Technical Report 3.2 | Green and Blue Infrastructure

The Social Functions of Green and Blue Infrastructure

International case studies and insights
for Addis Ababa

A Technical Report commissioned by the Addis Ababa Urban Age Task Force

URBAN AGE

Addis Ababa Urban Age Task Force

The purpose of the Addis Ababa Urban Age Task Force (AAUATF) is to support the City of Addis Ababa in advancing its strategic development agenda. The Task Force's work builds upon the Addis Ababa City Structure Plan (2017–2027), exploring opportunities for compact and well-connected urban growth that can be delivered through integrated city governance.

In addition to advisory activities and capacity building, it identifies strategic pilot projects to address complex urban challenges around housing, urban accessibility, green and blue infrastructure, and urban governance.

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Contents

Foreword

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The growing relevance of green-blue infrastructure within urban planning reflects a global trend to look at nature as the main source for sustainable long-term solutions in our cities. It highlights the importance of working with our natural environment instead of only aiming to control it. Urban forests, constructed wetlands, vegetated roofs, rainwater harvesting, bioswales, green public space and soil bioengineering are all examples of strategies that have recently gained the attention of local governments and design practices to improve the well-being of people living in cities.

Although this shift towards nature-based solutions is an important step towards more resilient cities, there is still a long way to go if we want to not only achieve environmental goals, but to get everyone on board by developing the skills and understandings needed for a more harmonious relationship with nature. Only when people and nature truly reconnect through this paradigm shift, will cities be on a real pathway towards long-term sustained change. In this sense, green-blue infrastructure presents us with an unprecedented opportunity to accomplish major social impact.

In 2020 the pandemic laid bare the serious inequalities within and between countries across the world, showing us the importance of investing in structural changes to make the world more just and resilient. As we move forward, many of us have come to realise that most of our cities are far from being ready to deal with exceptional circumstances like a sanitary emergency. The future will bring even more challenges, as we will need to mitigate the causes and adapt to the effects of climate change. At the Bernard van Leer Foundation, these demanding times have strengthened our conviction towards long-term urban resilience through inclusive and healthy environments. Our focus in early childhood development drives us to think of cities from the perspective of a baby or a toddler, an age when critical physical and cognitive capacities are in constant change, having a long-lasting effect on our development towards adulthood. Close connection to green and blue spaces, safe drinking water, clean air and healthy food are only some of the fundamental aspects that all urban environments should provide to all young children and their families. We sincerely believe that a city that takes into account the needs of early childhood is a city where everyone can thrive. The last year has reaffirmed our commitment to bring people together to deliver more powerful joint actions towards promoting the well-being of babies, toddlers and their caregivers in all cities.

Being part of the Addis Ababa Urban Age Task Force, we took on the challenge to look at green-blue infrastructure cases to support this city's strategic development agenda. Our emphasis, however, has been to identify and select green-blue infrastructure projects that include a strong social component, not only as a result of the project's implementation, but as part of an ongoing process that includes multiple stakeholders throughout the planning and implementation phases.

The traditional assumptions behind "infrastructure", usually conceived as heavy or top-down, are questioned in several of the projects presented in this report. Minimal interventions like a butterfly garden or a temporary bicycle path can have tremendous impact at the city or even national level when people feel empowered and exponentially scale their implementation. We are at a crucial point where the upscaling of citizen-led initiatives, in coordination with multiple public and private organisations is not only necessary, but totally feasible thanks to new ways in which people can receive and share information through rapidly expanding digital information technologies.

The 12 main case studies and 10 support case studies presented in this report explore different ways in which green-blue infrastructure is connected to society at different levels. Social impact, in this particular context, is understood as the active participation of society in the planning, implementation and use of nature-based solutions in an urban context. This report aims to identify different ways of tackling socio-environmental issues that can be relevant to Addis Ababa. It does not try to strengthen a particular definition of what green-blue infrastructure is, but, on the other hand, points towards a broader understanding of this urban planning approach from a more people-centered perspective.

Projects are diverse in scale and type. Massive infrastructural interventions like the sanitising of the Mapocho River in Santiago or the removal of an elevated highway in Seoul's centre go the extra mile and arrive at a fine grain interaction between project and people by not shying away from the conflicts that always come with change. Other projects depart from very small neighbourhood initiatives like the Dandora Transformation League in Nairobi or the Butterflyway Project in Toronto, to later become city or even country-wide enterprises that involve thousands of people of all ages and backgrounds.

Other projects like the water tank conversions in Medellín's Unidades de Vida Articulada or the OASIS schoolyards in Paris open our eyes to opportunities that have been there all along and only needed a new perspective. Infrastructural interventions in these cases look at overlooked and underutilised spaces with a creative eye and, through an economy of means, unleash their potential.

Innovation in governance also plays an important role in the implementation of socially impactful green-blue infrastructure. The creative land management case study of Caño Martín Peña in San Juan and the AGRUPAR

urban agriculture program in Quito prove this point. These projects succeed in organising people to actively engage with valuable green spaces of the city through unconventional socio-political arrangements that successfully negotiate with diverse and often conflicting interests.

Finally, it is important to mention the importance of data as a key factor for decision-making at the local level. Projects such as the Cleaner Air Network in Copenhagen and the Born Thriving Indicators in Tirana provide new directions on how to collect and use data in an effective and innovative way by visualising issues and opportunities that are not apparent to the naked eye.

Even though most case studies are internationally renowned and offer lessons that are applicable in many different cities around the world, the authors have made a significant effort to connect each case to the specific context of Addis Ababa. These cases offer several opportunities for insights, inspiration and constructive comparison that relate to the challenges that Addis Ababa and similar urban contexts are currently facing. I am looking forward to the next stages of our collaboration with the Addis Ababa Urban Age Task Force, and to discuss possible lines of action for a more inclusive, resilient and healthy city in close dialogue with nature.

1. Introduction

A high level of urbanisation, low capacity for public investments in infrastructure, and a need for policy reforms to guide urban interventions present important challenges in rapidly growing cities when aiming for sustainable and resilient urban development. In contexts where the younger populations represent an important percentage, and their proper development is an opportunity not to be missed, the creation of spatial conditions for this to happen is a necessity more than an aspiration. The main goal of this report is to provide social green-blue infrastructure (SGBI) examples that can inform such interventions for what the future of Addis Ababa could be, both for practitioners and policymakers. In this regard, pursuing socio-economic and spatial inclusion, environmental stewardship to avoid further degradation of the city and its surroundings, better urban adaptation capacities for changing conditions, and highly collaborative and participative processes involving different stakeholders are required to pave the way forward to face challenges that are already being amplified by climate change.

Case studies from different regions of the world are described here to offer examples of solutions and strategies that could address comparable issues in Addis Ababa. This report was developed in two stages. First, case studies were selected depending on the environmental and social similarities to Addis Ababa and the challenges this city currently faces regarding green and blue infrastructure, particularly with a gender and early childhood development lens. These projects also provide socio-economic opportunities to people often excluded. Second, the report then was divided into two main questions: What can be done? How can it be done? These questions organise the selected case studies in a way that first emphasises the environmental results of projects and then shifts focus to innovation in the social process and governance of the selected projects. Even though all case studies contain both interesting processes and results, hopefully this strategy helps to direct discussions towards the "what" and the "how" of each project. Both the design and implementation of social green and blue infrastructure projects are taken into account, hence directly addressing critical factors to nurture enabling conditions.

This report works as a tool box of ideas and strategies that can build departure points for pilot projects in Addis Ababa.

2. The applicability of Green-Blue Infrastructure case studies in Addis Ababa

Ethiopia is witnessing the rapid transformation of its urban landscape as a result of high levels of economic growth, averaging 10% a year, which the country experienced over the past 15 years. Its urban system is characterised by two extremes: the primacy of Addis Ababa, which concentrates nearly a quarter of the urban population, and a huge number of small towns below 20,000 inhabitants spread out thinly all over the country. Addis Ababa's population was 3.04 million in 2012 (1.5 million men and 1.6 million women) (CSA, 2012), approximately 4.1 million in 2019 and is expected to reach about 6.0 million in 2030 (Worku, 2020). Population growth fuelled by rural migration puts the city on pace to double in size within 15 years. While women form the majority of the urban population, children and youth comprise 38% of Addis Ababa's population (LSE Cities, 2018) of which 11% (1.1 million) is under five years old, based on the 2019 projection of the 2007 Census (UNICEF, 2019).

The population pyramid indicates that Addis Ababa's population is composed of a significant number of children and youth. Therefore, it is imperative that the urban development perspective and planning policies derive considering child and youth sensitive aspects when promoting multi-sectoral approaches in programme and policy design to enhance well-being, equality and equity among the different social strata and age groups.

Addis Ababa is the seat of the African Union, Economic Commission of Africa and the second city to host the largest number of embassies. Its rapid urbanisation is also catalysed as it tries to respond to the needs of these institutions that bring economic opportunities to the country that aspires to be a middle-income economy by 2025. For instance, the city is undergoing massive transformation through the development of large-scale transport, green and blue infrastructure and socio-cultural facilities among others. The city's resilience initiative looks at urban planning, innovative financing schemes, communication technology and trans-regional development to address issues as far-reaching as public health, affordable housing, unemployment, flooding and secure infrastructure.

The rapid population growth and urbanisation coupled with the government's Growth and Transformation Plan II (GTP II) (2015-2020) that aimed to substitute the agriculture-led economy for an industry-led one increased the demand on the usage of natural resources resulting into environmental degradation including GBI, clean water scarcity and sanitation, adding up to climate change impacts (Worku, 2020). Moreover, due to its geographical and geopolitical position, Addis Ababa experiences tensions of climate stressors, rapidly changing ecological conditions, intense migration, resource conflicts and complex urban growth trajectories. Its social fabric, infrastructure, politics, and built environment are filled with multiple socio-economic, cultural, environmental and human spatial settlement challenges.
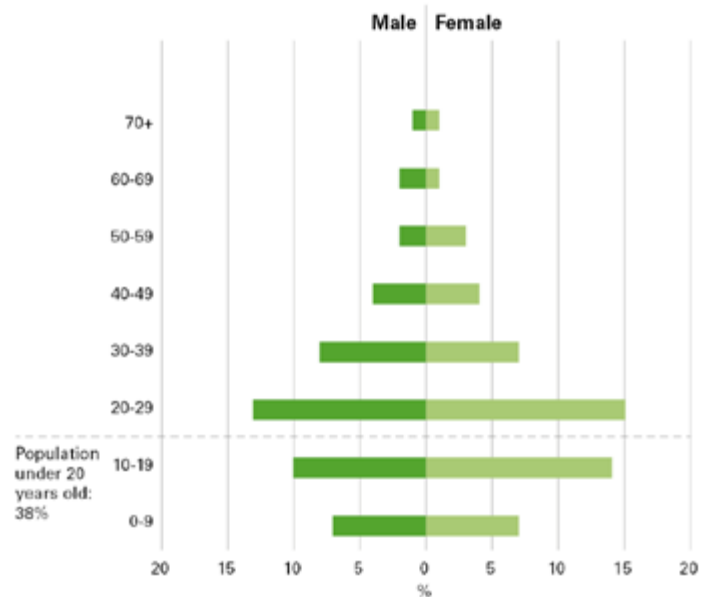
Addis Ababa's age profile /population pyramid
Source: LSE Cities, 2018 (Age profile, Addis Ababa - Data | Urban Age lsecities.net

For instance, since the early 2000s, Addis Ababa has lost significant green space areas, including streams and riversides, due to the construction boom and intense competition for land, which is exclusively state-owned. Between 1999 and 2020, the built-up area of the city increased from 134 km² to 380 km². Consequently, open and underdeveloped land quickly disappeared; rivers, streams and wetlands also were converted into housing and office developments or occupied by informal settlements (UN-Habitat, 2017). Currently the city has about 24 city-level parks with a total surface of about 148 ha which accounts for only 0.28% of the total city area. The city forest is estimated to be around 19.7% of the total city area (Sileshi & Hailu, 2020). There are on average 1.2 m² of green areas per resident, which is 8 times lower than the 9 m² recommended by WHO (UN-Habitat, 2017). There are two main forests, on the mountain of the Entoto and Guelele area, which also are developed partly as parks but are losing their greenery at the same time due to the expansion of the city.

Due to the loss of its green areas, clearance of trees and vegetation within the inner-city and the peripheries which are mostly characterised by mountains with dense forest, air pollution in Addis Ababa has increased by 62% between the years 1974 and 2018 (Makoni, 2020). The transport sector is also one of the main contributors to air pollution and climate change, roughly producing 90% of the hydrocarbon and carbon monoxide emissions (UN-Habitat, 2017) in addition to the widespread use of charcoal and firewood for cooking purposes.

Proper SGBI planning and implementation is required throughout the city in a balanced way. Because open spaces and green coverage have also been affected by lack of proper urban planning and partial implementation,

Addis Ababa city's structure plan (2017-2027) proposes green areas and parks of a total of 2730 ha. If implemented properly they would offer significant improvement in green areas and safe public space availability strengthening the socio-economic aspect of the city.

However, the lack of well-planned open spaces, streets and pedestrian pathways usually results in fear-based socio-spatial exclusion of vulnerable groups such as women, girls and children (Koskela, 1999). Experiences and attempts of violence produce unsafe space from which women are excluded on account of their gender (ibid). In Addis Ababa, women in poverty are usually engaged in informal sectors and mostly live in the inner city's deprived areas (Muluemebet in Eskezia, 2011), characterised by less lit places, narrow and hidden spaces with less visual porosity making them prone to violence and abuse.

Several pieces of research, especially during the COVID-19 crisis, reiterated that women form the majority in being caregivers to children, elders and people with disabilities (OECD, 2020). If women cannot safely use public spaces, reach areas of work because of access or lack of urban infrastructure or due to a threatening and unsafe environment, it will directly affect the city's socio-economic development as they constitute the majority of the population in Addis Ababa. For instance, agriculture being the leading economic sector of the country, 70% of the women's population in the country are engaged in agriculture and also account for the majority in urban agriculture in Addis Ababa (IMF, 2018). If urban and environmental spatial planning and its policy is reviewed from a gender perspective inclusive of all income status, the city will be gender responsive and inclusive of all age groups and social strata.

Furthermore, a vast number of informal settlements in Addis Ababa are located around rivers and mountains despite the geographical challenges that limit the ability to easily build and settle. Addis Ababa's urban, poorest, mostly female-headed households (Muluemebet in Eskezia, 2011) benefit from these rivers' water to produce their food, generate income through urban farming and firewood for cooking from the forest in the mountains. However, the water pollution and inadequate housing standards makes them vulnerable to flooding, and landslides, and affects their health. Moreover, as women form the majority in being caregivers while living in poverty, one study finds that 18% of children (under the age of 18) in Addis Ababa live in child poverty, lacking access to basic services in which lack of housing and sanitation are the most acute (UNICEF, 2019). Fear-based spatial exclusion from public services also exacerbates young children's access to basic services and public spaces, thus bringing more challenges to raising children in safe and healthy spaces.

Rivers and green areas are infrastructure that contribute to a healthy city as they incorporate urban space of ecology, recreation and social interaction while contributing to the growth of the national economy through tourism and land value. Developing a well-planned SGBI that responds to the temporal different needs of women, children and elders by also making them the agents of change through participatory process will help in creating a safe place to live and work for the society in all age groups. The need for a consolidative design in co-creating urban-nature based spatial solutions in a shared governance structure (Mahmoud et al, 2021) that incorporates a robust hierarchical leadership, community participation, public and private stakeholder ownership roles, and responsibilities with a clear communication line will result in equitable solutions that strengthen capacities for social innovation and develop local economies for a healthy and resilient city inclusive of all social strata and age groups.

The Sheger Riverside corridor development project, the tree planting initiatives, Entoto Park, Unity Park, launched by the Prime Minister of Ethiopia, as well as the Meskel Square to City Hall refurbishment project owned by the City Administration, among others, with an objective of greening and beautifying Addis Ababa can be taken as excellent SGBI initiatives vital for city climate change resilience and urban tourism as well as to serve as recreational facilities for a safe, healthy and socio-economically sustainable city.

The various identified case studies in this paper link social, economic, and environmental rights along a transect of transformation and project alternatives. The projects try to integrate and activate Green and Blue (GB) public spaces into schools, homes and neighbourhoods in the overlooked and neglected urban fragments by making them ecological and socio-cultural connectors of the city at large while enhancing community structures and social inclusion of all age groups and gender. Thus, they incorporate risk and uncertainty, forge new economies, ecologies and resilient community structures, and create productive landscapes along a gradient and over time. They link the green- water- urban nexus of specific sites, territories, collective settlement forms and ecological processes at multiple scales. They tackle challenges through a new set of resilient urban practices, stranded in changing flows and dynamic processes, unexpected health threats as COVID-19 and in the material reality of place by proposing time-based scenarios for spatial change through a systems lens and green-water-driven perspective.

As a result, it is believed that these case studies can provide relevant examples that can be adapted in the planning and design ideas and contextually implemented at various scales in the foreseen SGBI development projects in Addis Ababa.

2.1 Possible challenges in implementing the ideas of these case studies in Addis Ababa

The challenges that are commonly pointed out in SGBI projects are:

Institutional and governance structure, leadership, coordination, management and operation: having a fair play between these lines in ownership, power dynamics and politics, outlining systems and strategies to have a conducive government internal structure for a consolidative design of an institutional structure among several stakeholders; coordinated Public Private Partnership (PPP) to have a safe inclusive implementation and management (the reason why some of the implemented SGBI are fenced, closed and not effectively used by the community/society); public figure, social and economic viability/revenue/economies of scale;

Technical capacity and expertise: shortage of experienced experts that large scale projects require for their design, implementation, evaluation and management; community participation and consultation;

Lack of proper prior systemic guiding approaches for a scalable integrated spatial planning: timescale, feasibility studies and need for timely delivery in project planning and implementation to avoid later retrofitting (especially in design and build project implementations), ratifying construction permit standards, regulatory guidelines, socio- spatial policies and their law enforcement strategies for different urban segments' location, geographical characteristics; having a multi-scale design, integrated urban planning and coordination in the mega SGBI projects within the city;

Human rights issues, inclusiveness, and equity: having inclusive and equitable spatial development for all age, gender, and income groups; fair compensation strategies for the people who will be affected/ displaced due to the new development (the right to develop and use social and public spaces considering the land ownership rules of the government);

Participatory planning, awareness creation and paradigm shift: change in behaviour and attitudes by prior awareness creation strategies with the residents in how to live, maintain, and preserve SGBI to avoid environmental degradation (prevention of waste discharges towards the river, washing, defecation, dumping), how to create sense of ownership and citizen pride. Ways of community participation to avoid communication gap due to income status and type of socio-cultural lifestyle;

Evaluation and monitoring: the need to develop context-based socio-cultural and economic indicators /strategies to evaluate project performance during and after implementation of projects depending on their scale;

(another reason why some of the implemented SGB spaces are fenced, closed and not effectively used by the community/society); the role and valuation of ecosystems services at a local, regional, and national level;

Linking academia and practice for resilient cities: to have an evidence-based and feasible projection to inform a range of SBGI spatial policies for inclusive socio-cultural and economic benefits; how to understand and strategise the risk scenarios for natural and health threats before the cause (landslides, flood, invasions, epidemics, and pandemics: impact on both human health and physical settlements);

Climate change mitigation strategies: implementation of cost-effective ecological methods for projects to reduce climate change and the need for more finance in implementing engineering/mechanical solutions;

Enhancing socio-economic robustness and attractiveness for investment: to implement sound and bankable projects in SGBI for productive landscape; self-sufficiency for sustainability; uninterrupted government budget, and finance for the implementation of pilot projects;

Private sector engagement and advanced ICT: for large-scale, government-owned projects, the gap in mobilising finance by creating possible synergy with business and ownership; to implement modern technologies while taking into consideration the ability and capacity of the local community.

3. COVID-19 and Green-Blue Infrastructure

COVID-19 has challenged life in cities as we know it and evidenced —even further— the importance of nature and green-blue infrastructure in urban life. Never before have the lives of so many people around the world been affected at this scale or speed. With public health guidelines all over the world recommending the avoidance of crowded closed spaces and staying home or close to home, urban residents of many cities where conditions allow have been using the public realm in unprecedented numbers to be closer to nature and socialise, to exercise, dine and even shop at safe social distances. As a result, in communities across the world, green open spaces, parks and public infrastructure have seen dramatic increases in demand as these places became a refuge and provided respite from sanitary restrictions.

However, this is not the case in many places around the world. Slum residents in cities with fewer resources not only lack access to basic essential services such as water, sanitation, housing and health care, but they also lack access to functional public spaces, making it difficult to adhere to social distancing rules or to enjoy the benefits of well-designed and accessible open spaces and parks. This strongly suggests that public health matters should be considered in urban planning and city management. Health outcomes traditionally do not drive urban planning practices in many of these places, not to mention urban management and interventions such as slum upgrading and urban improvement programmes.

There is an urgent need to rethink and transform cities in such a way that they become more resilient, inclusive and sustainable, making sure that plans also include the capacity to respond to the present and potential future pandemics. Public investments in affordable and adequate housing, slum upgrading or urban management programmes and the provision of green and blue infrastructure should ensure that marginalised groups are part of the design process and have access to shelter and that the surrounding environment facilitates physical and mental health. However, under the understanding that resources to offer this are scarce, such as land or financial funds, cities need to be resourceful and innovative to face this challenge.

3.1 The case of Addis Ababa

Ethiopia also has been one of the countries in Africa which has been significantly impacted by COVID-19. Addis Ababa in particular has been severely affected by the spread as the impact of the pandemic is especially high in urban centres and in cities/countries with fewer resources and reserves (Dione, 2020).

The complex urban spatial compositions of Addis Ababa entwined with the impact and consequences of the COVID-19 pandemic, highly impacted vulnerable communities especially in urban poor areas. Thus, it made practitioners, policy and decision makers in both the public and private urban and health sector rethink and develop a more careful consideration of spatial and environmental planning.

For instance, the Environmental and Social Management Framework (ESMF) was set forth as a framework for identification, mitigation, monitoring and reporting of the environmental and social risks associated with COVID-19 in Ethiopia (MoH, EPHI, 2020). Due to the unbalanced distribution of public open spaces, it was reiterated that having a balanced spatial distribution of socio-economic and environmental infrastructures in urban areas at multiple scales would be crucial in achieving a more socially sustainable and healthier city. Furthermore, having institutional and policy reforms to implement coordinated basic health infrastructure developments in strategic locations across the city was considered to be vital. Public consultation, stakeholder engagements, active community participation, resource mobilisation, grassroots association and voluntary actions were the most significant pillars that helped mitigate the pandemic by reaching out to the community in awareness creation and social support. However, due to the limitation of public gatherings and shortage of open public spaces during the pandemic, Ethio Telecom, the sole internet service provider (ISP) in the country, upgraded its internet service and helped in reaching out to the community by providing free fundraising and awareness creation platforms, offering free and faster internet access to critical public institutions, higher education, students and teachers, to keep them connected (Ethio Telecom, 2021).

Due to the pandemic, it became more evident that human well-being is strongly linked with safe, well-planned and easily accessible green open public spaces. While Addis Ababa tries to respond to the ever-changing needs of its growing population, our spatial planning culture has to be revisited through the social determinants of health (WHO, 2012). Opportunities to walk, exercise and socialise in a well-planned, safe, natural setting contribute to physical and mental health. For instance, increased crime, violence, and abuse of women and children in the streets and in private or public work environments and transportation hubs were registered during the partial COVID lockdown (MoWCY, 2020; EWLA, 2020). Therefore, socio-spatial

variation that results from the formal and informal human settlement and the unbalanced resource distribution brings a huge divergence in health outcomes. Equal access to health and basic amenities make high-density areas less vulnerable to pandemics (Eltarabily & Elghezanwy, 2020), resulting in resilient cities inclusive of extremely poor and vulnerable groups such as women and children (Doyle et.al, 2020).

For instance, the Addis Ababa City Administration (AACA)-led Early Childhood Development (ECD) Initiative titled "Future of Hope'' has a policy directive that highlights the importance of learning through play and creating safe and healthy public spaces as they contribute to children's mental and social development (AACA-ECD, 2020). Thus, the Bureau of Women and Children Affairs, Bureau of Youth and Humanitarian Activities, Sport Commission, Bureau of Transport, and the relevant communities will collaborate to implement and run this initiative while the Green Development and Environmental Protection Commission will select ten sites in the city for designated child play areas. Moreover, the AACA School Feeding Programs (AACA, 2020), as well as the institutional reform that has been done by the Ministry of Women, Children and Youth (MoWCY) in setting up Children- Social Service Agency; the Universal Child Benefit; National Sex Offenders Registrar (MoWCY, 2020) can be stepping stones to devise an integrated urban spatial planning system that anticipates the challenging ecological, economic and political conditions and safety factors by understanding the history of urban form, power relations and physical geography of the city. They also will help visualise the complexity of interconnected future risks and propose alternative urban spatial scenarios for people and places that are safe and resilient to the future health and climate change shocks. Initiatives by private sectors such as Ledeg Crafts, which try to link child creativity with the urban environmental and physical settings, can also inject inclusive approaches that embrace the most vulnerable (Ledeg Crafts, 2021).

