



Urban Pathways

NATIONAL LOW CARBON URBAN ACTION PLAN BRAZIL



**Wuppertal
Institut**

UN HABITAT
FOR A BETTER URBAN FUTURE

UN
environment
programme

Author: Instituto Nossa BH

This publication is part of the Urban Pathways project

Urban Pathways Secretariat

www.urban-pathways.org

Funded by



INTERNATIONAL
CLIMATE
INITIATIVE



Federal Ministry
for Economic Affairs
and Climate Action



**NATIONAL LOW CARBON URBAN
ACTION PLAN
BRAZIL**

Urban Pathways

Project concept

Project aims

The Urban Pathways project helps delivering on the Paris Agreement and the NDCs in the context of the New Urban Agenda and the Sustainable Development Goals. It has established a facility in close cooperation with other organisations and networks active in this area to support national and local governments to develop action plans and concrete implementation measures to boost low-carbon urban development. This builds on UN-Habitat's role as "a focal point on sustainable urbanisation and human settlements including in the implementation and follow-up and review of the New Urban Agenda". The project develops national action plans and local implementation concepts in key emerging economies with a high mitigation potential. The local implementation concepts are being developed into bankable projects, focusing on the access to urban basic services to create a direct link between climate change mitigation and sustainable development goals.

The project follows a structured approach to boost Low Carbon Plans for urban mobility, energy and waste management services that deliver on the Paris Agreement and the New Urban Agenda. The project works on concrete steps towards a maximum impact with regards to the contribution of urban basic services (mobility, energy and waste management) in cities to global climate change mitigation efforts and sustainable and inclusive urban development. This project makes an active contribution to achieve global climate change targets to a 1.5°C stabilisation pathway by unlocking the global emission reduction potential of urban energy, transport and resource sectors. The project will contribute to a direct emission reduction in the pilot and outreach countries, which will trigger a longer term emission reduction with the aim to replicate this regionally and globally to make a substantial contribution to the overall emission reduction potential.

This project implements integrated urban services solutions as proposed in the New Urban Agenda providing access to jobs and public services in urban areas, contributing to equality and social coherence and deliver on the Paris Agreement and the Sustainable Development Goals. This is the first dedicated implementation action oriented project, led by UN-Habitat to deliver on inclusive, low-carbon urban services. Securing sustainability and multiplier effect, the project aims to leverage domestic and international funding for the implementation projects that will follow from this initiative



Urban Pathways



Urban Pathways Project and Replication Cities



DOCUMENT INFORMATION

The Urban Pathways project embarked on a four-year programme which started in October 2017. It helped deliver on the Paris Agreement and the NDCs in the context of the New Urban Agenda and the Sustainable Development Goals. Its aim is to make a direct contribution to sustainable urban development by focusing on implementation projects in the areas of mobility, energy, and resource management.

Initially, the Urban Pathways project focused on India, Brazil, Kenya and VietNam as four pilot countries for the implementation of the programme's identified work agenda. Over the years, it stretched its activities far beyond those countries, being active with pilot projects in 9 cities with replication activities in many more.

The Urban Pathways project had developed and helped to implement a variety of pilot projects for each of the partner cities. During this intense period of cooperation and interaction the team has gained understanding of some of the obstacles and gaps of the regulative framework and / or (lack of) capacities of the partner cities and countries. This report summarizes the lessons learnt, but with a focus on the national level and how the national authorities can help to support low-carbon action in cities.

The Urban Pathways approach starts with rather small-scale, bottom-up activities, believing in the potential of replicating and upscaling such pilot projects. Our experiences highlighted the fact that while material sites and infrastructure of course play an important role - a mindset change is a pivotal precondition for transitioning to sustainable urban development. Thus, small, low-cost projects, such as the EcoZone or Tactical Urbanism, focusing on neighbourhoods as the geographical scale can play an important role in speeding up low-carbon urban action. Also, at the neighbourhood level an intersectoral approach is easier applicable, addressing simultaneously different sectors, such as mobility and waste, through a series of activities that include tactical urbanism, awareness-raising, community participation and impact assessment. This report shall shed light on how the Urban Pathways pilot project can be scaled up, while making recommendations that focus on how the national level governments can help to initiate, strengthen and spread such action.

TRENDS, DRIVERS & POLICY ENVIRONMENT

Brazil is the 6th largest emitter of greenhouse gases in the world (SEEG, 2019) and responsible for releasing 10.4 tons of CO₂e per inhabitant annually, which is above the global average (7.1 tCO₂e). The number is higher than China (9) and India (4), but lower than the United States (18). In 2019, Brazil's GHG portfolio comprised five main emitting areas: the largest fraction of GHG emissions stemmed with 44% from the land-use change and forestry sector. This is followed by agricultural emissions with 28%, energy with 19% and by smaller fractions stemming from industrial processes and waste. It's important to highlight that within the urban context, the emissions from the energy sector are the most relevant. From 1990 to 2019, its emissions increased by 114%, going from 10% of Brazilian emissions in the early 1990s to 19% of these emissions in 2019. Transport is responsible for 47% of energy emissions, with 23% referring to passenger transport and 25% to cargo - it is observed that the use of petroleum products, diesel and gasoline are by far the biggest source of emission from this activity. Moreover, according to the 2026 Decenal Plan of Energy Expansion, emissions of the energy sector are expected to increase to 57% of total emissions in 2026 (Ministério de Minas e Energia, 2017).

Nevertheless, Brazil has achieved remarkable progress in reducing its GHG emissions since 2005.

With 40 percent of renewable share in the energy sector, Brazil has almost reached its Nationally Determined Contributions (NDCs) target of 45 per cent by 2030 (Arioli et al. 2018). On 9 December 2020, Brazil submitted its updated NDC, confirming its existing target for the year 2025 (a 37% reduction in emissions below 2005 levels), and committing to its previously indicative target for 2030 (a 43% reduction in emissions from 2005 levels). The submission also emphasises the NDC's compatibility with an "indicative objective of reaching climate neutrality in 2060".

