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Exploring the links between the use of NbS, mindshifts and transformative urban coalitions to promote climate resilience within an ongoing reurbanization process. The case of Villa 20, Buenos Aires

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In recent decades, informal settlement upgrading and housing deficit in Latin America has been addressed through a variety of urban programs, usually structured around physical-spatial and social actions with an emphasis on the provision of basic infrastructure and services, improved accessibility and connectivity and new housing, mostly done by conventional means. In general, they fail to incorporate new frameworks that provide solutions with strong environmental roots, such as Nature-based Solutions (NbS), Blue-Green Infrastructure (BGI) or Ecosystem-based Adaptation (EbA). This article explores the potentiality of NbS/BGI in contributing to solve structural problems in marginal urban areas, the mindshifts and actor coalitions needed to support this and how it may promote equity and justice. This is analyzed in a particular setting: Villa 20, an informal settlement in the City of Buenos Aires that is undergoing a participatory urban upgrading process with a strong participatory platform made up of multiple spaces and devices for consensual decision-making on re-urbanization aspects. In Villa 20, several interrelated projects and programs are focusing on sustainability. In particular, the Transformative Urban Coalitions (TUC) of the International Climate Initiative (IKI) is connecting decarbonization with urban inequalities and urban justice. The article reflects on some of the initial outcomes of the TUC program that builds upon the ongoing participatory upgrading process. To discuss the links between the use of NbS, mindshifts and transformative urban coalitions we look into the social setting, methods and tools that promote mindset shift. We explore initial mindset changes in government teams; community leaders; and

participants of an Urban Lab and the building up of a new transformative actor coalition. With this, we aim to better understand the possibilities and potential implications of implementing NbS in marginalized social contexts, contributing both to closing the knowledge gap and re-thinking future policies and programs.

KEYWORDS

decarbonization, transformative resilience, Nature-based Solutions, re urbanization, informal settlements, Buenos Aires

Introduction

Over the last decades, informal settlement upgrading and housing deficit in Latin America has been addressed through a variety of urban programs, often government led in partnership with other actors, structured around physical-spatial and social actions with an emphasis on the provision of basic infrastructure and services, improved accessibility and connectivity, and new housing (Brakarz et al., 2002; Rojas, 2009; Motta et al., 2018). This has been done mostly by conventional means and using gray infrastructure. More recently, these programs have started to address environmental concerns in relation to waste collection, safe sites and disaster risk reduction (Almansi et al., 2020). However, programs and interventions tend to fail to incorporate climate change considerations and new frameworks that provide solutions involving strong environmental roots, such as Nature-based Solutions (NbS), Blue-Green Infrastructure (BGI) or Ecosystem-based Adaptation (EbA). In fact, many of these upgrading programs developed well before there was any real concern around climate change impacts (Satterthwaite et al., 2020). There are still few studies on how informal settlement upgrading or re urbanization engages with climate change mitigation and adaptation (Collado and Wang, 2020). Seldom do programs in the region go a step beyond to provide for the needs these neighborhoods are experiencing today and will likely experience in the coming years in a context of climate change (Almansi et al., 2020). Not many programs aim for or result in providing integrated responses and the incorporation of climate resilience goals are usually complementary to the physical transformation of a neighborhood. Partially, this is because, as Ziervogel (2020) states, there is an inherent contradiction between “delivering urgent climate action while addressing the profound injustices that shape cities today” (p. 1) and “tensions between immediate needs vs. future needs” (p. 2). The lack of practical examples and inspiration could also be restraining needed changes. In other research¹ four ‘must haves’ have been summarized for

upgrading initiatives to incorporate measures such as NbS/BGI that contribute to climate resilience building. The first two are pre-requisites in any upgrading process, the last two need to be incorporated more broadly.

- Support community organizations to ensure initiatives are rooted in real needs and priorities (e.g., design of a rain garden contributing to flood mitigation during heavy rains).
- Support genuine local partnerships to ensure coherence and continuity of neighborhood transformation processes (e.g., new actor coalitions are exchanging knowledge and perspectives that drive innovation).
- Accelerate the incorporation of climate considerations when funding and investing in upgrading initiatives, long lasting infrastructure, and land use transformation (e.g., climate change considerations are incorporated in tender documents).
- Ensure funding that supports incorporating climate resilience in upgrading processes, including support to develop local funding sources (e.g., build the case so that it is incorporated as current expenditures in projects).

Cities increasingly face climate change impacts associated with extreme heat events, floods, water stress and windstorms to name a few. This is coupled with air, water and soil pollution and loss of natural habitats. Climate change is disrupting lives and livelihoods, especially for those who are the most vulnerable. Literature covers well how climate related risks are amplified for those who live and work in informal settlements and deprived neighborhoods (Revi et al., 2014; Hallegatte et al., 2016; Bazaz et al., 2018; UN-Habitat, 2018; Dodman et al., 2019; Satterthwaite et al., 2020; Leal Filho et al., 2021; Castellanos and Lemos, 2022) and how cities need to systematically address environmental risks together with social change (Revi et al., 2014; Ziervogel, 2019).

https://oecd-development-matters.org/2021/03/05/climate-resilience-building-in-informal-settlement-upgrading-processes/?blogsub=confirming#blog_subscription-5.

¹ See blog Hardoy (2021). Climate resilience building in informal settlement upgrading processes, in OECD Development matters

Responding to these challenges requires profound system change that involves not only structural and behavioral changes but also the realignment of values and goals held by collective and individual actors (Bartlett et al., 2016), changing the fundamental attributes of a system (Pelling, 2011; Intergovernmental Panel on Climate Change (IPCC), 2014). It requires new distributions of rights and responsibilities between state and citizens (Fraser et al., 2016) and bold leadership. Thus, actor coalitions are needed with the potential to reimagine and experiment (Ziervogel, 2019, 2020) in real life contexts.

There is a very direct connection between adaptation and addressing what the IPCC terms “risk-reducing” infrastructure (piped water that is safe, sufficient and affordable; good-quality sanitation and electricity; all-weather access roads; storm and surface drainage and street lighting and risk-reducing services –including hospitals/health care, emergency services. This is usually provided through upgrading in informal settlements. If it is done well, it builds household and community resilience to climate change (Satterthwaite et al., 2018, 2020). There is a less direct connection, however key, between decarbonization and informal settlement upgrading. But the need for GHG emission reduction is pressing to avoid dangerous global warming and therefore involves, amongst other things, looking into the design of buildings and infrastructure so they have lower levels of embedded carbon (Bartlett et al., 2016), and avoid future carbon lock in. In addition, as we move toward a warmer climate, more adaption will be needed. And delaying actions today will very likely reduce options in the future; without mitigation there is no realistic desirable future. Thus, climate change adaptation and mitigation need to be woven in informal settlement upgrading processes. Incorporating the dimension of climate justice aims to place concerns of equity and fairness in the center of the discussion.

The integration of nature as a fundamental element in urban development is often considered a luxury vis-à-vis the multiple development constraints faced by cities in the global south, particularly in deprived neighborhoods. In practice, the incorporation of nature in informal settlement upgrading and re-urbanization programs usually comes at the end of long conflicting and tiring processes, full of expectations around improving basic habitat and housing conditions and secure tenure. “Green” is presented as an additional complement that can only be thought of once urgent issues have been resolved by conventional means (Kozak, 2021). In such a context, integrating nature is usually limited to designing a few public spaces and planting some trees and other vegetation. There is little consideration and discussion around the role of nature and the use of NbS, BGI and EbA as practices that contribute to solving structural deficits in low-income neighborhoods while supporting transformative climate resilience, equity and climate justice.

Literature on the topic covers well how, in theory and practice, NbS, BGI and EbA tools act multidimensionally with the potential to contribute to the resolution of a vast array

of urban problems (e.g., floods, heat waves), while reducing GHG emissions, capturing air pollution and moderating the Heat Island effect, among many other benefits [FEBA (Friends of Ecosystem-based Adaptation), 2017; Browder et al., 2019; OCDE, 2020; Marsters et al., 2021; Ozment et al., 2021].

Despite progress made, there is an action and knowledge gap on how cities can further advance in the transformations needed to tackle climate change while ensuring response to the development needs of those most vulnerable and drive collective solutions (Garshagen et al., 2020). These include further exploration on transformative climate resilience, climate justice, and the use of NbS as a means to potentiate re-urbanization processes so that they can support transformation and climate justice. Cross-cutting these themes is the role of participation and mindset shifts. This article aims to start filling this gap by exploring the social context, methods and tools that promote mindshifts amongst local government teams, community leaders and actors participating within an urban lab set up to promote transformative change. This allows us to begin to examine the viability of new actor coalitions in promoting innovative ideas in already established participatory processes and explore to what extent the use of NbS can be advanced in marginalized urban social contexts, thus strengthening the search for equity and climate justice in reurbanization processes.