Social life plays a significant role in Ethiopians' way of life as a strong social support system is embedded in it. Despite the shortage of accessible green spaces in the inner city and social gathering restriction, small social gatherings such as weddings, funerals and group physical activities were inevitable and witnessed in parking areas and streets. This proved the importance of realising the open green and blue public spaces at least as proposed in the Master Plan if not more. Planning SGBI through social determinants of health will make cities more resilient in times of human health emergencies.

COVID-19 also revealed that an integrated private and public green open space planning in a multi scale for an adaptive and flexible use of spaces is essential to mitigate the spread of such pandemics. For instance, during the outbreak of COVID-19, schools and higher institutions compounds served as isolation spaces for people

with COVID-19 and temporary spaces for treatment centres. Tents and homeless shelters were implemented in community open recreational places and church compounds. Thus, the Addis Ababa City Administration took strong measures in upgrading public school facilities by the provision and maintenance of basic infrastructure (toilets, clinics, sport facilities) within their compounds.

Understanding these dynamics and mapping the urban historical and environmental morphology of the city will help speculate and implement resilient systems of SGBI in different scales. They could offer the opportunity to coexist with wildlife and facilitate the provision of ecosystem services for better health outcomes. They can advance a holistic and systemic conception of planning policy and design for the unfixed and constantly shifting patterns of human and natural ecosystem by merging a rich synthesis of healthy social interaction and ecological regeneration strategies.

4. Featured case studies

Case study locations

Initial criteria for project selection: environmental, social and operative issues tackled by case studies.
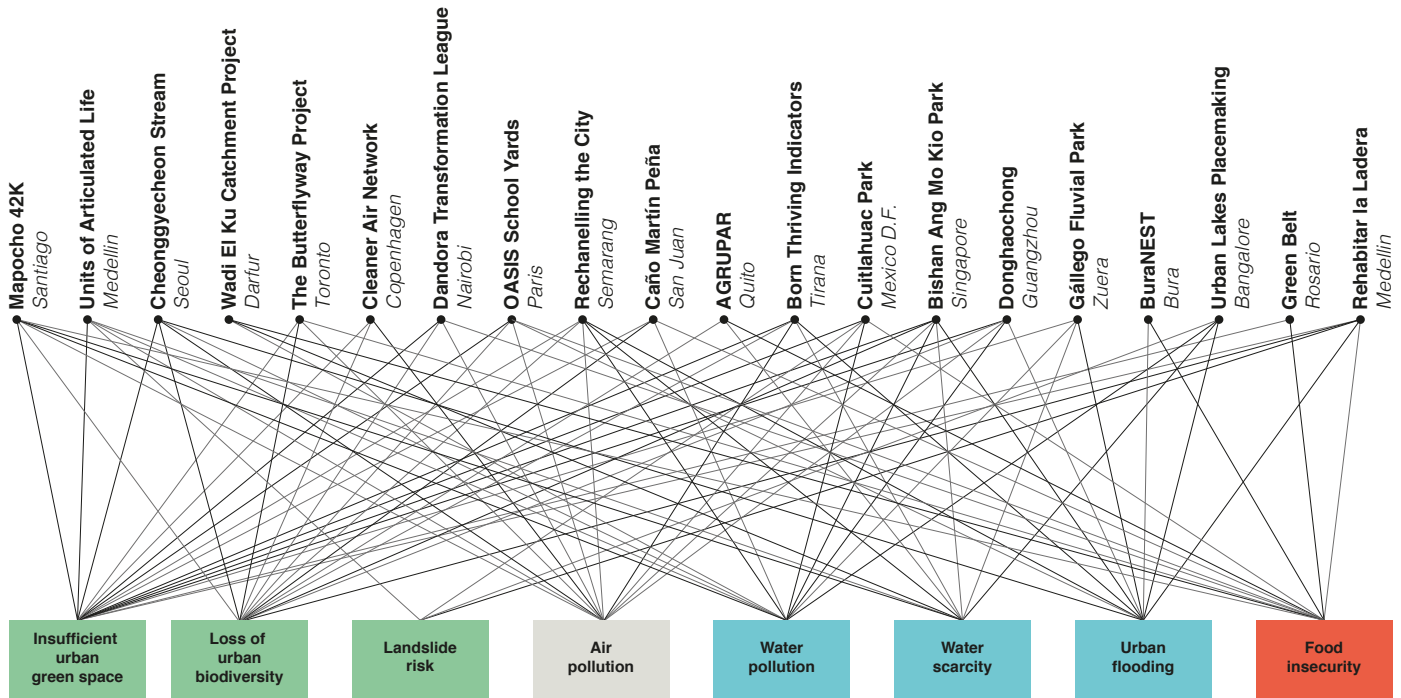
Country	City	Project	Environmental										Social						Operative				
			River/Creek Restoration	Landslide Risk Management	Flooding Management	Drought Management	Green space increase	Urban Agriculture	Renewable Energies	Green Complete Street	Ecosystems approach	Waste Management	Compact Growth	Urban and Rural Linkages	Social Equity	Early Childhood / Youth Needs	Socio-economic Inclusion	Citizen Participation	Settlements and Land Management	Governance	Financing	Low-Cost Mantainance	Comparable Socio-Economic Context
Chile	**Santiago**	**Mapocho 42K**				●	●		●	●	●	●		●	●		●	●		●	●		●
Colombia	**Medellín**	**Units of Articulated Life**					●	●		●	●			●	●		●	●	●	●	●		●
South Korea	**Seoul**	**Cheonggyecheon Stream**	●		●		●		●	●	●		●		●			●		●			●
Sudan	**Darfur**	**Wadi El Ku Catchment Project**	●			●		●			●			●	●		●	●	●	●		●	
Canada	**Toronto**	**The Butterflyway Project**					●			●	●				●	●		●				●	●
Denmark	**Copenhagen**	**Cleaner Air Network**					●		●	●			●					●		●			●
México	México D.F.	Cuitlahuac Park			●	●	●	●		●	●				●	●	●	●		●			●
Singapore	Singapore	Bishan Ang Mo Kio Park	●		●		●			●	●				●			●		●	●		●
China	Guangzhou	Donghaochong Greenway	●		●		●			●	●		●					●		●			●
Spain	Zuera	Gállego Fluvial Park	●		●		●			●	●			●				●		●			●
Kenya	**Nairobi**	**Dandora Transformation League**					●	●		●	●	●			●	●	●	●	●	●	●		●
France	**Paris**	**OASIS School yards**			●	●	●			●	●				●	●		●		●			●
Indonesia	**Semarang**	**Rechanelling the city**	●		●						●	●		●	●		●	●	●	●	●		●
Puerto Rico	**San Juan**	**Caño Martín Peña**	●		●					●	●	●			●		●	●	●	●	●		●
Ecuador	**Quito**	**Participatory Urban Agriculture**				●	●	●			●			●	●		●	●	●	●	●		●
Albania	**Tirana**	**Born Thriving Eco-Indicators**					●			●	●				●	●	●	●		●			●
Ethiopia	Bura	BuraNEST	●			●	●	●	●		●		●	●	●		●	●	●	●	●		
India	Bangalore	Urban Lakes Placemaking	●		●		●				●				●		●	●		●			●
Argentina	Rosario	Green Belt			●		●	●			●			●	●		●	●		●			●
Colombia	Medellín	Rehabitar la Ladera		●	●		●			●	●				●		●	●	●	●	●		

■ Criteria met   □ Criteria not met

Connection between case studies and green-blue infrastructure issues in Addis Ababa (based on Worku, 2020)

Main case studies:
- Mapocho 42K — *Santiago*
- Units of Articulated Life — *Medellin*
- Cheonggyecheon Stream — *Seoul*
- Wadi El Ku Catchment Project — *Darfur*
- The Butterflyway Project — *Toronto*
- Cleaner Air Network — *Copenhagen*
- Dandora Transformation League — *Nairobi*
- OASIS School Yards — *Paris*
- Rechanelling the City — *Semarang*
- Caño Martín Peña — *San Juan*

Support case studies:
- AGRUPAR — *Quito*
- Born Thriving Indicators — *Tirana*
- Cuitlahuac Park — *Mexico D.F.*
- Bishan Ang Mo Kio Park — *Singapore*
- Donghaochong — *Guangzhou*
- Gállego Fluvial Park — *Zuera*
- BuraNEST — *Bura*
- Urban Lakes Placemaking — *Bangalore*
- Green Belt — *Rosario*
- Rehabitar la Ladera — *Medellin*

Issues: Insufficient urban green space | Loss of urban biodiversity | Landslide risk | Air pollution | Water pollution | Water scarcity | Urban flooding | Food insecurity
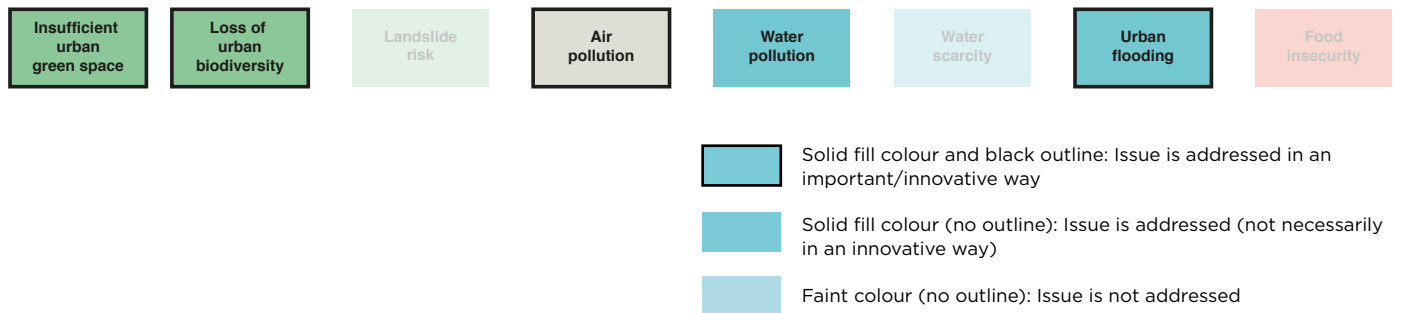
GREEN BLUE INFRASTRUCTURE IN ADDIS ABABA

Image by Ana Carolina Mesías

——— Faint line denotes a 50% connection (the case study addresses the issue but it is not the main issue/concern)

——— Solid black lines denote a 100% connection (the case study addresses the issue in an innovative way)

Key to case study classifications

For each case study included, the way in which it addresses the key green-blue infrastructure issues in Addis Ababa is assessed and represented in the following way:

| Insufficient urban green space | Loss of urban biodiversity | Landslide risk | Air pollution | Water pollution | Water scarcity | Urban flooding | Food insecurity |

☐ Solid fill colour and black outline: Issue is addressed in an important/innovative way

☐ Solid fill colour (no outline): Issue is addressed (not necessarily in an innovative way)

☐ Faint colour (no outline): Issue is not addressed

5. What can be done?

The urban functions that provide proper services to citizens of Addis Ababa need to be restored, extended, and improved. Increasing the accessibility and the availability of green spaces, connecting and creating other types of infrastructures such as mobility infrastructure, amplifying social and environmental services, and catalysing inclusive urban development are all concrete opportunities that need to be capitalised. Furthermore, due to present climate challenges and a future that promises to become even more turbulent, adaptive capacities are added values that need to be embedded into any green and blue infrastructure intervention (see Elmqvist et al. 2018). Not doing so might lead to increased occurrence of social conflicts, further urban degradation, and fewer opportunities to provide well-being, health, and safety to people (Nordås and Gleditsch, 2015), where children are especially vulnerable (Akresh, 2016).

Addis Ababa urgently requires ambitious interventions to contribute to its sustainable urban development, especially the ones that promote the well-being of people by reducing pollution and by protecting natural, cultural or recreational sites. Applying proper designs should allow taking advantage of the benefits of nature to aid the improvement of the physical, environmental and spatial quality of the city (see Beatley, 2008), and to help provide better psychological health for users. The main goal is to improve the quality of life of its citizens by better incorporating water and vegetation into the urban fabric (see Beatley, 2011). These natural solutions are even more desirable when the challenges of adaptation to climate change require a comprehensive approach that distinguishes between green and gray infrastructure to obtain successful solutions (see McDonald, 2015).

Different climate-related events might happen in the same locations but at different moments (see as an example Jacome Polit et al., 2019). This means that these events can present themselves in different forms, some of them aided by humans, provoking different undesired situations. While water scarcity might require retention and distribution strategies to make this resource available for everyone for extended periods of time, excess water might require having the capacity to adapt the landscape to retain large quantities and safeguard the integrity of the surroundings. Excess water can also provoke soil destabilisation (erosion) or landslides affecting hillside settlements. To face these scenarios, anticipation and versatility are extremely important.

Key ideas: Increasing SGBI presence, connecting infrastructures, amplifying services, spatial inclusion, adaptability, NBS.

Main case studies

Santiago: Mapocho 42K
Medellín: Units of Articulated Life
Seoul: Cheonggyecheon Creek
Darfur: Wadi El Ku Catchment Project
Toronto: The Butterflyway Project
Copenhagen: Cleaner Air Network

Support cases

Mexico D.F.: Cuitlahuac Park
Singapore: Bishan Ang Mo Kio Park
Guangzhou: Donghaochong Greenway
Zuera: Gállego Fluvial Park

5.1 Main case studies

5.1.1 Mapocho 42k
Santiago, Chile

| Insufficient urban green space | Loss of urban biodiversity | Landslide risk | Air pollution | Water pollution | Water scarcity | Urban flooding | Food insecurity |

Source: www.mapocho42k.cl

The Mapocho River flows through Santiago, Chile's capital city of almost 6 million inhabitants. For centuries, the river played an important role as a landmark of the city, until the 1970s, when it became a major sewage disposal canal. During the 1990s, the city was further disconnected from a large portion of the river due to the construction of a new highway. By the end of that decade, the Mapocho was a contaminated, smelly river and citizens perceived it as a no-go place.

Nowadays, the city has renewed its relation to the river thanks to Mapocho 42K, a project led by Pontificia Universidad Católica de Chile that stitches 225 hectares of a new integrated park system along 42 kilometres of Mapocho's south riverbank to the city by implementing minimal public infrastructure including a bike path, a pedestrian walkway, a continuous line of native trees, and connections to existing and new parks as a main spine along the eight communes it traverses.

Mapocho 42K was complementary to Mapocho Urbano Limpio, a less "visible" engineering project that already had sanitised the river waters in 2012, converting sewer

sludge into clean energy and biosolids into fertiliser and supplying new water for crops. In this sense, Mapocho 42K departed from an engineering achievement and took the next step: connecting the river to its citizens. From the outset, this project was a cooperative endeavour as it convoked all relevant stakeholders, turning this territory, both symbolically and functionally, from a fragmented to a collective space.

The cartographic and on-site research process led by the university clarified the location of critical parts where people would lose connection to the river, due to physical barriers like highway intersections, slums, vacant lots, the widening of roads, and restrictive infrastructure occupation. This diagnosis provided key information about the difficult situations where the route required an urban intervention to restore connectivity. The comprehensive mapping exercise demonstrated that the challenge to develop a continuous public space along the river was far from impossible, but that it required a large amount of time and energy from the leaders of the initiative to coordinate a large group of people and their interests.

The project is a large-scale intervention with an economy of means and has maintained continuity in time, despite multiple changes within the different public entities. This is mostly because it has been safeguarded by collective consensus over private intentions. Mapocho 42K proves that a bottom-up initiative can effectively complement a larger top-down river sanitation project (Mapocho Urbano Limpio) and achieve large-scale environmental impact without losing sight of society's involvement and engagement in the recuperation of this urban space.

In support of early childhood

Mapocho 42K brought people back in contact with the river through the implementation of a continuous public green space that acts as a balcony towards the river and as a democratic connector between several communes of different socio-economic strata both from urban and rural parts of metropolitan Santiago.

The Mapocho 42K greenway is also part of "Vias Verdes AAA" (All Age and Abilities). Families from diverse backgrounds now use it as a quotidian mobility alternative and frequently engage in sports activities such as Mapocho Río Arriba (10K race with an average of 1200 participants) and Mapocho 42kids (biking mornings for children). Data about the use of the project has been recorded for all ages (see key info).

Key info

Why?
To re-connect a recently sanitised metropolitan river to urban and rural sections of the city

What?
An inclusive greenway. 42 kilometres of public green infrastructure, including a bike path, a pedestrian path, a continuous line of native trees, overlooking plazas, and connections to 15 existing and new parks along the Mapocho River

Where?
Along eight communes of urban and peri-urban Santiago

Who?
Mapocho 42K_Lab at Pontificia Universidad Católica de Chile (PUC), Ministry of Housing and Urbanism of Chile, local municipalities, cycling activists, representatives of eight communes and all the neighbourhoods along the southern bank of the Mapocho River

How?
The project started as a Landscape Architecture Research Seminar at Pontificia Universidad Católica de Chile and since then has been active for ten years as an applied research project within the university, supported by public and private grants. Designs have been developed at the university and implemented by the different municipalities and the Ministry of Housing.

Mapocho 42K Tramo central Parque de los Reyes
Source: F. Croxatto, Mapocho 42K_Lab

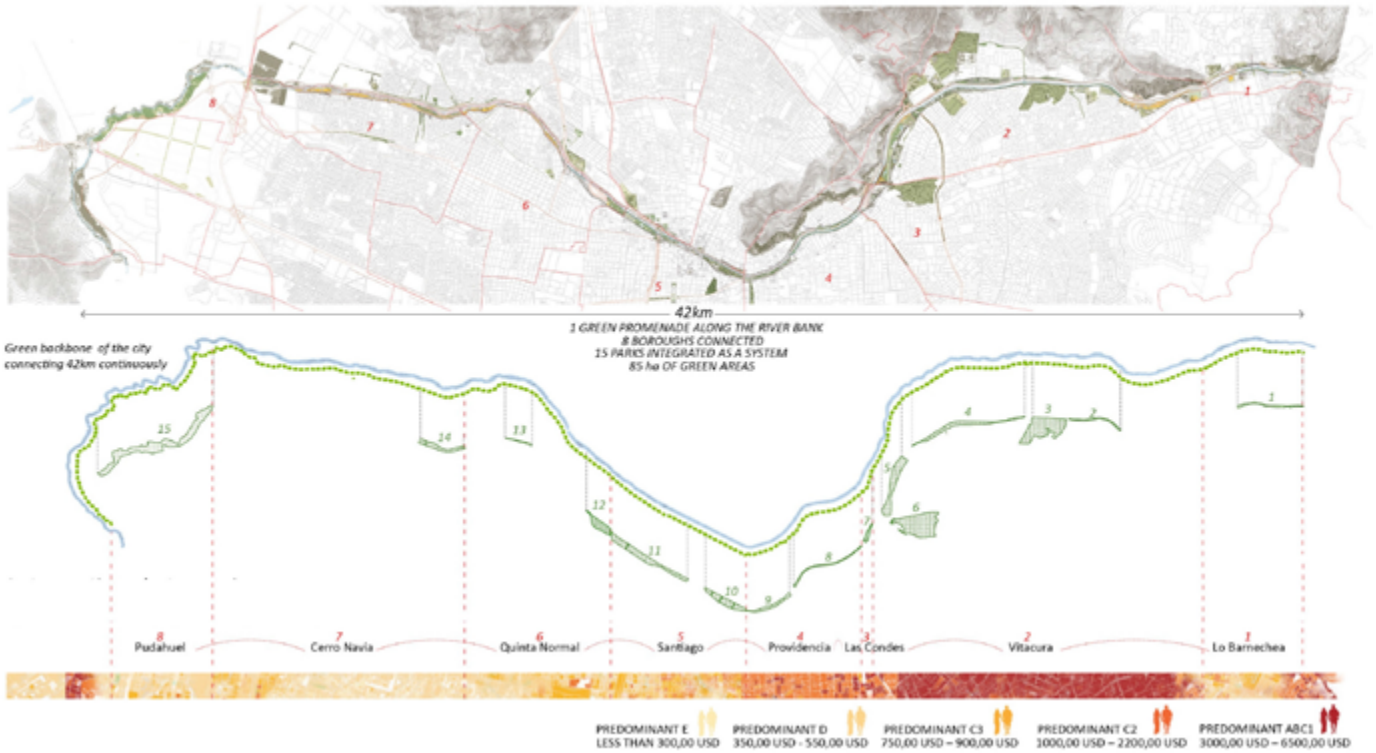Mapocho 42K Tramo Poniente Parque de la Familia
Source: C. Correa, Mapocho 42K_Lab

When?

2009: Spatial Research Seminar at PUC

2010: Public exhibition of mapping results

2011: Financial support by a grant from the San Carlos del Maipo Foundation for legal, urban, and landscape feasibility studies for the design of a continuous corridor

2013: Design and engineering consultancy for the first seven connected sections and design criteria for the additional eight sections, supported by the Ministry of Housing and Urbanism

2014-2016: Construction of the first phase

2016-2018: Stage 2, Poniente Park initiative

2019-2021: Stage 2, Tramo Oriente and Pasarela Metropolitana (Further connection of Mapocho 42K to the Metropolitan Park System). Extension towards the Maipo River
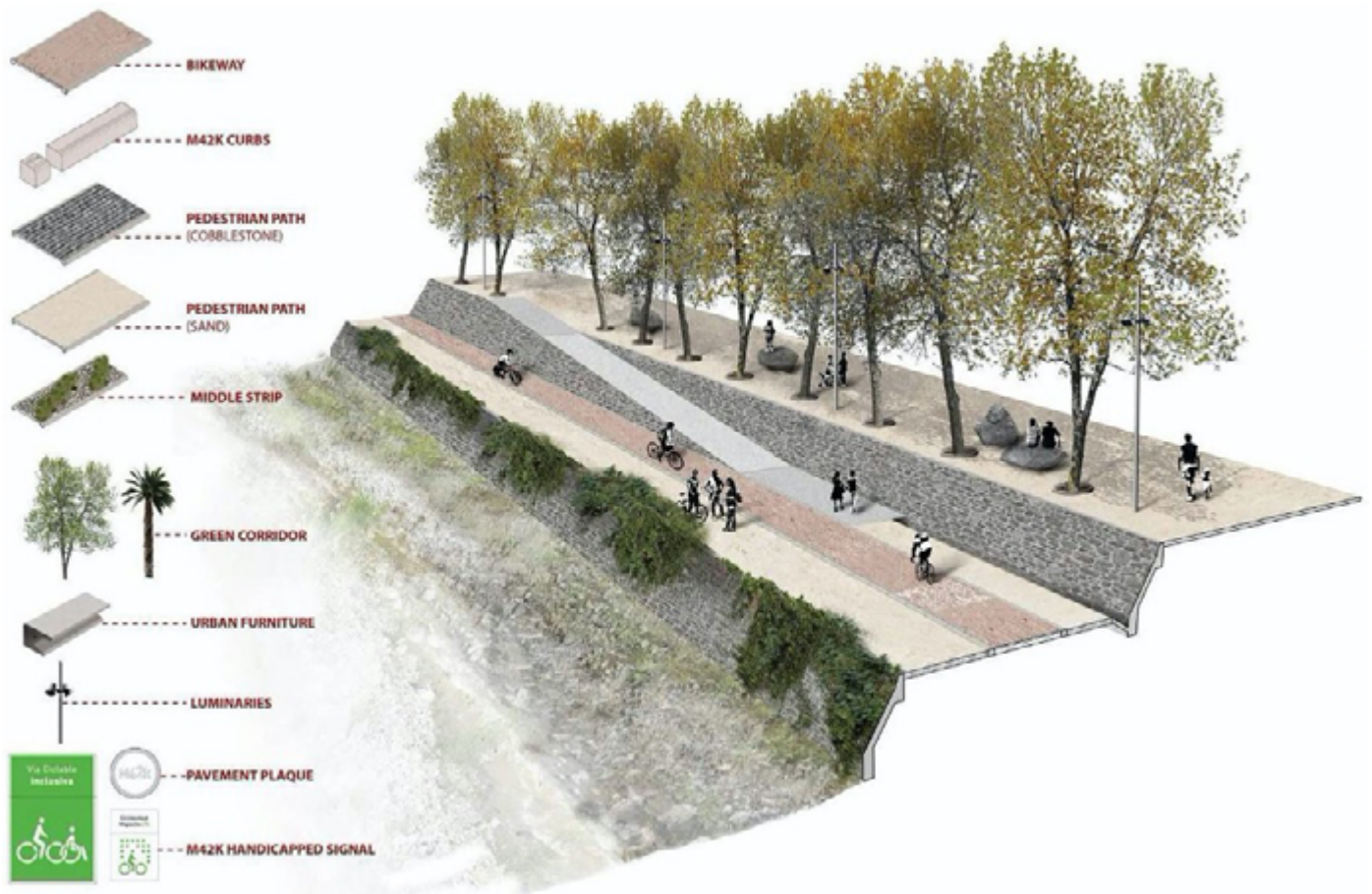
How much?
Cost of a section of trees, pedestrian path and bicycle path: US$ 1300/m (estimate based on a 2016 cost of 2 km in Providencia section), funded mostly by local municipalities and the Ministry of Housing and Urbanism

42km

1 GREEN PROMENADE ALONG THE RIVER BANK
8 BOROUGHS CONNECTED
15 PARKS INTEGRATED AS A SYSTEM
85 ha OF GREEN AREAS

*Green backbone of the city
connecting 42km continuously*

8	7	6	5	4	3	2	1
Pudahuel	Cerro Navia	Quinta Normal	Santiago	Providencia	Las Condes	Vitacura	Lo Barnechea

PREDOMINANT E	PREDOMINANT D	PREDOMINANT C3	PREDOMINANT C2	PREDOMINANT ABC1
LESS THAN 300,00 USD	350,00 USD - 550,00 USD	750,00 USD – 900,00 USD	1000,00 USD – 2200,00 USD	3000,00 USD – 6500,00 USD

15 parks connected through a green promenade along the river bank.
Different socio-economic neighbourhoods share the same public space.
Colours indicate predominant income levels (red: high, yellow: low)
Source: Iturriaga (2018)

- BIKEWAY
- M42K CURBS
- PEDESTRIAN PATH (COBBLESTONE)
- PEDESTRIAN PATH (SAND)
- MIDDLE STRIP
- GREEN CORRIDOR
- URBAN FURNITURE
- LUMINARIES
- PAVEMENT PLAQUE
- M42K HANDICAPPED SIGNAL

Mapocho 42K "kit of components" that adapt to the particular conditions of each municipality.
Source: Iturriaga (2015)

What has been the impact?