However, the positive trend in Brazil's policy of emission reduction seems to have ceased in 2016 (CAT 2018). On the one hand, urban emissions are increasing most rapidly due to the population and economic growth (The WorldBank Group, 2010). On the other hand, an increase in deforestation by 30 percent with more than half of it in the Amazon area, emitting approximately 130 MtCo₂ alone in 2016, conflicts Brazil's commitment to the Paris Agreement, including amongst others the aim of complete abolition of illegal deforestation (CAT 2018).

Moreover, despite the rise in ethanol use for vehicles, the road passenger transportation was still based with 70 per cent on fossil fuels in 2010. In addition to the persistent use of fossil fuels for vehicles, it is important to highlight the continuous increase of the fleet throughout the country and especially in medium and large cities. National statistics point to a fleet that has exceeded 100 million vehicles in recent years. According to the Global Status Report on Road Safety by WHO, Brazil has the fourth largest vehicle fleet in the world, only behind India, China and the USA. In parallel to this, the use of individual motorized transport to the detriment of public transport has grown. Among the reasons that explain this fact are urban policies that encourage automobiles and the crisis in the public transportation sector, which does not have a national financing policy and relies exclusively on fare revenue to maintain itself. As a consequence, CO₂ emissions generated by the burning of fuels in passengers' road transportation sector experienced a permanent rise since 1985 (Federal Government of Brazil/IPEA/MP, 2016). On transport, while biofuels have contributed significantly to decrease the emissions intensity of the road transport sector in Brazil, full decarbonisation of the transport sector will require a fast uptake of integrated solutions. 2019 was the year in which the most biofuels (ethanol and biodiesel) were consumed in Brazil.

Currently, Brazilian policies do not promote the diffusion of electric mobility. The country prioritizes ethanol to mitigate CO₂ emissions from the transport sector. Electric vehicles—particularly since over 80 percent of Brazil's electricity is renewable—may offer a viable way to decrease CO₂ emissions in Brazil, but will more importantly boost public health in cities. The local reduction in air pollutants is particularly key as tailpipe emissions are reduced to zero for both battery electric vehicles and fuel cell electric vehicles. Electric buses are one opportunity for the development of low-carbon industry and competitiveness in Brazil. Not only can jobs be created throughout the e-bus production chain, but investment in such public transit also reduces local air pollution and its impact on public health. Despite that, Brazil doesn't have a clear policy regarding electric vehicles and a robust transition plan to decarbonize the transport sector. Attempts have been made to articulate networks from civil society to foster the sector's energy transition. Among the actors that make up this network we can mention the Instituto Clima e Sociedade (Climate and Society Institute), C40 Cities, the International Council on Clean Transportation, the Instituto de Meio Ambiente e Recursos Hídricos (Environment and Water Resources), the Instituto de Defesa do Consumidor (Consumer Defense Institute) and the Instituto Nossa BH. What is proposed in these articulations is to carry out advocacy with local and national governments and the private sector so that there is the construction

of a national policy of acquisition and financing of electric buses for urban public transport. Currently, the city of São Paulo has a law requiring the increase of the electric fleet, but it is being disregarded. Experts forecast that by 2023 the fleet will grow by 100 vehicles. The city of Campinas will require electric fleet in its next tender, which is still under consultation. And the municipality of São José dos Campos established the electric fleet rental model directly by the city government, but has not yet implemented the mechanism. This approach is important since the bus company sector is articulated nationally and has as one of its sources of income the resale of vehicles between municipalities. In this sense, the energy transition of public transport can only be achieved if it occurs on a national scale.

Another pollutant factor is waste production and disposal. The waste sector includes the emissions associated with the treatment of solid waste, such as final disposal in landfills or the incineration of waste from healthcare services, and the treatment of liquid effluents, both domestic and industrial. Waste treatment, although accounting for only 4% of gross emissions in Brazil, is an important source of emissions for cities — especially the most populous ones. The main source of emissions in the sector is (with 64% of emissions) the final disposal of solid waste in landfills, be they controlled or open dumpsites. . The practice of landfilling is still being used in 60% of Brazilian municipalities. Already before the COVID-19 pandemic, there was an increasing trend of waste generation, both hospital and common, which suggests that actions to fight the pandemic may cause an increase in the amount of material collected, as well as in GHG emissions (World Bank, 2018). The amount of waste collected grew in all regions of the country and, in a decade, went from about 59 million tons in 2010 to 72.7 million tonnes. This means an 23% increase in emissions in the same period, the collection coverage increased from 88% to 92% (ABRELPE, 2020). Policy for solid waste management (SWM) in Brazil is guided by the National Solid Waste Policy (NSWP) which came into force in 2010 after a long process of discussion that lasted more than 20 years. NSWP mandates that municipal solid waste be reduced, reused, recycled, treated, and recovered. Only after all these steps can it be sent to sanitary landfills. The policy also established targets and deadlines. At the federal level, the Ministry of Environment oversees the implementation of the NSWP. It also coordinates the National Information System on Solid Waste Management (SINIR), which notes the origin, transportation and destination of the waste, and helps with technical capacity and design for SWM activities. As of now the country lags greatly in all the NSWP targets and deadlines. The preparation of SWM plans by municipalities and the closure of dumpsites are not only far below quantitative targets but also well past the deadlines set for each of them.

In general, what we see is a lack of financial resources, technical staff and interfederative articulation to meet the objectives.

