependence paths.

## 6. Conclusion

The experience in San Lorenzo neighbourhood reveals that cities can address societal challenges with NBS by considering people in the process and that active citizen is a fundamental enhancing factor of urban nature. The operationalisation of green concept in urban planning through NBS generated a shift in co-design and underpin the will to exchange and communicate in a *learning-by-doing* logic. A process-oriented approach, based on trial and error methodology, helped to trigger creativity, innovation and gain consensus among a set of *green scenarios* for the neighbourhood.

What is needed to upscale NBS from isolated initiatives to *emeralds of a green necklace* is a governance model which is context-sensitive and acknowledges local DIY actions. A shared green plan to identify priorities and actions would be helpful to prevent potential trade-offs. Monitoring and evaluating NBS benefits can provide a common ground for sharing knowledge and experience, thus is essential to upscale solutions.

## 7. Bibliografia

- Allmond, G. (2017). The First Garden City? Environment and utopianism in an Edwardian institution for the insane poor. *Journal of Historical Geography*, 56.
- Becker, G., & Mohren, R. (1990). *The Biotope Area Factor as an Ecological Parameter*. Berlin: Landschaft: Planen & Bauen.
- Bernabò Silorata, A. (2018). Penelope. Strategie urbane a San Lorenzo. In R. De Salvia, & R. Galluzzi, *Artisti a Roma*. Roma: Ponte Sisto.
- Braat, L. (2018). Five reasons why the Science publication “Assessing nature’s contributions to people” (Diaz et al. 2018) would not have been accepted in Ecosystem Services. *Ecosystem Services*, 30.
- Brown, G. (2005). Mapping Spatial Attributes in Survey Research for Natural Resource Management: Methods and Applications. *Society & Natural Resources*, 18.
- Buijs, A., Mattijssen, T., Van der Jagt, A., Ambrose-Oji, B., Andersson, E., Elands, B., & Steen Møller, M. (2016). Active citizenship for urban green infrastructure: fostering the diversity and dynamics of citizen contributions through mosaic governance. *Environmental Sustainability*.
- Casagrande, M. (2014). Third Generation City. Marco Casagrande. Retrieved from <https://www.casagrandelaboratory.com/marco-casagrande/#:~:text=Urban%20Acupuncture%3A%20a%20cross%2Dover,a%20touch%20with%20this%20nature.>
- Cohen-Shacham, E., Andrade, A., Dalton, J., Dudley, N., Jones, M., Kumar, C., . . . Waltersd, G. (2019). Core principles for successfully implementing and upscaling Nature-based Solutions. *Environmental Science and Policy*, 98.
- Cohen-Shacham, E., Walters, G., Janzen, C., & Maginnis, S. (2016). *Nature-Based Solutions to Address Global Societal Challenges*. Gland, Switzerland: IUCN.
- Davies, C., & Laforteza, R. (2019). Transitional path to the adoption of nature-based solutions. *Land Use Policy*, 80.
- Dewey, J. (1916/1997). *Democracy and Education. An Introduction Into the Philosophy of Education*. New York: The Free Press.
- Diaz, S., Pascual, M., Stenseke, M., Martín-López, B., Watson, R., Molnár, Z., . . . Shirayama, Y. (2018). Assessing nature’s contributions to people. *Science*, 359.
- Ehrlich, P., & Ehrlich, A. (1981). *Extinction: The Causes and Consequences of the Disappearance of Species*. New York: Random House.