– A green corridor of native trees now runs along 42 km of the Mapocho River.

– 225 hectares of a new integrated park system (half is still in process)

– People use fewer cars and more bicycles as a primary mode of transport between east and west of the city. Data for parts of the project demonstrate that there has been a threefold increase in cyclists from 3,000 to 10,000 per day in a 7-12 month period after implementation. These numbers currently average 12,000 cyclists per day.

– The river has been re-appropriated by people. Beside the physical presence of people, this can also be measured by the frequency with which the river now appears in digital platforms through texts, images and videos.

What were the challenges?

– A clear understanding of urban conflicts through thorough research and representation was tedious and slow at first, but paid off in the long run during design and implementation.

– The Mapocho is a torrent river, with water volume variations throughout the year and episodes of strong occasional floods. This has involved a permanent effort to use walls for flood containment. These walls are still a barrier between the city and the river. Nature-based strategies could be a next step to further connect people to water.

– Maintenance of already consolidated public spaces along the river is difficult as it relies on eight municipalities with different financial means.

– Environmental education for neighbours of the river needs reinforcement so that people stay connected to the river as a delicate ecosystem.

Source: www.mapocho42k.cl

New cycle pathway that connects the Renca comuna to Mapocho 42K
Source: https://revistapedalea.com/renca-inaugura-ciclovia-para-favorecer-la-movilidad (2020)

Riverside Park
+
Bikepath/Pedestrian corridor   Mapocho Riverbed

Mapocho 42K
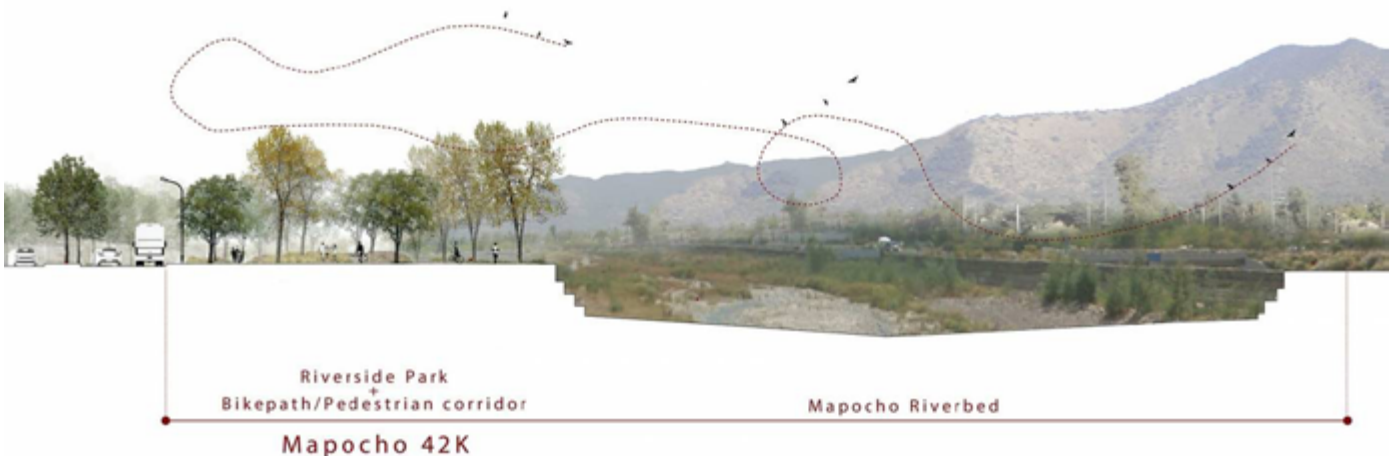
Social achievement: Connection of citizens to their river

Environmental achievement: Clean water and new resources from waste

An environmental and social river revitalisation. Cross section.
Source: Iturriaga 2015

What was the effect of COVID-19?

The pandemic has accelerated a transition towards more cycling and the implementation of new bicycle paths. Santiago is not the exception, and some communes have started to boost bicycle connectivity by redistributing vehicular and pedestrian roads. The Mapocho 42K route has become a central spine that organises several of these new temporary or permanent cycle paths. As more people are using bicycles instead of public transport, buses also are less crowded, allowing people to keep a safer distance. This shift in transit priority towards cycling will hopefully remain beyond the pandemic, as more people get used to the bicycle and take advantage of its health benefits, both for the planet and for themselves.

In connection to Addis Ababa

The Sheger Riverside corridor development project in Addis Ababa is one of the flagship programmes of the Government of Ethiopia, launched by the Prime Minister in 2019. The project covers 56 km of the river route, starting from the northern part of the city, branching out in several parts of the inner city, and ending at the southern part of Addis Ababa. There are formal and informal settlements along the riverside. Most households are happy to live there because of location and affordability, job opportunities, and economic benefits. They developed a strong sense of belonging and social ties as they have lived there for several years. The Sheger project envisions creating a new ecosystem in the metropolis by greening the riverside, connecting it to the urban fabric and attracting socio-economic activities and tourism. It is in its first implementation phase, foreseeing future challenging paths as it will be undertaken by different development partners in spatial configuration.

The Mapocho 42K project can be a good learning case on how to sustainably move forward in implementing and managing this large, city-scale SBGI project. For instance, in order to avoid eviction, it can engage and propose riverside communities to be protection and recovery agents in favour of ecosystems. It suggests cooperative project management systems which can engage private and public stakeholders to manage a fragmented territory and become a collective space. Mapocho 42K also shows how to work on bottom-up initiatives that can effectively complement a larger top-down river sanitation project. By using fewer cars and walking and cycling more as primary modes of transport along riverfronts, it can encourage child-friendly places to connect several socio-economic strata and age groups.

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River in Addis Ababa where the Sheger Riverside corridor development takes place.
Source: UN-Habitat, Sheger Riverside corridor development design guideline, 16 July 2021

Friendship Park - part of the new Sheger Riverside corridor development
Source: Addis Ababa City Administration, ADDIS HALL - Hall of Architecture and Urbanism, March 2021

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5.1.2 Units of Articulated Life
Medellín, Colombia

Insufficient urban green space	Loss of urban biodiversity	Landslide risk	Air pollution	Water pollution	Water scarcity	Urban flooding	Food insecurity

UVA La Libertad.
Source: EPM

In 2012, while looking at satellite photographs of Medellín at night, representatives of the Water and Energy Utilities Public Company of Medellín (EPM) realised that many dark and unsafe patches in the city corresponded to sites they actually owned: water storage facilities. These large infrastructures were built mostly between 1910 and 1950 on hills at the outskirts of the city and, after a few decades, were encroached by aggressive urban expansion, thus becoming fenced hot spots for crime and decay.

Through careful analysis of 144 sites, EPM selected 20 of them to be opened up and developed as public green spaces to attract community interaction. The criteria used for this selection was merely the social impact that the project would achieve. The more problematic the site, the more opportunities it had to bring positive change. The programme was called Unidades de Vida Articulada - UVA (Units of Articulated Life) - and started implementation in 2013.

For each UVA, the design process included a participatory approach through a "Laboratory of Imaginaries," where the community would present their needs, wishes and even names for the new public space. Interaction with society would continue throughout the whole design and execution phases, arriving finally to an inauguration where everybody felt a sense of ownership and pride.

UVAs generate a sense of safety and connection within the community. Their pedestrian mobility networks have stitched together neighbourhoods which used to be apart, repairing a physical and social separation that had been generated by the presence of closed-off water infrastructure. The cisterns, which are still in use, have been exploited as visual landmarks, creating a sense of place with contemporary design that has turned derelict infrastructures into architectural icons. These new green-blue urban spaces often include terraces and steps that overlook the urban landscape. Most importantly, the social impact of UVAs has relied on inserting subsidiary activities such as educational facilities, gyms, local libraries, or sports fields, which provide many types of activities in a weekly programme (Gallanti, 2017).

Nineteen UVAs have been built and the main takeaways of this process have been: a) Opportunities are already there. Just look at old places with new eyes; b) Political maturity allows for continuity. Medellín's process started in 2003 and has been sustained through several public administrations; c) Public spaces thrive when the community has been involved from the beginning and continues to do so afterwards through programming. People take care of what they "own"; and d) Every community deserves to develop its own identity. Standardisation is only cheaper in the short term; it is not sustainable in the long run.

In support of early childhood

Infrastructure that used to be fenced off from the public is now accessible by all segments of society, even though it remains functional as water supply systems. This strategy has been called "pedagogic urbanism" as the city becomes a learning space about how it functions. The provision of water and electricity are no longer abstract concepts but can be understood by everyone in the community. By turning infrastructure into fun play spaces, children now connect to water and electricity infrastructure in a different way and are growing up in safe, inclusive, green-blue spaces, constantly engaging in community interaction.

UVAs are managed by a team working closely with up to 25 community leaders, including children. They are appointed as the "Guardians of UVA", who suggest and promote activities relevant to each community. Ten UVAs also are connected to Buen Comienzo, a municipal programme that provides education, nutrition, and health services to pregnant women and to children up to five years of age.

Key info

Why?

To turn unsafe dark urban voids in the city to vibrant green-blue public spaces that engage neighbouring communities

What?

Nineteen water storage facilities have been opened up to public activity. Their infrastructural functions remain, but add social value to neighbourhoods that lacked communal amenities

Where?

In the hillsides of Medellín, where dense low-income neighbourhoods developed in the second half of the 20th century

Who?

Empresa de Servicios Públicos de Energía y Aguas de Medellín (EPM), the city's public enterprise in charge of water and energy utilities, in coordination with several departments from the municipality; UVAs are entirely public projects

Water tanks' original conditions and night map of Medellín.
Source: EPM
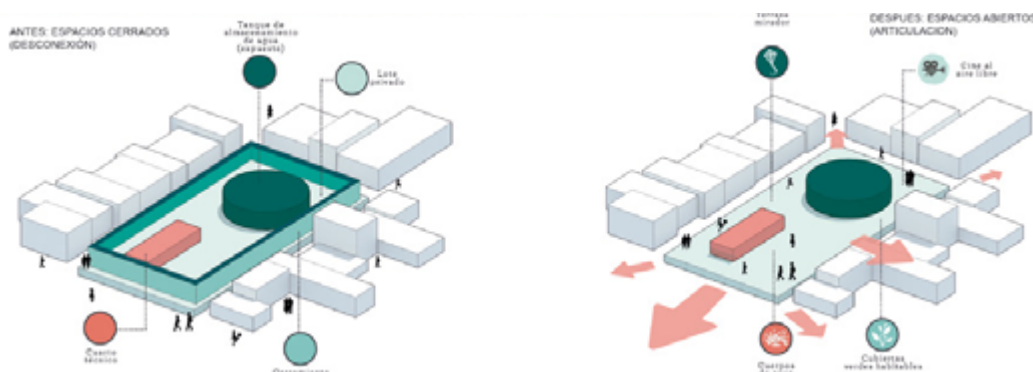
UVA Conceptual Premise
Source: EPM

UVA Nuevo Amanecer
Source: EPM

How?

A satellite image of Medellín at night revealed enclaves of darkness where utility infrastructure disconnected neighbourhoods and fostered crime. All of these sites were owned by EPM, an efficient and wealthy public company, so it was relatively easy to start a transformative process. Through creative and participatory work with the community, the designs and built projects truly belong to their surroundings. It is part of an ongoing urban planning model that Medellín has led for almost two decades

When?

2003: Medellín set off to provide high-end architecture and connectivity solutions to the city's less developed areas.

2012: EPM discovers 144 "black holes" in the city which are part of their own infrastructure.

2013: EPM launches the Unidades de Vida Articulada (UVA) project to redevelop 20 water storage facilities.

2014-2018: 19 UVAs inaugurated

How much?

Financial resources for the project come only from public funds (EPM and the municipality).

An approximate total of € 80,000,000 was invested in 19 UVAs with an average of € 4,500,000 per intervention. The most expensive project cost € 16,000,000 and the least expensive € 1,700,000

What has been the impact?

– Approximately 162,000 m² of new public spaces and 40,000 m² of new public buildings have been added to 19 different low-income neighbourhoods of the city.
– Communities that used to be separated from each other now have a common public space.
– Crime and the perception of danger have dropped.
– Moving to other parts of the city for recreational purposes has been reduced.
– What used to be derelict infrastructure is now architecturally iconic.
– Communities now experience a sense of civic pride

What were the challenges?

– The change of mentality about the role and function of utility infrastructure required a shift in paradigm.
– Perceptions of safety and danger regarding close public proximity to water supply and electricity facilities had to be questioned

What was the effect of COVID-19?

When coronavirus broke out in Medellín, local authorities implemented drastic measures to avoid contagion. This included closing the services in 14 Unidades de Vida Articulada. These spaces reopened later in 2020 but with a restricted schedule (9:30-16:00). During 2021, UVAs were reactivated in a hybrid mode. Some hosted safe in-person meetings while others still organised only on-line activities through the Google Meet platform. In this sense, UVAs have become "digital public spaces" for online social organisation during lockdowns

UVA Los Sueños
Source: EPM

UVA La Imaginación
Source: Colectivo 720

UVA El Orfelinato
Source: Sergio Gómez, Colectivo 720

UVA Santo Domingo
Source: Concypa

UVA Los Guayacanes
Source: Sergio Gómez, Carlos Tobón, Juan Fernando Cano

UVA La Imaginación
Source: Sergio Gómez, Colectivo 720

In connection to Addis Ababa

Addis Ababa has a mountainous geographical composition with dense forest around its periphery. Despite its challenging configuration that is usually prone to flood and landslide, a vast number of populations live in both formal and informal settlements.

Projects as in Units of Articulated Life could be related and its ideas adapted on projects like the new "Entoto Park" in Addis Ababa that is currently under development. That is, in creating a system that brings political leverage and willingness and on how to engage the community from the beginning to provide a sense of ownership, civic pride by incorporating activities for different age groups and genders. Implementing the notion of "pedagogic urbanism" will teach people and children to value, respect and preserve nature. UVAs are a good precedent for rehabilitating mountain areas by creating safe open spaces; reducing the perception of crime and danger due to darkness and inaccessibility; having visual porosity, close proximity, and balanced provision of open public spaces and minimising the need to go too far away. Places like these in Addis Ababa will foster a healthy, friendly and inclusive environment.

Entoto Park
Source: Ethiopian Embassy in Brussels, 27 August 2020 (Entoto Park - YouTube)

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5.1.3 Cheonggyecheon Stream
Seoul, South Korea

Insufficient urban green space	Loss of urban biodiversity	Landslide risk	Air pollution	Water pollution	Water scarcity	Urban flooding	Food insecurity

Source: PARK JI-HWAN/AFP via Getty Images

In the 1950s, Seoul followed a typical development model that prioritised the construction of infrastructure for car mobility and covered the Cheonggyecheon stream with an elevated highway. By then, the stream was used as sewage for low-income neighbourhoods, so the project symbolised development and modernity. By 2002, the highway started showing signs of decay due to corrosion and required a US$ 90 million investment to get it back into shape. This opportunity was used by the mayoral candidate Myungbak Lee to propose the demolition of the highway and the restoration of the stream as a green-blue public space.

The restoration project took 27 months and was executed with a constant overlap between research, design and construction. It was a risky move but proved positive, as it allowed for local residents to suffer the side effects of the construction process for less time. Although there was resistance, mainly from traffic engineers and from business owners, Lee's political leverage was strong enough to move ahead with the involvement of municipal agencies, residents and entrepreneurs.

Transportation planning was among the toughest issues that the government had to address, given the removal of busy roads in the downtown. The government planned circular-route buses, increased parking fees to discourage traffic, put a strict stop to illegal parking and introduced reversible and one-way lanes in addition to planning a better public transit system. Ironically, reducing travel lane capacity resulted in a decrease in vehicle traffic (Braess paradox).

The benefits of this project are innumerable. These include the creation of 16.3 ha of new green public space which hosts pedestrian and cultural activities, restores historical structures, provides habitats for animals and plants and prevents contamination and the heat island effect. (See "What has been the impact?")

Even though its participatory process is backed up by more than 4,000 meetings between government representatives and the community, and it currently has a high approval rate from citizens, Cheonggyencheon also has a discouraging side which is that many of the promises made by the government to displaced business owners were not kept and they were eventually displaced without ever achieving their side of the deal.

The main takeaways of Cheonggyencheon are environmental, social and economic. The project replaced

concrete and pavement with nature in the centre of the city, prioritising people over cars. It increased the quality of life of all surrounding neighbourhoods and attracted visitors worldwide. Finally, even though the restoration was more expensive than repairing the highway (US$ 90 vs. 345 million), in the long run it catalysed an estimated US$ 1.98 billion worth of capital investment in the project's area.

In support of early childhood

The restoration of Cheonggyecheon brings back water, vegetation, animals and people to the historic downtown of Seoul. Children are witnesses to a drastic change in mentality where infrastructure for cars has been replaced by green-blue infrastructure for life. This project represents a paradigm shift in how cities prioritise quality of life and reject the car-driven designs that were built all around the world in the second half of the twentieth century. Access to clean water for recreation is presented now as an urban right. Safe, healthy, inclusive public space supports the well-being of people of all ages.

Around the project, babies, toddlers and their caregivers particularly benefit from a 45% reduction in vehicle volume, which decreases small-particle air pollution by 35%. Children also have access to almost 30 native willow swamps, shallows and marshes, where biodiversity has increased almost sixfold.

Key info

Why?
To revitalise the old downtown of Seoul and restore the Cheonggyecheon stream in order to provide a healthy, green public space for locals and tourists, while raising land value and attracting investment

What?
Removal of the 18-lane elevated highway that covered the Cheonggyecheon stream and the construction of a water channel, park and promenade; a public transport upgrade also took place to cope with the changes in vehicular mobility through the centre

Where?
Along 5.8 kilometres along the Cheonggyencheon district in Seoul's old downtown

Who?
Seoul Metropolitan Government, Cheonggyecheon Restoration Centre, SeoAhn Total Landscape, Seoul Development Institute, Cheonggyecheon Restoration Citizens Committee and Cheonggyecheon Research Group (private partnership)

How?
Taking advantage of the fact that the elevated highway was corroded and needed a substantial fix, mayoral candidate Myungbak Lee proposed the restoration of Cheonggyencheon as his main campaign pledge.

Cheonggyecheon, before and after.
Source: Global Designing Cities

Cheonggyecheon, before and after.
Source: Seoul Metropolitan Government

His administration succeeded with this project, which launched him to the presidency of South Korea.

When?
2003: Highway demolition (July)
2004: Project execution
2005: Inauguration (October)

How much?
US$ 345 million, funded by the Seoul Metropolitan Government and a few partners

What has been the impact?
- A new 5.8 km continuous park for pedestrians, cyclists and wildlife
- Urban cross-connectivity improved by adding 22 bridges, connections with five nearby subway lines and 18 neighbourhood bus lines
- Small-particle air pollution was reduced by 35%
- 76% increase in pedestrian activity
- 45% decrease in vehicle volume
- Contributed to 15% and 3.3% increase in bus and subway ridership respectively
- Reestablishment of waterway connections
- 29 new native willow swamps, shallows and marshes.
- Biodiversity increased 639%
- Flood protection for up to a 200-year flood event
- Urban heat island effect reduced an average of 4.5 degrees C
- All scrap iron and 95% of waste concrete and asphalt from the demolition were salvaged and reused
- 64,000 visitors daily average: of these, 1,400 are tourists who contribute up to US$ 1.9 million to the city's economy

Source: https://seoulsolution.kr/

- Land prices increased by 30-50% for properties within 50 m of the restoration project
- Businesses in Cheonggyecheon increased by 3.5%

What were the challenges?
Public engagement for the development of the project has been presented as a success. It has been questioned by some researchers, as some promises by the municipal government to business owners were not kept.

What was the effect of COVID-19?
South Korea was one of the quickest countries to respond in a decisive way to the outbreak of coronavirus. Government restrictions were less needed, as the population responded positively to a self-isolation and social distancing campaign. In that sense, most public spaces in Seoul saw a sharp decrease in use. Cheonggyecheon already was a healthy public space before the pandemic and allows for pedestrians to socialise with social distance in this outdoor public space.

Conceptual site plan presented in 2002 by the Research Center Director of the Seoul Development Institute, Seoul Metropolitan Government
Source: www.landscapeperformance.org
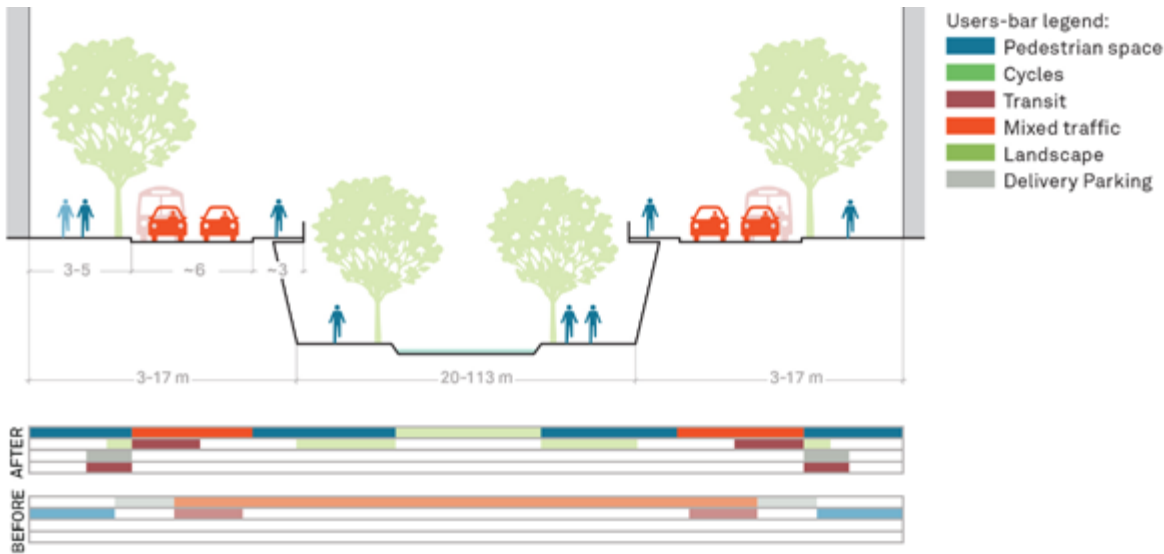
Section diagram
Source: www.global designingcities.org

In connection to Addis Ababa

Prioritising the value of the GB resources by integrating water bodies, vegetation and animals within the densely built inner-city centre and people's lives not only brings waterway connections and restores natural habitats, but can also have a significant impact on climate change by the introduction of specific habitats that can prevent contamination, air pollution and the heat island effect. It also can represent a paradigm shift in how cities should prioritise quality of life through nature and not only through transport-oriented urbanisation for economic development. SGBI design that prioritises human-centred planning will increase quality of life in health, urban cross-connectivity through planning a better public transit system, reducing travel lane capacity and decrease in vehicle traffic by increasing pedestrian activity. Moreover, turning infrastructure into fun play spaces through strategic small interventions will change the mentality of children in having the culture of giving value and respect for nature as they grow up. As Addis Ababa leans towards transit-oriented development, the "left over" spaces next to transport infrastructure could provide an opportunity to bring GB public spaces within the existing densely built urban fabric. Case studies like Cheonggyecheon Stream could provide additional project design development, management and operation strategies to similar projects like the "Gotera Interchange" green development in Addis Ababa.

Green public space development implemented in the leftover spaces under an overpass road crossing Africa Avenue/Bole Road
Photo credit: Tigist Kassahun, 07 May 2021

Gotera Interchange
Source: Gotera, Addis Ababa - Photographs | Urban Age (lsecities.net), May 2016
Photo credit: Dereje Belachew, accessed 02 November 2021

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5.1.4 The Butterflyway Project
Toronto and expansion to 400+ communities, Canada

Insufficient urban green space	Loss of urban biodiversity	Landslide risk	Air pollution	Water pollution	Water scarcity	Urban flooding	Food insecurity

Mitchell Elementary School butterfly garden, Richmond
Source: The Butterflyway Project - David Suzuki Foundation

The Butterflyway Project is an initiative by the David Suzuki Foundation to provide new natural habitats to pollinators such as bees and butterflies by coordinating a vast network of volunteering residents and organisations. Initially part of the Homegrown National Park Project, an award-winning initiative to help plant milkweed for dwindling monarch butterfly populations in three Toronto neighbourhoods, the Butterflyway Project took on a life of its own by expanding to more than 400 communities across Canada in four years.

Through a Butterflyway Rangers Program that began in 2017, community leaders were recruited to connect with local gardening and horticulture groups, businesses, municipal councillors, parks staff, schools and day care centres. Community events were set up to establish new butterfly gardens in every possible "bit of urban fabric", including parks, schools, yards, edges of laneways, between buildings and sidewalks.

Bee and butterfly pathways are important for urban biodiversity conservation. Reproduction of about 90% of flowering plant species depends on pollinators. Unfortunately, threats such as urban development, agricultural pesticides and climate change are dramatically reducing pollinator diversity and numbers. According to a 2016 UN report, 40% of all insect pollinators worldwide are under threat. Canada's more than 300 butterfly species do not only contribute to flower pollination, but also play other essential ecological roles, like becoming bird food.

Map of the first Butterflyway in Canada, Beaches neighbourhood, Toronto
Source: The Butterflyway Project - David Suzuki Foundation credit: Dereje Belachew, accessed 02 November 2021

Butterfly gardening is not only about providing new habitats for pollinators. Essentially, the Butterflyway Project is about fostering community and deepening the connection between people and nature in a fun and educational way. It is a project that shows that a small group of citizens can make a big difference by making their communities greener, healthier and socially connected. An important strategy of the programme has always been to keep local stories very personal, constantly mentioning the volunteers that are involved through its communication channels.

Scientific research has also become an important component of the Butterflyway Project. In 2019, iNaturalist developed BIMBY (Butterflies In My Backyard), a citizen-scientist component to identify butterfly species in the Lower Mainland of British Columbia; and 100 households in Toronto studied wild bees in their backyards to support University of Toronto Scarborough research.

"We want greener, healthier neighbourhoods. We want more wildflowers blooming and more butterflies flitting. We want more splashing in puddles, more bicycle bells ringing, and more children outdoors playing. We want more potluck dinners, more outdoor movies, and more street art murals. We want more joy and more community. We are Butterflyway Rangers." -Butterfly Ranger motto

In support of early childhood

In addition to the environmental benefits of adding green patches to support pollinators within the city, butterfly gardening has several educational and community-building advantages. Children (and their parents) learn about pollination and its importance for food security. They also engage directly with the life cycle of butterflies and the interrelations between different species of insects and plants for feeding and breeding. School infrastructure also changes, as a new learning component is added to outdoor spaces.

Key info

Why?
To establish new spaces of food and shelter for wild pollinators (butterflies and bees) in response to the negative effects of climate change, loss of natural habitats and widespread pesticide use. Also, to strengthen the connection between people and nature in cities

What?
A citizen-led movement to create local highways of habitat for bees and butterflies, known as "butterflyways", by planting pollinator patches with native wildflowers in yards, schools, streets, and parks in communities all across Canada

Where?
The project was launched in five Canadian cities during 2017, after the success of a first butterflyway in Toronto.

Map of the first Butterflyway in Canada, Beaches neighbourhood, Toronto
Source: The Butterflyway Project - David Suzuki Foundation credit: Dereje Belachew, accessed 02 November 2021
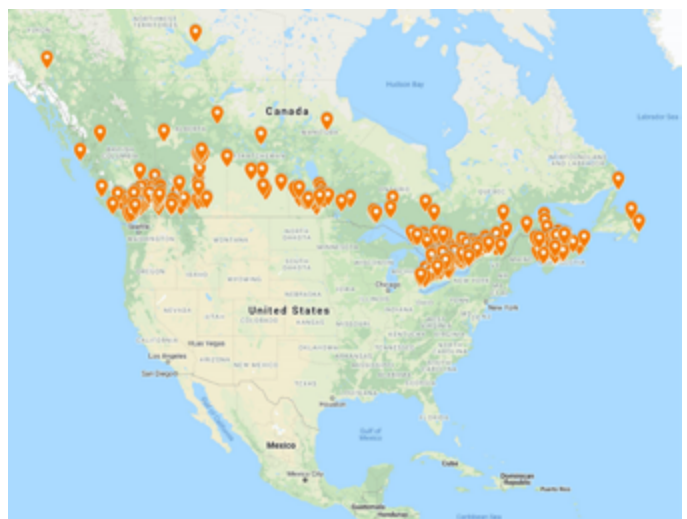
Map of more than 400 communities where Butterflyway Rangers were recruited in 2020
Source: The Butterflyway Project - David Suzuki Foundation accessed 02 November 2021

Build a highway of habitat for bees and butterflies at your school!

The Butterflyway Project

"Call for teachers" post
Source: David Suzuki FDN Twitter account. March 10, 2020

Pollinator patches have now been planted in more than 400 communities throughout the country and 15 official Butterflyways have been established in British Columbia, Ontario and Quebec

Who?

The David Suzuki Foundation leads the project and has recruited organisations like schools, local governments, neighbourhood associations, and approximately a thousand volunteers per year. Main supporting partners include Nature's Way, Cascades, VIA Rail Canada, Monarch Nation, and the Kenneth M Molson Foundation

How?

The Butterflyway Ranger program offers online leadership training for community leaders to influence and bring people together as volunteers. Each Ranger is tasked with organising a small local team to plant at least a dozen pollinator patches

When?

2013: Homegrown National Park Project begins in Toronto.

2017: Canada's first official Butterflyway is established in Toronto's Beaches neighbourhood.

2018: Recruitment and training of 192 Rangers across the country, distributing 22,000 native wildflower and seed packs, and establishing 200 pollinator-friendly patches

2019: Launch of BIMBY Butterfly B.C.

2020: The project received the Canadian Museum of Nature's 2020 Nature Inspiration Award and the first Butterflyway was recognised by Google Maps

How much?

The coordination of the programme is funded by the David Suzuki Foundation. The implementation is based on volunteer work. Butterflyway Rangers are expected to raise funds through local, provincial or national grants geared to education and nature restoration; to ask parent councils for funds to invest annually into the garden or help host a fundraising event; and to seek in-kind support from local businesses or universities and colleges

What has been the impact?

– 54,000 butterfly-friendly wildflowers into the ground
– 1000+ pollinator patches in 400+ communities
– Official Butterflyways established in 15 cities
– More than 1000 Butterflyway Rangers from more than 100 communities trained in four years

What were the challenges?

– The project is season-based. Communities can connect to the process only at certain times of the year.
– City government permissions and approvals for changes in public space can slow down the process

What was the effect of COVID-19?

"COVID-19 has caused tragic suffering. But it also reveals what's possible when humanity slows down and discovers
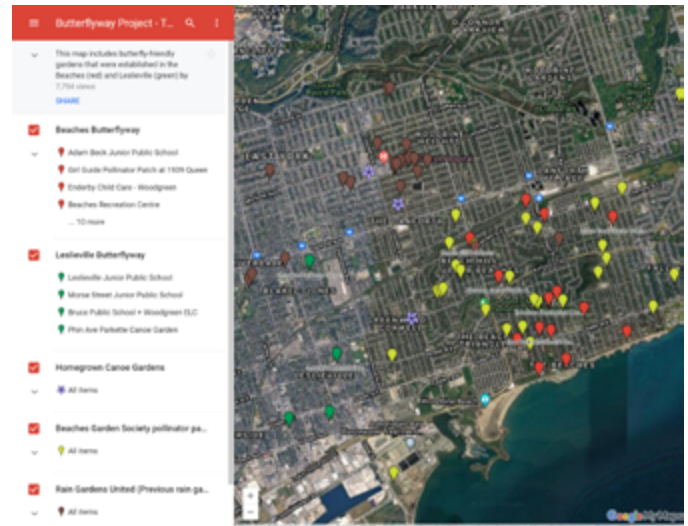
Map of different Butterflyway Project components in Toronto
Source: Google Maps
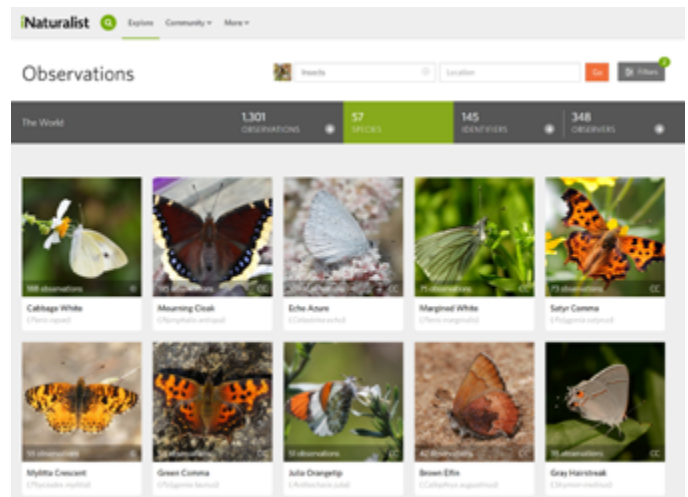
BIMBY (Butterflies In My Backyard), a citizen-scientist component to identify butterfly species in the Lower Mainland of British Columbia
Source: iNaturalist

what's important: loved ones, community, purpose — and healthy ecosystems." (davidsuzuki.org)

Despite the pandemic (which resulted in less funding available for wildflowers):

– More than 1000 residents volunteered to become Butterflyway Rangers in 2020.
– 251 took part in online training and planted hundreds of pollinator patches in yards, gardens, schools and parks in 134 communities.
– Six new Butterflyways were officially established.
– Representatives from 265 schools attended monthly Butterflyway School pilot project webinars.
– More than 18,000 people pledged to create backyard bee habitats as Bee-bnb Superhosts.
– People were more engaged with outdoor natural spaces for safe social interaction.

In connection to Addis Ababa

Bringing wildlife-in-the-city by creating outdoor natural spaces within enclosed private compounds can be one way of designing self-sufficient, healthy and resilient cities through adaptive use of spaces which have different functions. Envisioning productive landscapes in a small scale within a larger SGBI development can result into scalable projects that can have an impact in an urban scale. For instance, the private initiative Zoma Museum in Addis Ababa has similar concept development with the butterflyway project in implementing productive gardens within private compounds by creating new spaces of food and shelter for habitats, increased agricultural production, flowering plants and urban biodiversity conservation. Zoma Museum occupies two acres of land in a neighbourhood. It is a green oasis designed to be environmentally sustainable, incorporating various water cleaning systems, food farming areas, architectural and art pieces built with mud and local materials (Mattioli, 2019). Such strategies also will add an economic value by generating more income for the owners, generating employment as well as supporting initiatives such as school feeding programmes that help substitute budgets for food into other productive initiatives. Taking advantage of the organised local community for a common cause makes communities greener and healthier. It connects people and nature in a fun and educational way. The yards will contribute to children's environmental awareness and food literacy while bringing joy. Moreover, it will be a good example for a gender-responsive design approach as it will benefit women caregivers to have a place where they can leave their children within their work environment.

Zoma Museum and its edible garden in Addis Ababa
Photo credit: Benedetta Castrioto

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5.1.5 Cleaner Air Network
Copenhagen, Denmark

Insufficient urban green space	Loss of urban biodiversity	Landslide risk	Air pollution	Water pollution	Water scarcity	Urban flooding	Food insecurity

Air pollution is particularly harmful to young children
Source: Gehl

Air pollution is one of the most critical — and invisible — threats to human health in cities. According to the World Health Organization (WHO), nine out of ten people breathe air that exceeds acceptable levels of pollutants (World Health Organization. 2021). Approximately seven million premature deaths occur every year due to bad air quality: stroke, heart disease, chronic obstructive pulmonary disease, lung cancer and acute respiratory infections.

To address this issue, Gehl, in collaboration with the Bernard van Leer Foundation, Copenhagen Solutions Lab, Google and Utrecht University, proposed the Cleaner Air Network project, part of the Thriving Zones initiative that focuses on improving urban conditions for babies, toddlers and their caregivers. Air pollution is particularly harmful to young children under five as they breathe four times faster than adults and 90% of brain development occurs in these formative years.

Gehl mapped childcare institutions and playgrounds in Vesterbro and then documented lived experience close to these locations. Day care workers and caregivers also were interviewed about the public spaces they most frequently use. The resulting information was then cross referenced with recently developed air quality data from Google's Air View project, creating a unique snapshot of children and their caregivers' exposure to air pollution in their daily routines.

Results of this research showed that small children were mostly active on streets with very poor air quality. In contrast, close-by "pockets" with relatively better air quality were less used by small children. Using these findings, Gehl proposed a simple premise: reduce exposure in the most frequented places with poor air quality and invite to the less frequented places with better air quality.

Strategic urban design solutions were then suggested for two streets in Copenhagen's Vesterbro neighbourhood.

Small children are extremely vulnerable to poor air quality

Vesterbro neighbourhood: mapping of childcare institutions and public play facilities
Source: Gehl

Cleaner Air Network proposal: REDUCE + INVITE
Source: Gehl

The first one was to reduce exposure in Istedgade, a street that has higher than average air pollution levels where many small children spend time with their caregivers. Gehl proposed to remove on-street parking in the areas with high levels of hyperlocal air pollution, to introduce a green buffer as a pollution barrier and to establish traffic calming measures. Additional attention was given to reduce lingering at intersection corners where peak

concentrations of air pollution were found. Design solutions encouraged more "mid-street" activity through pavement design, public seating, and children-related facilities.

The second strategic solution was to invite pedestrians to Absalonsgade, a street with relatively good air quality that has the potential to attract more children and their caregivers. In this case, Gehl's proposal includes widening pavements, adding trees and public seating including separated bike lanes, and narrowing the road to lower vehicle speeds. Physical signage indicating the street as a cleaner air route was also important to make visible the benefits of choosing Absalonsgade as a healthier place to walk or play.

Air quality can vary by up to 800% between and within streets. Therefore, having a better understanding of air quality at the hyperlocal level can really change how urban designers make tactical decisions. Air quality data in cities is usually available as an extrapolation of information from a few static stations. This is a broad representation that can hardly be used for design purposes. Google's use of vehicles (Google Street View cars) equipped with sensors to measure nitric oxide, nitrogen dioxide, particulate matter, black carbon and ultrafine particulate matter provides new insights about air pollution at the human scale. Like many other technological advances by this giant tech company, Air View might be a game changer regarding the way local governments plan at the neighbourhood scale. The hyperlocal air quality interactive map of Copenhagen was the first to be launched worldwide in May 2021.

In support of early childhood

The effects of COVID-19 are the most recent proof of the importance of air quality in urban public space. The Cleaner Air Network is a concrete example of how hyperlocal data measured at street level, in this case air pollution, can interact with information on how young children use (or don't use) urban spaces. In times where schools are closed in many parts of the world, healthy and safe outdoor spaces in cities have become crucial for the interaction between babies, toddlers and their caregivers. For the first time, the air quality in these spaces now will be measurable at the hyperlocal scale across the whole city. Local governments will play an important role in the use of this new technology.

Key info

Why?

Air pollution is a serious "invisible" threat to all inhabitants in cities. Denmark's National Centre for Environment and Energy has estimated that around 550 Copenhageners die prematurely every year from pollution, and a larger number suffer from diseases developed from exposure to bad air quality from a young age

The Cleaner Air Network proposes joint reduce + invite urban design interventions to benefit the health of children and their caregivers in their normal daily routines.

Reduce exposure to air pollution
Invite to cleaner air routes and spaces

Source: Gehl

REDUCE strategy in Istedgade. Actual and proposed images
Source: Gehl

What?

"The Cleaner Air Network" in Copenhagen is a proposal for strategic urban design interventions to reduce the exposure to poor air quality, particularly in places used mainly by young children and their caregivers

Where?

Surveys on the use of streets and mapping of childcare institutions and public play facilities took place in Vesterbro and the Inner City neighbourhoods of Copenhagen. Two streets in Vesterbro were selected for a first urban design implementation pilot: Istedgade was proposed as a "reduce" street where strategies to improve air quality could take place. Absalongsgade, with better air quality, was proposed as the "invite" street which pedestrians could be encouraged to use

Who?

In response to a commission by the Bernard van Leer Foundation, Gehl was the main designer of the Cleaner Air Network, in collaboration with Copenhagen Solutions Lab, the Google Air View initiative and researchers from Utrecht University

How?

By crossing Google's Air View data on air pollution with Gehl's Lived Experience data focusing on young children and their caregivers, new maps allowed for envisioning tactical urban design interventions to improve the conditions of streets with poor air quality and to invite people to use alternative streets that already have better air quality

When?

– 2014: The Google Air View research project is launched in California.
– 2018: Partnership between Google Air View, the City of Copenhagen, Utrecht University, and Aarhus University (DCE - National Centre for Environment and Energy) to gather data on air quality at street level
– 2018-2020: Data collection for the Copenhagen Air View project
– 2019: Cleaner Air Network proposal by Gehl
– 2019: Google develops hyperlocal, street-level air quality insights on the Environmental Insights Explorer in Copenhagen and London
– 2021: Results and interactive map of Copenhagen Air View published

How much?

Costs for the development of the Air View Project are not disclosed.

Costs of data on air quality depend on agreements between project partners and local governments.

Urban design interventions are relatively low cost: planning and design, parking removal, planting, outdoor furniture, signage, etc.
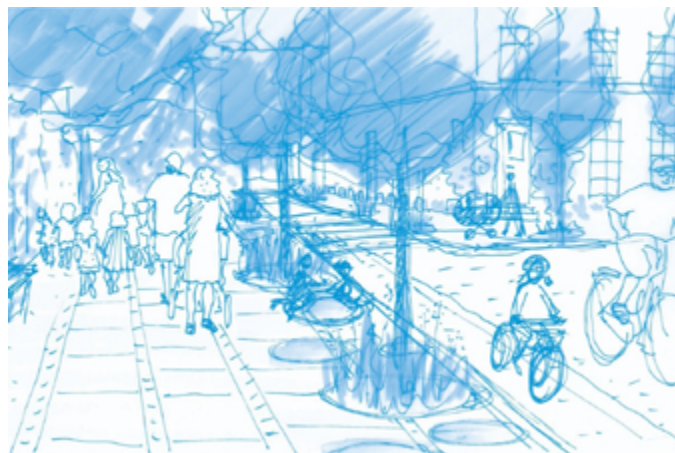
INVITE strategy in Absalonsgade. Conceptual render
Source: Gehl
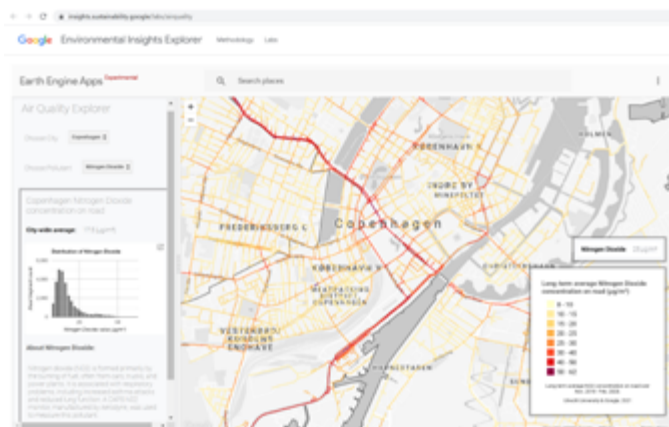
Hyperlocal Air Quality Map of Copenhagen
Source: Google EIE

Google Air View Project Car
Source: Utrecht University - Google

What has been the impact?

– Decision-making to city planners is facilitated by clear data on the crossing between hyperlocal air quality data and pedestrian circulation paths.
– Data has given nature a voice and designers an opportunity to listen and respond (Google, 2021).
– Studies support the hypothesis that a 30% decrease in levels of ultrafine particles at the pavement compared to

Meskel Square to City Hall project, around City Hall, Piazza (left and right)
Photo Credit: Bisrat Kifle, 19 May 2021

the middle of the road could be achieved in Istedgade.

– The impact of the proposed design solutions on reducing exposure to ultrafine particles (UFP) are yet to be tested and evaluated (Gehl et al., 2019).

– Data presented in the Copenhagen Air View map is key to put pressure on national and municipal decision-makers to take action on vehicular pollution

What were the challenges?
– Neighbourhood resistance to less parking
– Data privacy concerns

What was the effect of COVID-19?
COVID-19 has made a project like the Cleaner Air Network more relevant than ever. The pandemic intensified the use of outdoor public space for non-motorised transit and social interactions. The importance of safe and healthy streets for all citizens is very clear. Lessons learned from Project Air View and Thriving Zones are invaluable for new public infrastructure design around the world. A first outcome is that Project Air View's air quality insights will be integrated into the European Commission-funded European Expanse project, to explore how pollution impacts health and how hyperlocal air quality measurement can inform public policy.

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In connection to Addis Ababa

Addis Ababa's urbanisation tries to cope with the rapid population growth that results in a lack of proper urban planning and partial implementation. This leaves several urban "pockets" with an opportunity to be developed into SGBI. Like in the "Cleaner Air Network" project, these spaces often have better air quality as they are hidden within neighbourhoods or institutional compounds. Many of these spaces give an opportunity to easily include more clean, green spaces and children's playgrounds. Thus, encouraging "mid-street activities" that are inviting for both adults and children; implementing "traffic calming measures" and "making the invisible visible" by providing physical signage indicating streets with cleaner air routes contribute to having cleaner air. If measuring air quality at the hyperlocal level (with the new Google technology) would be applicable to Addis, it will highly benefit the health and well-being of the society, especially during the outbreak of COVID-19, where the importance of air quality in urban public space was more critical than ever. Therefore, the Meskel Square to City Hall (MS-CH) project in Addis Ababa is one of the urban refurbishment mega projects – being mainly a mobility and transport infrastructure project should incorporate green public spaces and make the streets pedestrian-friendly – that can inject these ideas into the existing physical design and implementation have a significant impact on climate change by reducing air pollution and building a healthier and "child" scaled city.

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5.1.6 Wadi El Ku Catchment Project
Darfur, Sudan

| Insufficient urban green space | Loss of urban biodiversity | Landslide risk | Air pollution | Water pollution | Water scarcity | Urban flooding | Food insecurity |

In a place where water scarcity creates social conflicts and environmental problems, this project sets out to manage water resources in an integrated way in the understanding that sharing resources in an equitable way among local communities must happen within natural boundaries. This implies engaging with resource users on the ground, and to monitor and collect data that represents the economic and social nature of the resource to manage it properly. Understanding how nature works allowed science to become the impartial partner to facilitate the process. The base for success was the combination of two things: structures such as weirs, canals and other forms of on-farm water management; and a decision-making system that includes communities along the watercourse, allowing coordination between users, preventing individualistic practices and allowing for a fair distribution of water.

The first step was to understand whether these structures could have negative social or environmental impacts. After making sure that communities were fully involved, ensuring women's participation in the different stages of the project was one of the main concerns. In order to reduce the gap between local communities and supporting institutions, the project is further supported by a three-tiered scheme: an Advisory Committee, a Technical Committee, and a Catchment Management Forum, where all stakeholders have a seat at the table and a role. At the end of the project only the Forum remains operative, ensuring the continuity of the initiative. As a result, there are now many community councils which regularly meet to evaluate better ways to use resources, and the rehabilitation and improved management of land, forest, and water resources was enabled, while helping to increase the income among the population.