From 2010 (the year of the NSWP sanction) until the present moment, no consistent initiatives and programs to stop such practices described above were implemented, such as the closure of inadequate disposal units still in operation, which currently receive more than 40% of the total MSW collected in the country. When considering the current scenario, it would take 55 years for uncontrolled landfills and dumpsites to be closed, which shows the urgency of solutions to make the necessary actions, continuously and sustainably.

In 2020, Brazil approved the Federal Law No. 14,026/2020 (new sanitation regulatory framework). As a result, municipalities could create a fee for waste management. Currently, 53% of Brazilian municipalities do not have a tax collection system to support their waste management infrastructure. It is expected that the creation of a disposal tax may also contribute to the promotion of waste reduction and reuse, which should be prioritized in the waste management hierarchy. The Ministry of Environment launched the new Solid Waste Management Plus National Information System (SINIR+) tool, which provides government agencies, investors, and citizens with 3-D maps, interactive panels and granular data on waste management. The tool was rolled out to partner with the private sector to drive sustainability by supplying it with information such as locations with potential for investment in waste collection or recycling services.

On April 14, 2022, the Brazilian government approved the National Solid Waste Plan previously foreseen by the National Solid Waste Policy of 2010. Their main objective is to support solid waste management and planning in federal, state, and municipal spheres. Within its 20 years' timeframe, the National Solid Waste Plan is divided into phases. Initially, the urban waste is diagnosed nationally, contemplating the national and international best practices addressing the issue. New mechanisms are supporting the compilation of information and population awareness. This is the case of the National Information System on Solid Waste Management (SNIR), displaying legal text, regulations, waste generation characteristics, reverse logistics schemes (Extended Producer Responsibility EPR). The National Solid Waste Plan will be updated every four years to assess progress in diverse sectors and evaluate investment gaps.

Despite strong improvements in access to basic services across the country (access to electricity, improved water supply, and improved sanitation cover 99 percent, 98 percent and 83 percent of the population respectively), many cities in Brazil face big challenges to improving the quality of the urban environment including through providing adequate solid waste management. Brazil produces 79 million metric tons of municipal solid waste per year; 90 percent of this waste is collected. Solid waste collection is becoming increasingly privatized, as indicated by the growing number of companies affiliated to the Brazilian Association of Public Cleaning Companies (ABRELPE).

Another important component of the urban context are the public areas in the cities, which can offer social, environmental, cultural, recreational, aesthetic and health benefits to the population. Public areas shape community ties in neighborhoods. They are environments for interaction and exchange of ideas that impact the quality of the urban environment. As an aggregator of people, public space has influence over the social dimension. The 2001 City Statute (Estatuto da Cidade) brought key principles and practices for equitable cities to the nation as a whole, including participatory urban master planning and the principle of the social function of the city – that is, that urban areas' core purpose is to ensure social well-being. The Ministry of Cities, established in 2003 (and folded into a new Ministry of Regional Development in 2019), led big, ambitious programmes that provided affordable housing, expanded basic services and strengthened social safety nets in urban areas across the country. These and other efforts created a path for improved access to basic services, strengthened social safety nets, and established a robust legal framework for urban development at the national level. However, in practice, there have been significant shortcomings that kept Brazilian cities deeply unequal. Furthermore, most of the cities expansion involved the consolidation and growth of mid-sized cities, especially those in large, dispersed metro areas. A large share, 46%, consumed grasslands, forests, wetlands and other ecosystems that provide vital services, including carbon storage, flood protection and biodiversity.

The next section will briefly summarize the main activities undertaken under the Urban Pathways project. The experiences gained when conceptualizing and implementing the pilot actions form the basis for the policy recommendations; the latter following in the last Brazil chapter.

EXISTING INITIATIVES (INCL. PILOT ACTION) AND SYNERGIES

Against this background of the trends and policy environment in Brazil, and considering that Belo Horizonte has one of the highest motorisation rates in Brazil, where 53% of the GHG emissions come from road transport, the Urban Pathway project has focussed its activities on the mobility sector (but linking it to other sectors, where possible). The following chapter summarizes the pilot activities implemented under the Urban Pathway project, and also those, which have been designed, but have not been implemented yet.

In 2010 Belo Horizonte approved an innovative Sustainable Urban Mobility Plan (SUMP), called PlanMob-BH. The plan, which is permanently monitored and was updated in 2016 and in 2019, includes comprehensive measures related to Transit Oriented Development (TOD), Bus Rapid Transit (BRT) and bike solutions, a number of pedestrianized streets and Zones 30 among others. The Urban Pathway pilots supported the implementation of three pillars within the SUMP: Sustainable City, Active Mobility and Traffic Calming Circles.

One of the municipality's focus areas is the establishment of priority zones for population density along public transport axes, reducing transport emissions – as described above, the main sector responsible for the burning of fossil fuels in Brazil. Belo Horizonte, one of the big cities to adopt this type of policy, established in 2019 a new master plan and in 2015 an urban development plan oriented towards public transport along its Ring Road. Belo Horizonte also adopts another policy, that of limiting the number of parking spaces in new buildings close to public transport axes, in order to reduce unfair competition between the car and public transport, and also implemented a new system of BRT. There are co-benefits for the health and economy of families and the city (SEEG, 2021). As can be seen, a good part of the urban policies for transport-oriented development have been incorporated in the reformulation of the Master Plan. Thus, what is needed is to develop the policies for collective and active transport around the new form of urban occupation.

The SUMP is still quite far from meeting its targets. The way it was approved in law, there is the forecast of a structuring network of public transport, a cycling network and a network of priority pavements. Only 60km of exclusive bus lanes have been approved for implementation so far. In the case of cycling infrastructure, 106km - only 26.5% of the planned amount - has been implemented so far. Recently, in the municipal budget cycle and in the actions of the city government, there is a noticeable inflection towards expanding actions to comply with the

plan. Even so, these actions need to be scaled up and pick pace if we are looking for concrete change.