We discuss the links between the use of NbS, mindshifts and transformative urban coalitions in Villa 20, an informal settlement in the City of Buenos Aires that is undergoing a process of participatory redevelopment. Villa 20, or Barrio 20 (how today is usually referred to), is located in the area of Villa Lugano in Commune 8, in the southern part of the city of Buenos Aires (CABA), Argentina.² In 2016, its population approximately reached 30,000³ inhabitants. It is the city’s fourth most populous slum, representing almost 20 per cent of the city’s total slum population.⁴

2 It is important to mention that in terms of Agenda, legal framework, institutional arrangements and funding possibilities, Argentina has advanced very much over the last years. highlighting the provincial law 14.449 (Ley Acceso Justo al Hábitat) of 2012 and national law 27.453 of 2018. Both are the result of the collaborative work and of social movements. Law 27.453 declares of public interest the regularization of informal neighborhoods and provides a residence certificate. The National registry of informal neighborhoods (Registro Nacional de Barrios Populares – RENABAP) generates data on these neighborhoods to aid the regularization process.

3 IVC (2016), *Informe Final Censo 2016 Villa 20*, Departamento de Estadísticas y Censos, gerencia Operativa de Intervención social y Hábitat, gerencia de Desarrollo Habitacional, Instituto de Vivienda de la Ciudad, Buenos aires, available at <https://vivienda.buenosaires.gob.ar/censo-villa-20>. At the beginning of the re – urbanization process a neighborhood census was coordinated by IVC.

4 Cosacov, N, M M Di Virgilio, A Gil, M L Gil y de Anso, T Guevara, M Imori, M L Menazzi, F Ostuni, C M Perea, M D Perelman, J M Ramos, M F Rodríguez, M Paschkes Ronis and P Vitale (2011), *Barrios al Sur*:

The article reviews the implementation process of the first phase of the action-research program “Transformative Urban Coalitions: Catalyzing Urban Partnerships to Drive Systemic Transformation Toward Sustainability (TUC) of the International Climate Initiative (IKI)”⁵ which aims to drive systemic transformations and connect decarbonization with urban inequalities and climate justice. In this first phase (2021–2023) the program in Buenos Aires is working to complement the ongoing reurbanization process, promoting the introduction of new ideas, tools and practices that aim to drive transformative change through the joint construction of an urban laboratory in Villa 20. When this article was submitted, we were half way through the first phase.

The article has six sections. Following the introduction, Section Concepts and methods covers concepts and the research methods used. Section Study area and project background presents briefly the study area and the goals of the TUC program. In Section Results, we present some initial results of the program by focusing on the tools and methods used to drive mindset shifts and support transformative coalitions. In Section Discussion the initial findings are discussed and Section Final reflections includes final reflections of the process.

Concepts and methods

Concepts

The TUC program is developed around the idea that decarbonization has to be socially just and that transformation has to be inclusive and driven by the needs and views of a diverse group of stakeholders. Villa 20 is appropriate as a case to develop the TUC action research project, allowing for a bottom-up approach to discuss ideas and procedures, co-design, generate consensus and implement jointly.

In the context of Villa 20, the key elements that facilitate mindshifts and build transformative urban coalitions (i.e., people working together to achieve radical change) are: (a) enabling individual and collective choices, (b) connecting with real social motives, and (c) supporting the circulation of ideas among participating actors and a broader set of stakeholders. Both mindset shifts and actor coalitions are central in supporting and promoting alternative frameworks and practices. The challenge is to explore –in the real world– how mindset

shifts and new urban coalitions can actually guide urban transformation toward desirable urban futures that are just and inclusive.

The concept of Climate Justice (CJ) is rooted in the idea that while the responsibility for Climate Change (CC) lies by and large with wealthy people, its most severe impact disproportionately affects the poorest and most vulnerable. It is not only that those who have profited the least from the benefits brought by industrialization are now absorbing its negative externalities, it is also a question of basic human rights. Unless effective CJ policies are put forward to compensate for this injustice, a growing number of people –mostly in the Global South– will not be able to afford Climate Change Adaptation (CCA) and will be left to a recurring cycle of humanitarian crises.

As opposed to a purely environmental and naturalistic understanding of CC, the perspectives brought by CJ frame it as a political and ethical question.

CJ means that the costs of CC, both in terms of mitigation and adaptation, should be chiefly paid by the wealthy and most powerful. It also means that the efforts invested in climate-change action should also contribute to ameliorate social inequality. This is consistent with the call to generate synergies between mitigation, adaptation and sustainable development included in the sixth *Report on Climate Change 2022: Impacts, Adaptation and Vulnerability* of the II Working Group of the Intergovernmental Panel on Climate Change (*Intergovernmental Panel on Climate Change, I. P. C. C., 2022*). That is, reducing the “trade-offs between adaptation and mitigation to advance sustainable development” (*Intergovernmental Panel on Climate Change, I. P. C. C., 2022*), (p. SPM-30). Or as *Antwi-Agyei et al. (2017)*, (p. 11) put it: a “triple win’ of adaptation, mitigation and development.” It is important, in all cases, to pay attention to how rights and responsibilities are distributed. Only recently is research exploring how climate justice addresses urban inequalities (*Bulkeley and Edwards, 2014*).

Achieving CJ is connected with the quality of participation and the spaces, methods and tools used to enable meaningful participation, problem solving and joint decision making.

Participation promotes that governance, policies and practices are discussed between those who are part and can be affected by the decisions made. Participation therefore, is a precondition in designing and implementing physical and social transformations within particular social and environmental settings (*Motta, 2017*).

There is a series of basic conditions to ensure high levels of participation in re-urbanization processes: (a) existence of political decision and resources; (b) existence of previous organizational processes that support and are willing to engage collectively in a process; (c) existence of a technical team trained to carry out substantial and locally designed participation

Villa Lugano, Villa Riachuelo, Mataderos, Parque Patricios y Villa Soldati a través del Tiempo, Working Paper 56, Instituto de Investigaciones Gino Germani-Universidad de Buenos Aires (IIGG-UBA), Buenos Aires.

⁵ The International Climate Initiative (IKI) is an important part of the German government international climate finance commitment, led by Federal Ministry for Economic Affairs and Climate Action (BMWK). <https://www.international-climate-initiative.com/en/about-iki/>.

processes. Within this set of conditions, the participatory management process faces the challenge of balancing and articulating these three initial conditions with others that emerge as a result of the implementation of the participatory process, and includes decision-making both at macro and micro levels. The participatory process develops in time and space in the form of a dialectical spiral, with twists and turns, as consensus is reached and the process is adapted to give room to requirements that constantly arise in complex and uncertain contexts.

In the implementation of participatory processes, a main challenge is how conflict is managed while respecting consensus and promoting strategies that strengthen the levels of participation in the decision-making process. It is within this participatory framework that transformative change can happen, and can both tension and strengthen the relationship process-project (Motta and Almansi, 2017; Almansi et al., 2020; Motta et al., 2021), generating more radical changes.

Following a CJ perspective, it is worthwhile to explore the possibilities of implementing Blue-Green Infrastructure (BGI)⁶ in low-income communities, such as Villa 20. As a general principle, BGI points to the recognition of the innate capacities of green space and water, and the ecosystems in which they are embedded, to produce environmental benefits and to enhance the quality of life (Kozak et al., 2020, 2021; Henderson et al., 2022). One of its most used definitions describes it as a:

Strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services⁷ [JNCC (Joint Nature Conservation Committee), 2019: 5].

The BGI toolkit includes components that have long existed in the vast majority of cities (e.g., parks, green corridors, rivers, streams, lagoons, wetlands, tree-lined boulevards and gardens), as well as innovations out of traditional urban elements (e.g., bio-retention reservoirs, floodable parks, green swales and other bio-infiltration devices). In other words, green spaces, watercourses and water bodies –of different sizes and shapes– have been part of the traditional landscape of cities in different cultures and geographies for ages. What is the advantage, then, of considering them now as part of a BGI? The advantages are manifold. Firstly, conceiving them –and consequently, planning, designing and managing them– in terms of infrastructure puts the focus on one of their main functions: that of constituting biological corridors and networks. These are networks that run through cities and metropolitan regions, connecting them with their hinterland, allowing biodiversity to flow. Like all kinds of

infrastructure, BGI requires a fixed support, anchored to the territory, which facilitates the circulation and distribution of services. Just as the networks for water, electricity, natural gas, mobile phone, internet –and all of the urban infrastructure that support life in cities– require pipes, tanks, cables and antennas – which allow the circulation of flows (i.e., the services provided)– BGI is also made up of fixed parts, rooted in the earth that provide the necessary biological continuity for the provision of ecosystem services (such as the decrease of the Urban Heat Island effect and the regulation of temperature in general; improvements in the quality of air and water through the use of the phytoremediation capacity of urban vegetation; noise reduction; CO₂ capture; and greater control in the management of stormwater runoff; among many others).