The project shows how inclusive water resource management and community-driven planning with an important gender lens can improve livelihoods through enabling sustainable increases in agriculture and related value chain productivity. The model created for inclusive and effective water catchment management can be scaled up and replicated elsewhere in Darfur. Even though the project's second phase aims for a wider outreach including residents from farming, pastoralist and agro-pastoralist communities in the wadi (a valley or seasonal riverbed), the local stories of nomads and farmers, including women, that now are represented and speak at the decision table as never before are what makes this experience relevant.

Today the project is propelled mainly by community engagement activities, evidenced by the strong community uptake of interventions. In the initial phase, communities in the five villages contributed with in-kind

Fighting COVID-19 and promoting peace come together in Darfur.
Source: United Nations, 2019

Food security and disaster resilience through sustainable drylands management in north Darfur, Sudan

Source: UNEP 2016, ECO-DRR IN SUDAN, image: © Albert Gonzalez Farran, UNAMID

labour to implement field interventions to eg, undertake rehabilitation work on the water retention structure, re-seeding of pastureland, and nursery establishment. Safety was also an issue addressed, the involvement of local CBOs (Community Based Organisation) was key in mobilising communities for Ecosystem-based Disaster Risk Reduction implementation. Women proved to be natural resource managers who expressed high commitment and enthusiasm. In a first level of involvement, women served as local champions participating actively in community consultations and decision-making meetings. Later, village level women's groups took the lead establishing the tree nursery and community forests that are still managed by them. As a result, the project is expected to further strengthen women's roles in water and natural resource management within the Wadi El Ku catchment.

In support of early childhood

Lack of access to land and water is a source of great hardship, especially for women who have to take care of children, resulting in them being marginalised from mainstream economic activities. Droughts have increased these impacts. Today, the women and children in a household play an important role in farming and livestock rearing activities. On farms, in particular, women are more active than men. The main contribution to children is the access provided to their caregivers to resources to support them. Furthermore, the project has impacted on women's lives by helping to provide incomes to support more girls to go to school.

Key info

Why?

Vulnerable communities are disproportionately affected by frequent droughts and high rainfall variability, especially when they are heavily dependent on natural resources

What?

The project provides a feasible alternative to the overall objective of establishing climate resilient livelihoods and reducing natural resource conflicts and displacement due to the loss of livelihoods

Where?

The initiative was born and currently serves as a demonstrative model to be replicated in the wider Wadi El Ku, as well as in Darfur and Sudan in the future

Who?

The Wadi El Ku Catchment Management project is supported by local communities and locally-based civil society organisations led by Practical Action, and is funded and promoted by the European Union and implemented by UNEP in partnership with the federal and state government

How?

The project aims for improved integrated water resources management (IWRM) by developing improved agricultural and natural resource management approaches supported by robust cooperation mechanisms. As a result, evidence-based policy and decision-making and scale up of successful environmental practices are offered

When?

Since the 1990s, Sudan has been receiving environmental support from the United Nations Environment Programme (UNEP). After a major conflict in the country ended, an environmental assessment of Sudan in 2007 was undertaken and as a response an integrated environment programme for Sudan was developed

How much?

EUR 10,000,000 to support the development of inclusive natural resource management systems and structures within the Wadi El Ku, to support community-level

Food security and disaster resilience through sustainable drylands management in north Darfur, Sudan
Source: UNEP 2016, ECO-DRR IN SUDAN, Cover image: © Albert Gonzalez Farran, UNAMID

agricultural and livelihoods adaptation, to improve local natural resource management practices, and to build institutional and organisational capacities

€16m EU-funded project, which is aiming to help 180,000 people

What has been the impact?

Health and environment: The project has helped with difficult challenges such as water and food scarcity, which in turn have taken an important toll in terms of food insecurity and related health issues. Ecosystems have also been restored replacing the ones lost to the war

Urban Farmers in Addis Ababa
Photo Credit: Addis Ababa Mayor's Office

Urban Farm in Addis Ababa
Photo credit: The Reporter, accessed on 08 June 2021

Social and cultural: The project showed how initiatives led by women proved to be more effective, especially when patience is required. It also means more time for them, another scarce resource, which has helped women and especially girls to devote time to other important activities, such as education

Political: It is believed that these projects have contributed to the repair of a diverse and culturally rich, but also profoundly affected by war, Darfur society: at the end, an opportunity to connect and rebuild old partnerships

What were the challenges?

In a region where water is a scarce resource and on which depend many peoples' livelihood, food supply, and others, the first hurdle was bringing together communities of farmers and nomadic camel herders, traditionally deadly enemies during the war, to participate in the project. However, the project has brought together many to be part of and benefit from the access to water

What was the effect of COVID-19?

This project has shown that strong local leadership can bridge the aid gap – advocating for needs, addressing conflict, and managing projects and resources, especially for the most vulnerable. Sudan's established capacity of more than 150 community management committees (CMCs), peace committees, natural resource groups, and other similar organisations across 12 states provide trusted voices with years of coordination experience. These groups and leaders have been mobilising to protect their communities against COVID-19. These efforts have been amplified by volunteer women who helped with the engagement with all members of the community. As the primary caretakers of their families, women are more sensitive to information about preventing the spread of the virus

In connection to Addis Ababa

Addis Ababa is under transformation through mega urban development envisioned to enhance and bring positive social, economic and environmental development.

Through these development processes vulnerable groups who live in informal settlements will inevitably be affected. A significant number of low-income groups of the society in Addis Ababa live along the river banks where their livelihoods depend on urban agriculture using water from the river despite its pollution. The livelihoods of this group of society will be threatened when development projects like the Sheger Riverfront development project are introduced. However, learning from projects like Wadi El Ku Catchment Project could save major impacts that result in eviction and disruption of social ties that existed for many years. Moreover, since urban agriculture in Addis Ababa is predominantly undertaken by women, projects as in the Wadi El Ku Catchment that encourage women in community engagement activities and management in the sectors that they dominate will result in community driven planning with an important gender lens. It will improve livelihoods and related value chain productivity that supports women's lives, which will in turn provide incomes and support more girls to go to school. Children also will benefit by the access to resources that are provided to support their caregivers. Most importantly, creating a decision-making system that allows the involvement of communities and also monitors women's participation in the different stages of the project will inform policy that can support inclusive and sustainable projects. COVID-19 has indeed revealed that informal social support that is embedded within a group of community tied with a common cause was comparatively much higher than the existing formal social support system.

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5.2 Support case studies

5.2.1 Cuitlahuac Park
Mexico City, Mexico

Insufficient urban green space	Loss of urban biodiversity	Landslide risk	Air pollution	Water pollution	Water scarcity	Urban flooding	Food insecurity

Source: www.parquecuitlahuac.mx

Where once was a garbage dump today lies a large recreational park to rescue public spaces. The park features the following environmental strategies: soil biotechnological regeneration, enabling an urban forest with native flora, and expanding the existing urban farming area of the city. However, one of the main characteristics of the park is that it is built with debris, such as plastic bottles and gravel. It also has a comprehensive water management system for sewage collection and treatment, which also is built based on PET plastic and gravel to prevent water seepage. For water treatment, a channel includes vegetation to transform residual water into irrigation water. The park is being built in phases and it has had an important number of visitors so far. The park is envisioned to hold activities such as urban agriculture or urban farms for all ages.

Source: https://www.chilango.com

Reppie/Koshe dumpsite emergency rehabilitation project
Source: UN-Habitat 14 March 2019, Completion of Phase I of "Reppie/Koshe dumpsite emergency rehabilitation project using the Fukuoka Method" (Powerpoint presentation). Photo credit to UN-Habitat.

In connection to Addis Ababa

Transformational SGBI projects such as the Cuitlahuac Park show how to turn garbage dump sites into large recreational parks and how to use specific vegetation to transform residual water into irrigation water in a cost-effective ecological way. This project could give additional insights to projects like the Reppie/Koshe dumpsite emergency rehabilitation project in Addis Ababa for its future planned interventions in the remaining dump site area. The Reppie/Koshe dumpsite emergency rehabilitation project was implemented in 2019 by UN Habitat with financial support from the government of Japan and Addis Ababa city government. The objective of this project was to contribute to the establishment of resilient, safe, and sustainable environmental administration systems for Addis Ababa city through the implementation of the Fukuoka Method of Solid Waste Management: specifically to (1) rehabilitate the collapsed area of the Koshe dump site to prevent further erosion and landslide over the surrounding settlements, (2) stabilise the existing main area of the Koshe dump site to prevent further collapse and methane gas explosion (3) provide technical support to Addis Ababa city government. The implementation of the Phase-I has helped the city to rehabilitate and stabilise the Koshe dump site on the pilot area as well as to utilise efficiently the available dumping area, which was a critical challenge to the city administration.

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5.2.2 Bishan Ang Mo Kio Park
Singapore, Singapore

Insufficient urban green space	Loss of urban biodiversity	Landslide risk	Air pollution	Water pollution	Water scarcity	Urban flooding	Food insecurity

In 2006, Singapore's Public Utilities Board initiated the Active, Beautiful and Clean Waters Programme, a long-term initiative to transform old bodies for drainage and water supply, into new spaces for community bonding and recreation. This led to the demolition of the Bishan Ang Mo Kio concrete channel, recycling the material for a landmark look-out point, and to the creation of a naturalised waterway. The design was based on a floodplain concept and has increased the river's conveyance capacity by approximately 40% while costing US$ 15% less than the redesigned concrete canal. Complementing computer simulations, traditional soil bioengineering techniques were proposed to stabilise the new river banks. For water treatment, a series of plant beds with soil media was created to clean water in conjunction with UV lighting. The water is cleaned by plants selected to extract pollutants.

A concrete sewage channel turns into a clean naturalised flowing river.
Source: Ramboll/Dreiseitl

In connection to Addis Ababa

The Sheger Riverside development in Addis Ababa is proposed along the two major rivers that start from Entoto, the northern highest point of the city and extend through different parts of the city ending at Akaki River, the southern part of the city. The river's corridors stretch separately (23.8 km and 27.5 km) crossing the densely built and populated part of the inner-city. The river's project development proposal's width is approximately 20 m with an average of 50 m green space along each side of the river. The extent of the green land in some areas will extend up to the nearest existing access road to integrate the GBI development with the existing urban build. Cases like the Bishan Ang Mo Kio Park, which try to create a naturalised waterway by cleaning water bodies in conjunction with UV lighting by water treatment systems and plants selected to extract pollutants, are crucial as references for projects like the Sheger Riverside project as they cover long routes that need different water cleaning interventions, depending on the level of pollution and proximity to the human habitat. Small-scale interventions like the Zoma Museum private project in Addis Ababa that implemented a series of small ponds to collect rainwater for reuse and treat the polluted streams by sunlight, plants, and sediment filters before joining the Akaki River; a biogas system to help power the museum: manure, taken from animals on the museum compound, and using the leftovers as fertiliser can also be good examples that can be integrated with larger waterway cleaning systems in projects such as Sheger.

Spatial characteristics of Kebena River near Bole Bridge, informal settlements and polluted environment
Source: Tigist Kassahun, March 2010

Sewage discharge into Kebena River
Source: UN-Habitat, Sheger Riverside corridor development design guideline, 16 July 2021

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5.2.3 Donghaochong Greenway
Guangzhou, China

Insufficient urban green space	Loss of urban biodiversity	Landslide risk	Air pollution	Water pollution	Water scarcity	Urban flooding	Food insecurity

The Donghaochong Greenway replaced a polluted former canal as part of a wider project to build dozens of kilometres of high-quality water corridors throughout the city. It also articulated water infrastructure with Guangzhou's BRT, a bike sharing system, and new public spaces in complement to the city's Transit-Oriented Development strategy. For the project, approximately 300,000 jobs were created. It includes 4.2 km of a water canal, 5.4 km of walkways, 1.3 km of bike paths, 3.2 km of roads and ten bridges. Built in record time between 2009 and 2010 in preparation for the Asian Games hosted by China, it has raised land values by approximately 30% in surrounding areas. It is important to note that the project was socially complex, as nearly a thousand families and about 48,000 m² of commercial buildings had to be relocated.

In connection to Addis Ababa

The Sheger Riverside corridor development project in Addis Ababa covering 56 km of the river route and its adjacent urban area can be classified as a SGBI development project. The main objective of this project is to make the river watershed clean; to increase the green space in the city by incorporating public space along the rivers suitable for walking, jogging, biking and providing green and recreational space and providing better livelihood by creating job opportunities and economic benefits. Therefore, strategic green and blue interventions in the Donghaochong Greenway that created high quality water corridors by articulating the water infrastructure, that created jobs and a bike-sharing system that complemented the transit-oriented development, resulting in raising the surrounding land value, could be contextually adapted in the Sheger Riverside project to raise urban economic development through scalable SGBI projects.

Friendship parks - Sheger Riverside corridor development project
Photo Credit: Tigist Kassahun, October 2021

Links and further research

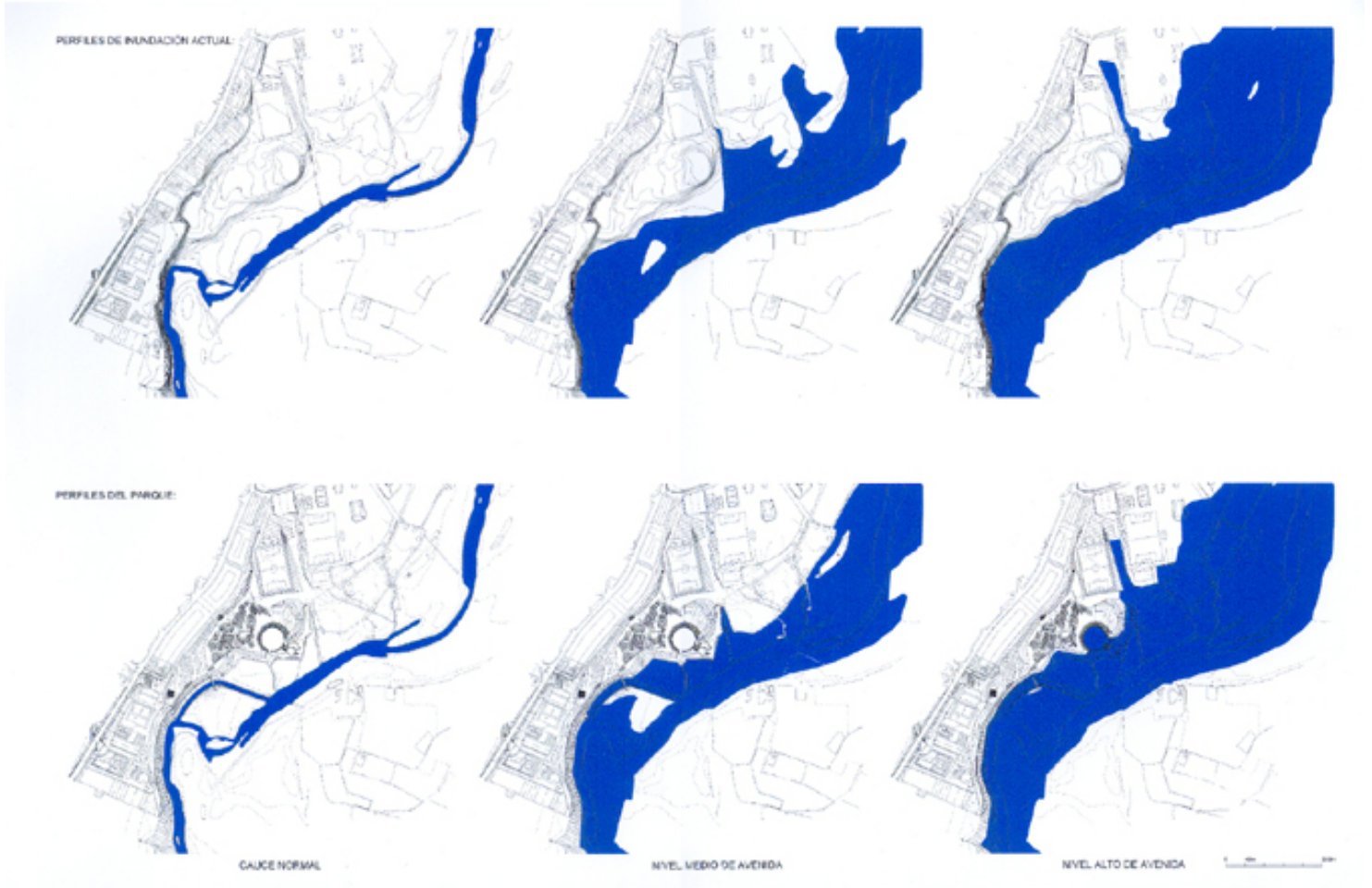Development Asia (2019). Creating Green Spaces in a Congested City. https://development.asia

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5.2.4 Gállego Fluvial Park
Zuera, Spain

Insufficient urban green space	Loss of urban biodiversity	Landslide risk	Air pollution	Water pollution	Water scarcity	Urban flooding	Food insecurity

Flooding scenarios
Source: M. Oliveres i Guixer, arquitecta, https://www.publicspace.org

The project recovered the riverbed and its riverbanks with three different topographic platforms from the river level up to the city level. These platforms serve several purposes: as flooding control to prevent the river overflow from affecting the city, as well as providing space for a mature forest in relatively good condition and allowing for spaces devoted to various activities, such as leisure and sports, and infrastructure especially devoted for school children and cultural activities by providing an amphitheatre. The platforms are designed in such a way that when the Gállego overflows, the excess water can be conducted safely by expanding the available river space. On the environmental side, improvement of water quality and restoration of the river's natural corridor was part of a larger plan to incorporate the river into the urban fabric.

Source: M. Oliveres i Guixer, arquitecta, https://www.publicspace.org

In connection to Addis Ababa

The Gállego Fluvial Park project, which focuses on the restoration of the river's natural corridor to incorporate the river into the urban fabric across multiple scales, complements the pilot project's vision of the park that was developed around Estefanos Church adjacent to United Nations Economic commission of Africa (UNECA) compound in Addis Ababa by the Addis Ababa City Greenery, Beautification and Cemetery Administration Agency. The park has been implemented by allocating spaces for various activities, such as leisure and sports, a playground for children and arenas for cultural activities that made the project socially active and inclusive of all ages and income groups. However, work should be done on the improvement of water quality and restoration of the river's natural corridor and making it part of the park instead of only bordering it. As a result, it will bring life to the previously "overlooked" space by integrating it into the active urban area and people's lives.

New Park around Stefanos Church adjacent to UN - Economic Commision for Africa in Addis Ababa
Source: Desta Keremela multimedia, (2) Desta Keremela Multimedia | Facebook , accessed 8 June 2021

River bordering the New Park around Stefanos Church adjacent to UN-Economic Commission for Africa in Addis Ababa
Photo Credit: UN-Habitat, 2019

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6. How can it be done?

When cities grow and develop in a spontaneous way, urban policies and interventions are required to address such dynamics in order to preserve valuable social assets that might exist. Otherwise, there is a risk of losing or dissolving social networks and social support systems of communities and their members. These losses can lead later to further environmental degradation, overcrowding, and isolation, affecting the social fabric of the city (see Riyadh and Norris, 1996). Such systems must be preserved as much as possible, either by intervening in existing settlements or by creating relocation projects as last resources.

On one hand, land and settlement management strategies can greatly help prevent undesired situations, such as risk creation or indiscriminate land consumption; and on the other hand, opportunities for interventions can be created by taking advantage of installed social systems to facilitate the process of implementing a project. Furthermore, by strengthening social ties in urban structures, the ability to respond efficiently to possible acute impacts and chronic tensions that may affect the city is enhanced (see Pelling, 2003). These advantages could be extended in participatory programmes aiming at managing and providing funds to finance different urban projects.

The process to include local communities in a joint work plan is of great importance. If proper coordination of numerous local parties is achieved, especially the ones who will benefit and use the infrastructure, experience shows that this can lead to the diversification of efforts to implement and manage these assets, hence reducing the dependency on public resources. Properly implemented processes could result in better and functional social capital localised in the area, appropriation and inclusion, while also encouraging entrepreneurship at a local level (see Forester, 1999). This also raises environmental awareness among users about the benefits and responsibilities we have with nature to avoid its degradation (see Biggs et al., 2015).

Key ideas: Preserving social networks, citizen participation, land and settlements management, SGBI financing, response to acute impacts and chronic tensions, environmental awareness.

Main case studies

Nairobi: Dandora Transformation League
Paris: OASIS Schoolyards Projects
Semarang: Rechanneling the City
San Juan: Caño Martín Peña
Quito: Participatory Urban Agriculture (AGRUPAR)
Tirana: Born Thriving Environmental Indicators

Support cases

Bura: BuraNEST New Town
Bangalore: Urban Lakes Placemaking
Rosario: Green Belt
Medellín: Reinhabiting the Mountain

6.1 Main case studies

6.1.1 Dandora Transformation League
Nairobi, Kenya

Insufficient urban green space	Loss of urban biodiversity	Landslide risk	Air pollution	Water pollution	Water scarcity	Urban flooding	Food insecurity

The Dandora Community Development Project was the World Bank's first large-scale urban intervention in the early 1970s by providing 6,000 serviced plots for workers of Nairobi's industries. Thirty years later, streets, parking, gutters and squares have disappeared under filth. Crime and unemployment have skyrocketed. Dandora has also come to be best known internationally as one of the world's largest informal waste dump sites.

In 2013, and against all odds, local youths called Mustard Seeds, later Dandora Transformation League (DTL), initiated a clean-up operation, decluttering drainage and unearthing courtyards, making public space attractive and safe again, while creating community and jobs on the way.

DTL's main strategy was to launch the Changing Faces Competition that supports communities to design and build their own public spaces with limited resources but lots of creativity. The success in Dandora has attracted local and international attention and through the Public Space Network (PSN) platform, 200 spaces have already been transformed in all of Nairobi.

What started as spontaneous engagement with youth groups and ex-convicts has now become a citywide movement and an international case study for action-based interventions. Between 2014 and 2019, more than 4,000 people from 200 youth organisations have collaborated with DTL, changing not only spaces but mindsets all over the city. Young people are engaged with the improvement of their neighbourhoods and find ways in which their activities create income. They are empowered and no longer expect the government to fix things. The perception of Dandora as a dangerous place has decreased approximately 70%.

According to PSN, the work of DTL has led to the emergence of child-friendly environments from three perspectives: design (hardware), use of spaces (software), and organisation of functions (orgware). Hardware refers to the design of the actual spaces, software is related to the participatory design processes, and orgware refers to the different uses and functions that the new spaces provide and how these are organised after construction.

An interesting outcome in 2015 was when UN-Habitat approached DTL for a Minecraft Workshop, through the Block by Block organisation. Participants (mostly children) developed plans on how a model court and a model street could be by playing Minecraft, a game that could be compared to virtual Lego. By using a game, children were included and given a space to make their voices heard in a process which is usually dominated by adult decision-makers.

Source: https://trueafrica.co/article/young-people-clearing-nairobi/

Source: courtesy of UN-Habitat

In support of early childhood

The Dandora Transformation League has had an immense impact not only on the spaces that children use (parks, squares, streets, courtyards), but on their mindsets. Young people are breaking the negative stigma of their neighbourhood and see themselves as agents of change. Including children and teenagers in planning processes through gaming and play (the Minecraft Workshop and the Changing Faces Competition) has been successful, as kids come with less preconceived ideas and can often be more creative and innovative than adults. DTL has taught us not to underestimate the huge potential of planning *with* children and not only *for* them.

Komb Green Solutions, Korogocho

Komb Green Solutions, Korogocho

Akili Ni Ngatu, Dandora

Akili Ni Ngatu, Dandora

Believers, Dandora

Believers, Dandora

Pirates, Mathare

Pirates, Mathare

Changing Faces Competition entries. Before and After.
Source: Public Space Network

Key info

Why?

To reduce crime and create work opportunities for one of the poorest and most dangerous neighbourhoods in Nairobi by creating clean, safe, healthy, inclusive, vibrant and connected public spaces

What?

A bottom-up initiative, Dandora Transformation League (DTL) engages young people (including many ex-convicts) in the clean-up and restoration of public spaces, supported by a minimum income from residents and by other income-generating activities like car washing, hire of skates for children, and urban agriculture. Some spaces are used as a playground during the day and as commercial parking at night

Where?

The initiative began in the neighbourhood of Dandora and now impacts several impoverished areas of Nairobi

Who?

Dandora Transformation League (registered non-profit community based organisation), Public Space Network Association (PSN) and supporting local and international members

How?

DTL came up with the Changing Faces Competition with the goal of mobilising teams of youth to compete for the best transformation of public open spaces, from garbage dumps to clean parks, gardens and playgrounds. PSN connects the community groups with the key actors and ensures a sustainable citywide public space management through a Public-Private-People Partnership model

When?

2013: First public space revitalisation at Mustard Seeds Court

2014: First edition of Changing Faces Competition in Dandora

2015: Minecraft workshop. Support of Block by Block 2017: Partnership with Public Space Network and scale up to Nairobi

2017: Dubai International Award for Best Practices 2018: Le Monde Smart Cities Citizen Participation Award

How much?

DTL, PSN and the Changing Faces Competition depend on financial support of the local community and donations

What has been the impact?

– Scale-up: a courtyard clean-up project became a city-wide initiative for public space development
– More than 200 public spaces rehabilitated from neglected spaces to gardens, playgrounds and car parks
– More than 200,000 new users

Mustard Seeds Court
Source: DTL

– Participation of more than 4,000 people from 200 youth groups between 2014 and 2019
– Reduction of crime (about 70%) and improved perceptions of safety and health

What were the challenges?

DTL is a story about all possible challenges: lack of economic resources, social stigmas, crime (and its perception). Dandora is still best known for being one of the world's biggest informal waste dumpsites

What was the effect of COVID-19?

One of the most important aspects of DTL's work was neighbourhood organisation. This proved essential during the early stages of the pandemic, when brigades were set up to help vulnerable members of the community. In partnership with Safe Hands Kenya, DTL joined national efforts to contain the spread of COVID-19 by distributing handwashing stations and fumigating public spaces in Dandora.

The fifth edition of the Changing Faces Competition took place in October 2020, strengthening the importance of safe and healthy public spaces. Data from John Michuki Park in the periphery of Nairobi, for example, showed that people visited the public space three times as much during the pandemic.

GROUP 5
Resting places, paving

Entrance Model Street
What is needed?

Block by Block Workshop, Dandora, Nairobi
Source: Block by Block team

DTL, in partnership with Safe Hands Kenya, fumigating public spaces in Dandora during the pandemic
Source: DTL Facebook page

In connection to Addis Ababa

Vacant and leftover spaces next to large infrastructure and around unplanned settlements/slum areas are found in most parts of Addis Ababa. Despite their inadequate or unclean spatial qualities, they are used as children's playgrounds, football fields, and small gathering areas for social activities that can pose serious health issues, especially during a pandemic like COVID-19. Initiatives such as those led by the Dandora Transformation League in Nairobi show how to strategically turn such places into clean and environmentally friendly urban spaces. Moreover, supporting vulnerable communities, unemployed youth groups and ex-convicts through projects that let them design and build their own public spaces, having income-generating activities with limited resources but lots of creativity will result in having safe and inclusive public spaces. A participatory action-based intervention that involves children and teenagers in planning processes through gaming and play will make their voices heard in a process which is usually dominated by adult decision-makers, especially if the government is always expected to fix things. The positive impact on the spaces and in their communities' mindsets will break any negative stigma by making them seen as agents of change. Integrating children's playgrounds in public parks makes a place inclusive of various social strata and gender and age groups. Even if some leftover spaces near large infrastructure may not be physically accessed, greening the area will serve as an urban green patch that links ecology with the larger green system of the city.

Semi-private neighbourhood parks developed by the community integrating children's playground
Photo Credit: Tigist Kassahun, 10 May 2021

Existing urban vacants next to large infrastructures with a potential to be developed into green landscapes in Addis Ababa
Source: Addis Ababa City Administration, ADDIS HALL - Hall of Architecture and Urbanism, March 2021

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6.1.2 OASIS Schoolyards Projects
Paris, France

Insufficient urban green space	Loss of urban biodiversity	Landslide risk	Air pollution	Water pollution	Water scarcity	Urban flooding	Food insecurity

Source: https://www.paris.fr/pages/les-cours-oasis-7389/

When resources are scarce, building resilience with green infrastructure means adapting and utilising existing assets to solve different challenges in an efficient way. Paris is the densest capital in Europe, only offering 14.5 m² of green space per inhabitant, and as a result presents a dominance of asphalted and impervious surfaces in public spaces.

This allows the city to barely provide green spaces to its inhabitants above the minimum recommended by the WHO, and increases both the urban heat island effect and the risk of storm water flooding. Since space is a highly demanded resource in Paris, the city aims at existing assets to tackle its resilience challenges of heat waves, flooding, declining social cohesion, and limited green space.

The majority of Parisians live no more than 200 metres away from a school playground. This has become an opportunity for the city to not only tackle climate change adaptation challenges, but also to tackle issues of social and spatial inequality. The OASIS project (Openness, Adaptation, Sensitisation, Innovation, and Social ties) seeks to increase the number of trees, green walls and

roofs to provide shade and contribute to locally temper heat waves. Vegetable gardens contribute to the children's environmental awareness and food literacy. The ambitious plan aims at transforming all of Paris's 800 schools into green spaces by 2040, hence providing suited pervious areas to retain excess water and help the local drainage system, plus offering cooling spots for Parisians during hot summers.

Renovations in school playgrounds involve the transformations of these local urban areas to adapt to climate change which are to be co-designed with teachers, children and parents. While initially the project seeks to provide cooling benefits for the main users of schools — students and teachers during school hours — it also has extended access to other vulnerable groups, particularly the elderly, during heatwaves. A next envisioned step is to offer the upgraded school playgrounds as open spaces to the wider public outside of school hours, and also to use the schoolyards to raise awareness on the impacts of climate change in the urban environment.

It is important to take into account some key learnings that emerged from pilots that took place in 2018. Standardising the frameworks and specifications used for transforming a school playground can substantially reduce planning and intervention time and costs. Also, it has been recognised that city planners and technicians need to develop a robust methodology for co-designing and co-building the OASIS school playgrounds with the wider education community. Furthermore, since school playgrounds are envisioned as sites for community interaction and conviviality, an important challenge that needs to be addressed is how to open the school playgrounds to the general public outside of school hours, while addressing all concerns about safety and upkeep. During the pandemic heightened security measures make it difficult to access schools even for parents.

In support of early childhood

By making schools available not only as centres devoted for education purposes, but also as places where caregivers can feel safe and comfortable - where their surroundings are well illuminated, with buffers to reduce the effects of air pollution, and with well-placed amenities such as benches and nearby, easy-to-board, convenient buses – schools can become assets to ease toddlers and children's development while also supporting caregivers, thus reducing economic costs for cities to provide diverse services and benefits.

Key info

Why?

To educate residents to risk culture on climate change, make refuges of freshness available to the most vulnerable populations, and create numerous meeting spaces to spur conviviality and solidarity

What?

Meet the local requirements of socio-spatial inclusion, public environmental health and climate change mitigation

Where?

800 schoolyards across Paris

Who?

Mairie de Paris (Paris City Hall), Resilience Office of the city

How?

The OASIS Schoolyards programme is part of Paris' Resilience Strategy. It attempts to meet the local requirements of socio-spatial inclusion, public environmental health and climate change mitigation

When?

2017: Presentation of the resilience strategy.

2018: The city launched this ambitious work to pilot three school playgrounds

Oasis Schoolyard at the Ecole Maternelle Charles Hermite
Source: www.paris.fr/pages/les-cours-oasis-7389/

2019: Paris will focus on renovating an additional 33 schoolyards.

2050: The city aims at scaling to more than 760 schools across the city

How much?

The renovation of three pilot school playgrounds cost approximately EUR 1 million in total from the city's existing budget for school renovations

What has been the impact?

Environmental: Eliminating soil pollution, replacing asphalt with porous material, increasing green spaces, modernising water management for flood control, installing cooling fountains, water sprayers, and other facilities, creating natural and artificial shade structures

Social: Reinforcing social cohesion by co-designing the school playgrounds together with local communities (including the pupils); benefits such as cooling are extended to vulnerable citizens, particularly the elderly, during heatwaves

Economic: Fewer public resources to help tackle resilience challenges

Political: Paris is now thinking of replicating the resilience approach used in the OASIS project to other infrastructure and facilities. 100 Resilient Cities (now Global Resilient

Oasis Schoolyard at the Ecole Maternelle Charles Hermite
Source: Henri Garat. www.thenatureofcities.com

Cities Network) is capturing and sharing the learnings of this work across the network, thereby elevating awareness of Paris' leadership in urban resilience

What were the challenges?

The project brought together 12 different city departments (including schools, health, roads, green spaces and water departments) to design and deliver the project in an integrated manner, using a common process, budget and schedule. A centralised office was key: the resilience office of the city. The city's eventual aim is to open the spaces to the wider public outside of school hours and to use the school playgrounds to raise awareness on the impacts of climate change in the urban environment. However, there are concerns about safety and upkeep that need to be tackled first

What was the effect of COVID-19?

In a time that calls for physical distancing measures that will be needed moving forward, opportunities for ample outside time, natural play and exploration should not be allowed to pass. As an often underutilised resource, school grounds and the natural infrastructure that exists in every city should be reimagined. Opportunities for moving lessons outside could be created to support the community's efforts to face this and future expected pandemics and to avoid hindering the capacity to provide the benefits from in-person learning experiences and community well-being, as well as mitigate the effects of climate change

Expérimentations 2018

Etablissements 2019

Etablissements projet européen "Actions innovatrices urbaines" 2020

Location of Oasis playgrounds in Paris, 2018-20
Source: O. Brumard and F. Renard (DEVE-SA). www.oppla.eu

58

In connection to Addis Ababa

Land is one of the scarce resources in the city of Addis Ababa. As the value of land rises, open spaces are built densely, reducing the number of private and public green areas. Therefore, unfolding the potential of enclosed green open spaces as in schools, yards, sport facilities, churches' compounds and the like could be the only opportunity for the city to breathe, recycle polluted air and cool. As in the OASIS project in Paris, transforming school playgrounds into green spaces in Addis Ababa will offer cooling spots that provide shade and contribute to locally temper heatwaves during the dry season. To use the upgraded school playgrounds as open spaces to the wider public outside will also raise awareness on the impacts of climate change and the possible mitigation strategies. Standardising the frameworks and specifications used for transforming a school playground can substantially reduce planning and intervention time and costs. Co-designing educational spaces together with local communities with less public resources reinforces social cohesion, strengthens safe social interaction for healthier and resilient cities that can mitigate the spread of pandemics such as COVID-19. Such projects bring new insights in Addis Ababa to develop school playgrounds as green urban patches that can serve to link ecology and society by being parts and connectors of the larger GBI of the city.

Spatial Quality of Public School Compounds in Addis Ababa
Source: Addis Ababa City Administration, ADDIS HALL - Hall of Architecture and Urbanism, March 2021

Bole Secondary School, Addis Ababa - defined by four main roads with large compound having a vast open green space that can be developed with a project concept like OASIS in Paris
Source: Tigist Kassahun's compilation on Google Earth 2021

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6.1.3 Participatory Urban Agriculture (AGRUPAR) Quito, Ecuador

Insufficient urban green space	Loss of urban biodiversity	Landslide risk	Air pollution	Water pollution	Water scarcity	Urban flooding	Food insecurity

Source: Municipio del Distrito Metropolitano de Quito

The Participatory Urban Agriculture project (AGRUPAR) is an emblematic programme, part of the city's policy for socio-economic inclusion. This programme has already transformed people's lives. AGRUPAR not only contributes to food security and sovereignty, but also contributes to the improvement of the income of families, as well as generates economic savings through the consumption of its own production. As a result, by combining those receiving urban farming support and the families that benefit directly from these farms, assistance has been provided to an average of 4,500 people per year through food production in 1,529 orchards in Quito's urban, peri-urban, and rural areas. This results in about 640 tons of fresh and healthy food, with more than 11 tons destined specifically for the city's most vulnerable neighbourhoods.

Urban farming is more than a collection of orchards located in the city. It is a programme designed to create, support, facilitate and promote healthy living through local, fresh and agroecological production of food. The programme has become more sophisticated through the implementation of low-cost and easy-to-adopt alternative infrastructures, specially designed for urban and peri-urban gardens adopted by means of a participatory process. On the other hand, AGRUPAR has been a

"hotbed" for agricultural micro-businesses of all kinds, promoting organic food production, animal husbandry, food processing and the production of organic inputs, among others. To support these efforts, a circuit of bio-fairs for the direct sale of surplus production from the urban farmer to the consumer configures a set of spaces for permanent supply of healthy and local food, and at the same time increases food literacy among participants and customers. While enabling healthy and supportive production, in a framework of fair price and weight, it also provides a space to practice solidarity and empathy.

This is a successful story of food security and economic relief through a gender lens: 84% of participants are women; 48 community savings and credit banks have been opened which benefit more than 500 urban farmers and their surroundings, and 47% of the production is destined for commercialisation and 53% for self-consumption. Benefits extend into the environmental realm: an average of 12.5 kilograms of household waste are recycled per week, which is equivalent to 0.65 tons per family per year; urban agrobiodiversity has increased by 72 edible species; and about 20 hectares have been rehabilitated to produce healthy food in urban and peri-urban areas.

In support of early childhood

Even though the improvements in access to and local availability of healthy food for vulnerable groups (both producer and consumer families) can be considered the main impact of the programme, nearly 170,000 consumers have attended the bio-fairs and were educated on healthy diets and nutrition. Surveys have identified increased dietary diversity among producers, consumers, and their families having a positive impact on reducing malnutrition, especially in children. Furthermore, awareness and healthy eating habits among children, as a result from participating in farm labour, has been recognised by their mothers as an additional positive effect.

Key info

Why?

The programme was launched in the aftermath of a deep economic crisis and set up on the basis of a broad urban consultation to facilitate socioeconomic inclusion

What?

The project supports the entire food value chain from growing crops to processing and selling produce from small farmers, usually in vulnerable situations

Where?

Farming practices usually occur in urban and peri-urban orchards, usually located in private plots, in the Metropolitan District of Quito

Who?

The Participatory Urban Agriculture Project (AGRUPAR) is implemented by the Economic Promotion Agency ConQuito, part of the Municipality of Quito

How?

Quito's Participatory Urban Agriculture Programme promotes the production, processing, marketing and distribution of healthy organic food

When?

Initially created in 2002, in 2010 AGRUPAR was institutionalised as part of the Municipality of Quito, hence allowing it to be funded with public funds

How much?

AGRUPAR has a budget within the annual operational plan of CONQUITO. Ninety percent of the budget is mainly financed by the Municipality of Quito (around US$ 200,000) and 10% comes from a self-management fund (around US$ 20,000). Ninety percent of the budget is allocated to financing the technical team; the remainder is used for organic certification, developing the Food Policy of Quito, the Interpretation Centre for Urban Agriculture of Quito, communication and technical assistance

Source: Municipio del Distrito Metropolitano de Quito

What has been the impact?

Health and environment: Due to environmental and socio-economic impact, its participatory and holistic approach involving the most vulnerable groups, and respect for the Future Justice Principles and Elements of Agroecology, AGRUPAR was recognised with the Future Policy Silver Award 2018, awarded by the World Future Council in partnership with FAO and IFOAM – Organics International.

Social and cultural: AGRUPAR advances and amplifies the city's efforts to approach different challenges, such as food security, job creation, income generation, environmental management, gender equity, social inclusion of vulnerable groups such as women, elderly, and migrants, and micro-entrepreneurship.

Political: AGRUPAR became the starting point of a process that triggered discussions about the problem of food in the city. The project received a recent political boost thanks to Quito's accession to the RUAF Global Partnership (formerly the RUAF Foundation) in 2016, as well as to the Milan Urban Food Policy Pact (MUFPP) in 2019. The programme has served as a foundation for additional achievements, such as the conformation of the Agrifood Pact of Quito, or the inclusion of the food agenda in different public policy instruments.

What were the challenges?

Despite local political transitions and diverse political visions on food, AGRUPAR has strengthened social relationships between producers and consumers, generating solidarity networks, and the inclusion of small farmers into the food system. Moreover, the adoption of a systemic and integrated vision allowed the project to attend to the needs of diverse target groups and to succeed in involving the most vulnerable groups.

What was the effect of COVID-19?

The increase in access to healthy food and diversification of the local food supply chain, coupled with the elevated importance placed on fresh produce, has empowered the city's response to the COVID-19 pandemic as well. This was evidenced in the support provided by farmers to other community members facing food scarcity by selling at affordable prices their surplus production, distributing 11 tons of food on a weekly basis.

In connection to Addis Ababa

For a city like Addis Ababa where urban poverty is quite acute, transforming urban vacant spaces into productive landscapes and reinforcing the culture of urban farming will be a strategic approach to mitigate poverty through food security. Projects like AGRUPAR, which design a system for urban food production that can help people to produce their own food for consumption and further generate additional financial income by selling the surplus, could therefore be an essential learning project for cities like Addis Ababa.

The success of the AGRUPAR project was in achieving food security, economic savings, and women's empowerment, an increased supply of healthy local food, food literacy, low-cost and easy-to-adopt alternative infrastructures, strong social cohesion through solidarity and empathy for vulnerable groups. For the Ethiopian society that has an embedded social support system through its socio-cultural way of life, if urban agriculture is well planned and integrated in the current green development initiatives, the city of Addis Ababa may be able to feed its own inhabitants; teach children and the society the importance of ecology; support vulnerable groups in times of health emergency as in the outbreak of COVID-19, when there was a scarcity of healthy food during lockdowns.

Urban agriculture next to a river crossing the Bole area mostly owned by the informal settlement adjacent to it
Source: Tigist Kassahun compilation on Google earth 2009

(left) Existing urban agriculture next to Sheger Riverside corridor development (right) Children and Nature at ADDIS HALL's compound's urban agriculture with Ledeg crafts' children
(Left) Source: UN-Habitat, Sheger Riverside corridor development design guideline, 16 July 2021 (Right) Photo credit: Tigist Kassahun, 14 June, 2021

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6.1.4 Caño Martín Peña
San Juan, Puerto Rico

| Insufficient urban green space | Loss of urban biodiversity | Landslide risk | Air pollution | Water pollution | Water scarcity | Urban flooding | Food insecurity |

Proyecto ENLACE del Caño Martín Peña. Transforming a City, People • Health • Environment • Governance, San Juan, 2014
Source: http://cano3punto7.org/pdf/transforming.pdf

The Caño Martín Peña is an invaluable natural resource for the metropolitan area of San Juan, Commonwealth of Puerto Rico. It is a body of water approximately 6 kilometres long that connects the San Juan Bay with the Los Corozos and San José lagoons. These lagoons in turn are connected at their other end with the Torrecilla lagoon through the Suárez Canal to Boca de Cangrejos. In this setting, some interrelated problems converge, such as human settlements with substandard dwellings, environmental pollution, and negligent management of the hydrology of the bay system with its canals, rivers, and lagoons. Nevertheless, the Caño Martín Peña offers unique conditions to create an extensive and continuous recreation area in the very heart of the city of San Juan.

The Fideicomiso (trust) Caño Martín Peña is a mechanism for eight communities in San Juan to overcome poverty, a public health crisis (gastrointestinal diseases), and an environmental crisis (biodiversity reduction and diminished marine life affecting the livelihoods of fishermen). This tool solves the problem of legal access to land to unplanned communities and enables the reinvestment of resources in the area with the increase of the land value after improving the spatial qualities of the Caño. While the Fideicomiso retains land ownership of 200 acres in the hands of the community, it allows renting the land, or in turn issuing surface rights, that can be inherited, mortgaged and sold. It also allows access to loans and building permits to improve buildings. The Fideicomiso works together with the ENLACE Project Corporation (public corporation with limited lifespan) and other public and private entities.

The ENLACE Corporation's aim is to recover and protect a natural resource, while providing access to new green spaces, plazas and walkways. Furthermore, preserving the remaining mangroves helps protect the city from climatic events such as hurricanes and storm surges. The project foresees providing safe homes for the nearly 1,000 residents living at risk. Nevertheless, the trust and the corporation need to be understood as vehicles to manage resources and organise actions, but the model relies mainly on empowered communities in partnership with the government, foundations, universities and the private sector. As a result, the project can afford to be ambitious by targeting residents of all ages to provide education, adult literacy, environmental awareness, health promotion, conflict management and violence prevention programmes, while also providing targeted support for micro-businesses led by residents.

The Trust was created from and with the community to seek a solution or to avoid the involuntary and voluntary displacement of the eight communities. The Fideicomiso is featured as a remarkable case that enabled urban poor in informal communities to transform an infrastructure project into a self-managed development project. Since its creation, planning instruments were formally adopted by the Puerto Rico Planning Board, and later turned into a bill. This gave the community involvement a permanent character. However, today there is still much work to do. Funding for the ecosystem restoration of the Caño is still at odds, just like funds for relocating families, and most of the communities still lack a stormwater system and have no sewage system, hence untreated sewage flows

directly into the channel. Frequent flooding aggravates this problem. Nevertheless, in a profoundly divisive context, the Fideicomiso brings people together towards a common cause.

In support of early childhood

The Martín Peña community experiences deteriorating environmental conditions, limits to physical activity and other factors that appear to be the reason behind the higher rates of diseases such as asthma and diarrhea in the community when compared with elsewhere in Puerto Rico. This has had a tremendous negative impact on small children, their development and their caregivers. Besides the contributions mentioned before to the well-being of the communities, the ENLACE Corporation enables evidence-based interventions that make it possible to confront these problems effectively in a participatory way and placing resources where they are most needed, putting at the centre the most vulnerable groups identified: children, the elderly, migrants and those with special needs. One of the expected results of these interventions, in the case of the first group, would potentially redound in benefits such as the development of children's intellectual functioning abilities.

Key info

Why?

The continued discharge of raw sewage and the plugging of the channel resulted in a severe disruption of the natural water flow and circulation within the San Juan Bay estuary system. Frequent flash flooding of the area during rain events directly exposes residents to these contaminated waters on a regular basis, affecting the lives of the residents and the health of the ecosystems

What?

The main purpose is to guarantee the permanence of the communities settled in the canal, improve their living conditions and recover the ecosystems of the area

Where?

Caño Martín Peña is a 3.75 mile long channel that provides a natural connection between San José Lagoon and San Juan Bay, Puerto Rico; maintains impoverished squatters;

and provides a waterway for the operation of an aquatic mass transit system.

Who?

The Group of the 8 Communities Surrounding Caño Martín Peña, Inc., better known as G-8, is made up of community leaders who represent each of the eight communities that border Caño Martín Peña to the north and south. Its leaders are chosen at community assemblies annually.

How?

In a highly participatory fashion, and taking advantage of the existing social capital, by reconnecting communities with the bodies of water to achieve environmental restoration and as an engine of socio-economic inclusion.

When?

- The Caño has had settlements since the 1920s
- Since the 1970s, the location has been intervened by different levels of government, including the U.S. federal government
- In 2002, after several attempts to expropriate and evict residents from the lands in order to widen and rehabilitate the Caño Martín Peña, the Land Trust entity was formed in conjunction with the ENLACE Project
- The Caño Martín Peña Land Trust is the custodian of all land transferred to the ENLACE Corporation, in compliance with Law 489 of September 24, 2004

How much?

The ENLACE Project receives funding from different organisations, public and private, including the U.S. FEMA. However, the main feature is that communities, along with other partner organisations, have a seat at the decision table, including budget allocation. Additionally, community members can receive loans as a mechanism to access financial resources under conditions compatible with their economic reality.

What has been the impact?

The Caño Martín Peña experience is seen as an innovative model to follow in the area of community engagement. It provides a new working style for public participation and

Proyecto ENLACE del Caño Martín Peña. Transforming a City, People • Health • Environment • Governance, San Juan, 2014
Source: http://cano3punto7.org/pdf/transforming.pdf

it is an example of the community's presence in decision-making that integrates education, recreation and health projects to face these and other social challenges.

What were the challenges?

The Caño Martín Peña is currently under political pressure with regards to who should custody and administer the land. Nevertheless, despite the litigation process occurring, the Fideicomiso remains in custody of the asset.

What was the effect of COVID-19?

San Juan's disaster history has been a difficult one. When hurricanes Irma and Maria hit Puerto Rico, poor and vulnerable neighbourhoods were among the most affected. In the eight communities along the Cano Martin Pena, 1,000 families lost the roofs to their homes and a safe place to sleep.

Based on the existing solidarity, lessons have been learned, and ingenuity and collaboration have been key to propose strategies to cope with difficult times. Examples of this are found when different actors partner with the communities to plan and implement solidary-community kitchens / resilient emergency centres in newly vacated schools, or rainwater harvesting and solar power systems to guarantee self-sufficiency, even if island-wide services collapse. In an island severely hit by the coronavirus pandemic, these experiences have helped to be better prepared.

Proyecto ENLACE del Caño Martín Peña. Transforming a City, People • Health • Environment • Governance, San Juan, 2014
Source: http://cano3punto7.org/pdf/transforming.pdf

Proyecto ENLACE del Caño Martín Peña. Transforming a City, People • Health • Environment • Governance, San Juan, 2014
Source: http://cano3punto7.org/pdf/transforming.pdf
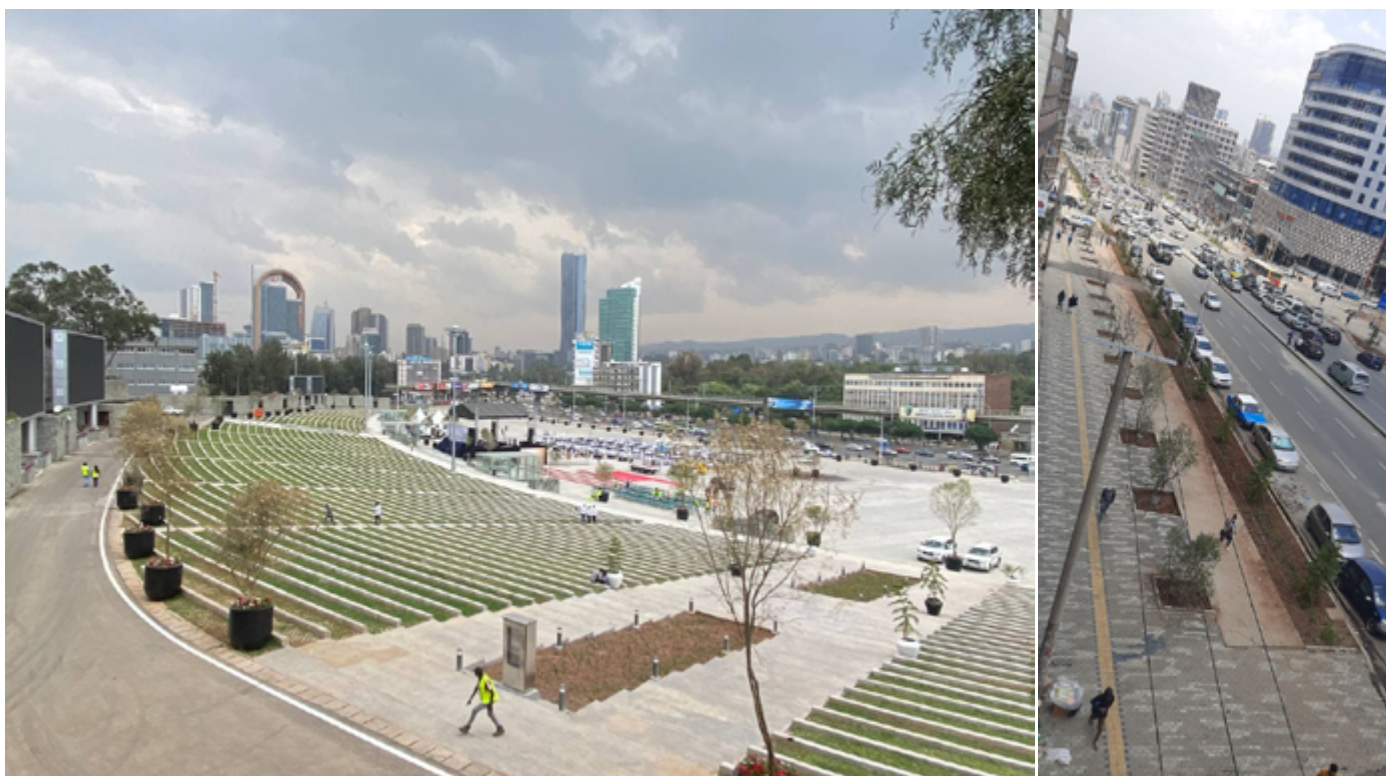
Left: Meskel Square to City Hall project, at Meskel Square, Right: Meskel Square to City Hall project, Churchill Avenue around Piazza
Photo credit for both pictures: Bisrat Kifle, 19 May 2021

In connection to Addis Ababa

In Ethiopia, land is owned by the government; however, projects like Caño Martin Pena can be adapted to develop large scale SGBI through small scale grassroots initiatives. Facilitating legal access to real estate properties to create inclusive and safe development of vulnerable families will enable them to reinvest in the resources and generate more income and overcome poverty. Improving the spatial qualities of their area will contribute to a healthy environment and increase their land value. Enabling the urban poor to transform a space for a common cause into a self-managed development project will result in socially sustainable urban development with a sense of ownership and belonging. Furthermore, allowing people to decide on how resources are invested, and participating in decision and policy making supports and contributes to community development, self-organisation and distributed governance, critical for building urban resilience. The Meskel Square to City Hall Refurbishment

in Addis Ababa, with an objective to enhance green open public spaces along the main street project route in Addis Ababa, aims also to propose initiatives that will empower the existing informal, micro and small businesses through small-scale income-generating activities that go hand-in-hand with the large-scale development. It also hopes to work in collaboration with important stakeholders that should have a say on the progress and outcome of the project such as the project-affected people, people working in the informal economic sector along the route, designers, supervisors of the project, contractors, and the government-owner of the project. The Corporate Governance Structure is, thus, proposed for its sustainable institutional arrangement. Since the project is still under construction and operation has not started yet, projects such as Caño Martín Peña could be good examples in how to inject small-scale productive green businesses through effective grassroots participation that can coexist with the existing governance system to build urban resilience for an inclusive and sustainable development.

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6.1.5 Rechanneling the City
Semarang, Indonesia

Insufficient urban green space	Loss of urban biodiversity	Landslide risk	Air pollution	Water pollution	Water scarcity	Urban flooding	Food insecurity

Cascading Semarang
Photo credits: Phase two report (04, 2019)

Semarang's location and topography in conjunction with urban growth create a complex water-related risk scenario. Climate change increases urban stress due to flooding from both the sea and mountainside. A systemic approach with a diverse set of measures has been proposed through five concepts focusing on different steps of utilising rainwater, but working together as one mechanism: spongy mountain terrace, micro interventions, rechanneling the city, feeding the industry and recharging the aquifer. rechannelling the city to provide additional water storage to reduce flood risk, improve water availability and quality, improve solid waste management, and provide better public space. Benefits extend into the socio-economic realm by boosting economic productivity and by reducing public health costs. The proposal also envisions a decentralised and scalable waste management system by using the water conveyance to collect solid waste through waste traps.

The existing storm water system aims at discharging the water as quickly as possible to prevent flooding; however, the availability of that water is lost. By taking the opportunities of (re)connecting existing streams and canals to the fine-grained water network, the surface water system is embedded within the urban fabric, stress is decreased downstream and other co-benefits such as

socio-culture, energy, health, economy and materials and waste are realised. The concept is complemented with additional strategies; the pilot project Peterongan Canal extension presents a series of water squares, parks and public spaces to improve the quality of the urban environment.

The accompanying visions of such places enhance the social and cultural qualities of the city. In a city with growing economic potential, urban development and livelihoods of residents are becoming increasingly affected by water-related challenges. Furthermore, in a city with an important presence of informality, which is mainly situated around the river banks and crowded public spaces, an improved and safer urban environment will play a key role in the socio-economic emancipation of socially vulnerable groups, especially women. In this scenario, the micro-interventions component aims at increasing the provision of water and the potential for vulnerable social groups to develop economic activities, improve food security and income stability for these groups.

The need for investments, public engagement and the incorporation of ecosystems into the resulting strategy builds a strong case to create synergies between economic growth, tackling the problem from the roots to meet

local urgencies, and to achieve water security in the face of climate change. For active and ample collaboration, gaming is proposed as an interface between abstract decision-making and material city-making. Simple tools and exercises allow non-design professionals to better understand the challenges and better express their vision for the city. A comprehensive programme, 'Building with People', enables an inclusive design process, where local people seen as key players are involved further.

In support of early childhood

By working under the right scales, and if done through a gender lens, interventions aiming at improving spatial quality, improving food security for most vulnerable groups, improving livelihoods and income stability, and improving conditions for development of local economy, all while working to provide for infrastructure to ensure access to water and to prevent climate related catastrophes, can all contribute to ensure caregivers to provide a stable, healthy, and stimulating environment for toddlers. Furthermore, the suggested design creates spaces that host different programmes for communities, such as playgrounds for children, multi-use squares, or sports activities.

Key info

Why?

Semarang is a coastal city seated at the foot of Mt. Ungaran, currently suffering a wide range of water-related events, hindering its development and affecting the most vulnerable

What?

Implement concerted set measures and actions in the city of Semarang that solve water-related problems on a systemic rather than on a symptomatic level

Cascading Semarang
Photo credits: Phase two report (04, 2019)

Where?

Semarang is part of one of the largest urban agglomerations in Indonesia, holding the fifth largest metropolitan area

Who?

Water as Leverage is an initiative supported by several partners, including the Government of the Netherlands, the Asian Infrastructure Investment Bank, the Global Centre on Adaptation, 100 Resilient Cities, among others

How?

Setting up collaborative teams to tackle water challenges in three Asian countries – India, Bangladesh and Indonesia – to produce projects that will ultimately serve as blueprints for water projects in other cities around the world

When?

2018: Close to 40 proposals were received in the first phase of the Water as Leverage programme

2018-2019: Collaborative work on challenges around climate action and impact
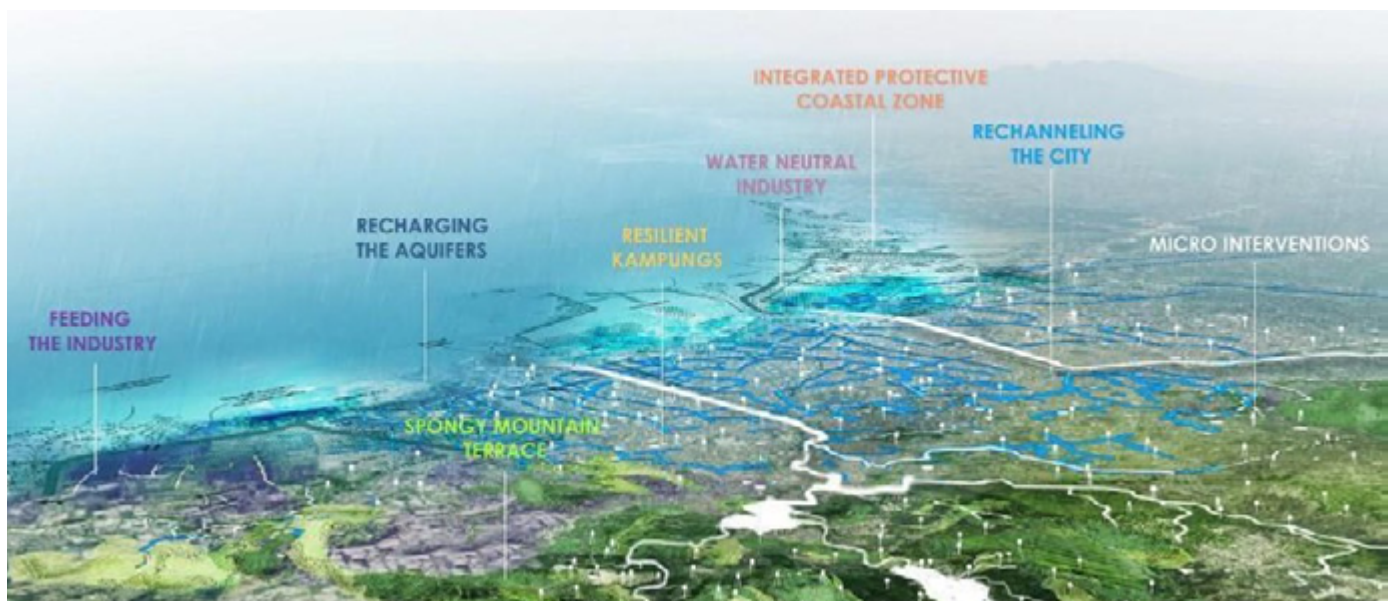
Cascading Semarang
Photo credits: Phase two report (04, 2019)

Cascading Semarang
Photo credits: Phase two report (04, 2019)

2018-2019: Results of the designs were presented, discussed and verified.

2019: Plans and strategies for implementation and financing are underway.

How much?
Two teams selected per city with predefined contract price of EUR 200,000 per team. Implementation costs vary depending on type of interventions ranging from 3.5 to 64 million US$.

What has been the impact?
Health and environment: By improving water systems for drainage and water supply, improving waste management services, building eco-zones and enhancing air quality, diseases are tackled and the city becomes more sustainable.

Economy: Provides more and better opportunities for socio-economic inclusion

Social and cultural: Generates new flexible space for social-cultural activities

Political: The approach goes in line with the vision of the Semarang mayor, "Moving Together Towards Great Semarang"

What were the challenges?
The proposal acknowledges that complex problems require an integrated approach. Water issues are proposed as the driving engine for the systemic improvement of social, urban, and financial challenges to deliver inclusive solutions through participatory processes.

In connection to Addis Ababa

Projects like Rechanneling the city can be adapted to bring new and additional environmental planning and designing insights to SGBI developments in Addis Ababa as they look at challenges and solutions with a systems lens. For instance, they try to tackle climate change for better health outcomes with a decentralised and scalable waste management system that can decrease urban stress linked with location and topography, presence of informality, a complex water-related risk scenario in conjunction with urban growth. Since projects done with a gender lens ensure a stable, healthy and stimulating environment for caregivers / toddlers and children, projects that design with a system lens will create active collaboration through abstract decision-making and material city-making to achieve an inclusive design process with local people as key players. The SGBI projects such as the Sheger Riverside corridor development project and Meskel Square to City Hall Refurbishment project in Addis Ababa that are foreseen to be developed around the riverside, mountain areas as well as in the vacant inner-city green open spaces can adapt the design strategies of rechanneling the city to come up with different scenarios at different scales (spatial

Meskel Square to City Hall project, Meskel Square used as a learning space for children and youth, ADDIS HALL and Ledeg Crafts
Photo credits: Tigist Kassahun, 14 July 2021

The river passing the inner-city of Addis Ababa, which is along the Sheger Riverside corridor development
Source: UN-Habitat, Sheger Riverside corridor development design guideline, 16 July 2021

and temporal), identify a diversity of actors with the community to support the project, and connect different factors to create an enabling environment with new socially inclusive urban planning insights.
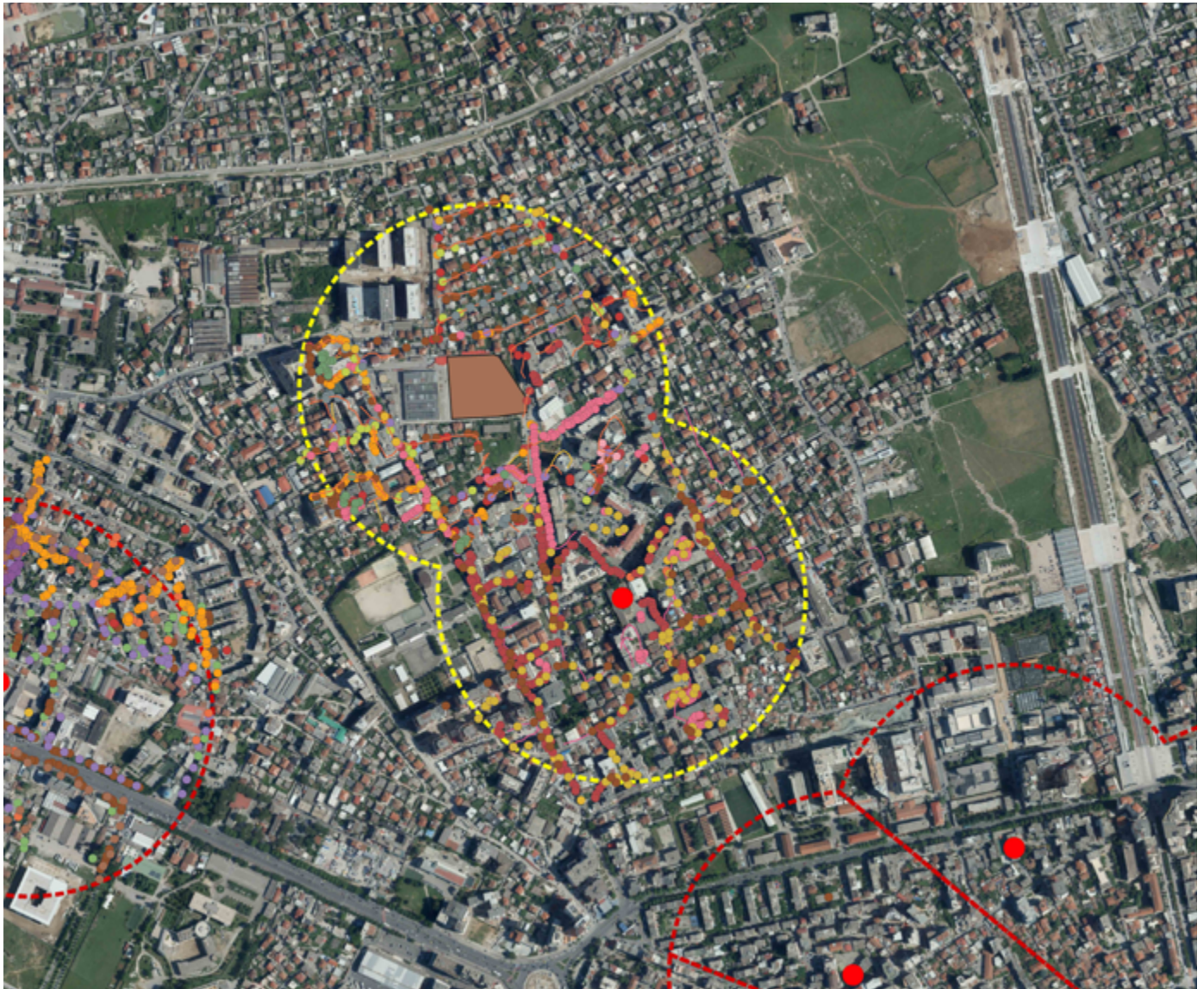
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6.1.6 Born Thriving Environmental Indicators
Tirana, Albania

Insufficient urban green space	Loss of urban biodiversity	Landslide risk	Air pollution	Water pollution	Water scarcity	Urban flooding	Food insecurity

Close-up of data collected in two neighbourhoods for the Infant Toddler Caregiver Neighbourhood indicator baseline, 2019.
Source: Maringlen Kalaj

In 2015, the Municipality of Tirana embarked on a major vision to focus a large effort on one-third of its population: children. The newly elected mayor, Erion Veliaj, set out to position the city as an international example of urban planning and design that focuses on the needs of the youngest members, following the motto that a city that takes early childhood development seriously is not only inclusive for young children, but for all citizens. Strategies included reclaiming spaces from cars to pedestrians, renovating parks, building new playgrounds, revamping kindergarten facilities, and a series of resource-efficient urban "acupuncture" interventions for infants, toddlers and caregivers (ITC).

An important aspect of this transition was for the municipality to move towards a more strategic and sustainable data-driven approach at the neighbourhood level. In 2019, together with local NGO Qendra Marrëdhënie and the support of the Bernard van Leer Foundation, it set out to collect data that maps physical and social attributes of urban environment that affect early childhood development. The presence of vegetation, the quality of sidewalks, attributes of playable spaces and levels of air pollution are only a few examples of what was collected. This collaboration led to the publication of the Born Thriving Infant Toddler Caregiver Neighbourhood Planning Framework, Indicators and Design Guidelines.

Born Thriving included 40 new indicators divided into five objectives: traffic calming, streetscapes, school parks, green space, and accessibility. Out of these, one-third (13) focus on the intersection between urban environmental aspects and early childhood development at the neighbourhood level:

3.1 *Number of primary schools with campus joint-use agreements*

3.2 *Hours per day that ITCs are present in the school park*

3.3 *Time per week caregivers engage with their 0-5 year old in outdoor green spaces*

3.7 *Presence of natural materials in play equipment*

4.1 *Frequency of large street trees*

4.2 *Length of pavement space in shade at noon*

4.4 *Presence of soil infiltration zones in the public realm*

4.5 *Incidence of chronic respiratory disease in children 0-5*

4.6 *Daily concentrations of PM2.5*

4.7 *Daily concentrations of NO2*

4.8 *Daily concentrations of PM10*

4.10 *Presence of public facilities using renewable sources of energy*

5.5 *Accessibility of adequately sized green space*

Creative ways of looking at the urban environment through neighbourhood-scale data can make underrepresented members of society (in this case, ITCs) visible to decision-makers in the city. Measuring caregiver behaviour through, for example, indicator 3.2 (hours per day that ITCs are present in the school park) can evidence the underuse of

Intercept survey with a student during data collection process in Tirana
Source: Courtesy of Qendra Marrëdhënie

Unmaintained play space above the Kombinat neighbourhood
Photo: Simon Battisti
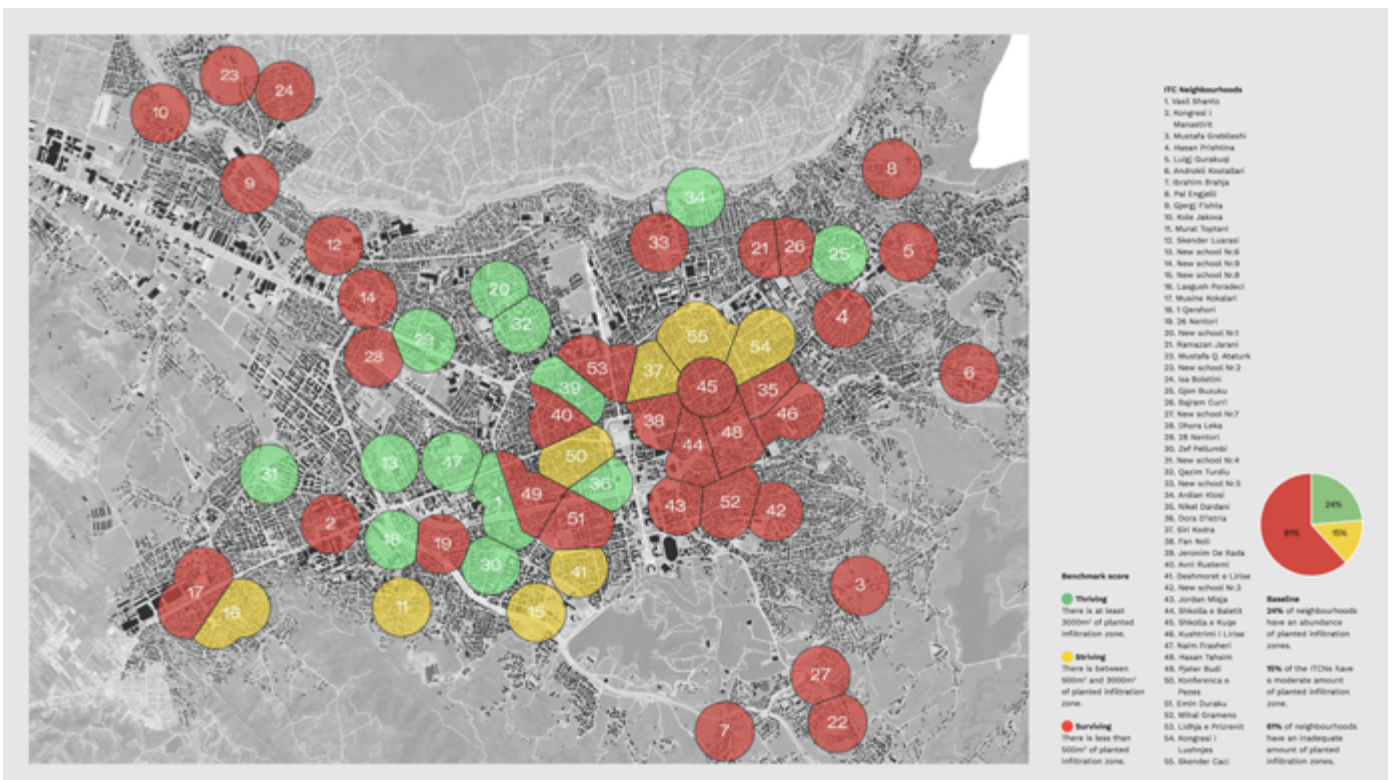
Presence of soil infiltration in the public realm map (Indicator 4.4)
Source: Born Thriving Infant Toddler Caregiver Neighbourhood indicator baseline report

New playground in Tirana's Komuna e Parisit neighbourhood, built in 2017; Tirana has built more than 50 playgrounds in the last six years.
Photo: Simon Battisti

green quality space for the whole neighbourhood beyond school hours. When mapped together with indicators 3.1 and 3.2, persuasive arguments could be made for transforming schoolyards into 24-hour functioning spaces.

Another example comes from indicator 4.4 (presence of soil infiltration zones in the public realm) which maps unpaved areas in the city, revealing informal or "undesigned" spaces that can be used for unstructured play, which is especially beneficial to young children's brain development. By acknowledging and preserving these spaces, the city can turn what would otherwise be considered "voids" into safe green playgrounds with only modest improvements like seating, waste collection, and basic play equipment.

Decision-making for strategic public funding can also improve when using an indicator like 5.5 (accessibility of adequately sized green space). In this case, the distance between homes and green spaces can clarify the locations where urban vegetation is scarce. In many cases, elementary and high school campuses (mapped by indicators 3.1 and 3.2) then appear as strategic opportunities to supply the needed green space to these underserved areas.

In support of early childhood

By structurally adopting ITC indicators, the city of Tirana also can work towards simultaneously meeting two other policy frameworks focused on early childhood development: UNICEF's Children's Rights goals and the UN's Sustainable Development Goals. Quantifiable and mapped results also can result in additional funding from international cooperation agencies.

Key info

Why?

Data collection and analysis supports Tirana Municipality's decision-making processes for strategic green infrastructure interventions in relation to early childhood development

What?

Out of the 40 Born Thriving indicators, 13 focus on environmental aspects of neighbourhoods in support of infants, toddlers and their caregivers. These belong to three categories: All About the School Park, Green and Resilient, and Proximity, Convenience, Accessibility

Where?

Data was collected in 55 neighbourhood clusters of 300-metre radius, which include 64 primary schools, 38 public kindergartens and 25 public nurseries throughout Tirana

Who?

The implementing agencies were the Municipality of Tirana and Qendra Marrëdhënie (QM). Other agencies involved in the supply of data include the National Territorial Planning Agency, the Tirana Parks and Recreation Agency, the Tirana Public Works Agency, the Albanian Department of Road Transport, the Albanian Ministry of Education, and local public schools. Funding was provided by the Bernard van Leer Foundation

Streets for Kids Implementation: Example of "demineralisation" of open public spaces
Source: Qendra Marrëdhënie

How?

In approximately 16 months, QM and the Municipality of Tirana developed an ITC Neighbourhood Framework, Indicators and Design Guidelines in a real-time feedback loop of research, study tours, workshops, public surveys and test events like temporary street closures and pop-ups.

When?

2015: Erion Veliaj is elected mayor of Tirana and establishes early childhood development as a priority of his administration. Funding secured for 21 new schools.

2017: Tirana adopts the Tirana030 Master Plan. The Urban95 Initiative connects to the Municipality of Tirana and QM.

2018: Tirana adopts the Green City Action Plan; 24-hour school policy announced. Harvard University fellows research ways Tirana's schools could anchor ITC-friendly neighbourhoods.

2019: Veliaj is re-elected. The municipality decides to adopt new models for ITC-friendly streets and neighbourhoods and co-authors the Born Thriving planning framework, guidelines, and indicators.

How much?

Data collection by QM was labour-intensive but not sophisticated or expensive, as a large percentage of the work depended on smartphone applications and student surveyors.

The cost of implementation projects varies, but is generally inexpensive as these take advantage of existing resources in the city and require only strategic minimal equipment like benches, garbage cans, natural play materials (rocks, sand, tree trunks) and, most importantly, vegetation.

What has been the impact?

– The Born Thriving policy framework, evaluation and monitoring tool, and neighbourhood design guidelines are currently being used by the Municipality of Tirana for decision-making on early childhood development initiatives.

– The collection and use of data have given way to strategic solutions for resource-efficient projects on urban green space.

– Streets for Kids, a programme also co-funded by the Bernard van Leer Foundation, is building safe routes and new open spaces created by street closures near primary schools.

– Tirana's first data office under the Department of Planning was established in 2019 with an initial staff of four. It aims to introduce and coordinate more methodical data collection efforts, including the Born Thriving indicators.

Streets for Kids Implementation. Example of sites pre and post interventions
Source: Qendra Marrëdhënie

What were the challenges?

Effective data collection and use is not an easy task. A few of the main challenges include:

– A lack of clear methodologies for data production and gathering and the absence of regular data revision policies

– Some data on early childhood development available at state level represents only national averages and is not disaggregated geographically.

– "There isn't an appetite for data because there isn't public trust that the data would be true." (Battisti, 2019)

What was the effect of COVID-19?

The data collection process for Born Thriving was over before COVID-19 lockdowns began so no interruption took place. However, as Albania had a strict lockdown for about eight weeks in April–May 2020, citizens were permitted to spend 60 minutes outside the home per day and QM collected air quality data on Born Thriving routes. Due to less traffic, a great improvement in air quality was found.

Lockdown did indeed affect the results of much of the previously collected data, particularly the one that measured behaviour, such as spending time in parks or maintenance routines of city workers.

In connection to Addis Ababa

Developing a set of neighbourhood indicators that can help in acknowledging and preserving public spaces; creating ITC-friendly neighbourhoods; creating various spatial qualities for various social strata and age groups in different contexts will help in designing "just" cities with balanced urban development. Urban development projects in Addis Ababa could adapt the Born Thriving Environmental Indicators' strategies in data collecting by mapping physical and social attributes of the urban environment at neighbourhood scale. Projects that design using evidence-based indicators can bring significant benefits for vulnerable groups and for young children's development and will make city managers commit until the project is successfully implemented, resulting in socially and economically "just" cities. Moreover, designing ITC indicators that map informal and undesigned space enables an institution to give careful planning consideration while crafting policy for action and to leverage city managers to compel them to act. In addition, it makes under-represented members of society decision-makers in the city. Quantifiable and mapped results also can result in additional funding from international cooperation agencies. In Addis Ababa, the new ICT park development project within the inner city can take insights from this project in developing its own park as a pilot project. Per the result, it can support the urban planning commission in how to design and use indicators to implement evidence-based urban development projects in the city.

Meskel Square to City Hall project: street side public space and greening interventions
Source: Mega project construction office, 20 June 2021

Meskel Square to City Hall project: Addis/Churchill View- street side public space and greening intervention
Source: Mega project construction office, 20 June 2021

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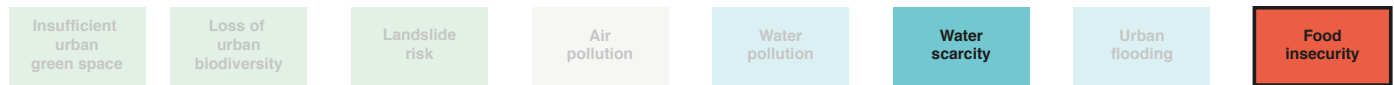
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6.2 Support case studies

6.2.1 BuraNEST New Town
Bura, Ethiopia

| Insufficient urban green space | Loss of urban biodiversity | Landslide risk | Air pollution | Water pollution | Water scarcity | Urban flooding | Food insecurity |

Source: Spiegel.de Photo: Bente Stachowske

BuraNEST (New Ethiopian Sustainable Town) is an urban planning real-life participatory experiment to create a socially, environmentally, and financially sustainable new town in the region of Amhara. While people continue to live as farmers in a rural context, enjoyment of the "benefits of development" is provided. According to the design team, "people don't need to go to the city because the city comes to them".

This strategy lessens the need for migration to bigger cities. The project began in 2010 as a collaboration between the Ethiopian government and Swiss planners and architects (ETH Zurich). The town's core comprises public infrastructure, an energy centre, educational gardens, a market and multifamily housing structures co-created with the local community. It is based on principles of self-building, self-provision, and self-management.
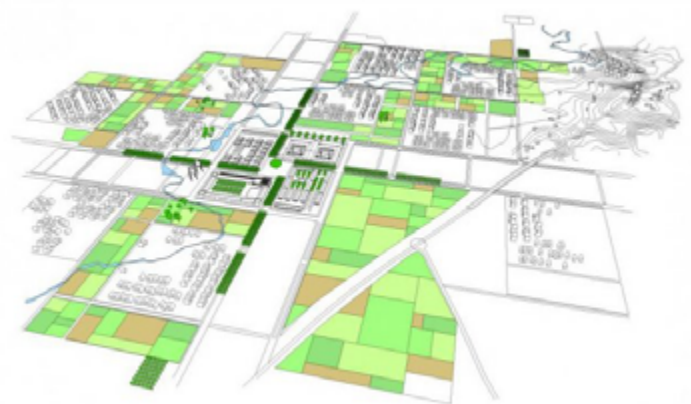
NESTown Model
Source Oswald, F. & Schenker, P. (2010)

Source: https://www.kraftwerk1.ch/aktuell/genossenschaftlicher-aufbau-aethiopien.html.
Photo credit: Sebastian Hefti

In connection to Addis Ababa

The BuraNEST project can be a substantial example in proposing on how to develop projects as in the Rural Transformations Centre (RTC) that were proposed to be implemented in every city together with the integrated agro-industrial parks (IAIPs) development in Ethiopia. The RTC is a key component within the agro-food sector. While the IAIPs will focus on adding value to locally sourced agricultural products and address constraints to private sector development by providing firms with access to infrastructure and utilities, as well as business services catalysing investment and job creation, the RTCs will be set up around each IAIP serving as aggregation points with modern pre-processing and market facilities, connecting the parks with the surrounding rural communities, and providing access to employment as well as income generation for the local community through a value chain development.

Feasibility study for Integrated Agro Industrial Parks (IAIP) and the RTCs to be completed by April 2015
Source: Ministry of Finance and Economic Development; Ministry of Industry, UNIDO –Topic-Inclusive & Sustainable Industrial Development, Programme for Country Partnerships ISID-PCP (Ethiopia), programme overview, objectives and priorities, governance structure; Date of presentation: 25 May 2015

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Integrated Agro Industrial Parks
Source: Ethiopia: Agro-industrial parks planned nationwide – Ethiosports, accessed on 8 June 2021

6.2.2 Urban Lakes Placemaking
Bangalore, India

| Insufficient urban green space | **Loss of urban biodiversity** | Landslide risk | Air pollution | **Water pollution** | **Water scarcity** | **Urban flooding** | Food insecurity |

The decline of "keres" (lakes) is the result of poor management and silt. Keres facilitated year-round water supply by capturing seasonal rainfall and recharged local groundwater. The recovery process of keres developed a sense of place that triggered environmental stewardship and collective action by exerting influence on other users. Here, placemaking techniques were applied, such as community events and learning about keres' history. In 2010 the government established a new co-governance model, where citizens and technical and ecological experts developed a management plan to better adapt keres' maintenance to local conditions. Today, keres are promoted as parks that provide flood mitigation, wastewater bioremediation, local water supply, biodiversity support, preservation of cultural heritage, religious activities and the livelihoods of communities.

In connection with Addis Ababa

In Addis Ababa there are "overlooked" urban spaces that are left undeveloped due to their challenging spatial and geographical configuration. As they usually require high level expertise to be developed as well as a large amount of budget/finance, they are left unplanned, resulting in occupation by informal settlements and not integrated within the urban fabric. The rivers and their surroundings, the areas in the mountains and the neglected public open spaces in Addis Ababa can be good examples of the overlooked and deteriorated urban spaces due to their large scale and complex spatial configuration. Thus, projects like Urban Lakes Placemaking could give relevant insights to the Addis Ababa city government in how to develop a co-governance model with citizens through an institutional aspect of spatial planning for large, scaled projects that comprise several stakeholders and various owners within the development route. Since governance, management, operation and ownership among others might be the overlapping challenges that limit the effective usage of the existing SGBI in the city, this case study can show how ecological experts developed a management plan adapting local conditions to create sense of place that triggered environmental stewardship and collective action by exerting influence on other users to preserve cultural heritage, religious activities and the livelihoods of communities.

Source: Stockholm Resilience Centre. Protecting your place Photo: A. Murphy

River and mountain area with informal settlements around Kechene area, Addis Ababa
Photo Credit: Tigist Kassahun, March 2020

Links and further research

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6.2.3 Green Belt
Rosario, Argentina

Insufficient urban green space	Loss of urban biodiversity	Landslide risk	Air pollution	Water pollution	Water scarcity	Urban flooding	Food insecurity

In 2002 the municipal government responded to an economic crisis by launching an Urban Agriculture Program with 800 communities providing for approximately 40,000 people. While a study reported that 36% of the area of the municipality was unused (lateral areas in railway tracks and urban highways, waterlogged or floodplain soils and undeveloped public spaces) in the face of urban expansion, agriculture is incorporated in the land use plan through a green belt with 800 hectares for community gardens, large-scale commercial production orchards, multi-purpose orchard parks, and productive neighbourhoods.

Its innovative approach reclaimed soils returned to a healthy condition now used for agriculture and cultural, sports, and educational activities. The active female and male farmer network launched a project to include unemployed youth to share these benefits.

In connection to Addis Ababa

Regenerating the used urban areas of different function into new green and blue social places through an asset-based community and environmental development will result in productive neighbourhoods using their own resources for multiple purposes such as agriculture as well as cultural, sports and educational activities. The strength of the Green Belt project was in its achievement in finding out the existing potential of the area and the community that helped capitalise on the existing resources and propose what can be achieved. Thus, prior planning together with the community within government initiatives to develop unused spaces helped mitigate an economic crisis. Moreover, the active female and male farmer network in a project launched to include unemployed youth to share these benefits made the project long-term and socially sustainable. In the same vein, the Reppie/Koshe dumpsite emergency rehabilitation project in Addis Ababa, which planned to convert part of Addis Ababa's solid waste dumpsite into a recreational area, was successfully implemented due to the active participation and involvement of the waste pickers who lived on the site. The waste pickers' community that informally settled in the dump site had a strong network of different groups. They formed a new group that comprised the different existing groups for collective project implementation and were recognised with legal involvement by the government and development partners. The project trained and employed them on site. As a result, most of the waste pickers became technically certified and changed their lives as they earned enough not to live on the dump site anymore. As a result, they developed a strong sense of

Source: Municipalidad de Rosario. Cinturón Verde

Reppie/Koshe dumpsite emergency rehabilitation project - success due to Community participation and involvement

Source: UN-Habitat, 14 March 2019, Completion of Phase I of "Reppie/Koshe dumpsite emergency rehabilitation project using the Fukuoka Method (Powerpoint presentation), Photo credit to UN-Habitat.

ownership and responsibility to maintain the area and be involved in the following phase as well.

However, financial sustainability for the continuation of the project was in question which meant they were unemployed again. Although the project has passed several challenges to complete Phase I, the following phases need strategic interventions and prior planning in its sustainability and how to work with the community for solutions and implementation. It will help not to disrupt existing livelihoods and avoid life threatening incidents. Thus, strategic insights can be adapted from projects like the Green Belt in how to work with multiple stakeholders' involvement of different social strata to achieve a common goal.

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6.2.4 Reinhabiting the Mountain
Medellin, Colombia

| Insufficient urban green space | Loss of urban biodiversity | Landslide risk | Air pollution | Water pollution | Water scarcity | Urban flooding | Food insecurity |

A project developed by EAFIT University, Leibniz University, and the Municipality of Medellín provides alternatives to urban problems derived from informal settlements on hillsides. These settlements create risk scenarios due to natural threats like landslides and floods. The initiative focuses on two strategies: 1) anticipating settlements where land prone to be occupied is identified and actions are taken to prevent such behaviours, such as environmental restoration, sustainable forestry, nature trails, parks, or urban agriculture. 2) Mitigating existing risk which focuses on risk reduction and improvement of quality of life of colonisers through slope stabilisation using bio-engineering, solid waste management, and resettlement of high-risk dwellings. Social involvement includes communication activities, training, and awareness programmes.
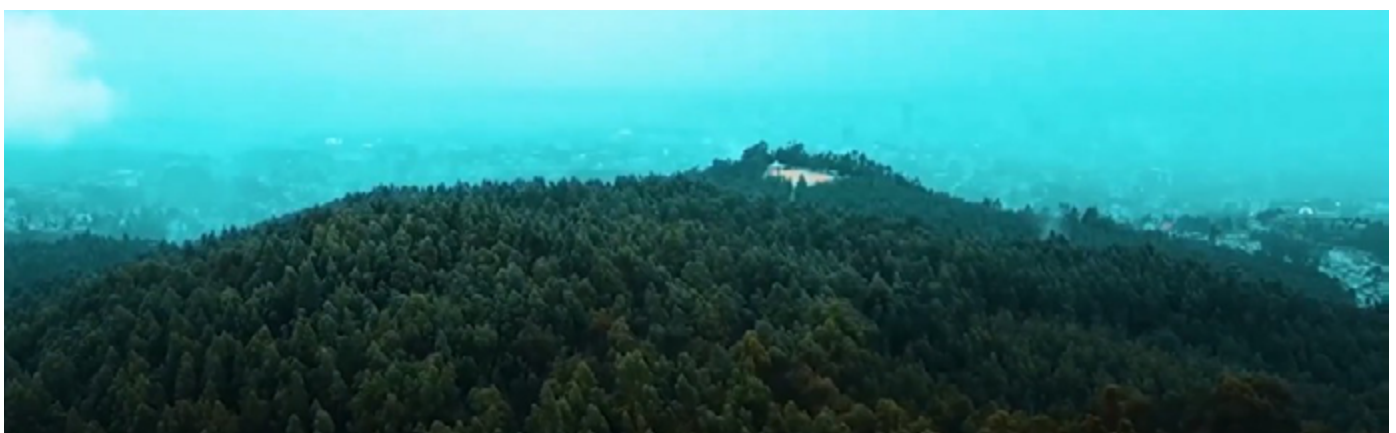

Source: EAFIT

In connection to Addis Ababa

The mountains surrounding Addis Ababa are rapidly urbanising with high-rise complexes. Some of the reasons are the shortage of land in the inner city and the economic importance of the top city view that increases land value. Private development is taking over these sites, building high-rise hotels, obstructing the view of the rear sites, clearing trees and paving open green areas. Urgent awareness and action should be taken by the building construction permit authority and the community, so that participatory and context-based spatial planning and design interventions – including SGBI principles – with new sets of regulatory guidelines and policies can be ratified. Creating viewpoints overlooking the urban landscape will raise the land and property value; increase revenues for

businesses; and provide attractive and recreational spaces for the society to appreciate nature and the urban built environment. SGBI design proposals for socio-economic benefit as in Reinhabiting the Mountain, Medellín, Colombia should be done with the community that can be inclusively re-appropriated back by them. Being part of the planning, design and solutions during development, will create a strong sense of ownership and trust with the government authorities, offering a better social and urban coexistence among communities of different social strata. SGBI development in such naturally gifted areas with dense forests and top views not only benefits the city in preserving as the lungs of the city but also could offer the opportunity to coexist with wildlife and facilitate the provision of ecosystem services.

Entoto Mountain
Source: Ethiopian Embassy in Brussels, 27 August 2020 (Entoto Park - YouTube)

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7. Main takeaways

7.1 Nature leads the way

Streets also can be inclusive green infrastructure

In many cities, streets are important public spaces. Vegetation brings comfort by providing shade and regulating temperature (reducing the heat island effect).

Waste is a resource

Sewer sludge can be clean energy, biosolids can be fertiliser, used plastic can be furniture, concrete debris can be a new topographic landmark.

Working with nature costs less

Green-blue infrastructure that includes soil bio-engineering, agroecology and ethnobotany might require higher initial investment but reduces costs in the long term.

7.2 Resourceful and creative

Use fewer resources more creatively

 Sometimes, a minimum investment in green-blue infrastructure can catalyse social transformation beyond government intervention.

Opportunities are already there

Looking at underutilised spaces with a creative eye can unleash their potential. Water tanks, landfills, public schools and parking lots can provide new functions for the community.

Infrastructure also educates

Society (especially youth) can learn from (and further support) environmental solutions by visiting and exploring utility infrastructure of the city (often fenced off).

7.3 For people and by people

Understanding the problem is half the solution

Comprehensive research and mapping assure that the right issues are addressed and that all stakeholders are involved.

Disagreements are usually an opportunity

Difficult social situations require more management skills and might take longer, but when these challenges are overcome, results are sustainable and impactful.

Small is the new big

Minimal interventions by citizens can have a strong impact when scaled-up. Communities that "own" a process depend less on political will and large public interventions.

8. In Conclusion - How far can you go?

Green-blue infrastructure planning should be geared towards long-term goals such as socio-economic inclusion or people's environmental stewardship and ecosystem services enhancement. It also should prevent negative consequences of unplanned settlements and amplify the capacity to keep and strengthen social ties. Knowledge and capacity building should be replicated to extend benefits at larger scales, beyond localised projects, thinking of these interventions as part of a greater system: the city. This should be a fundamental contributing measure that helps organise and maximise the benefits associated with mobility infrastructure, land use and public space planning, as well as economic and real estate dynamics while providing a broader view of natural and manmade threats and opportunities in Addis Ababa.

Sustainable infrastructures which include the recovery of the ecosystems in and around the city are key to help operationalise urban systems (Suzuki et al., 2010). At larger scales, the insertion of native species to connect parks and peripheries has positive impacts on increasing biodiversity, while strategies with nature-based solutions for rainwater capture and treatment could help save the city substantial economic resources. To the same extent, and to help face drought problems, some areas could be used as reservoirs with other additional urban services, such as parks, that would that would secure water for several days. Furthermore, benefits could be extended even further by improving the urban image, by providing additional square metres per capita of green space, and by reclaiming public space for people.

The ways that the city, as a complex system, finds solutions for current and future problems must be reformulated. Planning processes must be rethought and should evolve into mechanisms that allow inviting a diverse mix of sectors – including different levels of government, academia, business and industry, community organisations and non-profits – as a way to look at overlapping social and environmental challenges through different lenses, and to devise better strategies that reduce vulnerabilities and move towards a more sustainable and resilient urban development.

Current and future challenges

While most countries endorsed the 2030 Agenda for Sustainable Development, where many goals address poverty and exclusion in a multidimensional manner, measuring and reporting is still challenging. Efforts made to increase this capacity have led to alternative ways to close data gaps in critical indicators by, e.g., integrating data from non-traditional sources. Nevertheless, overall, only 50 of the 169 SDG targets are ready for progress assessment, half of the 230 indicators lack agreed measurement criteria (68) or sufficient data coverage (66) for regular monitoring or reporting or both (Adams and Judd, 2018). If these gaps include poverty, climate change, environment, gender, inequality, and governance, then understanding the impacts of inadequate urban development in early childhood and caregivers is a field that still needs to be clarified.

This is probably the most important challenge in the future, since what cannot be measured cannot be managed. Nevertheless, it also is acknowledged that the existence of more and better data and statistics does not guarantee their use, including in the policy making process. Countries and international organisations need to be emphatic about the importance of resource allocation to ensure not only data and information gathering, but also policy designing and project implementation to support closing this gap. Engagement across sectors and professions as well as public awareness, transparency, and accountability are essential elements in closing the science-policy gap.

Key ideas: long term goals, thinking in larger scales, systems thinking, resource optimisation, amplify and diversify benefits, theory of change, governance.

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Addis Ababa Urban Age Task Force Reports

Theme 1 | Urban Housing and Retrofitting

Policy Brief 1 | *The Addis Ababa City Block: a high-density, mixed-use and inclusive housing solution for the urban core*

Technical Report 1.1 | *The Addis Ababa City Block: inclusion and livelihood though the horizontal-above-vertical concept*, by Elias Yitbarek Alemayehu

Technical Report 1.2 | *Finding Housing Affordability: cost estimates and affordability paths for the Addis Ababa City Block,* by Jacus Pienaar

Technical Report 1.3 | *Sustainable Building Materials: exploring green construction options for new housing in Addis Ababa*, by Hannah Langmaack, Peter Scheibstock and Thomas Kraubitz (Buro Happold)

Theme 2 | Transport and Mobility Services

Policy Brief 2 | *Beyond Car Growth: digital van service as alternative to private car use in Addis Ababa*

Technical Report 2.1 | *Digital Van Service Demand: gauging interest in mobility alternatives among current and aspiring car owners in Addis Ababa*, by Philipp Rode, Bethany Mickleburgh, Jennifer Chan and Rebecca Flynn

Technical Report 2.2 | *Digital Van Service for Addis Ababa: understanding the transport landscape and the potential for digital bus aggregation in Ethiopia's capital* by Chris Kost and Gashaw Aberra (Institute for Transportation and Development Policy (ITDP))

Theme 3 | Green and Blue Infrastructure

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Technical Report 4.1 | *Participatory City Making: polycentric governance and human-centred, inclusive urban design,* by Meinolf Spiekermann and Marc Steinlin

Technical Report 4.2 | *Urban Knowledge Management: solutions for the Addis Ababa City Administration*, by Bersisa Berri

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Technical Report 4.4 | *Addis Ababa Spatial Compendium: mapping and urban analytics for Ethiopia's capital*, by Alexandra Gomes and Philipp Rode (LSE Cities)

Addis Ababa Urban Age Task Force

Founding Partners

The Task Force is a partnership between the Addis Ababa City Administration Plan & Development Commission (AAPDCo), LSE Cities at the London School of Economics and Political Science, the Alfred Herrhausen Gesellschaft, and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

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Addis Ababa City Plan and Development Commission is committed and fully dedicated to preparing research-based city-wide short, medium and long term strategic development plans (both socio-economic and spatial) in order to transform the city to one among the middle-income cities in the world; create a liveable city for the citizen; and make Addis Ababa the best destination for investment in Africa. The commission is accountable to promote urban economy and jobs; deliver urban renewal and housing for citizens; improve urban environment and quality of life; and support policy decisions that will register accelerated, sustainable and equitable economic growth and a climate resilient green economy.

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