The Zone 30 km/h pilot projects: In order to increase road safety and create awareness for climate change and related topics such as sustainable urban mobility and the importance of public space, a first Zone 30 km/h was implemented in the Cachoeirinha neighborhood. The intervention was made by BHTRANS, in partnership with ITDP (Institute for Transportation and Development Policy) and support from the citi foundation and the Nossa BH institute. The main axis defined for intervention was Simão Tamm Street, used by vehicles that cross the neighborhood and by students from schools located in the region. The original width of the space destined for the car naturally induced an excessive gain in speed, while the reduced width of the sidewalks meant that many of the pedestrians used the street. To carry out the speed reduction and the changes in the urban layout, data was collected, vehicles were counted and discussions were held with local leaders and schools in the region. The workshops with the students were held in February and April 2019.

After the planning stage, the intervention team matched the project initially prepared with the suggestions collected during the workshops and meetings. Finally, the intervention was scheduled to take place between April 26 and 29, 2019. The area received temporary urban furniture, landscaping elements and removable signage, in addition to the following physical measures to reduce vehicle speed: implementation of chicanery; sidewalk widening; reduction of the radius of curvature at intersections.

The intervention was completed on April 26, 2019, and an opening party was held by the Residents' Association. In the two days following the conclusion, painting activities and a bicycle repair workshop and a conversation circle about urban mobility, gender and bicycles were also carried out.



Figure 1 - Simão Tamm Street in Cachoeirinha after the urban intervention

Source: authors

After the implementation of the intervention, surveys were carried out to evaluate the project, and compared with those carried out previously. In view of the positive results generated by the intervention, the Municipality of Belo Horizonte chose to maintain the new design after the end of the temporary intervention. Thus, in September 2019, permanent physical elements and new signage were installed, reinforcing the geometry. Some changes were also made to the original proposal, incorporating adjustments observed in the test period.

A second Zone 30km/h was implemented in the surroundings of the Anne Frank Municipal School in the Confisco neighbourhood during September and October 2019. BHTRANS, the Municipal Mobility Department, was leading the implementation, with the support provided by the Wuppertal Institute, UN-Habitat and WRI Brasil. The Confisco neighbourhood is located in the Pampulha administrative region, a peripheral area of Belo Horizonte. The Zone 30 km/h was designed in a participatory way,

involving street painting, tactical urbanism and community participation. The debate about the intervention and the elaboration of its project were done in partnership with the school community, involving mainly elementary school children and students from the Youth and Adult Education. The implemented 30 km/h Zone relied, however, only on temporary equipment, such as paint on the asphalt and furniture made of tires, flowerpots, and PET bottles. There was, as in the Cachoeirinha neighborhood, a day of festivities for the implementation, with the holding of an “open street”. It is important to emphasize that the community got much more involved in the execution of the street than in the Cachoeirinha project, which created a sense of belonging that would be verified even two years later. While the 1,000 students of the Anne Frank Municipal School were direct beneficiaries of the pilot project, the residents benefit as well: a 23% increase in pedestrians in this area has been measured, proving that the traffic calming measure contributed to an improved feeling of safety and public space.

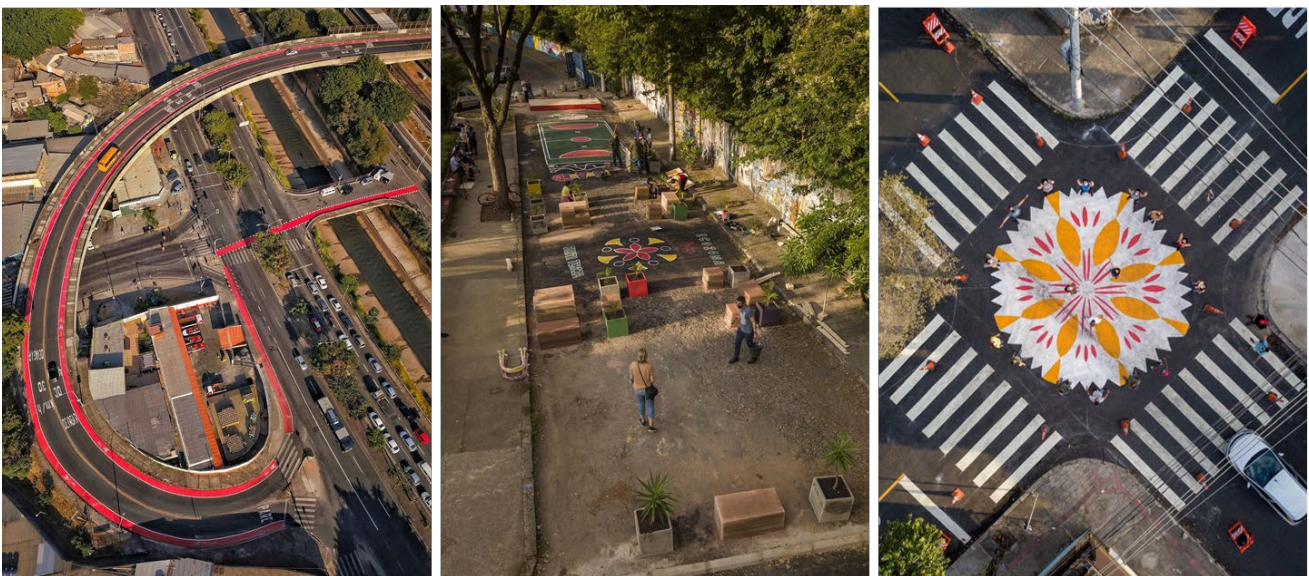


Figure 2 - Anne Frank School Surroundings on the day of the intervention inauguration

Source: Trevisan (2021)

The pilot project in the Confisco neighbourhood was considered a success by the local authorities as well as the residents. Therefore, it was replicated in May 2021 in Santa Tereza - with a broader scope, including elements of active mobility, public space, green infrastructure and waste management. The EcoZone in Santa Tereza consisted of two components. The first component was the construction of a new bike lane that connected the new cycling infrastructure built by the Municipality during the COVID-19 pandemic to the Joaquim Ferreira da Luz Square, one of the neighbourhoods main squares. The second part focused on the implementation of a “permanent open street”, that incorporated road space to the Joaquim Ferreira da Luz

Square providing the neighbourhood community with a larger public space. The project was implemented by the local authority, BHTRANS, and a local NGO, NossaBH, and it counted on the support of the Transformative Urban Mobility Initiative (TUMI), WRI Brasil, the Wuppertal Institute and UN-Habitat. Again it was implemented together with the local community, using street paint and tactical urbanism, like urban furniture (benches, garbage cans, plants). The intervention was preceded by meetings and articulations with the local community, and three virtual meeting were held, with the participation of dozens of interested people, such as the Santa Tereza Residents' Association, business owners from the area, people from Rede Lixo Zero (Zero Waste network), as well as people directly or indirectly interested in the project.



There was a wide repercussion of the project in the city and on social networks, among residents and cyclists, with high acceptance, indicating the potential of small interventions that have great impact. This success points to the validation of new stages of the Ecozona Project in the Santa Tereza neighborhood, which has a very engaged community.

In its second phase, the EcoZone Santa Tereza Project will carry out actions to further improve the connectivity, walkability and road safety in the area through the implementation of Zones 30 in two school surroundings. Moreover, the project will cooperate with Lixo Zero and the Municipal Program

EcoEscola to increase the amount of families and businesses in the neighborhood that separate at source. These include projects such as urban gardens, composting, tree planting, conscious use of water and gardening projects in schools. In 2019, there were more than 321 schools engaged.

Air Quality sensing powered by Citizen Science: Air pollution due to motorized car traffic is a serious problem in Belo Horizonte. Therefore, another activity of the Urban Pathways project was the implementation of air quality sensing powered by Citizens Science. In October 2019 the FabLab Newton Paiva was identified as the best local partner to implement the Air Quality (AQ) sensors assembly workshop. FabLAB Newton is a MIT-accredited laboratory with digital (computer-aided) manufacturing equipment for the design and prototyping located at the Newton Paiva University in Belo Horizonte. The FabLab Newton is also part of the Fab City Strategy, a network of FabLabs that connects makers in more than 70 countries and 600 labs. With its inherent zero waste and carbon reduction goals, linked to education, innovation, skills development and the creation of employment opportunities and livelihoods through the relocalisation of manufacturing, the FAB City approach can contribute to sustainable urban development goals. After training FabLab on how to assemble the kits (six kits have been shipped in Feb 2020), additional 100 kits might be purchased - expanding the city's AQ monitoring network significantly. Air quality was measured in the confiscation (2019) and Santa Tereza (2021) interventions. More recently, under the present ULLC project, air quality was measured in Cachoeirinha, Santa Tereza and Confisco again. The results, summarized, are the following:

Table 1, 2 and 3 - Air quality measured in Cachoeirinha, Santa Tereza and Confisco - 2022

Cachoeirinha - 20th and 21st of July 2022					
Variable \ Value	Minimum Value	Maximum Value	Average Value	Median	Reference Value**
Air Temperature (°C)	15.47	54.49*	24.97	21.08	19.4
Air Humidity (%)	24.76	84.69	62.87	69.14	58.4
PM 1 (ug/m ³)	3	36	10.64	11	na
PM 2.5 (ug/m ³)	3	51	13.66	14	<35
PM 10 (ug/m ³)	3	51	13.77	14	<150
Equivalent Co2 (ppm)	400	1851	1,106.08	1171	<400
VOCs (ppb)	0	516	131.68	117	<250
* Outlier value due to sun or other heat source exposure					
** Belo Horizonte july air temperature and air humidity reference values sources: National Institute of Meteorology. PM 2.5 and PM10 - US Environmental Protection Agency. VOC - World Green Building Council. Equivalent Co2 - European Environmental Agency					

Confisco - 22nd and 23rd of July 2022					
Variable \ Value	Minimum Value	Maximum Value	Average Value	Median	Reference Value*
Air Temperature (°C)	13.76	25.5	19.34	18.84	19.4
Air Humidity (%)	50.29	87.51	68.54	67.48	58.4
PM 1 (ug/m ³)	0	24	7.8	7	na
PM 2.5 (ug/m ³)	0	32	9.93	10	<35
PM 10 (ug/m ³)	0	35	10.06	10	<150
Equivalent Co2 (ppm)	400	1,791	1,181.62	1512	<400
VOCs (ppb)	0	439	149.97	179	<250
* Belo Horizonte july air temperature and air humidity reference values sources: National Institute of Meteorology. PM 2.5 and PM10 - US Environmental Protection Agency. VOC - World Green Building Council. Equivalent Co2 - European Environmental Agency					

Santa Tereza - 25th and 26th of July 2022					
Variable \ Value	Minimum Value	Maximum Value	Average Value	Median	Reference Value*
Air Temperature (°C)	14.18	27.91	20.21	19.99	19.4
Air Humidity (%)	52.58	84.82	68.06	67.28	58.4
PM 1 (ug/m ³)	0	18	5.78	5	na
PM 2.5 (ug/m ³)	0	25	6.92	5	<35
PM 10 (ug/m ³)	0	25	6.98	5	<150
Equivalent Co2 (ppm)	400	1,705	1,031.46	1,191	<400
VOCs (ppb)	0	345	103.56	120	<250
* Belo Horizonte july air temperature and air humidity reference values sources: National Institute of Meteorology. PM 2.5 and PM10 - US Environmental Protection Agency. VOC - World Green Building Council. Equivalent Co2 - European Environmental Agency					

Source: authors

PILOT PROJECT CONCEPTS FOR FUTURE ACTION

Apart from the implemented pilot projects described above, there are several project concepts, which have been co-developed with the local authorities, but for which funding is not yet secured. During preparation of the concepts together with the local counterparts, some observations have been made regarding the national level framework and are therefore included here as well.

Fleet renewal of diesel by electric buses: The SUMP plan of Belo Horizonte, mentioned in the introduction, also includes the replacement of the diesel bus fleet by electric buses by 2030, which will contribute to the achievement of the city's GHG emission reduction goal of 20% by 2030 in comparison to 2007 levels.

In December 2015, BHTrans tested a BYD electric bus on two routes of public transport. During the tests, BHTrans directors and technicians evaluated the safety and comfort aspects for users and drivers. The bus is 100% electric, powered by iron phosphate batteries, and can be charged in only five hours. The electric bus is already being manufactured in Brazil, where it has been tested in public transportation lines in many cities, including São Paulo, Porto Alegre and Campinas (BHTrans, 2015).

The goal of the city is to include at least 25 electric buses in the conventional bus service funded by international resources. This pilot project, which was submitted with the support of Urban Pathways, was one of the 20 finalist cities (from the 140 that submitted an application) of the Global Climate City Challenge, a joint initiative of the Global Covenant of Mayors (GCoM) and the European Investment Bank (EIB). However, Belo Horizonte was not selected for the next phase and is actively looking for further financing sources to fund its 25 first electric buses (Estimated budget: 3.6 million EUR; Estimated GHG emissions reduction: 1,888 tCO₂/year).

Currently, a bill is being discussed in the city council that obliges the renewal of the car fleet under the responsibility of the city hall for the electric matrix until 2028 and the renewal of the entire fleet of public transport for the electric matrix from 2028.

Waste Management and Urban Agriculture in Belo Horizonte/Brazil: Another project concept developed with support of the Urban Pathways project focuses on decentralized waste management and urban agriculture, also using the EcoZone approach described above. More specifically, the project wants to reach the following goals (i) improvement of four Composting Centers through physical improvements in spaces and restructuring of the

collection dynamics, enabling effective waste management in 20 neighbourhoods of Belo Horizonte. It is expected to reduce GHG emissions by roughly 30%, through the composting of organic waste, which will no longer be sent to the landfills/dumpsites; (ii) decentralized management of solid waste and implementation of low carbon solutions for its collection; (iii) the implementation of Agroforestry Systems (AFSs) and urban gardens through training in poor communities in Belo Horizonte and nearby municipalities, together with urban farmers and partner organizations, minimizing food waste in distribution, management, storage and in food processing; (iv) training and integration of local communities, where materials will be produced for the dissemination and diffusion of experiences of positive and participatory transformation of public spaces, as well as educational and training activities customized to the target audience and the implementation of agroforestry through workshops and communities-based planning and actions.

Building Green Infrastructure - Restoration of Landfills in Public Parks: Another project developed under Urban Pathways aims at the rehabilitation and restoration of an area that was used to dispose of solid urban waste and transform it into a public park. Along with this the inclusion of communities directly affected by landfill operations in the revitalization project would be promoted. The protection and effective management of natural ecosystems within and beyond city boundaries is critical to ensuring that urban environments are buffered from the effects of climate change and that vital services such as clean air, clean water and opportunities for outdoor recreation that are essential to human health and well being can continue to be provided to an increasingly urban population. The project aims to boost the dialogue, policy and action plans and the integration of biodiversity and natural ecosystems in urban and regional planning and development, addressing this at the level of neighborhoods, cities and the wider landscape. The project will benefit about 100,000 inhabitants, in a region where the situation of social vulnerability is worse than the municipality average - it is a population mostly in condition of high social vulnerability and low per capita income. This scenario is complemented by the restricted or non-existent presence of public leisure and entertainment facilities in most neighborhoods.

The implementation of the small pilot projects carried out in Belo Horizonte show the great potential of living labs to: 1) test innovative measures with relatively low budget, 2) gain the community support and the public acceptance for its permanent implementation and replication, 3) collect the necessary data to adjust the projects and proof their viability and upscaling, and 4) engage relevant partners, including academia and private sector.

For the pilots that were implemented in the field of sustainable mobility and public space, their success can be summarised in three key elements, i.e., (i) community participation, (ii) inter-institutional cooperation and (iii) before and after assessments, which included vehicles and pedestrian counts, surveys, air quality and noise monitoring. The overall results of the projects are low-cost interventions, where the road safety for pedestrians and cyclists and the social cohesion in the selected neighbourhoods are increased.

Moreover, the positive perception from the public, 78% of the residents would like the interventions to become permanent, and the visibility that this and the previous zone 30 projects have achieved, have led to the institutionalisation of this type of interventions and its city-wide replication in Belo Horizonte. At present, ULLC project in Belo Horizonte has elaborated a guide that will explain step by step all the elements and stakeholders that need to be considered for a successful implementation. For this purpose, the institution will create a dedicated team that will have the replication of Zones 30 km/h and EcoZones in the city as its main task.

At the time this report is being finalised, a further 30km/h zone is being implemented in the city. This is the 30km/h zone on the banks of the Tamboril stream, in the Jardim Felicidade neighbourhood. This intervention will articulate the need to revitalize the open-air stream with the guarantee of pedestrian space, made from the standpoint of the community's needs

POLICY RECOMMENDATIONS

Against the lessons learnt from conceptualizing, discussing, and implementing the Urban Pathways pilot projects and understanding the obstacles and challenges for cities to do so, the following chapter comprises policy recommendations for the national level. Guiding question is: how could national governments contribute to replication and upscaling of the local low-carbon urban action?

As a background, it is necessary to understand that, despite being a federative republic composed by Union, States and Municipalities, the governmental structure in Brazil is established with much more power and resources to the federal government. Thus, listing recommendations for national low carbon policy also means understanding how the federal government can contribute to foster and make more effective the actions of municipal governments, since most of them lack technical expertise and financial resources to implement the guidelines that are already established in national policies for urban mobility or solid waste management, for example. In this sense, the creation of governance structures with the participation of representatives from the municipalities and the union, as well as the linking of resources and the creation of programs for the elaboration of proposals are solid guidelines to support national actions in the Brazilian scenario.

Sustainable Mobility, Transport and Public Space

In order to enable the implementation of pilot projects at the neighbourhood level that allow small, medium and large municipalities to start the necessary transformation process, several steps should be conducted by the corresponding Brazilian authorities, such as the Ministry of Regional Development:

- Integrating a **goal on turning road space into public space** in the urban development strategy and the National Urban Mobility Plan (NUMP).
- Setting up a **funding programme on urban transformations and public space** for such small-scale, low-cost pilot projects, where cities, NGOs or local communities can apply for funding.
- Establish targets for 30 km/h zones and equivalent to be met by municipalities, which will serve as **criteria for the release of federal funds** linked to urban mobility projects.
- Incentivizing the cities with a **national challenge / prize for urban transformation**.
- Elaboration of **Guidelines** for the implementation of such projects, based on the

experiences so far, to replicate it throughout the country. This could provide the tools for the implementation, community participation process, stakeholder engagement and monitoring and evaluation.

- Integration of **Zones 30** and other traffic calming measures in school and hospital surroundings **in the National Mobility Act / NUMP**.
- Establishment of an **inter-institutional and inter-sectoral committee, comprising national and local** level stakeholders, that enables the discussion and exchange as well as the monitoring of the above mentioned activities.
- Creation of a task force between the federal government and municipalities to **draw up urban proposals to reduce speeding and increase pedestrian space**, including funding mechanisms to do so.
- Creation of a task force between the federal government and municipalities to **review contracts and bidding process for municipal public transport**, establishing three types of targets: reduction of emissions, financing the system by extra-tariff resources and increasing the accessibility of vehicles, in order to make public transport a real priority.
- Encourage the creation of consortia of municipalities for the integrated operation of urban mobility issues at metropolitan level

Regarding the electrification of public transport, the national government should support the following:

- **Foster new business models and partnerships in public transport.** Given the high upfront costs of e-buses in comparison with ICE buses, the electrification of public transport will require the adoption of business models, financial mechanisms and partnerships that consider the total cost of ownership (TCO) as the main variable. Successful programs, like in Sao Paulo and Campinas, were those that were partnered with bus manufacturers to plan the charging network, and local banks to establish low risk financing.
- Establish a new national regulatory framework for public transport that facilitates the separation of municipal bidding processes: the separation of the public transport concession between fleet provision, garage provision and bus operation is key to making electric buses available, for example.
- **Implement pilot programs early with well-trained operators.** These pilot programs could help to see the advantages of the technology and gain trust for the program through

transparency and stakeholder input.

- **Local manufacturing.** As in Campinas, local manufacturing should be added to service and research electric buses. This can help to further increase the economic value of such programs by providing jobs to the local community.

In this sense, solutions focused on urban mobility, which use strategies such as territorial planning, reduction of motorized travel and mobility prioritization active and collective displacement of passengers, should be guided by the Avoid - Shift - Improve (ASI) Approach, i.e.:

- Avoid large motorized displacements – especially by cars – in cities, bringing opportunities, mainly for work and education, to places with high housing density.
- Change the way people travel, promoting modal shift from individual motorized transport to collective or active transport, which emits less greenhouse gases per passenger.
- Improve technologies and operating systems by increasing energy efficiency and using cleaner sources of energy.

In addition, Brazil's government can help unleash the power of competitive, compact, connected, inclusive, clean and resilient cities by seizing opportunities such as to:

- Establish a national strategy for cities that promotes sustainable economic growth, social inclusion and environmental sustainability, with tailored approaches to meet the needs in different regions and city types.
- Develop and support metropolitan governance to foster integrated and sustainable urban development. Create a regulatory framework, with funding, for this.
- Prioritise low-carbon transport investments, including multi-modal integrated transport networks, cycling and walking infrastructure and electrification, to reduce air pollution and GHGs and enhance urban accessibility.
- Revamp national housing programmes and policies to ensure they provide safe, affordable and sustainable urban housing with access to jobs and basic services.
- Support cities in expanding finance for low-carbon and resilience building projects to improve service delivery and help address infrastructure investment deficits.

- Promote fiscal reforms that balance the distribution of tax revenues to cities and align fiscal incentives to promote low-carbon sectors and actions in urban areas.

The expansion of green areas in public spaces will perform important functions for socio-environmental quality: leisure, public health, improvement in air quality, improvement in community coexistence, climate improvements, green corridors, creation of eco-neighborhoods; and it is present in people's sense of belonging to public spaces, community participation, increased social relationships, health and well-being. Wide, accessible streets, squares, parks, sidewalks, bike paths and urban furniture stimulate interaction between people and the environment, generate a positive use of space and increase urban vitality. In addition to focusing on high-density, urban areas, it is crucial to consider the peripheries, guaranteeing quality public spaces to the population that does not live in the city center.

Waste Management

The national level incentives mentioned above for urban pilot projects (the funding programme on urban transformations and public space, the national challenge / prize for urban transformation projects) should explicitly encourage the integration of different sectors, e.g. adding resource and waste management components to public space and mobility projects. The small-scale, bottom-up interventions can lead to an increase of awareness also on the resource management issues.

Based on the exchange with local counterparts during the last three years under Urban Pathways, the following suggestions for the national level to tackle the solid waste management value chain are presented:

- a. **Support capacities for local Solid Waste Management Plans:** by 2015, 2,325 out of Brazil's 5,570 municipalities (about 40 percent) had submitted their plans, against the NSWP target of full coverage by 2012. The lagging municipalities face constraints in capacity for developing such plans or resources for hiring private consultants for the task. One of the key issues for local authorities is to be equipped to deal with a wide variety of environmental, economic, and social responsibilities. In the absence of sufficient in-house capacity, municipalities have resorted to hiring consulting firms that often are not familiar with specific local conditions. Feedback from municipalities suggests that in many cases private consulting firms produce standard action plans that are too far

removed from real needs. This is of concern because access to federal funds earmarked for SWM is conditional on submission of plans. On this matter, UN-Habitat released a free online course introducing the first steps to develop in a participatory and inclusive manner municipal solid waste management strategic and action plans based on data. The Urban Pathways project will support a Portuguese version in the coming months.

- b. Closure of dumpsites and use of landfills: despite the NSWP target of closing all dumps by 2014, there are 3,000 dumps still open in Brazil, mostly in the North, Northeast and Midwest regions. In order to address this issue the Federal Government should:
 - i. Guarantee the National Law enforcement
 - ii. Implement a monitoring and verification system
 - iii. Unlock financial resources to the municipalities
- c. Recycling or waste reduction targets: although recycling and waste reduction are included in the NSWP, no official targets are in place in the respective law.
 - i. Official, realistic recycling and waste reduction targets, also at municipal level, with a clear timeframe should be included in the NSWP
 - ii. National Awareness Campaign on Source Separation
- d. Reduce organic waste directed to landfills: 50% of Brazilian waste is organic, which can be used as feedstock for composting. However, 95% of the organic waste goes to landfills in the country. Reducing the amount of organic waste going to landfills can be supported by the national level through:
 - i. Making separate collection of organic waste mandatory
 - ii. Creating a market for digestate/compost through use of the same as soil enhancer instead of synthetic fertilizer, for animal feed from black soldier fly larvae and for energy produced through biodigestion
 - iii. Providing incentives for the construction of organic waste treatment plants through for example tax reductions, import duty reductions, etc.
 - iv. National Awareness Campaign on Reduction of Food Waste
- e. Additionally, the following city level strategies can be explored:
 - Strategy for food waste reduction
 - Encourage home composting
 - Expand the composting of pruning residues
 - Establish, through a decree, the management of organic waste from big

generators

- Enforcement of the national legislation (Law number 14.016, July 2020), which provides for the fight against waste and the donation of surplus food for human consumption. This law allows establishments related to the manufacture of food products, from industrialized products to ready-to-eat meals and fresh food, to donate their surplus, provided they meet some specific criteria.
- f. Waste pickers: there are 800,000 waste pickers active in Brazil, of whom about 50 percent operate informally, and the rest is organized in about 20,000 cooperatives. Out of 5,570 municipalities, fewer than 100 municipalities have contracts with waste-pickers' cooperatives. Cooperatives vary widely in working conditions and safety, and nature of contracts. In many cases, the scale of activities in the cooperatives is not sufficient to meet the needs of prospective buyers of recycled material. Recognizing the enormous social and environmental dimension of the service provided by waste pickers, the law establishing the National Solid Waste Policy (PNRS) established that all law enforcement instruments should promote the structuring and development of cooperatives and their economic emancipation. In particular, any reverse logistics system that is to be implemented should promote the productive inclusion of the collectors (they are expected to be key elements for packaging EPR for example). The recommendations to formalize the role of waste pickers as an important agent for the municipal waste system are:
- Strengthen recycling cooperatives through enforcing the existing law that promotes the structuring and development of cooperatives
 - Build capacity in the informal sector, provide technical support, equipment, etc.
 - Guarantee that the state level regulation will assume social inclusion as a public policy objective and promote organization and regularization/registration of cooperatives
 - Facilitate the direct sales of the recyclable material, avoiding intermediaries (the intrinsic value of material are not enough to promote social inclusion)
- g. Decreasing the amount of waste generated is a goal of the NSWP and an objective to be achieved by each waste generator. The internal reuse of waste is a reality and there are already companies that establish this practice as one of the ways to comply with the policy, since there are quantitative and mandatory targets to be stipulated in their solid waste management plan. In the case of materials that cannot be returned to the production chain,

companies must carry out the environmentally correct destination, and it is possible to value this process, observing the valuation characteristics of each type of waste, reducing environmental impacts and pollution risks and promoting a circular economy.

- h. Promote strategic partnerships to accelerate the circular economy at a city level. São Paulo was the first city to join Ellen MacArthur Foundation, with a group that already includes global businesses and philanthropic organisations. The partnership will support the City's efforts to make progress in the frame of localised Sustainable Development Goals (SDGs) and will convene multiple city stakeholders and authorities to build a comprehensive circular economy approach for better growth in the city. Therefore the national level should:
 - i. Promote strategic partnerships to accelerate the circular economy at city level.

The National Solid Waste Policy appears to have fostered a change in attitudes toward solid waste among manufacturers, businesses, and the public at large. However, public buy-in to and compliance with the new regulations are too low. The average person simply does not see the connection between their individual behavior and Brazil's waste problem. There is a need for more information campaigns focusing on the enormous impact that improper waste management has not only for the environment, but also for public health, and for unsustainable resource use.

National Awareness Campaign on “my waste, my responsibility” and link to environmental pollution, including marine litter

URBAN PATHWAYS



Urban Pathways



**Wuppertal
Institut**

UN HABITAT
FOR A BETTER URBAN FUTURE

UN 
environment
programme



More information about the
Urban Pathways project can be found at:

WWW.URBAN-PATHWAYS.ORG