Secondly, thinking of green spaces, watercourses and water bodies in cities as nodes, links and connectors of a network – and not as isolated episodes– not only enhances the capacity to produce ecosystem services and the management of their distribution, but also makes it possible to create circuits and itineraries with environmental quality, which enable new ways of circulating in cities. For this reason, BGI synergizes with sustainable mobility networks and particularly with those of non-motorized modes.

Finally, planning cities in these terms, quantifying the benefits and the socio-environmental contribution of ecosystem services, also makes it easier to discuss BGI on an equal footing with the other urban infrastructure, including –and especially– the allocation of resources. This means shifting landscape planning and design from the place of the ornamental, sumptuous and accessory, to that of the productive and essential; understand their budgets as an investment (in the same sense as that of the rest of the urban infrastructure) and not as an expense (as the maintenance of green spaces is traditionally conceived in municipal management).

Planning BGI means making room for nature in the city.⁸ This motto, necessary in all city neighborhoods, is particularly urgent in low-income neighborhoods, where the highest levels of overcrowding are found and public spaces act as essential expansions of the houses and flats. It is also in these neighborhoods where there is usually less quality green space per inhabitant, and where the phytoremediation capacity of vegetation is also most needed, along with the provision of ecosystem services to cope with heat waves and flood risk.

The current COVID-19 crisis has highlighted the need for quality green spaces close to where people live –ideally, in <15-min walk. A robust BGI network reduces the risk of flooding and improves the quality of water in storm water systems and their recipient water bodies, while promoting sustainable mobility and contributing to improving environmental quality.

⁶ BGI is usually understood as a form of NbS.

⁷ Ecosystem services are the multitude of benefits that nature provides to society. Biodiversity is the diversity that exists among living organisms, which is essential for the function of ecosystems and for them to provide their services (see FAO, 2021).

⁸ We refer here to the construction of places that favor the generation of natural ecosystems located in the city, deliberately avoiding the theoretical debate on the nature-artifice dichotomy.

Cities with better BGI networks, *ceteris paribus*, have better resources to cope with the current pandemic. Firstly, due to the high correlation between environmental quality and lethality of COVID-19, particularly in terms of air pollution.⁹ But also in terms of availability of contact with natural environments to look after the mental health of the population;¹⁰ even more so if the BGI is intertwined with mobility networks for pedestrians and cyclists.

The installed idea that the urgent needs of low-income neighborhoods, such as Villa 20, do not allow to pay attention to the environmental dimension in their planning and management hinders the ability to notice the multidimensional potential of BGI and its direct and indirect benefits in socio-economic and socio-environmental terms. The challenge is to think of BGI in low-income neighborhoods not as a complement that can be incorporated once all the previous urgencies have been resolved, but as one of the means available to address those urgencies; a path to the provision of services and the construction of urbanity with quality of life.

The incorporation of ideas in relation to SbN, sustainability and transformative change involves mindshifts and requires reflection on how ideas are transferred, co-created and circulated, together with a question mark regarding those whose needs and aspirations are being addressed (Romero Lankao et al., 2018; Chu and Cannon, 2021; Leal Filho et al., 2021). Díaz-Márquez (2019) brings attention to how in the process of circulating ideas, initial chore ideas are modified and new, unexpected, outperforming ideas emerge. The accent is placed in the internal capacity of individual and collective actors in changing ideas and therefore their reality (Liernur, 1986; Jajamovich, 2013). In the case of the re-urbanization process of Villa 20, social relations are built and strengthened around the circulation of ideas. These collectively constructed outperforming or out-of-the-box ideas guide the implementation of the re-urbanization process. In Villa 20, this molded the relationship between actors, the dialogue between demands and outcomes, and the overall management of the process. There was no space for copycat, importing or imposing ideas. Each one of the elements and instances of the re-urbanization process was the product of a discussion that resulted in an alternative idea than the one originally envisaged. This platform holds the TUC program, and sets the bar high.

⁹ See, for example, Bhaskar et al. (2020). Beyond the current pandemic, the magnitude of the harmful effects of atmospheric pollution on health –mainly produced by the emission of internal combustion engines– was already well known, in terms of incidence in the increase in respiratory diseases, disorders in cognitive development and premature deaths.

¹⁰ Access to green spaces reduces the risk of developing a wide range of disorders in children during adolescence and in adults. It is an important intervention at an early age to reduce the risk of depression, anxiety and drug abuse. See, for example, Engemann et al. (2019).

Any new idea and its implementation will be discussed, de-constructed and implemented only if it contributes to solving neighborhood needs. Discussion of ideas in the Buenos Aires UL of the TUC program are always filtered by their pertinence, social acceptance and their contribution to solve identified needs. Special attention is paid to the horizontal circulation of ideas and knowledge between actors and the integration of ideas and concepts missing until now.

Research methods

Research for this paper was conducted by a group of professionals and academics involved in one of the TUC program pilot cities (Buenos Aires), and responsible for the implementation of catalytic initiatives in Barrio 20 as well as the operation of an Urban Lab where new or alternative ideas can be discussed amongst a broad group of actors to create innovative solutions in a real-life setting. The TUC program is based on a process of action-research where different instruments, strategies and means are applied for the collection of information: interviews, direct observations, video recordings, document analysis, etc. Mainly, the techniques focus on direct or participatory observation, semi-structured interviews and audio and video recordings. These techniques allow triangulation of different sources and the use of flexible strategies given the diversity of ongoing situations, increasing interpretative certainty.

Data for the paper was collected during 2021 and part of 2022. Its collection, analysis and systematization are the result of a process of social construction of knowledge brought about by the interaction of participating actors and gathered during dialogues with key actors, small group meetings, field trips, and urban labs. Instruments are socially constructed by the participating actors of the Urban Lab: social leaders of Villa 20, city officials of the Housing Institute of the City who coordinate the re-urbanization process in Barrio 20, city officials from the Environmental Protection Agency who develop the city climate agenda, and city officials from the Urban Anthropology Secretariat that produce data for climate analysis, amongst others. The collective process allows us to reflect on ongoing practice, learn from it, conceptualize, and generate feedback that can further improve work. The social construction of knowledge operates as an integrating axis between practice and the transformation sought from the implementation of the TUC program.

These socially constructed and locally generated data is complemented with information from the ongoing re-urbanization process and specific literature that contributes to advance our understanding on the possibilities and potential implications of implementing NbS in marginalized social contexts.

Though the IKI TUC project on which we develop our research is at an early stage it has, nevertheless, generated some

evidence that shows an initial transformation in mindsets and actor coalitions. We organize these evidence in two analytical dimensions: (a) mindshifts and new coalitions expressed in changes of discourse of participating actors and integration of new actors and (b) design of interventions by the integration of ideas that were not on the discussed before.

Study area and project background

Study setting

The re-urbanization process in Villa 20 (see Figure 1) began in 2016 and it is anchored in a strong participatory platform made up of multiple spaces and devices for consensual decision-making on re-urbanization aspects (Motta and Almansi, 2017; Motta et al., 2018; Almansi et al., 2020). Until the participatory process of socio-urban integration started in 2016, Villa 20 shared the typical problems of low-income neighborhoods: lack of adequate provision of basic services and infrastructure (water, sanitation, electricity, all-weather roads, education and health services, communal and green open spaces), as well as poor housing conditions, overcrowding, poor ventilation and lack of natural light.

Due to its dimension and characteristics, the re-urbanization process-project (Motta and Almansi, 2017) of Villa 20 is a complex intervention developed in stages, coordinated by the Instituto de la Vivienda de la Ciudad (Institute of Housing of the City of Buenos Aires – IVC¹¹) and designed by the Participatory Management table (*Mesa de Gestión Participativa - MGP*) established by Law 5705/2016 of the City of Buenos Aires, which provided the legal support to the participatory process. Each stage of the process-project has different participatory devices which allow reaching decisions by consensus over varied aspects and themes. From the beginning, the different steps and participatory devices contributed to the design and implementations of the urban, housing and socio-economical dimensions of the re-urbanization process. In 2018, an Environmental-care table (*Mesa de Cuidado Ambiental*) was created to discuss and solve environmental problems, such as urban solid waste collection, floods, pests (especially rats), among others.

“Villa 20 has the best re urbanization law amongst all villas of the city of Buenos Aires. The secret to this is to have different political factions or fronts working together with neighbors and reaching consensus. We have discussions but the idea is to add, to push forward. In six years, much has been achieved but much remains to be done. My son has

learned from all this, he will carry on in the future as the re urbanization process needs at least three more decades” (Community leader, march 2022).

In this particular setting, between 2018 and 2019 authors participated in the inception phase of the TUC program, which finally started in 2021 and is currently half-way of phase 1¹². Villa 20 represented an ideal setting to test and develop the TUC program due to its strong and consolidated participatory process cross-cutting an ongoing reurbanization process. This included strong social relations and shared capacities between actors, a solid community organization and experience in practical physical transformations, therefore permeable to a virtuous process of circulation of old and new ideas. In addition, members of the Buenos Aires TUC team had been involved in the initial years of the reurbanization planning process maintaining very good relations and trust with community leaders, neighbors and the city government teams coordinating the re urbanization process.

Today in Villa 20, several interrelated projects and programs are focusing on sustainability. In addition to the TUC program there are also the following initiatives: (1). the Estrategia de Vivienda y Hábitat Sustentable (EVHS - Strategy of Sustainable Housing and Habitat), which is a government platform designed to improve urban conditions while reducing environmental impacts promoting adequate and affordable housing, norms on bioclimatic construction, energy efficiency and renewable sources, awareness raising, innovation, and development of indicators; (2). The Environmental Sustainability Project funded by Development Bank of Latin America (CAF) which is a component of the Socio-integration program of Villa 20, Rodrigo Bueno and Playón Chacarita. It aims to strengthen IVC responses in relation to environmental sustainability¹³; and (3). A cooperation with Agence Française de Développement (AFD) to support the city in developing urban policies and sustainable mobility¹⁴. An important difference between these programs and TUC is the approach used, while these tend to be top-down in their design, TUC proposes active co-design and collaboration.

¹¹ The Institute of Housing is an entity of the government of the autonomous City of Buenos Aires with administrative and financial autonomy, whose role is to implement housing policies in the city.

¹² The Project started in 2021. It is planned in two phases: phase 1: 2021 – 2023, and phase 2: 2024 – 2026.

¹³ It works across three axes: a. capacity building of community members and IVC staff on themes that go from sustainable design and bioclimatic architecture to circular economy, b. Solid waste management, and c. neighborhood project fund to support community actions on energy efficiency, use of renewable energy sources, urban green, vegetable gardens amongst others.

¹⁴ In the case of Villa 20, a participatory diagnosis identified the need for tactical urbanism, coordinating a cultural, social and sports agenda, and improving green spaces.

Project background

The TUC program aims to shift the sustainability trajectory of cities toward zero carbon emissions by 2050 by altering the deeper social, technological, and political structures and systems that are currently reinforcing high-carbon, resource-intensive urbanization. With this goal in mind, the program facilitates the establishment of transformative urban coalitions to develop new strategies for addressing local challenges in urban development and inequality while at the same time reducing carbon emissions. It is sustained on the idea that to be sustainable, rapid decarbonization has to be socially just and should create tangible social value. Therefore, transformations must be inclusive and driven by the needs and views of diverse groups of stakeholders, including citizens, policy makers, private sector and community-led organizations, among others. In order to change structures and values, the program seeks to shift the mind-sets of citizens and urban decision makers and build new actor coalitions.

It is led by a consortium of organizations (The United Nations University Institute for Environment and Human Security, UNU – EHS; the World Resources Institute, WRI; the International Institute for Environment and Development, IIED; and German Institute of Development and Sustainability, IDOS), and implemented locally by WRI Brazil, WRI Mexico and IIED – América Latina in five Latin American cities¹⁵ with their respective catalyst projects. It has various work packages (transformative research, capacity sharing, community of transformation, comms and film) structured around the implementation of projects in each of the pilot cities. TUC employs the approach of Urban Labs to support the implementation of catalyst projects and promote the creation of transformative coalitions. Within these urban labs, local actors explore, co-create and innovate in real-life contexts to shift development pathways.

Applying an urban-lab framework, TUC in Buenos Aires aims to generate mindset shifts across multiple actors and transformative urban coalitions to support decarbonization, equity and climate justice by means of integrating alternative practices such as the use of BGI approaches to potentiate a re-urbanization process, and in this way make them an integral component of future re-urbanization processes. In this context, decarbonization is not just an end in itself, but a means of solving structural problems and advancing climate justice in the process.

Results

With the idea of understanding how to promote processes that facilitate mind shifts toward climate adaptation and

¹⁵ The five cities are: Recife and Teresina in Brazil; Neocalpan and León in Mexico, and Buenos Aires in Argentina.

mitigation actions in marginalized communities, we reflect on the initial outcomes of the TUC program in Villa 20 currently underway. A growing body of literature points to the need for caution in framing resilience and climate adaptation related interventions as benefiting everyone (Chu et al., 2016; Meerow and Newell, 2016; Shi et al., 2016; Chu and Cannon, 2021; Johnson et al., 2021; Leal Filho et al., 2021). Therefore, right from the start, special consideration has been placed on: (1). co-designing the intervention strategy, discussing tools and methodologies and sharing information and knowledge between all participating actors; (2). The design of NbS as an integral component of adaptation and mitigation actions with the potential of triggering other social benefits.

As explained, we explore changes in mindsets of stakeholders involved in the TUC program and how, in the context of the Buenos Aires urban lab, ideas for Villa 20 are co-created driving transformative change. Essential to our research is to gain understanding on how to support processes that trigger mind shifts toward decarbonization and transformation, and the central role played by “participation.” We will briefly present the strategy and tools used during this first year of implementation and highlight some initial mind-shifts we observe between those involved in Buenos Aires.

TUC implementation

The TUC program started in 2021 in the middle of the pandemic. In Buenos Aires, as in other places, it was impossible to generate face-to-face exchanges. During most of 2021 the team in Buenos Aires focused on generating bilateral meetings with different actors from government, the community, the academy and NGOs. These bilateral meetings initially presented the program, how it linked into the re-urbanization process of Villa 20 and its potential of influencing future urban policies regarding informal settlements. Exchanges also allowed for the presentation and discussion of the concepts and tools used in TUC such as decarbonization, transformative change, NbS and BGI, the idea to work within urban labs and how it all connected and contributed to the ongoing re-urbanization process. An initial stakeholder map and the local context knowledge of the team contributed to identify who our main partners were for the initial stages of the program.

The main actors are the following:

- IVC with its different dependencies as they coordinated the re-urbanization process in Villa 20 and other informal settlements within the city. Also, they are housed within the Ministry of Human Development and Habitat responsible for coordinating all social integration programs. Within IVC, we coordinate work with International Relations



FIGURE 1
View of Villa 20. Source: IVC 2021.

in charge of overseeing all international programs, the “technical team” responsible for designing physical intervention and overseeing construction work, “the social team” that ensures the coordination of social policies and the “coordination team” responsible of tying everything together and make it work for the neighbors of Villa 20. With the teams within IVC we had a number of meetings and in September of 2021 signed a collaboration agreement for the implementation of the TUC program in Villa 20. With the “coordination team.” We also engaged with the coordinators of the Strategy of Sustainable Housing and Habitat (EVHS) and Environmental Sustainability Project that had also begun their work so as to align strategies and search for complementarities.

- Community leaders: Villa 20 has a very strong social organization operating under the umbrella of different political fronts. In the past, they fought for needed improvements and recognition, up until 2016 when the Integral Upgrading Process for Villa 20 was approved unanimously by the city legislature. Thereafter, community leaders have worked together to ensure the materialization of the integral upgrading process, the building of new houses and the titling process. We had several bilateral meetings with community leaders, we discussed and reframed concepts, included their concerns and began to co-design a specific engagement strategy with the community.

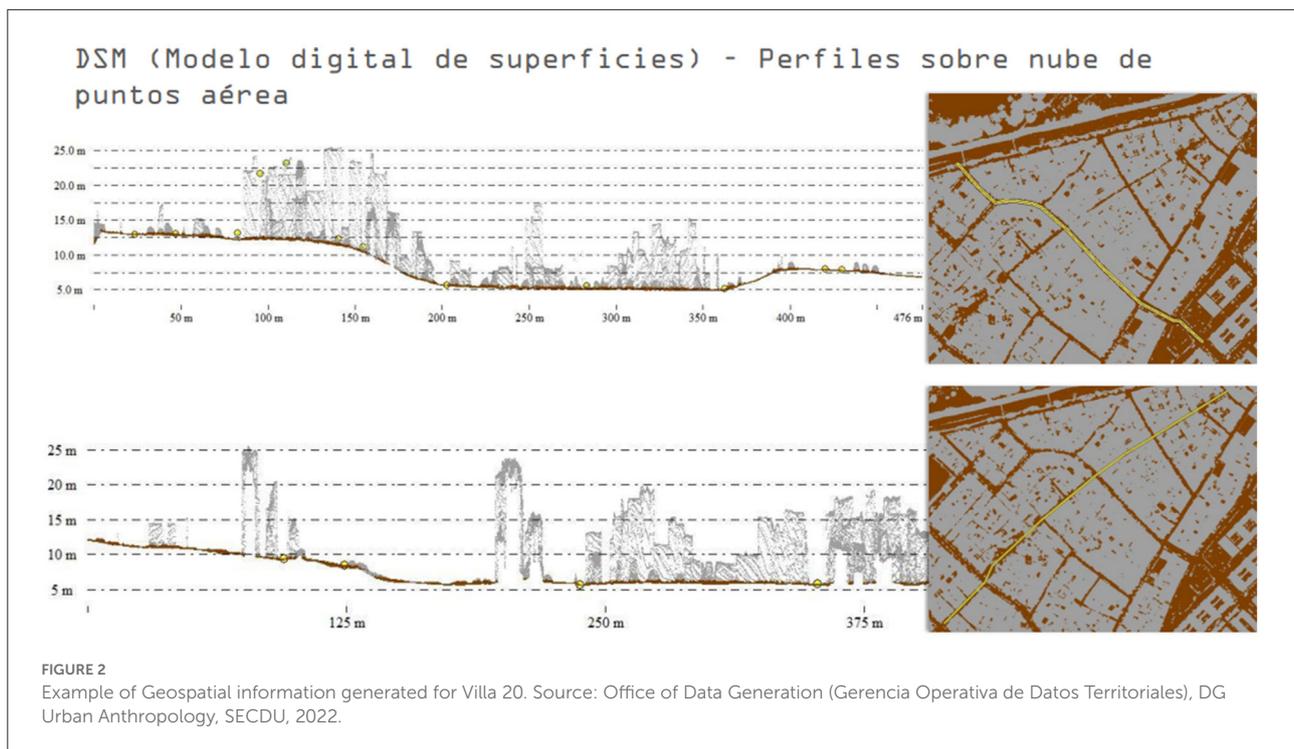
“IKI [The TUC program]¹⁶ brought an environmental dimension, we have severe environmental problems. When it rains water drains and sewage gets clogged, everything is cement and gray, we don’t have green spaces” (Interview with community leader, March 2022).

Neighborhood priorities, everything connects to the environment, for example rain or extreme temperatures reheats [electrical] cables, generates an explosion and fire. Now we talk more about it and begin to connect (Interview with community leader, March 2022).

What do I expect from IKI [the TUC program]? I wish for tools, gain knowledge, and understand the problems ahead that we need to deal with. During the [re urbanization] process we kept talking about the environment but we really do not understand what it is. We talk about waste, recycling. If you ask me, I will tell you we need trees but I have no idea why or which trees are best. So, we want to have tools so we can claim for our rights and generate awareness amongst neighbors (Interview with community leader, March 2022).

- Other city government offices: In particular, we began to articulate with the City Environmental Agency

¹⁶ The IKI TUC program is commonly referred to as IKI (International Climate Initiative or Internationale Klimaschutzinitiative in German).



(Agencia de Protección Ambiental – AprA) that is responsible of the City Climate Plan (PAC) and through them we were approached by the Office of Data Generation (Gerencia Operativa de Datos Territoriales) of the Office of Urban Anthropology. Until recently, these government areas had very little work in informal settlements.

“..members of AprA were invited to a workshop in Buenos Aires during the inception phase of TUC [June 2019].. I was particularly taken by the program and saw an opportunity to work more closely with staff involved in the coordination of the re urbanization process in Villa 20 and start incorporating indicators related to informal settlements in the PAC” (Meeting with Climate Manager of AprA, March 2022).

Later that year AprA conducted a pilot study to monitor temperature within Villa 20. Once we started with the Urban Lab the Office of Data Generation offered to prepare geospatial information for Villa 20 regarding sun incidence and solar radiation, digital elevation, soil absorption capacity, and temperatures as shown in Figure 2.

As briefly explained in Section Study area and project background, the participatory work in Villa 20 that supports the re urbanization process-project is organized around a series of participatory devices that operate at different scales. The main device is the participatory management table (MGP) where representatives from the community supported by a group of academics, NGOs, the ombudsman and professionals from the city government build consensus and oversee the general

re urbanization strategy. The Environmental care table (*Mesa de cuidado Ambiental*) took responsibility overseeing mostly day-to-day environmental problems associated with garbage collection, rodents and their relation to health problems. After the COVID 19 pandemic this table was renamed Environmental table (*Mesa Ambiental*) and in late 2021, when face-to-face group meetings were approved, it was natural that all sustainability projects and programs involving in one way or another Villa 20 would be discussed within this table. The TUC program was presented and soon it was settled that on a monthly basis these meetings would focus on co-designing the catalyst project. These meetings turned into the Buenos Aires Urban Lab, where we discuss ideas, iterate, innovate and plan to implement in a real-life context. In these meetings, we have the participation of all members of the environmental table (community leaders, city ombudsmen, IVC) plus representatives of AprA, Urban Anthropology, the other sustainability projects, and the TUC team. We invite specialists, academics, other community or government referents, as needed. Therefore, Urban Lab meetings become an opportunity to bring in new actors, ideas, resources, strategies, and greater incidence capacity, and in the process form a new actor coalition.

Analytical dimensions of transformative change

Mindshifts and new actor coalitions

To drive transformation the local team of the TUC program designed an incremental engagement strategy. A sequence of



FIGURE 3
Urban Lab Buenos Aires – 1st meeting, March, 2022. Source: TUC program.

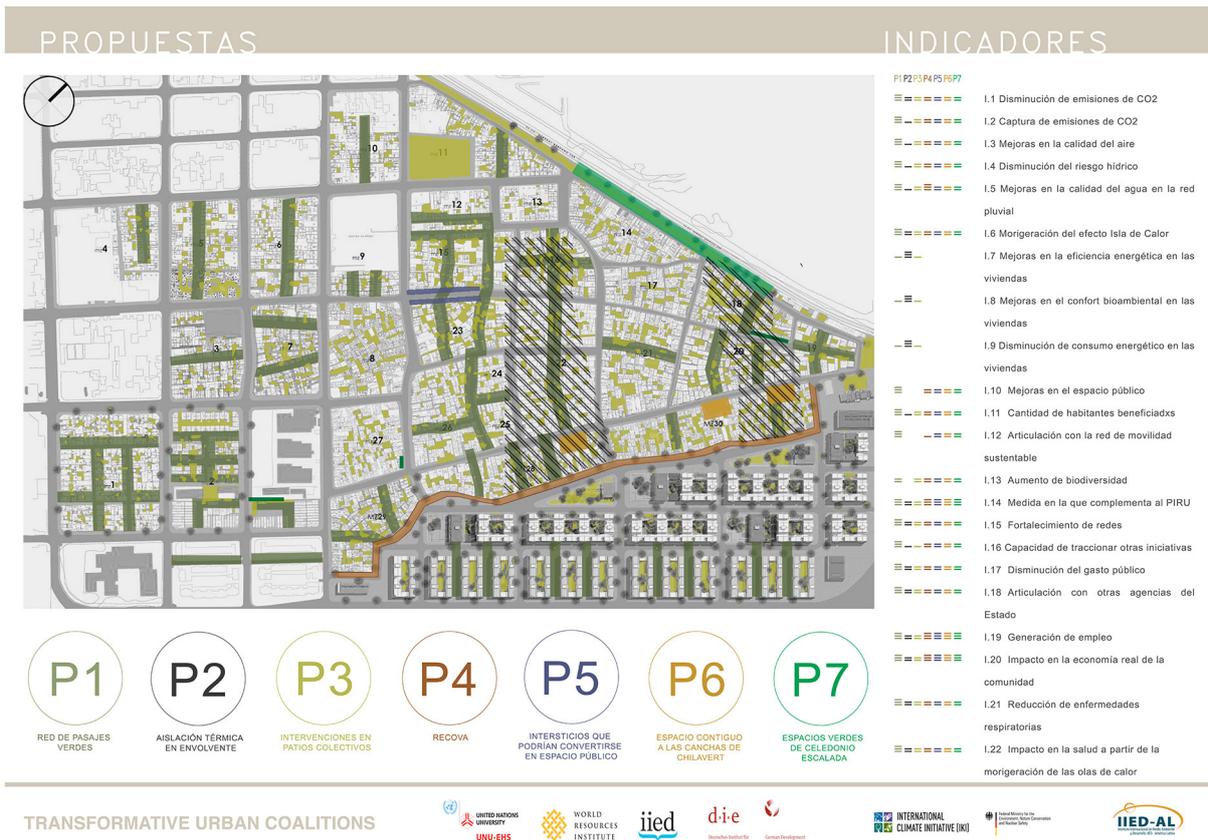


FIGURE 4
Possible pilot projects with indicators. Source TUC Program.



FIGURE 5
Visit to Paseo Ambiental del Sur APRA, April 2022. Source TUC Program.



FIGURE 6
Urban Lab Buenos Aires, 3rd meeting, May 2022. Source TUC Program.

six urban lab meetings was designed with its corresponding set of tools and methodologies to reach various results during each meeting. In between these urban labs, individual and small group meetings were held with participating actors to design and validate each one of the following steps, including the next urban lab workshop.

Urban-lab workshops cover presentation of participants, their role and interests, presentation of the TUC program, recap of the re-urbanization process, explanation of new concepts and hand on engagement with participatory design and in the near future with implementation and monitoring.

In order to achieve the integration of actors and enhance the work of the coalition, it was necessary to identify what contributions were brought to the urban Lab by each one. In this sense, the first urban Lab workshop was aimed at having each of the groups of actors present their specific knowledge and made available to the new coalition to guide decisions (see Figure 3). The systematization of the written and audio-visual records of the urban Lab shows how collective knowledge is gradually built: the group of social leaders described the re-urbanization process, the IVC presented an update of the re-urbanization work plan, APrA presented the multiple activities they carry out in relation to climate change and especially described the study of heat islands implemented in Villa 20, and urban anthropology described the digital geospatial analysis tools it uses to generate maps of solar radiation and temperature, models of digital elevation, urban vegetation, etc. and how this could be used in Villa 20, and the TUC team presented initial ideas of the use of NbS and BGI with concrete examples that could be used.

In a following urban lab workshop we continued to share information on experiences where NbS/BGI was used in different contexts as a way to inspire innovation and worked on a general evaluation of different sectors of the neighborhood to be intervened. A matrix with possible areas of intervention, typologies of interventions and a set of indicators to understand what these measures were contributing to was used as a tool to evaluate the relevance of the intervention in the different sectors.

The matrix proposed a number of possible pilot projects (P1 to P7) and identified a series of indicators related to the aims of the TUC project (I1 to I22). The potential projects included interventions aimed at architectural scale (e.g., addition of thermal insulation in the building envelope of existing houses), as well as urban-scale proposals (e.g., a network of green streets). The indicators linked to the pilot projects can be divided between: a. those that aim to measure environmental benefits, including decarbonization (e.g., reduction in CO₂; carbon sequestration; air/water quality improvement; flood-risk reduction), and b. those that aim to assess general co-benefits, including the strengthening of the current re-urbanization process (e.g., public-space improvement; job creation; strengthening of community

networks). The matrix was summarized and illustrated on a map with the geo-identification of the proposed pilot projects (Figure 4 and Table 1).

In addition, a guided visit coordinated by APrA to a nature reserve¹⁷ near Villa 20, including composting stations, nurseries, orchards, wetlands, wind turbines and solar panels, was generated as a learning and exchange opportunity, as triggers for intervention ideas (Figure 5).

The progressive development of a new coalition of actors is central in supporting mind-shifts. The incorporation of new actors to the ongoing participatory process is gradual and by means of the Urban Lab, as they incorporate new frameworks, participating actors also need to integrate knowledge developed during the re-urbanization process (Figure 6). We soon began to observe and register mind-shifts, actors incorporating new concepts and ideas, considering their relevance, social acceptance and if they are contributing to solve identified needs, and coalition building. For example:

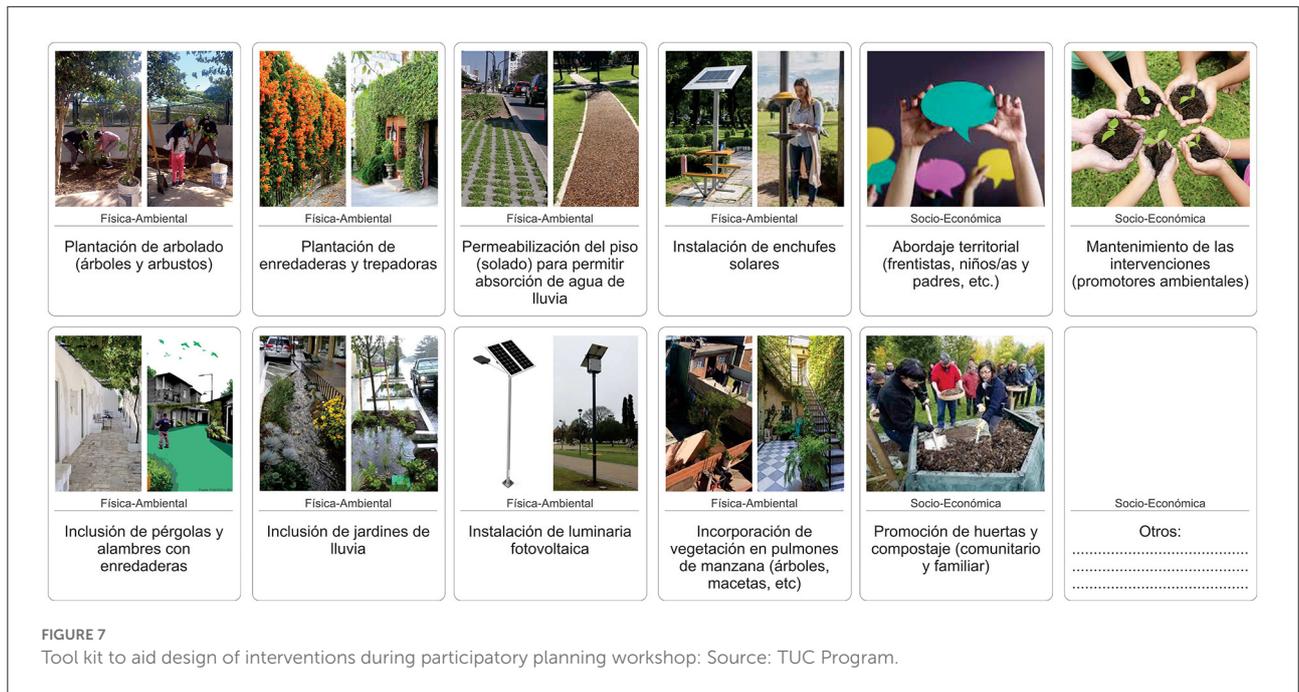
“Maybe I didn’t realize it, but when they showed it to me, we went to the finalized alley [Passage 19] and it is all cement. There is a lack of green, I don’t know why, but it is missing. We wanted so much to finish the passage and we didn’t think of something more sustainable.” (Community leader, March 2022).

These initial three urban lab meetings, together with encounters with community leaders, technical and coordination teams from IVC and territorial visits prepared the setting for a fourth urban lab meeting focused on design interventions.

In the following urban lab, during the workshop, participants were divided in three groups to agree on a set of goals TUC interventions should respond to and discuss and agree, in broad terms, areas and types of intervention. Participants agreed on a shared goal: through the collaborative work of actors to improve bioclimatic comfort of houses to reduce respiratory problems. And included several specific goals: complement the re-urbanization process and other public-private interventions in the neighborhood, reduce the heat island effect and flood risk, improve stormwater quality, use of communal spaces, enhance biodiversity and awareness raising on climate change and environmental risks and the need to sustain actions in the long term.

A workshop methodology was applied based on the use of a toolbox (see Figure 7) containing different cards associated to a type of intervention (e.g., tree and shrub planting, green walls, pergolas, rain gardens, permeable soil, etc.), possible areas of intervention (street, alley, communal courtyard, public space), and as well as the necessary activities to sustain it (related to ownership, capacity building, awareness raising, maintenance, among others).

¹⁷ Visit to ‘Paseo Ambiental del Sur’ on April 2022.



Finally different intervention areas were prioritized and agreement was reached on three intervention levels (retrofitting finished work, new minor interventions in alleys and courtyards, and complex interventions in new streets. In addition, modifications to tender documents, connections to other ongoing projects, and an overall “green” master plan for the neighborhood began to be discussed.

Design of interventions as drivers of transformative change

The fourth urban lab was carried out before the closing of this paper. Its goal was to initiate the participatory design of each intervention by sector, with the participation of the community (neighbors from each sector) (see Figure 8). Each sector group was provided with satellite images, maps of particular areas, transparencies with elements such as trees, shrubs, green walls, and small urban wildlife, tools for cutting and pasting, and catalogs of native vegetation and NbS and BGI tools to consult. After a recap on past urban labs and an introductory presentation by a landscape specialist, each group discussed problems associated with climate impacts and began a hands-on process to design a possible intervention. The following figures illustrate the process.

The problems to be mitigated with TUC interventions are, in general: heat in summer, reduced sunlight in winter, absence of vegetation and absorbent soil, reduced space for incorporation of street furniture or BGI interventions, car parking in pedestrian areas. The interventions proposed were: vegetation on vertical support, flower beds, complementary

structures between opposite front walls as support for vegetation - shade planes, incorporation of absorbent soil sectors, murals with games, tensors between facades (support for green - shade planes), trellis trees, vehicle control devices, signage and labeling: to interpret the heritage of the elements present and that are being added in the area.

The potential of physical transformations within the neighborhood through the co-design of different interventions applying NbS tools that complements the construction work of the re-urbanization can be seen in Figure 9. These physical transformations contribute to anchor ideas in a real-life setting, implementing options that can be measured qualitatively and quantitatively, generate appropriation, and convince others regarding the multiple benefits of NbS. NbS/BGI measures are discussed and a new dialogue established with technical government teams to discuss possibilities, this is validated by the different actors involved in the urban laboratory, and acts as a catalytic of mindshifts.

Next steps include meetings and UL workshops to discuss initial technical and financial feasibility, preparation of executive project drafts to discuss at workshops focused on each of the areas of intervention, preparation of budget and implementation plan.

Discussion

As mentioned, we are at an early stage of the IKI TUC project, however we are registering evidence of the transformation process initiated. We find evidence of mindshifts

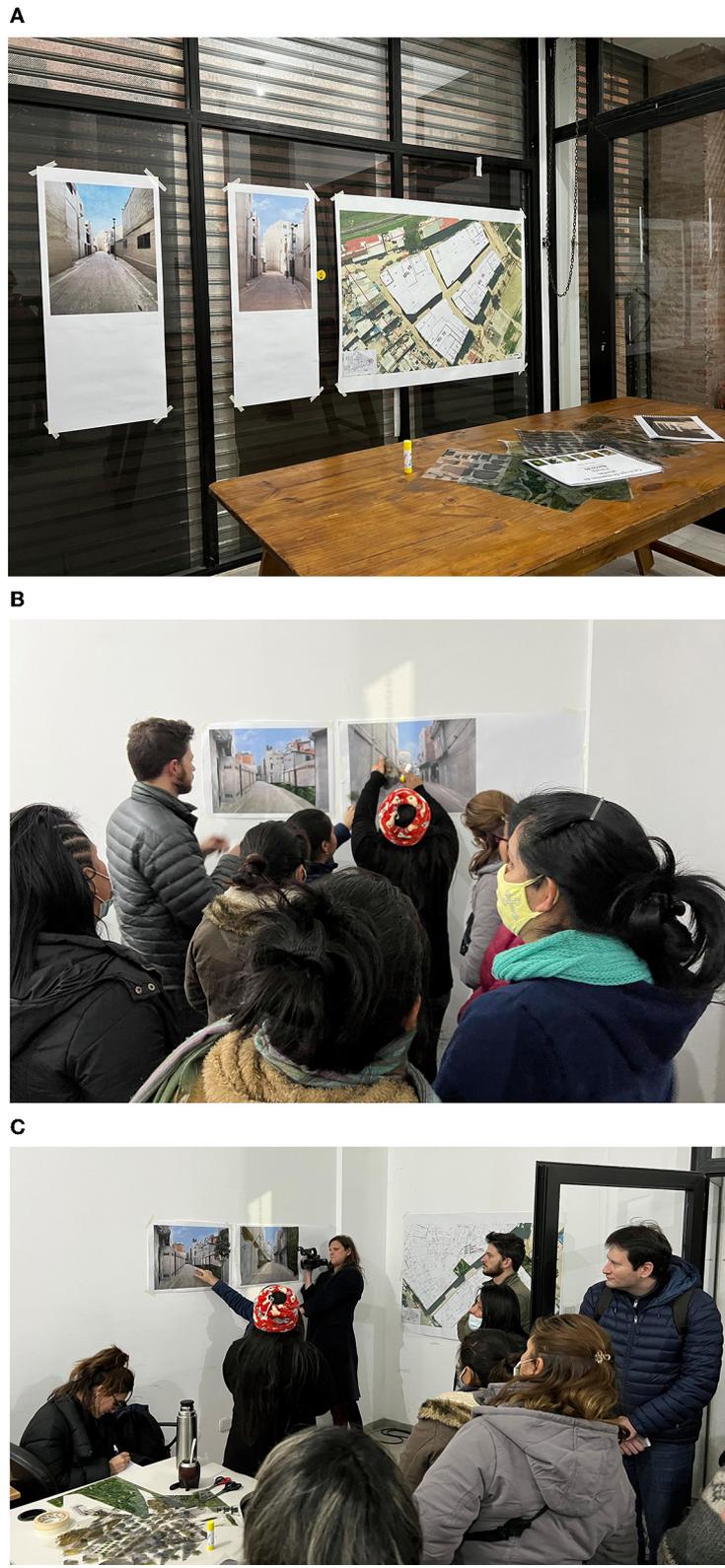
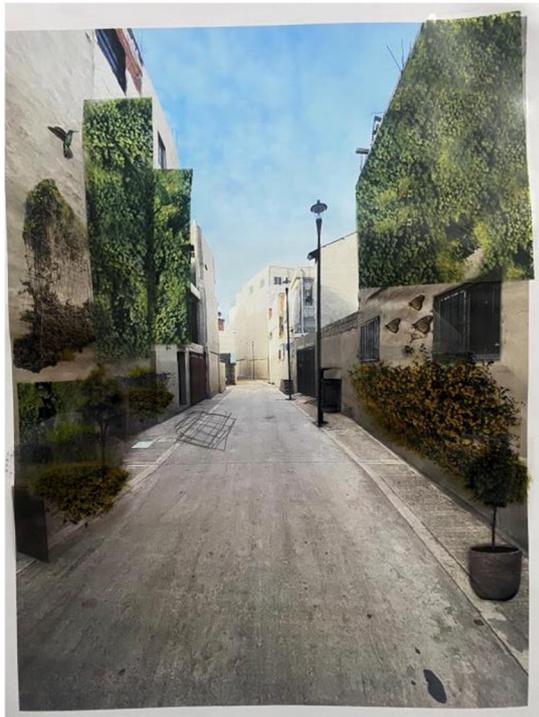


FIGURE 8
(A–C) Working during Urban Lab meeting, June 2022. Source: TUC team.

A



B



C



D



FIGURE 9 (A–D) Working on ideas of pilot projects - Before and after - during Urban Lab meeting, June 2022. Source: Mariana Giusti for TUC program.

and new actor coalitions along three different dimensions as mentioned in Section Concepts and methods.

From dialogues with community leaders, it is clear that everyone is learning by doing and that the TUC program offers an opportunity to debate over themes that were almost absent from the re-urbanization process – and even city planning at large. For example, a community project funded under the Environmental Sustainability project of CAF opted to work on *Pasaje 19* in order to generate awareness by means of and artistic intervention and align that intervention with the use of BGI designed within the TUC project. There is a recognition that environmental aspects were usually something to be discussed once other pressing issues were covered. However, now it is easier to see connections and how addressing these environmental concerns within the design process maximizes outcomes, for example the use of impervious soil may be contributing to increased water runoff and the lack of green increases heat island effect. From records of meetings of the *Mesa de Cuidado Ambiental* initially and now *Mesa Ambiental* it is possible to observe how the focus has shifted from addressing environmental emergencies such as waste collection to more strategic and long-term environmental concerns such as heat island effect and heat waves or the need to incorporate pervious ground.

In many aspects, TUC program provides a support mechanism to enable a learning process and empower citizens to meaningfully engage in a collective planning process. If they know what to ask for, community leaders will act to get it and will work with their neighbors to raise awareness and generate appropriation and commitment.

“The educational part is fundamental, to sit down and explain ourselves from scratch. We learned how to read architectural plans from scratch, and we ended up modifying them. We learned what sustainability is, what renewable energies are, how they work in other countries, their benefits, that maybe they work in other countries and not here... We need knowledge, not only at the environmental table, I had proposed to go to schools, those kids have already grown up in another context” (Community leader, march 2022).

A much-awaited intervention of the re-urbanization process was the opening of an alley (*Pasaje 19*) and it was nicely done. However, after months of talking about climate change, NbS and BGI, urban-lab participants realized that these pedestrian walkway had all types of green missing as mentioned earlier in the article. A recognition it had been a missed opportunity to design something better, more forward looking into the climate problems they were already experiencing. The same occurs in terms of the design of new housing and institutional buildings within the neighborhood, or the use of renewable energies; what could have been done better? What can we do from now on? The visit generated by APrA to Paseo Ambiental del Sur allowed

participants to incorporate in their intervention’s new insights. Awareness regarding the missing green goes beyond *Pasaje 19*.

“..we never talked about it at the MGP. For example, when we discussed about the new buildings being constructed, we thought they had to have a patio and green areas. But when they told us about including green terraces, we said no because of the cost for the neighbor to maintain them. We could have said yes and discuss that city government be in charge of maintaining it until the building consortium could. Now we are complaining because we did not put green terraces, what fools” (Community leader, march 2022).

Interest generated on the TUC project is also a noteworthy indicator. Not only has the *Mesa Ambiental* allocated time to work on the TUC project, commitment is also constantly high. Meetings have regularly 30 participants. In between workshops there is constant generation of bilateral meetings or activities in relation to the themes of the project.

The urban lab in terms of the different actors involved and the TUC program, are soon becoming a kind of trusted “advisors” on these themes. Each participating actor comes with particular expertise, resources, capacity to generate data, and bring other actors onboard. Its horizontal participatory dynamic allows a collective design of the process.

“When we started discussing new housing, architects from the university showed us that we could do other things such as patios to improve ventilation, green spaces, etc. We could discuss that because we had learned about it and worked with the architects who were advising us” (Community leader, march 2022).

“I would like IKI TUC to contribute to building better public policies. In Barrio 20 things have been done differently. I am a teacher; I would like future generations to think about the environment in all areas” (Community leader, march 2022).

For government teams, TUC is also providing a valuable opportunity, especially in terms of actor engagement and facilitating discussions that were not really on the table due to other priorities and agendas.

“Our work is evaluated in terms of achieving specific results and using NbS/BGI is not between them ... TUC provides an opportunity to discuss in detail themes that are left out due to other priorities, lack of specific tools and time” (City official, may 2022).

Both APrA and Urban Anthropology are collaborating actively in the urban lab. For example, along with APrA we are designing a strategy to install temperature and humidity stations to monitor changes, with the aim of using it as an awareness

TABLE 1 Criteria used to aid prioritization of interventions.

Criteria	Climatic corridors Plan	Influence construction documents of re-urbanization plan	Community awareness	NbS within communal patios	NbS in Alley of block 19	NbS in Alley of block 20	NbS in Barros Pazos street
Climate benefits							
Reduce CO ₂ emissions							
Capture CO ₂ emissions							
Increase biodiversity							
Mitigate heat island effect							
Urban environmental benefits							
Improve air quality							
Reduce flood risk							
Improve bioclimatic comfort of houses							
Improve water quality that goes to drainage system							
Improve use of public space							
Articulate with the sustainable mobility network							
Complements the re urbanization process							
Capacity to trigger other initiatives							
Reduces public expenditures							
Articulates with multiple government agendas							
Social benefits							
Strengthens networks							
Has a real positive economic impact within the community							
Reduces respiratory diseases							
Positive health impacts related to mitigation of heat waves							
Source TUC Program.							

raising tool, generating data for the City Climate Action Plan, monitoring TUC interventions and as an engagement strategy with IVC. Along this line, the Office of Urban anthropology is preparing data for the intervention areas prioritized in the urban lab, both to guide intervention and be used to influence decision making.

“All the information [geospatial] we generate needs to be useful to the community, we can arrange a visit and show all the data gathering instruments we use, we are here to contribute to the process” (City official, UL march 2022).

The coordination team of IVC is using and adapting methodologies and approaches developed for the Buenos Aires Urban Lab for other activities such as the titling process or the environmental table. Within the framework of the Environmental Sustainability Project funded by CAF, it was also noticeable how several of the community projects used ideas discussed within the urban labs and adopted them in their proposals.

“Participating in UL workshops allows us to experience and appropriate tools, workshop methodologies and incorporate themes that contribute and elevate discussions in other participatory spaces such as at the MGP as we initiated work around titling” (City official, may 2022).

Final reflections

This paper has covered the social setting, methods and tools used to initiate mind-shifts that drive transformative climate resilience in Villa 20. We looked into the specific context and problems of an informal settlement, such as Villa 20, and explained the tools and methods used (bilateral meetings, urban lab workshops, tool box, funding of initiatives, generation of data, site visits, etc.) to generate mind-shifts and introduce NbS as a mean to gain equity and climate justice as well enhancing climate resilience in marginalized urban social contexts. We also presented the Buenos Aires urban lab as a place where we can both follow transformative change and use it as a tool to generate mind-shifts and coalition building.

The TUC program is providing an opportunity to debate themes that were almost absent in the discussions and implementation of the re-urbanization process, and even from city planning at large.

We cannot ascribe mind set changes to TUC alone as many programs and initiatives are being implemented in the city and within Villa 20 that contribute to generate new discussions and practices that directly and indirectly modify mind sets. Also, news and social media constantly bring attention to climate change and environmental problems. However, within this brief

period we have seen that many of the actors involved with TUC often begin to relate addressing pressing needs regarding housing, infrastructure and services (part of the re-urbanization process) with NbS and climate change adaptation and mitigation goals. Also, a recognition that these themes can be discussed and acted upon in marginalized urban settings, not something for the “formal” city, contributing to address re-urbanization with climate change adaptation and mitigation in mind. And how this integration can, in fact, potentiate positive results, offering a kind of win-win situation. Essential to our research is to gain understanding on how to support processes that trigger mind-shifts toward decarbonization and transformation, and the central role played by “participation.” This small but significant changes are registered during interviews, field visits, meetings and ULs.

All participants at the Buenos Aires Urban Lab are learning by doing, finding an opportunity to innovate and collaborate with climate resilient transformation in mind. The ULs have opened a participatory space where new actors are getting involved and contributing to the ongoing re urbanization process, ideas are circulated that elevate and potentiate discussions. Initial results suggest, following [Bahadur and Tanner \(2014\)](#), that initiatives that transform must understand climate resilience from the perspective of those who are part of the process, challenging ways of thinking and working. The integration of NbS and BGI measures that are low-tech and modular allow for a more direct involvement of neighbors along all the process, from co – design to actual implementation and maintenance.

In an attempt to summarize enabling factors that have contributed to initiate mind set changes we highlight the following:

- The particular moment themes around climate resilience, climate change, decarbonization and the use of measures such as NbS is brought to the discussion and how it is consciously presented as contributing to overall neighborhood improvement.
- The decision that weekly participatory discussion tables that oversee the reurbanization process were allocating equal time between overall technical issues and environmental issues.
- Having financial resources to actually implement, something concrete with physical results that contributes to anchor transformation.
- The possibility to be part of the implementation. Interventions will be implemented by community groups generating employment opportunities and developing capacities.
- Good working relationships between participating actors and established procedures, built over years, which allowed for an easy incorporation of new actors.

- Visibility, most actors involved take advantage of the visibility that a project such as this can generate to further bring change and support to the neighborhood.

There are many practical challenges ahead, in particular, the long-term maintenance of the interventions, and scaling up sustaining coherence between future interventions and urban policies. We expect that the process developed will generate the needed mind-shifts and create collaborations between actors to overcome these challenges.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

JH wrote first draft of the manuscript. JH and DK edited final version. All authors contributed to sections, contributed to design of the research, read, and approved submission.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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