- European Commission. (2009). *White paper. Adapting to climate change: Towards a European framework for action*. COM(2009) 147/4. Brussels.
- European Commission. (2011). *Our life insurance, our natural capital: an EU biodiversity strategy to 2020*. Brussels.
- European Commission. (2013). *Green Infrastructure (GI) – Enhancing Europe’s natural capital*. COM (2013) 249 final.
- European Commission. (2015). *Towards An EU Research and Innovation Policy Agenda for Nature-Based Solutions & Re-Naturing Cities. Final Report of the Horizon 2020 Expert Group on’ Nature-Based Solutions and Re-Naturing Cities’*. Brussels: Directorate - General for Research and Innovation.
- European Commission. (2015). *Towards An EU Research and Innovation Policy Agenda for Nature-Based Solutions & Re-Naturing Cities. Final Report of the Horizon 2020 Expert Group on’ Nature-Based Solutions and Re-Naturing Cities’*. Brussels: Directorate - General for Research and Innovation.
- European Commission. (2019). *The European Green Deal*. COM (2019) 640 final.
- European Commission. (n.d.). *Nature-Based Solutions*. Retrieved from European Commission: <https://ec.europa.eu/research/environment/index.cfm?pg=nbs>
- Frantzeskaki, N., Vandergert, P., Connop, S., Schipper, K., Zwierchowskad, I., Colliere, M., & Lodder, M. (2020). Examining the policy needs for implementing nature-based solutions in cities: Findings from city-wide transdisciplinary experiences in Glasgow (UK), Genk (Belgium) and Poznań (Poland). *Land Use Policy*, 96.
- Fratini, F. (2018). Laboratorio San Lorenzo. Prove di rigenerazione sostenibile nel quartiere di San Lorenzo a Roma. *Urbanistica Informazioni*, 282, 92-95.
- Fratini, F. (2020). Oasi Verdi a San Lorenzo. La rigenerazione a piccoli passi. *CRIOS*(19).
- Gehl, J., & Svarre, B. (2013). *How to study public life: methods in urban design*. Island Press.
- Hansen, R., & Pauleit, S. (2014). From Multifunctionality to Multiple Ecosystem Services? A Conceptual Framework for Multifunctionality in Green Infrastructure Planning for Urban Areas. *AMBIO*.
- Kabisch, N., Frantzeskaki, N., Pauleit, S., Naumann, S., Davis, M., Artmann, M., . . . Bonn, A. (2016). Nature-based solutions to climate change mitigation and adaptation in urban areas: perspectives on indicators, knowledge gaps, barriers, and opportunities for action. *Ecology and Society*(21).
- Kipar, A., & Sala, G. (2014). Raggi verdi. Green Vision for Milano 2015.
- Lydon, M., & Garcia, A. (2015). *Tactical urbanism. Short term Action for Long Term Change*. Washington: Island Press.
- Lynch, K. (1960). *The Image of the City*. MIT Press.
- MEA. (2005). *Ecosystems and Human Well-Being: Current State and Trends*. Washington: Island press.
- Monastersky, R. (2015). Anthropocene: The human age. 519.
- Pasqui, G. (2018). *La città, i saperi, le pratiche*. Donzelli.
- Pauleit, S., Zölch, T., Hansen, R., Randrup, T., & Konijnendijk van den Bosch, C. (2017). Nature-Based Solutions and Climate Change – Four Shades of Green. In N. Kabisch, H. Korn, J. Stadler, & A. Bonn, *Nature-based Solutions to Climate Change Adaptation in Urban Areas*. Springer.
- Peterson, G., Harmackova, Z., Meacham, M., Queiroz, C., Jiménez Aceituno, A., Kuiper, J., . . . Bennett, E. (2018). Welcoming different perspectives in IPBES: “Nature’s contributions to people” and “Ecosystem services”. *Ecology*, 23.
- Piano, R. (2014). *Il rammendo delle periferie*. Il Sole 24 Ore.
- Raymond, C., Frantzeskaki, N., Kabisch, N., Berry, P., Breil, M., Nita, M., . . . Calfapietra, C. (2017). A framework for assessing and implementing the co-benefits of nature-based solutions in urban areas. *Environmental Science and Policy*, 77, 15-24.

- Rémy, J., & Voyé, L. (1981). *Ville, ordre et violence: Formes spatiales et transaction sociale*. Paris: Presses Universitaires de France.
- Sassen, S. (2010). *Cities are at the center of our environmental future*. S.A.P.IEN.S.
- Seiwert, A., & Rößler, S. (2020). Understanding the term green infrastructure: origins, rationales, semantic content and purposes as well as its relevance for application in spatial planning. *Land Use Policy*, 97.
- The Economics of Ecosystems and Biodiversity. (2010). *Mainstreaming the Economics of Nature*. The Economics of Ecosystems and Biodiversity.
- UN-Habitat. (2019). *Mixed reality for public participation in urban and public space design. Towards a new way of crowdsourcing more inclusive smart cities*. United Nations Human Settlements Programme.
- United Nations Department of Economic Affairs. (2019). *World Urbanization Prospect. The 2018 revision*. New York.
- Ward Thompson, C. (2011). Linking landscape and health: The recurring theme. *Landscape and Urban Planning*, 99.
- World Bank. (2018). *The World Bank Data*. Retrieved from <https://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS>