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BANGLADESH, CHINA, GERMANY & INDIA

Guidance Notes for Sustainable Urban Infrastructure Investments

How the Asian Infrastructure Investment Bank (AIIB)
can advance the urban transformation



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ABBREVIATIONS

ADB	Asian Development Bank	IEA	International Energy Agency
AIIB	Asian Infrastructure Investment Bank	IIT-D	Indian Institute of Technology - Delhi
AMC	Ahmedabad Municipal Corporation (India)	IKI	International Climate Initiative
BCCSAP	Bangladesh Climate Change Strategy and Action Plan	IL & RRF	Integrated Landfill & Resource Recovery Facility
BRAC	Bangladesh Rural Advancement Committee	IPCC	Intergovernmental Panel on Climate Change
CBF	Climate Bridge Fund (Bangladesh)	ITDP	Institute for Transportation & Development Policy (China)
C&D	Construction and demolition	LGU	Local Government Unit (Philippines)
CFC	Child-friendly City (China)	MCI	Mercy Corps Indonesia
CPRD	Centre for Participatory Research and Development (Bangladesh)	MDB	Multilateral development bank
CSBNE	Centre for Sustainable Built and Natural Environment (India)	MHT	Mahila Housing Trust (India)
CSCAF	ClimateSmart Cities Assessment Framework (India)	MLP	Multi-layered packaging (waste)
CSE	Centre for Science and Environment (India)	MoHUA	Ministry of Housing and Urban Affairs (India)
ECU	Equivalent car units	MPa	Megapascal Pressure Unit
EV	Electric vehicles	MRT	Material recovery facility
GBRT	Guangzhou Bus Rapid Transit (China)	MSMEs	Micro, small and medium-sized enterprises
GCWS	Garbage Concern Welfare Society (India)	NCICD	National Capital Integrated Coastal Development
GEP	Green Entrepreneur Program (India)	NDC	Nationally Determined Contribution
GHG	Greenhouse gas	NGO	Non-governmental organisation
GMP	Green Management Program	NUA	New Urban Agenda
GoB	Government of Bangladesh	PCDIP	Philippine City Disaster Insurance Pool
GoI	Government of India	PV	Photovoltaic
HAP	Heat Action Plan (India)	QYMSSC	Qingdao You & Me Social Service Centre (China)
HVAC	Heating, ventilation and cooling technologies	SDG	Sustainable Development Goal
IAP	Ikatan Ahli Perencanaan Indonesia	SuDS	Sustainable Drainage System
ICLEI	International Council for Local Environmental Initiatives	TCFD	Task Force on Climate-related Financial Disclosure
ICSC	Institute for Climate and Sustainable Cities (Philippines)	TNFD	Task Force on Nature-related Financial Disclosure
		UNCBD	United Nations Convention on Biological Diversity
		UNEP	United Nations Environment Programme
		UNITAR	United Nations Institute for Training and Research

EXECUTIVE SUMMARY

Urbanisation is a global megatrend that will bring immense challenges in the coming decades, especially in Asia and Africa. Achieving the goals of sustainable development, limiting global warming and preserving ecosystems and biodiversity will depend to a large extent on whether we succeed in making the expansion and reconstruction of urban infrastructure sustainable.

In view of the chronic underfunding of infrastructure in most developing countries and emerging economies and a continuing strong growth in investment needs to bring about the transformation of cities towards poverty eradication, sustainability, greenhouse gas neutrality and climate resilience, development banks have a special role to play: Due to their particularly good knowledge of the capital markets in developing countries, as well as with favourable loans, venture capital and guarantees, they can reduce the investment risks of classic private investors and thus develop a leverage effect that corresponds to many times their own investments.

To ensure that infrastructure investments support the transformation of cities towards sustainable development pathways, we propose seven principles and 31 subordinate criteria. To operationalize them, we developed a sustainability traffic light system and applied it to the urban sector strategy, the urban project portfolio, the corporate strategy, the business plan 2021 and the financial risk management of the Asian Infrastructure Development Bank (AIIB). We chose the AIIB because the development of tomorrow's infrastructure is at the heart of its mandate, it is led by China and it is determined to be green, lean and clean. The same approach can be applied to other infrastructure investors and investees, too.

Our paper is intended as a contribution, making suggestions for how to guide investments in the urban transformation towards curbing emissions, enhancing resilience, protecting biodiversity and achieving the SDGs. The toolset that we present is preceded by an introductory section that summarises the most important urban challenges and transformative imperatives for action. This is complemented by concrete project examples that highlight different facets of the development of a sustainability-promoting infrastructure. All project examples were submitted to an international call for proposals and selected by the editors. They are illustrative and do not necessarily reflect the views of the editors.

The publication concludes with ten recommendations for the AIIB on how it can support urban transformation and become a sustainability and climate bank, by using our sustainability criteria: Urban net-zero principle, urban climate resilience principle, urban efficient land-use and spatial planning principle, urban nature-positive principle, circular economy & zero-waste principle, socially inclusive & resilient city principle, and urban pro-poor principle.

The following recommendations, among others, are included: Organisation of a stakeholder consultation process for reviewing our approach and suggestions; revision of the urban sector and the corporate strategy in view of the results of our sustainability check, including specific sustainability targets for portfolio development and target achievement indicators; inclusion of a climate – post-pandemic economic recovery in the business plan for 2022; amendment of key risk indicators, using metrics to quantify physical climate risks, as well as the stranded asset risk of carbon-intense infrastructure; wider disclosure of project-related documents of public interest; transparent documentation of the implementation of the pledge to fulfil the Bank's Paris alignment commitment by mid of 2023.

This report continues a series of reports already published, including one on the alignment of AIIB with the Paris Agreement and the SDGs (2019) and another on pro-poor and climate resilience principles for infrastructure investment, with a special focus on AIIB (2020).



1. INTRODUCTION

Urbanisation is one of the decisive global megatrends shaping the future of our world to an extent that is beyond our imagination and in many cases disruptive. On Cities Day 2020 (31 October), 56.2% of the global population were living in cities, up from 10% in 1900.¹ By 2050, that figure will reach 75%, or 7 billion people.² Already today, 43.5% of African, 51.1% of Asians, 74.9% of Europeans, 81.2% of Latin Americans and 83.6% of North Americans are urban, and half of them live in cities with more than 500,000 inhabitants.

Urban agglomerations are more than geographical locations. They are highly complex and dynamic points of cultural development, political power and economic wealth: McKinsey's top 600 cities account for more than half of global GDP and thus are the arteries of the world's economy.³ However, the importance of cities for civilisation extends far beyond the economic sphere: they are younger and much more diverse than rural areas as they attract communities of different nationalities, faiths and ethnicities.

¹ <https://www.weforum.org/agenda/2020/11/global-continent-urban-population-urbanisation-percent>

² <https://www.lse.ac.uk/cities/urban-age>

³ https://www.mckinsey.com/~/media/McKinsey/Featured%20Insights/Urbanization/Urban%20world/MGI_urban_world_mapping_economic_power_of_cities_full_report.pdf

With continuous urban growth, infrastructure demands in terms of housing, transport, energy, water and sanitation, healthcare, food, education, connectivity, etc. are also growing. Bangladesh's capital, Dhaka, is growing by 15,000 new inhabitants every week, pushing the municipal administration to its limits and beyond. Thus, urbanisation is a challenging process, putting high pressure on urban societies, governments, infrastructure development, natural resources, ecosystems and the climate. Urban services are provided extremely unequally, as the COVID-19 pandemic has exposed.⁴ Apart from the huge equality gap and poverty, the lack of sustainability is another big challenge of urbanisation. According to UN Habitat, cities account for 60% of greenhouse gas (GHG) emissions and 78% of global energy consumption.⁵ In addition, 60% of the area projected to be urban by 2050 is yet to be built on. Depending on how the enormous amount of additional infrastructure is developed in the next 30 years, it can either pulverise the 1.5°C temperature goal or help to meet it. For the second option, development banks are crucial levers as providers of capital and ideas.

Seen another way, cities are extremely fragile in the face of climate impacts such as heat waves, flooding, drought, storms and sea level rise. Even if global warming was limited to below 2°C, by 2050 at least 570 cities with 800 million inhabitants will be exposed to rising seas and storm surges.⁶ If today's and tomorrow's infrastructure is built in the right way, it could greatly contribute to strengthening urban resilience.

The needs of the urban poor demand particular attention – because the urban poor are the most vulnerable. This is reflected in the strong call for inclusiveness in Sustainable Development Goal (SDG) 11 Sustainable Cities and Communities, particularly its target to 'substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels'.⁷ The commitment to leaving no one behind has been gaining significant momentum since the New Urban Agenda was adopted in 2016,⁸ particularly in the context of the current global pandemic crisis.⁹ Social and physical infrastructure are key to ensuring inclusiveness.

People living in informal settlements deserve a life of dignity and recognition for the indispensable contribution they make to the city. Without their workforce, cities would collapse. Thus, these people are to be treated with respect and integrated for the sustenance and sustainability of the city.

The fact that many cities, especially smaller cities, are growing almost uncontrolled and unplanned, that many cities, including and especially mega-cities, are growing far beyond their capacity limits, leads to a multitude of problems and creates the seedbeds of tomorrow's disasters.

In this already extremely difficult situation, which is exacerbated by often completely inadequate financial and urban planning capacities, to now also manage rapid decarbonisation and improved adaptation to the consequences of climate change is a mammoth task. This can only succeed if all actors, from the residents to the business sector and the city administration to the investors, pull together as far as possible and develop a common basic understanding of transformation and its urgency.

The 2020-2030 is the last decade left to achieve rapid and profound transformations in urbanisation 'just in time'. Who would seriously deny the need for such transformations in the face of climate crisis, pandemic, and growing inequality and the social divisions that goes with it?

In the first part of this report,

- we highlight major urban challenges,
- how they could be solved
- and what a sustainable urban infrastructure of tomorrow might look like.

The future is full of opportunities and construction of the road to get there has long since begun. The world's cities, large and small, have become a laboratory of change where urbanisation is being rethought. SDG 11, the New Urban Agenda (NUA),¹⁰ and the Paris Agreement goals to become climate resilient and carbon-emission free by mid-century, provide the overarching reference framework for the sustainable city. Thousands of projects are working to make them a reality. Through their swarm intelligence, something new can emerge that is more and better than the sum of their parts. We present 29 of these projects, all of which have the potential to be replicated many times over.

4 <https://www.wri.org/research/towards-more-equal-city-framing-challenges-and-opportunities>

5 <https://www.un.org/en/climatechange/climate-solutions/cities-pollution>

6 <https://www.c40.org/other/the-future-we-don-t-want-staying-afloat-the-urban-response-to-sea-level-rise>

7 <https://www.undp.org/content/undp/en/home/sustainable-development-goals/goal-11-sustainable-cities-and-communities.html#targets>

8 <https://habitat3.org/the-new-urban-agenda>

9 <http://library.fes.de/pdf-files/iez/18168.pdf>

10 NUA is a global shared vision that was adopted at the UN Conference on Housing and Sustainable Urban Development (Habitat III) in Quito, Ecuador, on 20 October 2016.

Of course, none of these real-world projects are perfect. Development never proceeds in a straight line but as a search process. This also applies to our sample projects. But what they stand for is initiative and the will to contribute to a better infrastructure. Better' means different things depending on the project: inclusion and social sustainability, more sustainable value creation, waste prevention, decarbonisation, climate resilience and much more. While we are also well aware of the limitations of the projects presented here, we nevertheless consider them to be interesting and mostly transformative examples, worthy of being presented in their diversity in this report.

Mainstreaming and upscaling good practice projects requires large investments and a strong willingness to take financial risks, which are typical for the investment projects of innovative but capital-poor, small and still largely unknown funders. This is particularly true for developing and emerging countries, which in themselves entail high risks. Effective levers are needed to mobilise far more capital for transformation: In view of their mandate, development banks have a special responsibility to provide risk capital in these cases or, by means of risk hedging, to attract private and institutional investors to the reconstruction and development of sustainable physical and social urban infrastructure.

Lean, clean and green infrastructure financing is at the very core of the Asian Infrastructure Investment Bank (AIIB), the first multilateral development bank, with China as its largest investor. Despite its claim, the AIIB is not (yet) a sustainability bank, as we have analysed in detail in our two previous studies 'Aligning the Asian Infrastructure Investment Bank (AIIB) with the Paris Agreement' (2019) and 'Climate Resilience and pro-Poor Principles for Infrastructure Investments' (2020).¹¹ But it has the potential to evolve in this direction and become a major capital provider for urban transformation, especially in Asia.

Therefore, in the second part of this report,

- we analyse how well the AIIB is positioned to advance urban transformation
- and what it could do to improve its transformative performance.

This report has been produced with the participation of pioneers of urban change. Many of these projects are particularly aimed at the poor, the vulnerable and those on the margins of society who must fight daily for their survival and dignity. With our good practice examples, and the description of transformative imperatives going beyond the case examples,

- we first want to encourage others in similar situations to follow suit.
- Second, we want to show the AIIB and other development banks the variety of innovative, sustainable and pro-poor infrastructure projects that are worth investing in.
- We further want to encourage development banks to invest only in urban infrastructure projects that serve the implementation of the SDGs, the New Urban Agenda, and the Paris Climate Agreement.
- And we urge the banks to establish and expand special budget lines to finance medium, small and micro sustainable infrastructure projects, including those that invest in social infrastructure, as it is often these projects that can make a big difference for the poorest in society, enabling them to become active participants in change.

Furthermore, with this report

- we hope to contribute to the capacity building of civil society, micro, small and medium-sized enterprises (MSMEs) and office bearers in municipalities to better understand the urban sector policy of AIIB and their importance for sustainable urban development.
- Finally, we want to contribute to deepening the mutual understanding and dialogue between various stakeholders and the AIIB on issues related to the urban transformation agenda.

11 <https://germanwatch.org/en/16354> and https://germanwatch.org/sites/default/files/framework_report_-_criteria_to_align_aiib_with_pa_climate_resilience_goal_2020-09-16.pdf



1.1. METHODOLOGY

With regard to the good practice examples included in the report, the report benefits from a wide range of contributions made by non-governmental actors, think tanks and community-based organizations, mostly from Asian member countries of AIIB. The one thing they have in common is the intention to best prepare their societies for the phenomena of urbanization and climate change and the present and future challenges that they entail. Contributions were received after a call for case studies had been shared publicly and widely. Potential contributors were asked to submit good practice examples of infrastructure development that address at least one of three paradigms by way of one of their underlying categories in urban and sub-urban areas:

- Social sustainability,
- Ecological sustainability
- Economic sustainability.

Contents of the case studies are the original work of their rightful, listed owners and do not express the views of the principal authors of this study. We thank all contributors for their support. Throughout its narrative sections that address the need to ensure sustainability in all the forms necessary, this report portrays good practice examples of urban sustainability projects. These examples are meant as a non-representative selection of the diverse and often ingenious efforts to aid in the necessary transformation in cities worldwide.

The intention is to showcase these contributions in their original forms and refrain from substantially altering them. They thus provide a background against which the sustainable urban

infrastructure investment principles and criteria are developed in this report by the principal authors of the study. Principles and criteria are based on a thorough analysis of the sustainability challenges arising from the key trends of urbanization, as summarized in this report, and explained in detail in many other studies.

Due to the special focus on infrastructure investments, and here again the specific attention to the role of development banks, especially the AIIB, the sustainability principles and criteria were defined by the authors and then transformed into a simple sustainability traffic light in such a way that they lead to investments that promote the achievement of five target areas, guided by the goals of the Paris Agreement, the Agenda 2030 and the SDGs, the Convention on Biological Diversity, the New Urban Agenda, and other multilateral frameworks:

- Fast systemic decarbonisation and systemic climate resilience building;
- Efficient land-use;
- Restoration and protection of biodiversity, ecosystems and their services;
- Social inclusion, equity and resilience towards external shocks, as for instance a pandemic;
- Circular economy, zero waste, and a sustainable consumption and lifestyles.

Conclusions and recommendations made here are by no means reflected by the case studies, rather they provide a meaningful base for a discussion about how to guide urban development to make it resilient, carbon-neutral, inclusive and sustainable.

1.2. GLOSSARY

Asian Infrastructure Investment Bank (AIIB)

The Asian Infrastructure Investment Bank is a multilateral development bank headquartered in Beijing, China, whose mission is “financing the Infrastructure for Tomorrow”. It began operations in January 2016 and has since grown to 105 approved members worldwide, investing in 32 of them thus far. Working with partners, AIIB intends to meet client countries’ needs by unlocking new capital, crowding in private investors and investing in infrastructure that is green, technology-enabled and promotes regional connectivity. Alongside the New Development Bank, AIIB is one of the youngest MDBs. It has pledged to be fully aligned with the Paris Agreement Goals by July 2023.

CO₂ equivalent (CO₂-eq) emission

The amount of carbon dioxide (CO₂) emission that would cause the same temperature change, over a given time horizon, as an emitted amount of a greenhouse gas. CO₂-equivalent emission is a common scale for comparing emissions of different GHGs but does not imply equivalence of the corresponding climate change responses.

Greenhouse gases (GHGs)

The atmospheric gases responsible for causing global warming and climate change. The major GHGs are carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O). Less prevalent – but very powerful – greenhouse gases are hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆).

Multilateral development banks (MDBs)

Multilateral development banks, or MDBs, are supranational institutions set up by sovereign states, which are their shareholders. Their remits reflect the development aid and cooperation policies established by these states. They have the common task of fostering economic and social progress in developing countries by financing projects, supporting investment and generating capital for the benefit of all global citizens.

New Urban Agenda (NUA)

The New Urban Agenda is an action-oriented 24-page document that provides the global principles, policies and standards required to achieve sustainable urban development, to transform the way we construct, manage, operate and live in our cities. It will guide the efforts around urbanization for a wide range of actors including nation states, city and regional leaders, funders of international development, the private sector, the United Nations programmes and civil society for the 20 years following its inception in 2016. The New Urban Agenda takes into account the synergies that exists with other global agreements, inter alia the Sustainable Development Goals, the Paris Agreement, Sendai Framework for Disaster Risk Reduction 2015-2030.

Net zero CO₂ emissions

Net zero carbon dioxide (CO₂) emissions are achieved when anthropogenic CO₂ emissions are balanced globally by anthropogenic CO₂ removals over a specified period. Net zero CO₂ emissions are also referred to as carbon neutrality. To achieve the Paris Agreement’s long-term temperature goal, countries aim to reach global peaking of greenhouse gas emissions as soon as possible and achieve a climate neutral world by mid-century.

Nationally determined contributions (NDCs)

All countries that are party to the Paris Agreement are asked to prepare, communicate and maintain successive nationally determined contributions that they intend to achieve. They thus pursue domestic mitigation measures, with the aim of achieving the objectives of such contributions. Some countries’ NDCs also address how they will adapt to climate change impacts, and what support they need from, or will provide to, other countries to adopt low-carbon pathways and to build climate resilience.

Paris Agreement

The Paris Agreement under the UNFCCC was adopted on December 2015 in Paris, France. The agreement, adopted by 196 Parties to the UNFCCC. The three goals of the Paris Agreement are to 1) hold the increase in the global average temperature to well below 2°C above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels, 2) strengthen the ability of countries to deal with the impacts of climate change through adaptation and increased resilience to the irreversible consequences of climate change, and 3) make finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development.

Transformation

A desirable change in the fundamental attributes of natural and human systems. Including – in the context of this report – positive pathways for greenhouse gas emissions, atmospheric concentrations, and global mean surface temperatures implied from mitigation and adaptation actions associated with a set of broad and irreversible economic, technological, societal and behavioural changes. This can encompass changes in the way energy and infrastructure are used and produced, natural resources are managed and institutions are set up and in the pace and direction of technological change.

Urbanisation

The conversion of land from a natural state or managed natural state (such as agriculture) to cities; a process driven by net rural-to-urban migration through which an increasing percentage of the population in any nation or region come to live in settlements that are defined as urban centers or their periphery.

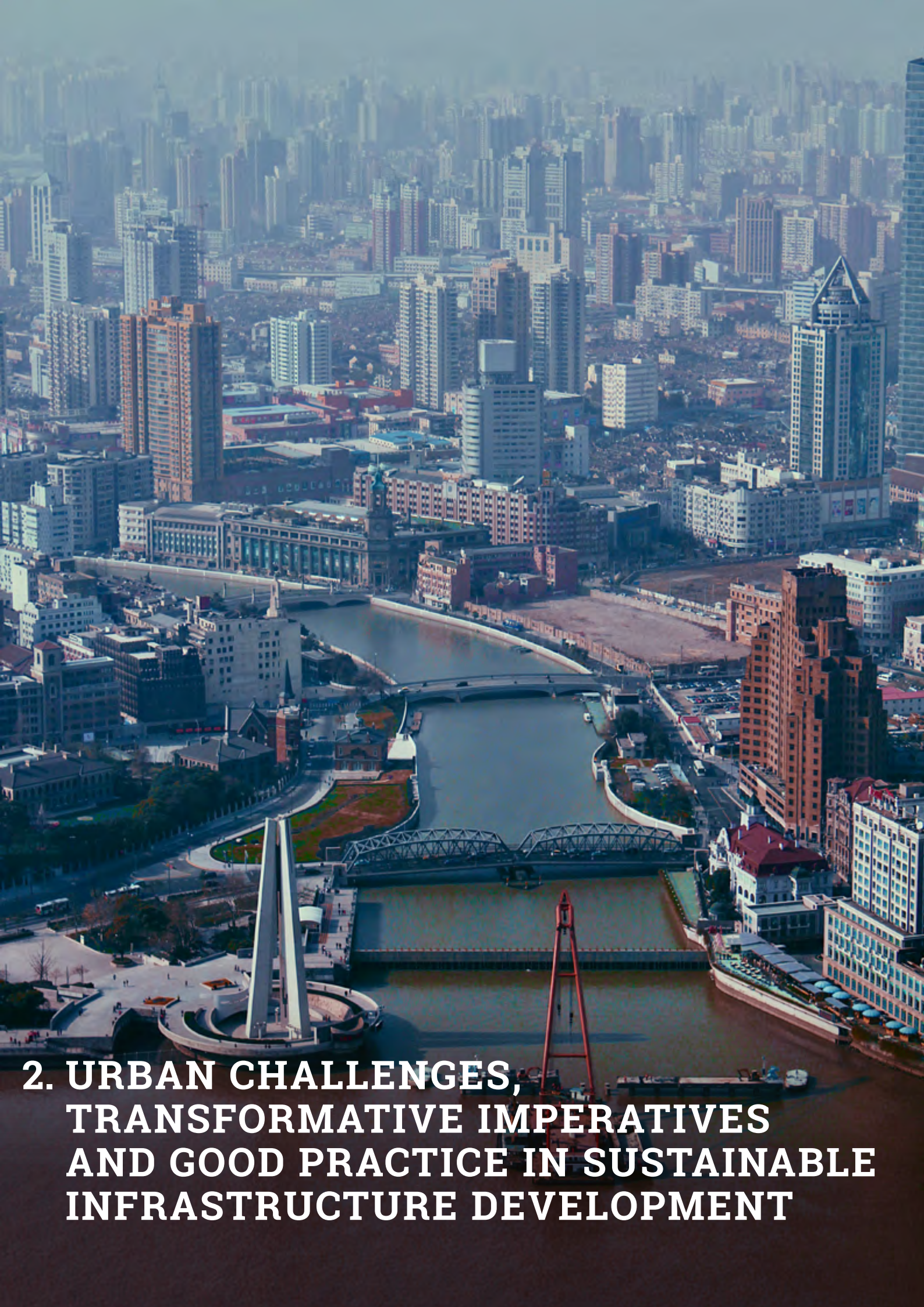
United Nations Framework Convention on Climate Change (UNFCCC)

The Convention was adopted on 9 May 1992, in New York, and signed at the 1992 Earth Summit in Rio de Janeiro by more than 150 countries and the European Community. Its ultimate objective is the “stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.” It contains commitments for all Parties.

Sustainable Development Goals (SDGs)

The SDGs, also known as the Global Goals, were adopted by the United Nations in 2015 as a universal call to action to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity. The 17 SDGs are integrated—they recognize that action in one area will affect outcomes in others, and that development must balance social, economic and environmental sustainability. Countries have committed to prioritize progress for those who're furthest behind. The SDGs are designed to end poverty, hunger, AIDS, and discrimination against women and girls.





2. URBAN CHALLENGES, TRANSFORMATIVE IMPERATIVES AND GOOD PRACTICE IN SUSTAINABLE INFRASTRUCTURE DEVELOPMENT

2.1. CITIES AND CLIMATE CHANGE

The IPCC in its special report on 1.5°C on global warming concluded that cities and urban infrastructure make up one of four critical global systems that are key to reducing GHG and preventing long-term global warming to 1.5°C above pre-industrial levels.¹² Cities are the major GHG emitters. Given that 18% of all global emissions currently come from just 100 cities (Moran et al, 2018), and that urban areas are also responsible for 68% of the global carbon footprint, and if indirect carbon emissions originating from the consumption of goods and services are also taken into account, then fast and massive mitigation action in megacities and in large and rapidly growing secondary cities is imperative. Megacities and large cities constitute an immediate potential for a reduction in emissions. Moreover, they are usually wealthy and credit worthy, and thus very attractive to investors. By contrast, secondary (smaller) cities have tighter financial margins but are nevertheless vital to breaking dependency on high-carbon development as they grow and become large cities.

So far, urban GHG emissions are still rising across all regions. Moreover, the projected urban growth of the next decades will result in a huge spatial expansion, and thus land conversion and further loss of carbon sinks. Therefore, it is important to ensure that cities in future grow with greater land-use efficiency than at present. Urban land use is particularly inefficient in China, India and Africa, and it is generally less efficient in small cities as compared to larger ones (Güneralp et al, 2020). Retrofitting informal settlements bears a particularly high and very cost-efficient transformation potential towards achieving low- or carbon neutral urban environments. Using innovative micro-scale energy technologies, sustainable low-cost building practices, decentralised water and sanitation utilities, and zero-waste approaches not only mitigates emissions but also provides better services, employment opportunities and inclusiveness, thus contributing towards achievement of SDG 11.

Apart from these approaches, massive transformations in the built environment, in urban spatial planning, in transport infrastructure and in resource demand are all needed to avoid another huge spike of emissions in the context of accelerated urbanisation. For example, steel and concrete – the most commonly used urban building materials – are high emitters in production and little to zero carbon-storage capacity. In a business-as-usual scenario, ongoing urbanisation will lead to an increase of annual urban infrastructure-based emissions of 23% by 2030 compared to 2017, rather than the required complete

decarbonisation by 2050 (IEA, 2017). Therefore, achieving SDG 11, *'making cities and human settlements inclusive, safe, resilient and sustainable'*, with its target 11.3, is crucial in order to avoid rapid urbanisation with poor urban planning and high carbon lock-in. That alone would most likely occupy the scarce remaining carbon budget, breaking the 1.5°C temperature threshold: *'By 2030, enhance inclusive and sustainable urbanisation and capacity for participatory, integrated and sustainable human settlement planning and management in all countries.'*

Cities are increasingly affected by climate change (IPCC, 2018). Cities on low-lying coasts are particularly vulnerable to multiple climate risks such as sea level rise, salinity, heat stress, flooding and storm surge. The world's seven largest megacities – Tokyo, Jakarta, Delhi, Seoul, Mumbai, Manila and Shanghai – are in Asia. Apart from Delhi, all are coastal cities. Coastal cities are the fastest growing cities – in terms of infrastructure investments, but also in terms of the climate risks they face. Jakarta, Shanghai, Bangkok, Ho Chi Minh City and Guangzhou are expected to suffer enormous losses due to coastal flooding caused by sea level rise, exacerbated by land subsidence resulting from excessive groundwater extraction. The increasing severity of tropical cyclones will also bring about rising economic costs, particularly in Bangladesh, China, India, Indonesia, Philippines and Vietnam. Guangzhou, Ho Chi Minh City, Jakarta, Kolkata, Mumbai, Shenzhen and Tianjin – which all faced coastal flood-related losses totalling USD 1.5 billion in 2005 – will suffer annual flood-related losses reaching USD 32 billion by 2050 (Dulal, 2019).

Altogether, the most rapid urban growth has been and continues to be in cities with limited adaptive capacity, and at highest risk are areas of unplanned rapid urbanisation, i.e. informal settlements, especially if they expand into land prone to flooding or landslides (IPCC, 2018). In Indonesia alone, urbanisation is predicted to elevate flooding risks in a range of 76-120% between 2000 to 2030 (Muis et al, 2015). Another increasingly concerning risk relates to urban settlements that are expanding fast into areas affected by water scarcity. It is projected that this could apply to an additional 350 million people if there were to be a 1.5°C temperature rise, a figure that could increase to more than 400 million at 2°C of global warming (Liu et al., 2018). Cities are especially susceptible to heat, causing problems to both health and economic activity, especially outdoor activities, but also in non-air-conditioned buildings. An additional 1.7 billion people will be exposed to severe heat if temperatures rise from 1.5 to 2°C of warming, according to projections (IPCC, 2018).

12 https://www.researchgate.net/publication/329679906_Summary_for_Urban_Policymakers_What_the_IPCC_Special_Report_on_15_C_means_for_Cities

Not only people, but also transport, energy and building infrastructure are vulnerable to all these climate risks. This could undermine their profitability and lead to premature write-offs and even total loss, particularly in low-lying cities affected by sea level rise. Therefore, cities are key to facilitating climate adaptation to enhance resilience. So far, however, many infrastructure investments are not adequately climate risk-informed. For example, on 7 February 2021, a piece of the Nanda Devi glacier broke off, avalanched into the Rishi Ganga river and flooded part of the Chamoli Valley in the state of Uttarakhand. More than 150 people are still missing and at least two hydro-electric power projects were significantly damaged. This

highlights the need for resilience standards and compliances for buildings and infrastructure, which is largely missing. The same is true for lifecycle assessment of infrastructure investments.

Poverty is not the only factor that determines vulnerability to climate change. Age, gender, physical exposure and other factors also play a role. But it can be said that poverty determines the extent of climate vulnerability to a particularly high degree. In order to strengthen the resilience of cities to climate change quickly and efficiently, it is therefore right to adopt poverty-oriented approaches.

2.1.1. THE CLIMATE-RESILIENT ZERO-CARBON CITY

Cities have between 25 (Global North) and 35 years (Global South) to become zero-carbon cities. Looking at it from a climate justice perspective, rich cities need to decarbonise faster; poorer cities have more time. The challenge for both will be tremendous. Urban mitigation options and transformation pathways vary, depending on development level and many other socio-economic, political and geographical factors.

One key factor for successful decarbonisation is the avoidance of urban carbon lock-in in the form of long-lasting infrastructure, inefficient land use, and patterns of space use that inevitably result in high emissions. Carbon lock-in occurs at the levels of infrastructure and technology choices, political and economic planning, and individual and social group behaviour. At all levels, systemic changes are required. The fact that they need to take place very fast will necessarily lead to disruptions, which need to be moderated, connected with a positive vision, and used in a way that as much innovation as possible comes out of them. Therefore, urban decarbonisation is a complex process, taking place at multiple layers of strategies and actions. A second key success factor lies in the provision of co-benefits for the urban population, especially the most vulnerable, for example higher incomes, less pollution, improved mobility or better health.

Mitigation strategies are needed for physical infrastructure and spatial urban form (density, mixed use of urban neighbourhoods), energy and material use, behaviour and lifestyle, and the restoration of urban carbon sinks. Decarbonisation needs to be target-oriented and planned holistically. By September 2020, almost 1,000 cities and regions representing more

than 828 million people had pledged to shift towards net-zero GHG emissions.¹³ Many of them are organised in networks such as C40,¹⁴ ICLEI Local Leaders for Sustainability,¹⁵ EU Covenant of Mayors for Climate and Energy,¹⁶ or US Climate Alliance.¹⁷ They have become pioneers of change, supporting each other through cooperation. Most cities, however, cannot undertake the fundamental changes needed for decarbonisation on their own. They need national government support, enabling legislation, and public and private investments.

In terms of construction, the carbon-free city is dominated by recycled materials, organic building materials such as wood and bamboo, ecological insulation materials, minerals and stones of regional origin, and high-tech green products such as CO₂-free steel and cement. Wood in particular will play a prominent role in the building turnaround and will experience a revival. This also applies to the construction of multi-storey high-rises. A material revolution replacing cement and steel with wood in urban construction could have double benefits for climate stabilisation, as demonstrated by Potsdam Institute for Climate Impact research:

*"First, it can avoid greenhouse gas emissions from cement and steel production. Second, it can turn buildings into a carbon sink as they store the CO₂ taken up from the air by trees that are harvested and used as engineered timber. However, while the required amount of timber harvest is available in theory, such an upscaling would clearly need most careful, sustainable forest management and governance."*¹⁸

¹³ <https://newclimate.org/2020/09/21/accelerating-net-zero-exploring-cities-regions-and-companies-pledges-to-decarbonise/>

¹⁴ <https://www.c40.org>

¹⁵ ICLEI: International Council for Local Environmental Initiatives, at <https://www.iclei.org>

¹⁶ <https://www.covenantofmayors.eu>

¹⁷ <http://www.usclimatealliance.org>

¹⁸ https://www.pik-potsdam.de/en/news/latest-news/buildings-can-become-a-global-co2-sink-if-made-out-of-wood-instead-of-cement-and-steel?set_language=en

Deep decarbonisation relies strongly on green and sustainable electricity. At the core of urban decarbonisation will be electric transport, heating and cooling powered by renewable energies, complemented by huge energy efficiency gains. Transportation and buildings make up the biggest proportion of urban energy consumption. Replacing fossil fuel with renewable energy will thus reduce the urban carbon footprint significantly. The shift to less carbon-intense building materials, that is, buildings made out of biomass (especially wood) instead of concrete and steel, combined with a circular use of materials, will be the second cornerstone. Efficient urban land use and spatial planning, with higher-density mixed-use neighbourhoods (residential combined with economic and service functions) leading to cities of short distances, and increasing nature-based solutions (e.g. natural cooling to reduce air and surface temperatures) as well as the restoration of urban carbon sinks, including through urban gardening and green roofs, will significantly contribute to GHG mitigation. Apart from urban trees, green roofs are important carbon sinks through the combined effect of biomass and organic soils. Moreover, they are very effective in terms of stormwater management (Luo et al, 2015).

So far, retrofitting buildings, waste management (including in the form of circular economy activities), the promotion of renewable energy and green transport are the main urban GHG mitigation actions (Hsu/Rauber, 2021). Many of these actions can be piloted at low cost, with high immediate emission effects, with the participation of, and benefits for, inhabitants of informal urban settlements and other lower-income groups. Upscaling them to a significant size, however, requires large-scale public and private financing, going beyond the capacity of the inventors of those pilot approaches. To close the finance gap, development banks have an important role to play, especially in the large majority of cities without international creditworthiness and thus, no chance to issue green bonds to access international capital markets.

Last but not least, it is important to differentiate between the mitigation pathways of established and of future urban settlements. While new settlements can be planned and implemented as net-zero cities, decoupling resource usage from economic growth, using 100% renewable energies, and offsetting remaining emissions in urban carbon sinks, the transformation to net zero is much more challenging and disruptive for established cities. Therefore, participatory approaches are very important, in order to ensure public support and ownership.

Building the climate resilient city to minimize growing risks caused by extreme weather events and by slow onset changes like sea level rise, is of importance for poverty eradication and

overall urban societal resilience building. Adaptation pathways have to be taken that are equitable and take differentiated vulnerabilities into account. In view of pre-existing social challenges (e.g. with regard to poverty, employment, gender, health, education etc.), the social dimension of climate adaptation needs to be fully taken into account, including by employing pro-poor approaches (see below).

Just as in the case of becoming a net zero city, urban adaptation is a matter of multi-layer interventions at spatial, physical infrastructure, technical and behavioural levels. Here, too, a distinction must be made between adaptation strategies for existing and for future cities, for informal settlements and for wealthier parts of the city, and between the very few, well-funded powerhouses of the global economy and the many less creditworthy secondary cities.

Forward-looking adaptive spatial planning that takes into account future climate risks is of utmost importance. Areas at risk of flooding in the future would no longer be allowed to be built on. Existing settlements might be relocated. In order to reduce the heat stress that will increase in the future, land-use planning must consider better ventilation, more urban water areas and increased greening.

Physical urban infrastructure, including energy, water, sanitation, digital, transport and buildings, must be planned and constructed in an adaptive way that factors in climate risks for the lifespan of infrastructure. By definition, it is planned, designed, built and operated in a way that anticipates, prepares for and adapts to changing climate conditions (OECD, 2018). As we have pointed out earlier, infrastructure itself needs to be resilient to adverse impacts; it must not contribute to undermining the climate resilience of poor and vulnerable people and ecosystems; and it must contribute explicitly to systemic climate adaptation, and thereby contribute to achieving the Paris Agreement's climate resilience goal, the goals of the Sendai Framework for Disaster Risk Reduction, and the SDGs in alignment with the Addis Ababa Action Agenda on Financing for Development.¹⁹

Often, physical, social and nature-based infrastructure are closely intertwined. The German North Sea coast is protected against storm surges by artificial dikes whose stability is essentially guaranteed by a special grass cover. To keep this stable, grazing by sheep is essential. In many tropical countries, coastlines are protected through a combination of sea walls and mangroves. These and other examples show that physical adaptation measures alone are insufficient. They need to be embedded in a broader climate risk management approach

19 https://germanwatch.org/sites/default/files/framework_report_-_criteria_to_align_aiib_with_pa_climate_resilience_goal_2020-09-16.pdf

based on in-depth understanding of how lives and livelihoods are or will be affected by climate hazards, and how they can become resilient. To be sustained, physical adaptive infrastructure must have a clear and positive impact on urban livelihoods, particularly those of the urban poor (Soltesova et al, 2014). The good practice examples we show below build on this principle.

Behavioural adaptation, to be effective, needs to take into account social dynamics and local knowledge. This works particularly well when participatory approaches are taken. For this to happen in poor contexts, with regard to slum dwellers for example, cooperation with their associations and peer learning from successful participatory rural appraisal approaches, as well as the adoption of locally led adaptation²⁰ to urban contexts, is advisable. So far this has only been a niche approach in urban resilience-building, but deserves more attention, particularly in poor cities with a high percentage of slum dwellers.

Nature-based solutions play a vital role in enhancing urban resilience. Green infrastructure such as mangroves for coastal protection, trees as wind breakers and for shading, parks for air cooling, cleaning and ventilation, and green roofs and backyard greening for stormwater and flood management, as well as the restoration of urban eco-systems, waterbodies and landscapes to avoid erosion and protect watersheds are all effective and cost-efficient.

Technical adaptation measures, from engineered measures like wave breakers, flood gates, river levees and slope stabilisation, but also the choice of building materials and the architectural design of buildings, air conditioning and insulation, cool pavements or heat-resistant road surfaces are effective but less

affordable and accessible, especially for poorer cities, due to high construction and maintenance costs. They may play a more important role for newly built urban infrastructure.

In view of the climate risks we face, the introduction of technical resilience standards²¹ and compliances for materials, buildings and infrastructure is much needed. To a certain degree they will be context-specific, reflecting the diversity of cities and their climates. They should be science-based and their implementation affordable. For long-lasting physical infrastructure, the proof of their resilience throughout the entire lifespan should become mandatory. Investments in low-cost and high-impact infrastructure, with triple wins for climate mitigation, adaptation and development, should always be prioritised while options that place an additional burden on vulnerable groups are to be avoided.

As in the case of decarbonisation, building networks for peer learning and advocacy, as well as accessing climate finance are essential for cities to become resilient. The Resilient Cities Network,²² the resilience-building programmes of ICLEI throughout all world regions,²³ and the many projects of donors like the European Union,²⁴ development banks²⁵ and climate funds²⁶ are important steps towards urban resilience, but need to be further mainstreamed and upscaled.

Good practice is important as it can inspire further innovation, replication and mainstreaming. The following good practice examples on topics such as housing, urban planning, capacity enhancement, housing, flood and heat protection, and climate risk insurance, have in common that they are cost efficient, widely applicable and pro-poor.

2.1.2. GOOD PRACTICE IN ZERO-CARBON URBAN HOUSING

In this chapter we present three examples of good practice: an innovative business approach to promote solar rooftop and clean technology in India; a renewable energy project for social housing in the Philippines; and a private sector initiative on cost-efficient net-zero housing in the Netherlands – with replication potential for the Global South.

20 <https://www.wri.org/initiatives/locally-led-adaptation/principles-locally-led-adaptation>

21 See for instance <https://www.unep.org/resources/practical-guide-climate-resilient-buildings>

22 <https://resilientcitiesnetwork.org>

23 <https://resilientcities2019.iclei.org>

24 <https://www.resilient-cities.com/en/>

25 <https://development.asia/summary/achieving-urban-resilience-calls-business-unusual>

26 https://www.international-climate-initiative.com/en/details/project/climateresilient-urban-planning-support-for-city-authorities-in-the-philippines-17_IL_153-2878 and <https://www.gcfprojects-undp.org/urban-resilience>



MINUSCO2: PROMOTING URBAN SOLAR ROOFTOP AND CLEAN-TECH, MUMBAI, INDIA

by Siddharth Deshmukh, Managing Partner, MinusCO2, Navi Mumbai, India²⁷

MUMBAI, India



CHALLENGE

The limited adoption of distributed solar and clean-tech solutions in the residential, institutional, and commercial sectors in India's megacities is a key problem hindering a faster energy transition to renewables. Key reasons:

1. Solar and clean-tech require high capital expenditures. Institutional finance is generally not available without additional collateral.
2. Operations and maintenance are considered as burdens by consumers.
3. Customisation to meet consumers' requirements is complex, e.g. energy storage, architectural solar, electric vehicles, and higher energy efficiency.
4. Clean-tech is not mainstreamed among urban citizens, who rely very much on governmental action and policy.
5. Most impact investing opportunities are available only to institutional investors, not to retail investors.



SOLUTION

In order to leverage our expertise in rooftop solar, clean-tech and impact investment, and our understanding of the customer, MinusCO2 is working on two fronts:

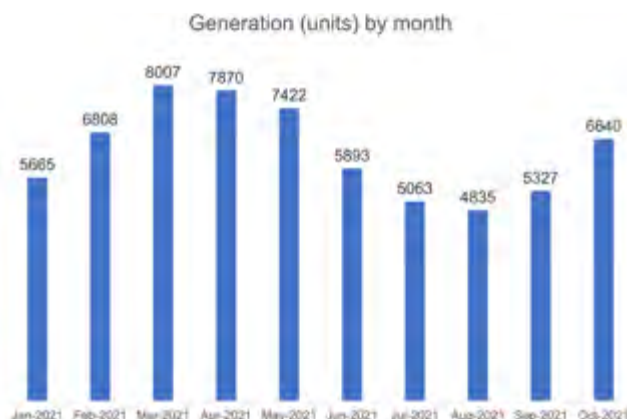
- A. Customer: With zero-investment from customers, we design and install customised solar plants on their premises – and receive payments on a pay-per-use basis for the generated solar power. The solar tariff is 30-60% cheaper than their existing tariff, generating savings of 40-60%. At no additional cost, we own and manage the plant for a duration of 10-15 years, and then transfer it for free. With our solar-plus model, we offer other clean-tech solutions.
- B. Retail impact investors: Solar and clean-tech assets generate environmental and financial returns (i.e. impact investment). To illustrate, the solar tariff payments create cash flows that realise healthy returns (14-15%) on the invested capital. We invite the retail private investor to partner with us, providing an attractive impact asset class.



RESULTS & LESSONS LEARNED

In less than a year (during COVID-19), MinusCO2 has successfully transitioned eight residential societies, one hospital and one college to solar power, and also on-boarded ten retail impact investors as partners. In addition to solar rooftop, the solution set includes energy storage, electric vehicle charging, integrated 2-in-1 solar rooftops, and rainwater harvesting.

We have made sustainability profitable for investors, customers, the company and society. The democratisation of impact investment, in turn, increases the awareness and buy-in into urban sustainability. This mindset shift is imperative for urban citizens to become active participants in creating the decarbonised cities needed for our future. The expansion of distributed clean-tech deployment and citizen participation (both as customer and as investor) builds resilience.





THE ALPAS MICROGRID EXPERIENCE DURING THE COVID-19 PANDEMIC IN MANILA, PHILIPPINES

by Wilson Fortaleza & Maitet Diokno,
Center for Power Issues and Initiatives (CPII),²⁸ Iloilo City, Philippines

 **MANILA**, Philippines



CHALLENGE

In 2011, ALPAS²⁹ members living in a danger zone³⁰ were given support from the government to build new homes through a 'Peoples Plan'. ALPAS, an affiliate of Kilos Maralita, was looking forward to using clean and affordable electricity once members transferred to their new settlement. The challenge, thus, was to implement a solarisation project to electrify the homes of its 546-member households.



SOLUTION

In 2018, ALPAS entered into an agreement with a private solar power provider and non-governmental organisations (NGOs) to solarise their 26 buildings. In government housing projects, power utilities require 90% occupancy before they can be connected. Absent this they are provided with power generators for temporary power, or advance payment to a utility company to facilitate household connections. In many cases, residents end up with no power for months, even years.

Because financing options were limited, the solarisation project had to be installed in stages. First, a microgrid distribution system was built and smart meters were installed. Smart meters operating on prepaid cards³¹ tell residents how much energy they are using in real time. This helped the energy-poor group in ALPAS manage their electricity consumption. Knowing their financial limits, half of them chose not to make use of the advance load programme extended to them during the lockdown. This enabled them to avoid a debt trap and bill shocks³² suffered by other consumers.

The experience has been mixed, mainly because solarisation of social housing requires financing that is sensitised to the needs of the poor. A project implemented in instalments led to higher-than-normal tariff. This created tensions within, causing solar installation, the key component to power cost reduction, to stall prior to the pandemic.



RESULTS & LESSONS LEARNED

Yet an important lesson to learn from this project is that a microgrid system where residents can manage their real-time purchase and consumption can make a difference to their financial decisions and outcomes.

Another is the need to legislate financing programmes to the green transitioning of the social housing sector. Building microgrid systems is key to building healthy and climate-resilient communities. But building these systems needs adequate financial support.



²⁸ <https://www.facebook.com/CenterForPower>

²⁹ Aniban ng Lehitimong Paninirahang Ligtas sa Sakuna (Association for Legitimate Housing Safe from Disaster)

³⁰ Highly vulnerable to flooding and similar disasters.

³¹ Residents would purchase electricity in packets of PhP150 depending on their available funds and electricity needs.

³² Bill shock was the skyrocketing electric bills during the lockdown period.



'ENERGIESPRONG' INITIATIVE IN THE NETHERLANDS – A MARKET-LED INITIATIVE FOR NET-ZERO ENERGY HOMES

by Jiexin Li, China Lead, Architecture 2030,³³ China and the USA

AMSTERDAM, Netherlands



CHALLENGE

Buildings belong to the largest consumers of energy and producers of carbon emissions in the world. To reduce emissions, existing buildings can be retrofitted through energy efficiency and airtightness improvements, adoption of low-carbon heating, ventilation and cooling technologies (HVAC), as well as electricity microgeneration, such as solar photovoltaics (PV).

Today, most home energy retrofits involve isolated measures undertaken by separate contractors, without any guarantee on energy saving performance. This lack of coordination between different suppliers makes retrofitting complicated and unattractive. In addition, these retrofits often rely on government subsidies and charitable funding. The lack of a business case has hindered the retrofitting of buildings, at scale, in many countries.



SOLUTION

Working with social housing associations, the Energiesprong model offers a comprehensive whole-house retrofit package with guaranteed net-zero energy consumption. This typically involves offsite manufactured, insulated facades and modules integrated with renewable heat sources and PV panels. The contractor offers a 30-year energy performance guarantee for a net-zero annual energy consumption amortised over the calendar year. This is based on a guaranteed internal temperature of 21°C in living spaces, and a set allowance of hot water and electricity consumption (like a mobile phone plan). The site installation can be completed very fast thanks to advanced offsite manufacture and modularisation.

The business case for the social housing associations is based on transforming the energy bills of tenants into an energy plan. This energy plan is a 'service fee' (or increase in rent) that costs the tenant the same as the bill that was previously paid to the utility. This fee can be seen as the instalment on the loan taken for the refurbishment. For the social housing associations, which will (most likely) borrow (part of) the money for the investment from a financier, a 5.25% internal rate of return is guaranteed. The service fee allows them to pay back the financier over time. Energiesprong's lender is WSW social bank, which has provided €6bn to underwrite government-backed 40-year loans to housing associations.



RESULTS & LESSONS LEARNED

Energiesprong has successfully retrofitted 5,700 homes in the Netherlands since 2013 and the model has been introduced to other countries, for example the UK, Germany, France and the US. It provides a package retrofitting plan for building owners, makes homes more comfortable, improves the aesthetics and reduces carbon emissions. It also proves to be a good business case for building retrofitting, thereby reducing the reliance on subsidies.



2.1.3. GOOD PRACTICE IN CLIMATE SMART INFRASTRUCTURE PLANNING AND CAPACITY ENHANCEMENT

The following two good practice examples from India and the Philippines focus on climate-smart urban infrastructure planning and capacity development for urban climate disaster risk management.



THE CLIMATESMART CITIES ASSESSMENT FRAMEWORK HELPING INDIAN CITIES TO ADDRESS CLIMATE CHANGE

by Vaishali Nandan, Project Head,
Climate Smart Cities Project at GIZ,³⁴ Bonn, Germany



CHALLENGE

India is ranked 20th among the countries most at risk of climate change impacts, according to the Global Climate Risk Index 2021 by Germanwatch.³⁵ It ranks third in terms of greenhouse gas emissions, thus becoming a crucial player in combating climate change. It is estimated that 44% of India's rapidly growing carbon emissions have urban origins, thus making cities key to addressing climate change.

Following the Paris Agreement in 2015, the Government of India (GoI) declared in its Nationally Determined Contribution (NDC) that the country would take steps to reduce the emission intensity by 33-35% compared to 2005 levels by 2030. The National Action Plan for Climate Change defined reporting commitments at the national level, which meant that cities were reporting via the various urban development missions initiated by the Ministry of Housing and Urban Affairs (MoHUA), such as the Swachh Bharat Mission or the Atal Mission for Renewal and Urban Transformation. However, the flipside was that cities were rather unaware of the simple add-on actions that they could undertake to reduce emissions in their daily functioning or to become resilient. Selected cities like Rajkot, Surat, Nashik or Coimbatore implemented some actions with the support of international partners like C40, GIZ or ICLEI-SA. However, the upscaling potential of these support programmes beyond some pilot cities is unlikely, considering the huge number of more than 4,000 urban areas in India.



SOLUTION

Channelling implementation through various urban development missions does not foster a climate lens for infrastructure development. To sharpen such a focus, technical support was provided under the 'Climate Smart Cities' Project, funded by the International Climate Initiative (IKI) of the German Federal Ministry of the Environment. The project has been jointly implemented by MoHUA and GIZ.

In early 2019, MoHUA, GIZ and the National Institute of Urban Affairs (NIUA) undertook consultations with around 26 organisations (national, international, think tanks, NGOs, cities) to brainstorm about a possible framework for a holistic and climate responsive planning system at city level. The result was the ClimateSmart Cities Assessment Framework

³⁴ For more details: <https://www.niua.org/csc> and <http://www.urban-industrial.in/csc>

³⁵ https://germanwatch.org/sites/default/files/Global%20Climate%20Risk%20Index%202021_2.pdf

(CSCAF). It is a first-of-its-kind assessment framework developed to assist cities in understanding the challenges of climate change, and where they can improve and make efforts towards green, sustainable and resilient urban habitats. The Framework builds on a set of progressive indicators covering energy and green buildings; urban planning, green cover and biodiversity; mobility and air quality; water resource management; and waste management.

Several workshops were held in 100 cities all over the country. Data collection was initiated in mid-2019 and results were presented in January 2020 in the Smart Cities Conference in Vishakapatnam.



RESULTS & LESSONS LEARNED

For the first time, cities had a report in their hands which presented their existing condition and provided a roadmap towards combating climate change with a plan for further actions, including investments. These reports, for the first time, made Indian cities comparable based on similar parameters, paving the way for peer-to-peer learning and knowledge exchange.

With the success of the first round of the Assessment Framework, MoHUA provided funds to NIUA for 'Building Climate Action in Cities' and setting up the Climate Centre for Cities (C-cube) with a mandate to extend the CSCAF exercise from 100 to 500 cities and conduct training and continuous assistance for cities. A 'ClimateSmart Climate Alliance' was formed by MoHUA with more than 70 national and international organisations, to provide additional support. Further, the revised National Mission for Sustainable Habitat guidelines from 2021 also includes the CSCAF indicators for reporting on the NDCs and SDGs.

The second round of the Assessment Framework – CSCAF 2.0, was launched in September 2020 and extended to 126 cities.

The results are expected to be announced in 2021.

Capacity-building initiatives for cities through helpdesk activities, support training, training of experts and institutes, and various other activities have been initiated. GIZ continues to be a strategic and knowledge partner in the process. It is envisaged that this exercise will have an impact on the lives of every urban dweller in India in the future.





ReBUILD: RESILIENCE CAPACITY BUILDING FOR CITIES TO REDUCE DISASTER RISKS, PHILIPPINES

by Kairos Dela Cruz, Deputy Executive Director,
Institute for Climate and Sustainable Cities (ICSC),³⁶ Manila, Philippines³⁷



CHALLENGE

The first phase of the United Nations Development Programme's Project ReBUILD, 'Resilience Capacity Building for Cities and Municipalities to Reduce Disaster Risks from Climate Change and Natural Hazards', was implemented to address the gaps in the capacities of both national and local institutions. Despite the Philippines' generally deep experience of rapid onset disasters, particularly in disaster management and adaptation, their current level of capacities is easily overtaken by the worsening impacts of climate change. National and local actors share the burden of being responsible for ensuring the survival of the most vulnerable people. One of the most glaring gaps identified is the lack of fundamental capacity to know neither when an adverse event is likely to happen, nor the magnitude and scale of potential damage, and what the correct coping mechanisms and adaptation options are.



SOLUTION

ReBUILD approaches this problem systematically by identifying only three regions of focus. For those, the overall governance framework will be improved through a mix of policy, mechanisms, systems, tools and specific interventions. The project listed the following outputs:

- development of climate/disaster risk vulnerability assessments
- identification of priority climate/disaster mitigation actions
- mainstreaming of climate/disaster risk management in plans
- planning on socio-economic resilience of the poor and vulnerable
- manage local knowledge.

Looking at these outputs, it can be seen that the project seeks to go full circle in setting up models of implementation that can be replicated and scaled up.



RESULTS & LESSONS LEARNED

Being in the early stages of implementation, a project impact assessment that focuses on effectiveness cannot be done at this point. However, based on feedback and official documents, it can be assumed that ReBUILD was able to deliver on its commitments together with its partners. The project was able to underscore the importance of knowing the problems first before planning or making any decisions. The project was also able to build experience which shows that assessments are as important as the actual intervention. Investing in good data and information will open more opportunities, especially in building climate-proofed plans. The project was also able to show that a science- and evidence-based approach in planning and budgeting is possible even at local level, as long as ample technical assistance is extended. It is also commendable that the project focused on river basins and their systems. This way, it was able to break the common practice of planning in silos despite sharing a common natural resource.

 **MANILA**, Philippines



³⁶ <https://icsc.ngo>

³⁷ For further information: kairos@icsc.ngo

2.1.4. GOOD PRACTICE IN URBAN FLOOD PROTECTION AND INSURANCE SOLUTIONS

Protecting urban agglomerations against riverine flooding, sea level rise, storm surge and flooding from heavy rain are key concerns of climate risk management. Examples of good practice from Manila (Philippines), Semarang City (Indonesia), and Ho Chi Minh City (Vietnam) are presented here, complemented by an urban climate risk insurance approach, again from the Philippines.



MANGROVE REHABILITATION: A NATURE-BASED STRATEGY FOR COASTAL RESILIENT SEMARANG CITY, INDONESIA

by Dr. Hendricus Andy Simarmata, President of IAP Indonesia,⁴⁰
Arif Gandapurnama, Senior Researcher, and
Khair Ranggi, Associate Researcher,
Centre for Strategic and International Studies, Jakarta,⁴¹ Indonesia



CHALLENGE

 SEMARANG CITY, Indonesia

The low-lying coastal ecosystem of Semarang City is highly exposed to climate-related risks such as tidal floods, coastal abrasion, sea level rise and high tide. Many communities, including 1,600 fishers, rely on the 9,000 hectare (ha) coastal ecosystem for their livelihoods. The increasing risks of this sensitive coastal area are exacerbated by land subsidence that reaches 1-18 cm/year and by mangrove degradation. During 2005-2017, coastal abrasion caused the loss of nearly 192ha residential and productive land, with accretion recorded at only 2.2ha. Changes in the shoreline were thus unavoidable. Between 2013 and 2017 alone, a 2.7km shoreline setback was measured. These rapid changes and coastal dynamics require sound and locally designed interventions to increase coastal resilience. Because of the high land subsidence rate, hard infrastructure will not be effective for coastal protection, as the structure will increase surface load to the sinking area. A nature-based strategy, including mangrove rehabilitation, thus has become the preferred solution for Semarang City.



SOLUTION

Mercy Corps Indonesia (MCI) started with mangrove rehabilitation in the coastal area of Semarang City in 2010. Understanding the vital role of community in ensuring mangrove sustainability, MCI applied a combined approach of ecosystem restoration and community development in their project. Over 332,500 mangrove trees were planted in two different areas, with 40% average survival rate. To protect the mangrove belt from coastal risks, a 700-metre-long breakwater made of old tyres and a 200-metre-long hybrid engineering breakwater were built.⁴² Community development activities included capacity building on better mangrove cultivation and maintenance techniques, low-cost breakwater design and also mangrove-related alternative livelihoods. It enhanced the community's adaptive capacity in responding to the risks, provided alternative incomes and reduced asset losses and damage caused by coastal disaster events. As an ecosystem, the mangrove belt is able to serve the role as green coastal defence structure, breeding place and water purifier, and it provides critical economic resources to the community not to mention its carbon sequestration potential.

⁴⁰ www.iapindonesia.org

⁴¹ www.csis.or.id

⁴² Harris, Kaitlin, Prayoga, I Nyoman, 2017. The link between mangrove ecosystem services and increased coastal urban resilience: The case of Semarang, Indonesia. <https://www.accrn.net/blog/link-between-mangrove-ecosystem-services-and-increased-coastal-urban-resilience-case-semarang>



RESULTS & LESSONS LEARNED

This MCI project is an excellent demonstration of possible co-benefits between nature-based solutions and community development in building coastal and community resilience to climate change impacts, while also contributing to blue carbon stocks. While the effectiveness of mangroves as a means of coastal protection can only be assessed in the long term, the fact that they provide socio-economic and environmental co-benefits has driven the local government to shift their coastal development focus towards nature-based strategies. Hybrid engineering that integrates mangrove rehabilitation with hard structure for coastal protection can be an option if relying on green structure alone is not feasible, for instance in areas with mangrove growth rates that are much slower than land subsidence rates.

In 2021, the Semarang City government has set a target to rehabilitate 94.4ha of mangrove forests, which is more than ten-fold the current mangrove cover, to regenerate the coastal ecosystem. It is critical for success to adopt the MCI approach. Learning from similar mangrove activities implemented by other institutions in Semarang City, such as Bintari Foundation and The Nature Conservancy, can provide a substantial input, too.



Breakwater made of old tyres and mangrove seedlings in the intervention area. Photo: Mercy Corps Indonesia, 2014⁴³

⁴³ Prayoga, Nyoman. 2014. Presentation Material: Building UCCR in Coastal Area of Indonesia. Presented at the Asia Pacific Adaptation Network Conference.



THE METRO MANILA FLOOD MANAGEMENT PROJECT, FINANCED BY AIIB AND WORLD BANK

by Kairos Dela Cruz, Deputy Executive Director,
Institute for Climate and Sustainable Cities (ICSC),³⁸ Manila, Philippines³⁹

 **MANILA**, Philippines



CHALLENGE

The Metro Manila Flood Management Project seeks to address an almost every-day occurrence in the Metro Manila during the rainy season: flooding. As a problem, flooding is not new to the country. However, most of the efforts initiated to address this problem have been futile and ineffective. Geographically, Metro Manila can be considered as a low-lying area located between two large bodies of water, Manila Bay to the west and the Laguna de Bay on the south-east. Metro Manila is in the direct path of flash floods from the northern mountain ranges through the river systems that are tributaries to the Philippine Sea. Unabated urbanisation destroyed much of Metro Manila's natural drainage, resulting in inundation. The wet weather pattern in the Philippines, characterised by at least 20 typhoons in a year and prolonged rainy seasons, almost make flooding a sure occurrence in Metro Manila.

There appears to be fragmentation in flood control efforts generally, which probably stems from the fact that efforts are distributed across different agencies and levels of governance (local and national) with little to no coordination or holistic view.



SOLUTION

This project tries to take on the flooding problem through a comprehensive strategy that combines structural intervention with social preparedness. The project, technically, seeks to alleviate the flooding problem in 17% of Metro Manila's total land area, or 11,000 hectares, which is home to an estimate of 3.5 million Filipinos. The project will have around 1.7 million direct beneficiaries. This overarching objective can be further broken down into four components:

- modernising of drainage areas
- minimising solid waste dumped in waterways
- participatory housing and resettlement
- project management and coordination.

This project sets itself apart from the usual infrastructure projects because of the third component: participatory housing and resettlement. This component offers a comprehensive housing programme to those addressed by the project.



RESULTS & LESSONS LEARNED

Although it is too early into implementation to assess whether this project is effective in achieving its objective, the project is commendable for ensuring that the already vulnerable and marginalised urban poor communities are responsibly transitioned out of the project area. The project specifically and explicitly mentioned that those who have been affected by the project are shielded from the project's technical footprint. This approach allowed the project to develop a healthy relationship with the communities and agencies involved in its implementation.

³⁸ <https://icsc.ngo>

³⁹ For further information: kairos@icsc.ngo



ADB CITY DISASTER INSURANCE POOL PROJECT IN THE PHILIPPINES

by Kairos Dela Cruz, Deputy Executive Director,
Institute for Climate and Sustainable Cities (ICSC),⁴⁴ Manila, Philippines⁴⁵

 **MANILA**, Philippines



CHALLENGE

The Philippines is regarded as one of the world's most disaster-prone countries. Its economy's fragility when it comes to coping with disasters keeps on setting back the whole country every time disaster strikes. Local government units (LGUs) are often left to carry the burden of ensuring that resources are available to provide immediate response to disasters, without compromising other social services expected from LGUs. Since the severity and frequency of disasters varies from year to year, it is not impossible to imagine that an LGU able to cope with the first typhoon would have a hard time dealing with the second or third one, not to mention other disasters such as earthquakes. Urban areas, particularly cities, have higher vulnerabilities because they host key economic hubs and large populations.



SOLUTION

The Asian Development Bank (ADB) introduced the Philippine City Disaster Insurance Pool (PCDIP) project to provide near-immediate pay-outs through parametric insurance. This project explicitly aims to close the funding gap needed by LGUs to provide immediate disaster response and post-disaster recovery.

By design, PCDIP selected ten cities as pilot areas to collectively buy insurance through a single platform. Creating a pool will reduce the premium requirement without compromising the quality of coverage.



RESULTS & LESSONS LEARNED

PCDIP is still in the last stages of the project development pipeline. However, commendable project features already show promise this early on, such as having a strong rationale, innovative cost reduction approaches, and complementarity.

As a risk transfer mechanism, the project underscores the importance of being able to absorb and bounce back after a disaster hit. As a country with low insurance penetration, this project certainly builds something important and demonstrative. This is also seen in the project's focus on cross-learning across its pool of cities.

PCDIP is primarily able to reduce the premium costs of the pool by selecting its members from different parts of the country, which in turn diversifies the risks that the pool has to cover. In addition, the project is designed to have a managing body, which would further lessen the cost of coverage.

On the one hand, PCDIP is creating something new in the front of risk financing among cities. On the other hand, it is able to find complementarity with other risk financing windows, especially those of the government.

⁴⁴ <https://icsc.ngo>

⁴⁵ For further information: kairos@icsc.ngo



SUSTAINABLE DRAINAGE SYSTEMS IN HO CHI MINH CITY, VIETNAM

by Nguyen Hoang My Lan, MEng. Lecturer,
University of Social Sciences and Humanities, VNU-HCM,⁴⁶ Ho Chi Minh City, Vietnam



CHALLENGE

Urban flooding is one of the negative consequences of the development process in Ho Chi Minh City, Vietnam. From 2016 to 2020, the city government spent more than VND 25,000 billion (USD 900 million) on anti-flood projects, including public and private investments. However, flooding locations appear increasingly within the city due to urban development and heavy rainfalls. Hence, the proper solution for Ho Chi Minh City is a Sustainable Drainage System (SuDS), the most effective approach in urban storm-water management. SuDS refers to techniques that fit particular sites to deliver best benefits for flood control, environmental improvements and amenity creation. Selecting the suitable SuDS technique depends not only on the technical characteristics but also on the community's opinions. Thus, a study was conducted, aiming at identifying the most suitable SuDS approach for the Nhieu Loc - Thi Nghe sub-catchment in close consultation with the community.



SOLUTION

More than 200 households were interviewed in order to select those SuDS techniques that would be most appropriate to their living situation. The community's priorities are determined by household characteristics, flooding situations, and living site characteristics. In particular, proximity to the nearest park from the resident's house affects people's choice: the nearer a household is located to a park, the more likely it is that two or even three of the SuDS benefits – flood control, environmental improvements and amenity creation – will occur (see figure below). Therefore, the application of SuDS should start from parks within the sub-catchment. For example, it is possible to renovate or apply detention ponds to temporarily store water during heavy rains, leading to flood mitigation, air conditioning and increasing property values for the surrounding residential areas. Conclusively, the SuDS scheme can be designed to meet the community's interest.

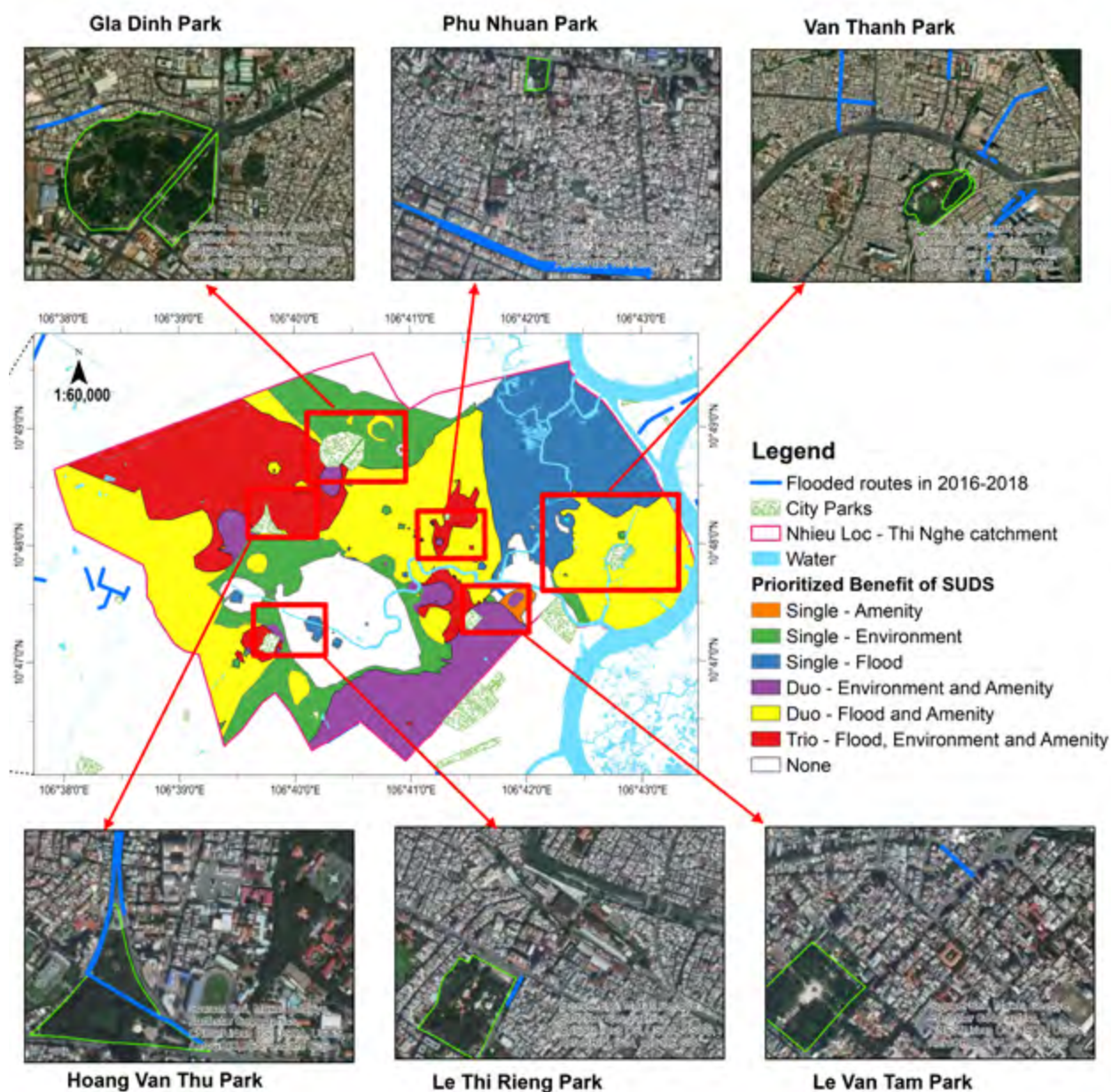


HO CHI MINH CITY, Vietnam



RESULTS & LESSONS LEARNED

The community's opinions and choices presented in the study coincide with the planning goal to develop a nature-based drainage system, as stated in the Master Plan for Socio-Economic Development of Ho Chi Minh City up to 2020, with a vision to 2025. SuDS can be widely applied in Ho Chi Minh City following the findings in the case study of Nhieu Loc - Thi Nghe. Community involvement in the whole process of SuDS projects, from planning and design to building and operation, will optimise social impacts.



Spatial distribution of SuDS benefits based on community preferences in Nhieu Loc - Thi Nghe sub-catchment, University of Social Science and Humanities VNU-HCM

2.1.5. GOOD PRACTICE IN REDUCING URBAN HEAT STRESS

Heat waves are one of the biggest climate risks that particularly affect cities in warm climate where most mega-cities of the world are located. India is the country with most big cities being exposed to heat stress. How to reduce the heat risk either through social or through physical infrastructure is discussed in the following two examples.



RETROFITTING HOMES USING 'MODROOF' TECHNOLOGY IN INDIAN INFORMAL SETTLEMENTS

by Dr. Ajita Tiwari Padhi, formerly National Facilitator at LAYA, Visakhapatnam, India⁵¹

 AHMEDABAD, India



CHALLENGE

Mahila Housing Trust (MHT) has been working with women groups to respond to challenges to a decent living and dignified livelihoods. It relates to the question of urban resilience from the perspective of the most marginalised women living across informal settlements experiencing increasing climate variability and extremes.

The dream of safe and decent housing eludes most of the communities living in Indian informal settlements. There, houses are typically tiny spaces with tin sheets or plastic covers serving as roofs. "We surround our house with vessels of different shapes and sizes to collect rain water falling from the roofs during the monsoons," says Meena Soni of Vishwasnagar informal settlement in Ahmedabad. "Further, the rain falling on the roof makes it too noisy for us inside. Especially the summers are tough with people getting sick due to extreme heat inside the house, leading to hospitalisation for many, adding to household expenses." Elaborating further, Soni says that "the RCC⁵² roofs are too expensive for us and we do not want to invest in a roof that cannot be transported, recognizing that we might receive orders to clear the informal settlement anytime".



SOLUTION

"The 'modroof' changed our situation to the better and brought me closer to my dream home", Soni continues. The 'modroof' technology emerged as a response to the challenges faced by the slum dwellers, including unstable tin roofs, extreme heat indoors, freezing cold during winters, open to rains, and monkey problems, according to Bhavana Meheriya of MHT. Made of paper waste and coconut husk as primary raw materials, the modroof is a low carbon, low energy, water and fire-resistant resilient technology. After two pilots and subsequent design modifications, the technology was validated by the women. The dream of *Pakka chat* (permanent roof) of the women has become true with this technology. It meets their aspirations look-wise, is accessible, affordable,⁵³ user friendly and can be transported and relocated anywhere. Temperature data showed a 5-6 degree drop in temperature in the house with the modroof, which has resulted in slashing electricity bills (less cooling needed). The technology has received an institutional certification, too.

⁵¹ For further information: ajita@indiaclimatecollaborative.org or www.laya.org.in

⁵² RCC: reinforced cement concrete

⁵³ A 10x10 roof costs around INR 50,000 (USD 650), accompanying costs of levelling, etc. included.



RESULTS & LESSONS LEARNED

A large part of the success goes to the local innovator based in the city, who is committed to tweaking the design to meet different end-user needs. To make this technology available to all, MHT has developed a financing model via credit cooperatives which allows women to take advantage of loans for getting this housing technology. So far, 500 modroofs have been installed in Ahmedabad informal settlements and MHT is interested in taking the approach to several other cities across India. However, the challenge for the communities lies in receiving loans from commercial banks for this infrastructure investment. Thus, this infrastructure could be nationally streamlined through the City Heat Action Plans for upscaling across the country and South Asia.





BEATING THE HEAT THROUGH HEAT ACTION PLANS (HAPS) IN INDIA

by Dr. Ajita Tiwari Padhi, formerly National Facilitator at Laya,⁴⁷ Visakhapatnam, India

 AHMEDABAD, India



CHALLENGE

The IPCC Special Report on managing the risk of extreme events highlights higher daily peak temperatures with more intense heat waves.⁴⁸ This puts particular groups, especially outdoor workers and people in informal settlements, at higher risk of heat-related health issues. According to a report from the Indian Meteorological Department (IMD), heat wave casualties are increasing every year and India was worst hit by heat waves in 2015, causing 2,300 deaths, making it the fifth highest in world history in terms of heat wave casualties. It did not impact just people, but also caused death to an unaccounted number of wildlife, birds, poultry, etc., across the country. Several Indian states, including Andhra Pradesh, Telangana, Odisha, Uttar Pradesh and Rajasthan, are at extreme heat risk.



SOLUTION

The recognition of adverse impacts pushed states and cities in heat wave zones to draft 'Heat Action Plans' (HAPs). Leading the way with its Heat Action Plan in 2013, Ahmedabad became the first city in South Asia to come up with such a plan. The HAP is part of a broader collaboration between Ahmedabad Municipal Corporation (AMC) and public health and policy institutions and experts.⁴⁹ AMC adopted this action plan as part of its disaster preparation plan. This has enabled interventions on a broad scale across the city's municipal agencies. The actions are centred around enhancing public awareness of extreme heat, an early warning system, heat preparedness planning, capacity building of health professionals, and convergence between emergency services, health services, city authorities and local communities. Ahmedabad's HAP uses a simple colour-coded 'heat alert' system which sends out alerts: 'yellow' (temperatures between 41.1 and 43°C), 'orange' (43.1 to 44.9°C) and 'red' (above 45 degrees and considered to be extreme heat alert).

The response to HAP has led the city to rapidly improve its public health infrastructure as an adaptation response by way of strategic positioning of ambulances around heat hotspots, higher hospital preparedness as a result of early warning and forecast, cool drinking water stations, and change in work timings. The impact of the HAP is calculated based on the data of mortality and morbidity available with the health department every year.



RESULTS & LESSONS LEARNED

As a result, during the 2015 heatwave, only seven deaths were recorded in Ahmedabad in comparison to the similar heatwave in 2010 which claimed 1,300 lives.⁵⁰ Ahmedabad's simple and cost-effective model encouraged 11 states and 17 cities to adopt and develop HAPs in India. Some cities utilise roof white-washing and WhatsApp alerts as additional response mechanisms. Hopefully, through education, awareness raising, and support for vulnerable people in the heat hotspots of the country, deaths due to heat can be eradicated. This case can be used as an example of best practice to replicate in other areas all over India and elsewhere, creating a standard for municipal management.

⁴⁷ For further information: ajita@indiaclimatecollaborative.org

⁴⁸ IPCC, 'Managing the risks of extreme events and disasters to advance climate change adaptation', 8 March 2012: <https://www.ipcc.ch/report/managing-the-risks-of-extreme-events-and-disasters-to-advance-climate-change-adaptation>

⁴⁹ Institutions and experts at the Indian Institute of Public Health, Public Health Foundation of India, Natural Resources Defense Council, Icahn School of Medicine at Mount Sinai, and supported by the Climate and Development Knowledge Network (CDKN)

⁵⁰ www.pwc.com/gx/en/industries/healthcare/casestudies/heat-health-action-plan-in-india.html

2.2. CITIES AND ENVIRONMENT

The over-exploitation and contamination of groundwater resources, alarming levels of air pollution, fast advancing land-use changes turning fertile land and nature into concrete jungles, are alarming signs of the present urban crisis, and, in particular, the massive loss of biodiversity, which has risen to a 100,000 times the long-term average, is leading many experts to speak of the sixth mass extinction (Ceballos et al., 2017). This crisis is a result of very serious and undesirable developments in our capitalist economy and our model of prosperity and development (Mazzucato, 2021). All these lead to the loss of ecosystem-services and the space where this is most obvious is the urban environment.

Groundwater decline and depletion has become a big issue for many urban areas around the world because withdrawal has exceeded recharge for a long time. In Jakarta, the fastest sinking city in the world, and at the same time a city where still 60% of inhabitants have no access to piped water, land subsidence has reached alarming levels of 10-25cm per year due to groundwater extraction, sea level rise and land subsidence caused by the heavy load of buildings.⁵⁴ Ho Chi Minh City is facing similar problems. Almost 50 Chinese and 30 Indian cities are likely to face acute water crises by 2050 and some have already reached that point – Chennai, for example.⁵⁵ The contamination of groundwater in combination with excessive drilling, less precipitation, massive population growth and unplanned urban expansion has led to the point where inhabitants have been left dependent for months on water tankers and forced to wash in dirty water. Experts warn that many Indian cities have just five years left to resolve their water problems (Hirsch et al., 2019).

Air pollution has achieved new and unprecedented heights in many cities of the world. Cars and trucks, factories and power plants, the burning of straw, and cooking and heating with

charcoal, wood, coal or waste are contributing to it. Soot and smog, as well as hazardous air pollutants like mercury, dioxins or benzene lead to eye irritation, asthma, bronchitis, heart attacks or cancer.⁵⁶ According to the World Health Organization (WHO), air pollution leads to seven million premature deaths per year.⁵⁷ The top positions in the air pollution ranking of major cities in 2020 were held by Hotan (China), Ghaziabad, Bulangshar, Birsakh Jalalpur, Bhiwadi, Noida, Greater Noida, Kanpur, Lucknow and Delhi (all India); the first 50 positions are held by Asian cities.⁵⁸

Urbanisation is a key driver of land-use changes, particularly in developing countries, leading to a rapid decline of arable land and eco-systems as well as biodiversity loss. Contemporary urbanisation by and large is characterised as urban sprawl, that is, highly extensive land take with environmentally detrimental effects. Low urban density leads to high loss of land, higher energy consumption, longer transportation times, and many more negative effects. The United Nations Convention to Combat Desertification (UNCCD) has warned that by 2030, in a business-as-usual scenario, 1.3 to 3.3 million hectares of arable land will be lost per year, due to urbanisation.⁵⁹

Pollution, land-use change leading to habitat loss, overexploitation and climate change are key drivers of biodiversity loss at alarmingly high rates.⁶⁰ Nature is in peril and urbanisation is one of the most intensive and rapid human-induced drivers of biodiversity loss.⁶¹ Losses in biodiversity, natural landscapes and ecosystems lead to a larger environmental footprint of urban infrastructure. Ultimately, this has a negative impact on the sustainability of people – and cities too.

54 <https://www.channelnewsasia.com/cnainsider/why-jakarta-is-world-fastest-sinking-city-floods-climate-change-781491>

55 <https://www.livemint.com/news/india/30-indian-cities-likely-to-face-acute-water-risks-by-2050-wwf-11604371789053.html>

56 <https://www.nrdc.org/stories/air-pollution-everything-you-need-know>

57 <https://www.dw.com/en/who-air-pollution-causes-7-million-premature-deaths-a-year/a-59264198>

58 <https://www.iqair.com/world-most-polluted-cities>

59 <https://www.downtoearth.org.in/news/agriculture/urbanisation-to-cause-huge-loss-of-prime-farmland-uncdd-66562>

60 <https://india.mongabay.com/2020/09/nature-in-peril-as-biodiversity-losses-mount-alarmingly-states-the-living-planet-report/>

61 <https://www.frontiersin.org/articles/10.3389/fevo.2020.00073/full>

2.2.1. THE GREEN CITY

Business-as-usual urban development and related infrastructure investments ignore the value of natural capital and therefore do not integrate 'loss of value of ecosystem services' in making investment decisions. In contrast, a green city is characterised by minimising negative environmental impacts as far as possible and systematically assessing, valuing and maintaining or improving ecosystem services. The green city is a city that does not displace nature but, on the contrary, builds on nature-based solutions wherever possible.

A green city requires forward-looking, nature-sensitive and holistic urban planning because many of the foundations of the green city are already laid through the spatial structure and the utilisation concepts of a city, for example, the concept of a compact city of short travelling distances between the basic functions of living, working, culture, recreation and leisure. If these functions are condensed and mixed, distances – and thus traffic and time loss – are drastically reduced, and infrastructure costs can also be reduced (Dempsey, 2010).

A green city is characterised by a dense cluster of parks and waterbodies that minimise surface runoff, cool and ventilate the air, and improve air quality. Trees along the streets provide shade for streets and buildings, roofs are greened and buffer precipitation, and greened walls create urban habitats for insects, butterflies and birds. Horizontal and vertical urban gardening can provide fresh vegetables and reduce freight transport to the city. Green urban building codes provide an enabling framework and incentives to green the city.

Connecting informal settlements and businesses to treatment plants, with a third biological treatment stage distributed throughout the city, reduces water pollution and significantly improves hygiene. Surface unsealing, for example of car parks and roofs, as well as through the creation of green spaces, slows down surface runoff, thereby reducing the risk of flooding and relieving the burden on the sewage system.

The air quality of cities can be dramatically improved through: industrial emission protection; reduction and electrification of private motorised transport; insulation of buildings;

electrification of heating, cooling and cooking; conversion of energy supply to renewable energies; and a ban on burning waste and crop residues.

Dense urban development reduces land consumption; this is achieved through appropriate urban planning guidelines and consistent re-densification, with simultaneous promotion of mixed quarters that reduce inner-city ways and thus also traffic. In particular, the extensive elimination of the separation of inner-city working and shopping and suburban living in pure dormitory towns is extremely important here. The reduction of inner-city space for motorised individual traffic creates space for pedestrians, cyclists, and green and water areas. The city becomes greener and more liveable.

A green city protects and restores ecosystem-services, using nature-based solutions that address both, community needs and biodiversity conservation. Green urban planning supports the roll-out of nature-related financial disclosure and its uptake by urban stakeholders, including the private business sector. According to the Global Biodiversity Outlook 5 of the Convention on Biological Diversity (CBD)⁶² and the UNEP Finance Initiative,⁶³ the loss of biodiversity, which has not been curtailed so far, severely undermines the natural resource base of industries, which are highly dependent on them. Therefore this will further undermine and endanger value chains, for example of the food, pharmaceutical and clothing industries, finally jeopardising supplies to cities of goods for daily needs, urban economic value generation and employment. Nature-related financial disclosures make these risks transparent and help to minimise them. A green city, through awareness raising, education and well guided planning, can greatly support pathways that lead to zero-net impact of urbanisation on biodiversity.

These and other approaches to greening the city presuppose a corresponding awareness of the problem and the support of the urban population, which is why education and public participation are very important.

62 <https://www.cbd.int/gbo5>

63 <https://www.unepfi.org>

2.2.2. GOOD PRACTICE IN GREEN URBAN INFRASTRUCTURE

Our first good practice example has urban farming at the core, showing how a farming community in the old Indonesian city of Bogor benefits from it, and the urban environment and visitors, too. The second good practice is about ground-water recharging through drilling recharge wells by traditional well diggers, a very poor community. The third example is from China, about urban community gardening and waste composting.



IMPROVING PARTICIPATION IN DECENTRALISED COMMUNITY-LED COMPOSTING IN QINGDAO, CHINA

by Chun Wu, Program director at Beijing Woqi Foundation, Beijing, China⁶⁷



CHALLENGE

The waste management hierarchy, according to the UNEP and United Nations Institute for Training and Research (UNITAR) *Guidelines For National Waste Management Strategies Moving From Challenges To Opportunities*, indicates an order of preference in waste management action. The most preferred action is prevention and reduction. The Chinese government has also long taken note of waste problems. In 2016, waste-sorting policies were piloted in 46 cities to divert waste away from traditional incineration and land filling. By 2019, the city of Qingdao in Shandong province had 11 domestic garbage treatment facilities with a processing capacity of 9,945 tons per day that mainly used incineration. It was unsustainable and infringed against the waste management hierarchy. But since Qingdao became a pilot city, it gained momentum in changing the status quo, giving local non-governmental forces a new space to push for change.

 QINGDAO, China

67 www.woqifoundation.org.cn



SOLUTION

In March 2019, supported by Vanke Foundation and Beijing Woqi Foundation, the Qingdao You & Me Social Service Centre (QYMSSC) launched the Community Kitchen Waste Recycling Project to explore decentralised community-led composting in China. By April 2021, QYMSSC has mobilised 10 communities that composted 50.45 tons of kitchen waste and 12.75 tons of garden waste. The resident population in Chengyang district is 745,000, of whom about 23,000, or 3%, have participated in composting. This provides a good example for bottom-up non-governmental waste treatment upgrading and the building of green cities.

QYMSSC started their work from kindergartens in the communities, combining waste composting and natural education. Then, they gradually gained the trust of other key stakeholders and expanded their model to other living areas in the communities. They finally formed a strategy of 'household sorting - community collection - community composting - community garden' that not only allows residents to participate and witness the miraculous transformation from garbage to community gardens, but also reduces the cost, pollution, and carbon emissions of downstream waste treatment.



RESULTS & LESSONS LEARNED

In addition to providing technical support to kitchen waste composting, QYMSSC also trains and empowers community volunteers, creating incentives for public participation and sustainable, inclusive and resilient communities.

In terms of policy advocacy, QYMSSC made great efforts to expand the influence of its initiative through public communication, workshops, site visits, in-person training etc. As a result, the Chengyang District of Qingdao is now considering incorporating decentralised community-led composting into their solid waste management subsidy system by the end of 2021, as well as encouraging the scaling up of the practice in the district.



Composting zone and community garden transformed from garbage dumping site.
Chun Wu



Community stakeholders discuss the plans of community gardens.
Chun Wu



BOGOR URBAN FARMING, INDONESIA: LOW COST, BUT WITH CO-BENEFITS TO CLIMATE ACTION

by Dr. Hendricus Andy Simarmata,
President of Indonesian Association of Urban and Regional Planners (IAP),
Jakarta, Indonesia⁶⁴



CHALLENGE

Bogor, a garden city, is facing a double challenge. On the one hand, it is projected to experience temperature rise of approximately 3°C, which will exceed the Paris Agreement's global targets. Already today, Bogor is experiencing climate-related disasters, such as (1) limited water resources, (2) depleting urban ecosystems, and (3) potential food insecurity. On the other hand, Bogor has to decarbonise in the years to come. The city's most significant contributors of greenhouse gas emissions are the energy, transportation and solid waste sectors, together with emissions from afforestation and land-use change. Therefore, the challenge is how to plan and implement initiatives with climate mitigation and adaptation co-benefits at low cost.



SOLUTION

Besides maintaining the green spaces of Bogor, urban farming can contribute with additional social and economic benefits. Located south of Bogor, the community of Ciharashas village offers an organic paddy field that provides education and tourism attractions. The area is of 23 ha in size, consisting of 10 ha that belong to the community and 13 ha to private developers. The visitors can learn a variety of techniques, from seeding selection to harvesting activities. They may also experience the operation of livestock, fish ponds, medicinal plants and bio-energy from the waste. In addition, the community provides traditional games, outdoor activities and water recreation.

The maintenance of the farm helps ensure water circulation and the prevention of soil erosion. Tree planting can increase carbon stocks and soil carbon sequestration. It also reduces energy consumption for food transportation, supports a conducive microclimate and a low-carbon and healthy diet. Besides protecting the environment and the climate, urban farming supports rainwater management, food security, and economic and social resilience. The production of paddy, fish, livestock, vegetables and fruit-bearing plants followed by educational tourism activities creates socio-economic development benefits for the Ciharashas farmers.



RESULTS & LESSONS LEARNED

The co-benefits approach aims to adapt and mitigate climate change. It has positive spill-over effects for sustainable development. A lesson learned from this project is that the community could implement this approach with low own investments. Infrastructure development costs (i.e. educational and tourism facilities) were mainly captured by the city government and private investors. Through these investments, the farming land's value increased. The community also charges USD 0.7 as entrance fee from visitors. During the COVID-19 pandemic, the number of visitors per day was reduced to 400 – half of the maximum capacity.

Urban farming that offers educational and tourism attractions certainly produces multiple benefits for the farmers and the city. Putting the community at the centre of the development is the key to success that other cities should adopt to initiate urban farming programmes. The Ciharashas urban farming project was awarded first place in the National Climate Initiatives Competition in 2019.



Ciharashas urban farming. Pinastika, 2021





Sketch showing recharge wells and their effects



MILLION WELLS FOR BENGALURU, INDIA

by Shubha Ramachandran, Head of Water Projects,
Biome Environmental Trust India,⁶⁵ Bangalore, India



CHALLENGE

Bengaluru's water comes from the Kaveri River 100km away, from 300m below the city, and from thousands of borewells that are drilled deeper every year. Water availability from the Kaveri River depends on regular rainfall in the catchment area, which is now facing deforestation, land-use changes, etc. The hard rock geology of the region makes deep groundwater availability a gamble – the deeper one drills, the less the chance of finding water. This affects Bengaluru's water resilience and sustainability. All strata of society are affected by this unpredictability – the poor more, as in any crisis situation.

 **BANGALORE**, India

65 <https://biometruster.org>



SOLUTION

On the one hand, recharge wells prevent flooding due to heavy rain in low-lying areas, where the water table is not high, by sending surface runoff into the ground, preventing it from pooling and stagnating. On the other hand, the availability of water during the dry season is much higher, because the run-off during rainy days was caught and stored in the ground. Continuous recharge of groundwater over a period of time raises the water table, recharging borewells and open wells, which then provide water for longer periods.

As a socio-economic co-benefit, livelihoods of the well diggers could be improved by employing them for digging more recharge wells and reviving open wells. Moreover, their traditional heritage and knowledge is being preserved.

Biome Environmental Trust started a campaign to promote the digging of recharge wells in 2015, and is expected to run until 2025.⁶⁶ The campaign hopes to ensure rising groundwater tables in Bengaluru by digging one million recharge wells across Bengaluru. By 2021, an estimated 200,000 wells had been dug and another 800,000 were still needed. Thanks to the campaign, 3,000 families of well diggers have had regular work. In the longer run, the campaign might be extended beyond Bengaluru to other parts of the Indian state of Karnataka, as well as to other states, where hydro-geologically applicable.



RESULTS & LESSONS LEARNED

Already in 2008, Rainbow Drive, a community with 400 plots and drying borewells, consulted Biome and dug 360 recharge wells that have resulted in an increase of water supply of more than 100,000 litres a day. Inspired by the results, other communities visited the site, learned about groundwater recharging and took the approach up.

The environmental benefits of the approach are clear. Recharging groundwater raises groundwater tables at large scale, contributes to keeping seasonal streams affluent longer, makes rivers and lakes hold water for longer periods, and improves soil moisture to the benefit of vegetation.

In terms of economic benefits, the digging and maintenance of 200,000 wells has generated revenues of INR 8 billion or about USD 108 million (200,000 wells at INR 40,000 or USD 535 each) for well diggers and ring makers. Enterprises that produce concrete rings, rainwater filters and other materials, as well as companies that lend pumps or provide transport, benefitted too.

In terms of social benefits, well diggers have been benefitting the most. They are from a scheduled community that ranks low in India's caste hierarchy. Thanks to the campaign, their traditional skills were highly sought. The revival of well digging over the last two decades has helped them return to their traditional occupation. Well digging is a specialised skill requiring strength and technique. Reclaiming their lost heritage has empowered them and has raised their status in society.

66 <http://bengaluru.urbanwaters.in/about-the-million-wells-campaign>



2.3. CITIES AND SOCIAL DEVELOPMENT

Central aspects of sustainable urban development for cities today and in the future are increasing social and human challenges, which were further extrapolated by the COVID-19 crisis and its impacts.

According to the World Inequality Report, global inequality within countries has risen sharply since 1980,⁶⁸ with wealth being increasingly concentrated in the hands of a very few. Beyond economic disparities, cities themselves have become more fragmented, with over 75% of the world's cities becoming more unequal over the last 20 years.⁶⁹ Concretely, this physically manifests in the development of informal settlements, where access to basic sanitation and clean drinking water is often severely limited.⁷⁰ Globally, one in three city dwellers, or over 1.2 billion people, do not have access to basic everyday services.⁷¹ Nevertheless, urbanisation increases because climate and environmental degradation and disasters increasingly force people to migrate to cities to earn their livelihoods.⁷² In 30 years, UN Habitat expects around 90% of urban growth to occur in less developed regions, such as Southeast Asia, South Asia or sub-Saharan Africa. Because of the rapid pace of these trends, growth is predicted to occur largely unplanned, which will lead to a growth of informal housing and informal settlements.⁷³

Many forms of inequality, particularly in the developing world, have been widened by the adverse impacts of COVID-19. For example, Oxfam India finds that the wealth of Indian billionaires has risen by 35% during the lockdown.⁷⁴ On the flipside, the economic burdens of the pandemic are largely carried by workers in the informal economy, lower-skilled workers, and small and medium-sized businesses, who are often left without social protection and in serious fear for their livelihoods.⁷⁵ As the United Nations has noted: *"As with so many aspects of this pandemic, the impacts are falling disproportionately on those who were already in precarious circumstances and who can least absorb the additional blow."*⁷⁶ These unequal consequences raise further questions of how to achieve a just recovery for all.

Just as social and economic inequalities have come even more to the forefront, access to basic technologies is another critical issue of our time. Globally, one billion people lack electricity, and four billion people lack internet access, which affects work and schooling opportunities.⁷⁷ During the pandemic, school closures aggravated youth inequalities, with, for example, 65% of students in Indonesia being affected by a lack of internet access. On a broader scale, the current youth population faces severe challenges. The so-called 'Pandemials', young adults aged 15-24, are not only confronted with a major global climate and financial crisis, but they are now entering school and the workforce during a pandemic that has severe impacts on their education, economic prospects and mental health. Furthermore, their employment prospects are becoming even more insecure in times of the Fourth Industrial Revolution, in which 47% of employment is in danger of being automated.⁷⁸ Young people have become increasingly frustrated about these intergenerational inequalities and in some cases, such as in India, have reacted with online and offline protests.

Beyond the severe consequences for young people, the pandemic has also disproportionately negatively affected women. Women have felt the economic consequences, with 70% of working women across nine of the world's largest economies believing that the progression of their careers will be slowed by the pandemic's disruption. Furthermore, women tend to carry the increased burden of unpaid care work and face the growth of social tensions in lockdown, resulting in an overall rise of gender-based violence.⁷⁹

In addition to these social and economic challenges, cities in the future will face growing problems related to population growth and aging. While the number of young people is expected to increase across Africa, the regions of Oceania, Europe and Asia are faced with an increasingly older population.⁸⁰ The resulting shift in the workforce together with the fragmentation or lack of societal security systems in the areas of elderly support, disability or medical care, pose new challenges for urban infrastructure investments.

68 <https://wir2018.wid.world/files/download/wir2018-full-report-english.pdf>;
<https://www.un.org/en/un75/inequality-bridging-divide>

69 https://unhabitat.org/sites/default/files/documents/2019-09/strategic_plan_2020-2023.pdf

70 <https://data.unicef.org/resources/progress-drinking-water-sanitation-hygiene-2017-update-sdg-baselines/>

71 <https://www.wri.org/initiatives/cities-all-towards-more-equal-city>

72 https://www.unhcr.org/gcr/GCR_English.pdf

73 https://unhabitat.org/sites/default/files/documents/2019-09/strategic_plan_2020-2023.pdf

74 <https://www.oxfamindia.org/press-release/inequality-virus-india-supplement-2021>

75 https://unsdg.un.org/sites/default/files/2020-07/policy-brief-the_world_of_work_and_COVID-19.pdf;

WEF The Global Risks Report 2021; <https://www.imf.org/external/pubs/ft/fandd/2021/06/inequality-and-COVID-19-ferreira.htm>

76 https://unsdg.un.org/sites/default/files/2020-07/policy-brief-the_world_of_work_and_COVID-19.pdf, page 2

77 <https://www.worldbank.org/en/topic/infrastructure/overview#1>

78 <https://www.sciencedirect.com/science/article/abs/pii/S0040162516302244>

79 <https://www.unwomen.org/-/media/headquarters/attachments/sections/library/publications/2020/policy-brief-the-impact-of-COVID-19-on-women-en.pdf?la=en&vs=1406>

80 https://www.un.org/en/development/desa/population/publications/pdf/popfacts/PopFacts_2019-6.pdf

2.3.1. THE SOCIALLY INCLUSIVE AND RESILIENT CITY

While many of social and economic divides were accelerated by the COVID-19 crisis, the current situation provides a unique opportunity to develop and implement new and more far-reaching solutions. The pandemic has exposed the vastness of poor access to quality infrastructure in housing and health, and the need for labour and social equity reforms. Although it has highlighted the immense magnitude of these problems, the pandemic has also provided a new impetus for urban development concerns. To tackle societal problems effectively, future urban development efforts should focus on the two core principles of resilience and inclusivity.

Inclusive urban development puts people at the centre of its approach. It builds on the idea that the fulfilment of basic human rights, such as access to clean drinking water and sanitation or the right to food, is at the heart of development projects. A particular focus is placed on the needs of the most vulnerable populations to ultimately secure the sustainability, quality and equity of the projects. To ensure and support ownership and to build capacity, bottom-up development of small-scale financing opportunities can be an important and effective measure.

The necessity to integrate inclusiveness in financing projects is two-fold. On the one hand, there already exist enormous unmet infrastructure needs, such as access to decent housing, drinking water or energy, of both urban and rural poor populations. In particular, urban informal settlements, while showing the greatest growth rates, also have the most critical need for the provision of basic human needs. These vulnerabilities will rise sharply if they are left unaddressed. In response, cities presently have the best opportunity to reshape and build this infrastructure differently to holistically improve the quality of life for the most vulnerable.⁸¹ A crucial step in achieving inclusiveness is the mainstreaming and clear application of a gendered perspective at all levels of a project. As women and gender minorities have different perspectives, face unique constraints to access and use public spaces, and are burdened with social and economic disadvantages, urban development needs to encourage gender-inclusive planning and design to ensure the building of environments that reduce gender inequity.⁸²

On the other hand, investments in urban infrastructure offer possibilities for innovative social benefits and could prevent further deterioration. For example, investments in climate-friendly urban infrastructure are not merely tackling environmental threats that are particularly endangering the poor population and exacerbating inequalities. These investments are also expected to create numerous new jobs, especially for low-skilled workers, and will improve environmental health for entire city populations due to reduced air pollution.⁸³ Additionally, better-targeted financial investments can enable local communities to form coalitions for change and innovation.⁸⁴

Efforts to 'build back better' also need to foster resilience among the most vulnerable people and the population at large in order to achieve sustainable improvements in the face of new challenges. In the short term, it will be essential for cities to design and implement local plans for effective responses to health risks and develop risk communication tools that engage communities and encourage compliance.⁸⁵ In the longer term, urban resilience can most effectively be strengthened through multisectoral, whole-of-society approaches that tackle existing hazards and vulnerabilities.⁸⁶ For example, the provision of clean water and adequate sanitary conditions in all urban communities will be essential to help prevent the outbreak and transmission of infections, such as the coronavirus.⁸⁷

The current challenges in urban regions are often tightly interconnected, as are the solutions. For example, investing in girls' education together with family planning has the potential to fulfil human rights and to avoid nearly 85 gigatons of carbon emissions by 2050: Increased access to reproductive health care, family planning resources, and 12–13 years of schooling are essential components to achieve the United Nations' 2015 medium global population projection of 9.7 billion people by 2050. Without access to health care, family planning and higher education, the world's population could grow by another 1 billion people. The resulting emission reductions of the lower population growth could come up to 85 gigatons of carbon dioxide, just within the window of 2020–2050. Thus, investing in girls' education and health care has positive climate impacts, too, and was ranked 6th out of 80 solutions to combat climate change by UNESCO cities Project Drawdown.⁸⁸ Putting the most vulnerable people at the centre of urban infrastructure investment will ultimately foster more sustainable solutions.

81 https://files.wri.org/d8/s3fs-public/2021-10/transformations-equitable-sustainable-cities.pdf?VersionId=zPX4NKSaAwZkYtclrWKwzVoXr_tSjcoT

82 <https://www.worldbank.org/en/topic/urbandevelopment/publication/handbook-for-gender-inclusive-urban-planning-and-design>

83 WEF Report The Global Risks Report 2021;

84 https://files.wri.org/d8/s3fs-public/2021-10/transformations-equitable-sustainable-cities.pdf?VersionId=zPX4NKSaAwZkYtclrWKwzVoXr_tSjcoT

85 <https://www.preventionweb.net/publication/strengthening-preparedness-COVID-19-cities-and-urban-settings>

86 <https://www.preventionweb.net/publication/strengthening-preparedness-COVID-19-cities-and-urban-settings>

87 Felicity (2020) 'Green Recovery for cities and sustainable infrastructure'

88 <https://drawdown.org/solutions/health-and-education>; <https://www.brookings.edu/blog/education-plus-development/2021/02/10/why-is-girls-education-important-for-climate-action/>

2.3.2. GOOD PRACTICE IN SOCIALLY INCLUSIVE URBAN INFRASTRUCTURE

In the region of Asia and the Pacific, inequality is also on the rise, leaving large groups of people behind and contributing to a widening of disparities, particularly in income and wealth. These trends have left communities without sufficient access to healthcare, education, technology and protection from natural disasters and environmental hazards.⁸⁹

The following examples illustrate ways in which the challenge of inequality in the region can be concretely addressed. Some projects address the human right for adequate housing, and they provide vulnerable communities with sustainable homes.⁹⁰ These projects thereby support a more people-centred developmental financing approach that seeks to put human rights at the core of its efforts.

Focusing on the most vulnerable populations is another important aim of the good practice examples collected here. While some provide basic infrastructure for climate refugees, others specifically consider children to be key stakeholders in shaping urban development. As such, projects are tailored to foster inclusion of vulnerable and affected communities.

Lastly, the following good practice examples also illustrate different approaches to actively encouraging local participation and engagement. While creating a physical space for community has a direct impact on inclusion efforts, small-scale funding allows for bottom-up efforts to be strengthened. Through engagement of local communities, projects aim to build long-term sustainable resilience.



CLIMATE SMART AND SOCIALLY INCLUSIVE COMMUNITY CENTRES, PHILIPPINES

by Rodelon Ramos, Design and Innovation Manager and
Erly Kris Faeldonia, Area Program Manager,
Habitat for Humanity,⁹¹ Manila, Philippines



CHALLENGE

Oftentimes, urban communities are faced with a lack of appropriate community facilities designed and built to improve the lives of local people and to support their overall development. Community facilities such as multi-purpose halls, healthcare centres and schools, to name a few, are publicly accessible social infrastructure provisions that generate a particular social service and amenity to their intended users.



⁸⁹ <https://www.unescap.org/publications/inequality-asia-and-pacific-era-2030-agenda-sustainable-development>

⁹⁰ <https://www.ohchr.org/EN/Issues/Housing/Pages/AboutHRandHousing.aspx>

⁹¹ www.habitat.org.ph



SOLUTION

In its key partner communities, Habitat for Humanity Philippines has set out to build well-designed, disaster-resilient, climate-smart and accessible multi-purpose community facilities. As an urban community-based infrastructure, this type of facility provides an integral space for communal learning, recreation and social cohesion. The current design of the multi-purpose centre initiated by Habitat for Humanity Philippines was reconfigured to adopt to the changing needs and requirements of the end users, upgrading and overhauling the previous design, bearing in mind the comfort and convenience needs of occupants, as well as the sustainability of the building and the site it was built on. The design also pays homage to the vernacular Filipino architecture, lending a gable roof style that is an aerodynamic shape effective in withstanding strong winds during storms and typhoons.

Bearing in mind disability-inclusive development and the Accessibility Law of the Philippines (Batas Pambansa 344), the improved community multi-purpose centres offer an accessible ramp, wide doorways and clearances, and a spacious accessible toilet. The multi-purpose centre is also designed to be passively ventilated using wide louvers, and naturally illuminated by translucent panel doors, skylights and generous window openings. Its compact shape is a throwback to the '*bahay-na-bato*' and '*bahay-kubo*', the most resilient and enduring examples of local Filipino architecture, blending in effortlessly with the local environment. The structure of the facility is also designed to be structurally sound and disaster-resilient, espousing the Build Back Better principles in its design. Another salient feature of this community facility is a community kitchen equipped with a range burner, freezer, cookware and piped water supply. A rainwater harvesting tank was also installed to collect and recycle rainwater for domestic use.



RESULTS & LESSONS LEARNED

Two elementary schools in Samal have already been provided with a multi-purpose centre. Before their construction, the schools lacked space to prepare and distribute food to the children and did not have sufficient room for teaching. Now, the schools have a well-equipped kitchen with the necessary appliances to cool and prepare food, and the other rooms in the centre can be used for different purposes based on different occasions, such as classes, bible sharing, meetings and other school and community-related activities.



Community facilities. Rodelon Ramos/Erly Kris Faeldonia





CHANGSHA, CHINA: CHILD-FRIENDLY CITIES ARE FRIENDLY CITIES FOR EVERYONE

by Deng Han, Innovative Transportation Project Manager,
Institute for Transportation & Development Policy (ITDP), Beijing, China⁹²



CHALLENGE

The early years of a child, from ages 0-5, lay the foundation for the social, emotional, cognitive and physical development for the rest of a person's life.⁹³ There are approximately four billion people living in urban areas today and nearly a third of them are children.⁹⁴ Population growth, coupled with existing urbanisation and development patterns, will continue to produce polluted, congested and unsafe environments for its most vulnerable and most promising residents – babies, toddlers and young children – unless we challenge and change our current frameworks.



SOLUTION

While many cities around the world⁹⁵ have started to address issues of children living in cities, the first in China is the city of Changsha, in the south-central region of the country. In 2015, Changsha put forward the goal of creating a 'Child-friendly City (CFC)' in the Changsha Long-term Development Plan 2050. In 2018, Changsha issued the Three-Year Action Plan for Creating a 'Child-Friendly City' in Changsha which includes 42 actions on three aspects: policy-friendly, space-friendly and service-friendly. The city planned and implemented 20 child-friendly schools, 90 child-friendly communities, 12 children's parks, 50 living crosswalks, 100 baby-care rooms in public places, and other such facilities. The city also compiled the *Changsha Child-Friendly City Development White Paper* in order to improve the studying, living and playing environments of more than 1.7 million children (0 - 14 years old) in Changsha. In terms of becoming policy-friendly, Changsha has established a city-level working framework with government leadership and civil society participation, and developed children's councils for a long-term mechanism of children's participation. The city organises activities on the theme of children's participation using holidays such as International Family Day and World Children's Day.

 **CHANGSHA**, China

⁹² <https://www.itdp.org>

⁹³ 'Why Early Childhood Development?', UNICEF, Accessed 1 November 2020, https://www.unicef.org/earlychildhood/index_40748.html

⁹⁴ 'Growing Cities', UNICEF, <https://childfriendlycities.org/growing-cities>

⁹⁵ <https://childfriendlycities.org>



RESULTS & LESSONS LEARNED

After six years of efforts, the goal of creating a 'child-friendly city' has been incorporated into the various planning and construction plans of the city, and the general pattern of building a child-friendly city has been set. Changsha's contribution to CFC has inspired Shenzhen (2016), Shanghai (2017), Guangzhou (2019), Beijing (2019) and many other Chinese cities to implement innovative actions to become child-friendly, too. The 14th Five-Year Plan of China in 2021 proposes to develop 100 more such child-friendly cities, while strengthening child-friendly renovation of urban public spaces, living communities and out-of-school activity sites. Only when cities are designed with children's needs at the core will they become safe, sustainable and inclusive environments for everyone.



Created child-friendly space
in Changsha. Deng Han





DESIGNING PLANET-, PEOPLE- & POCKET-FRIENDLY HOMES IN KERALA, INDIA

by Ajay Abey, Director of Centre for Sustainable Built and Natural Environment, Kerala,⁹⁶ India



CHALLENGE

Housing is a basic right but soaring land prices and exorbitant cost of materials make dreams of owning a house difficult to achieve for many across India. Current practices of constructing houses in India tend to cut off inhabitants from their surrounding natural environment and pay little attention to environmental impacts of building materials across their full life cycle. Moreover, buildings in India are highly energy inefficient and usually fail to factor in seasonal variations or make use of available passive energy sources. Most affordable housing projects also fail to even provide quality living spaces for its residents. By some estimates, India has a demand for 50 million units⁹⁷ of houses in the affordable housing segment. The high ecological costs of meeting this important socio-economic right and possible ways of avoiding this zero-sum game is not getting the attention it should.



SOLUTION

The Centre for Sustainable Built and Natural Environment (CSBNE), Kerala, has developed a new type of house which has a Rib and Skin Shell Slab System, Light Weight Masonry System and Multi-layer Roofing System, which they plan to make copyleft.

The techniques prioritise use of economical and eco-friendly materials and systems, with an emphasis on conserving and protecting resources, recycling and efficient use of materials. Processes that are conducive for the local economy are built into the techniques. The role of aided self-help is emphasised in the solutions.

The homes, designed as nuclear-family residential dwelling units, utilise the entire parcels of available land through development of built models on stilt platforms with lightweight floors. The buildings are energy-efficient, climatologically appropriate and culturally relevant, and provide a holistic built environment through backyard farming, cattle, poultry, fish rearing etc.

 **KERALA**, India

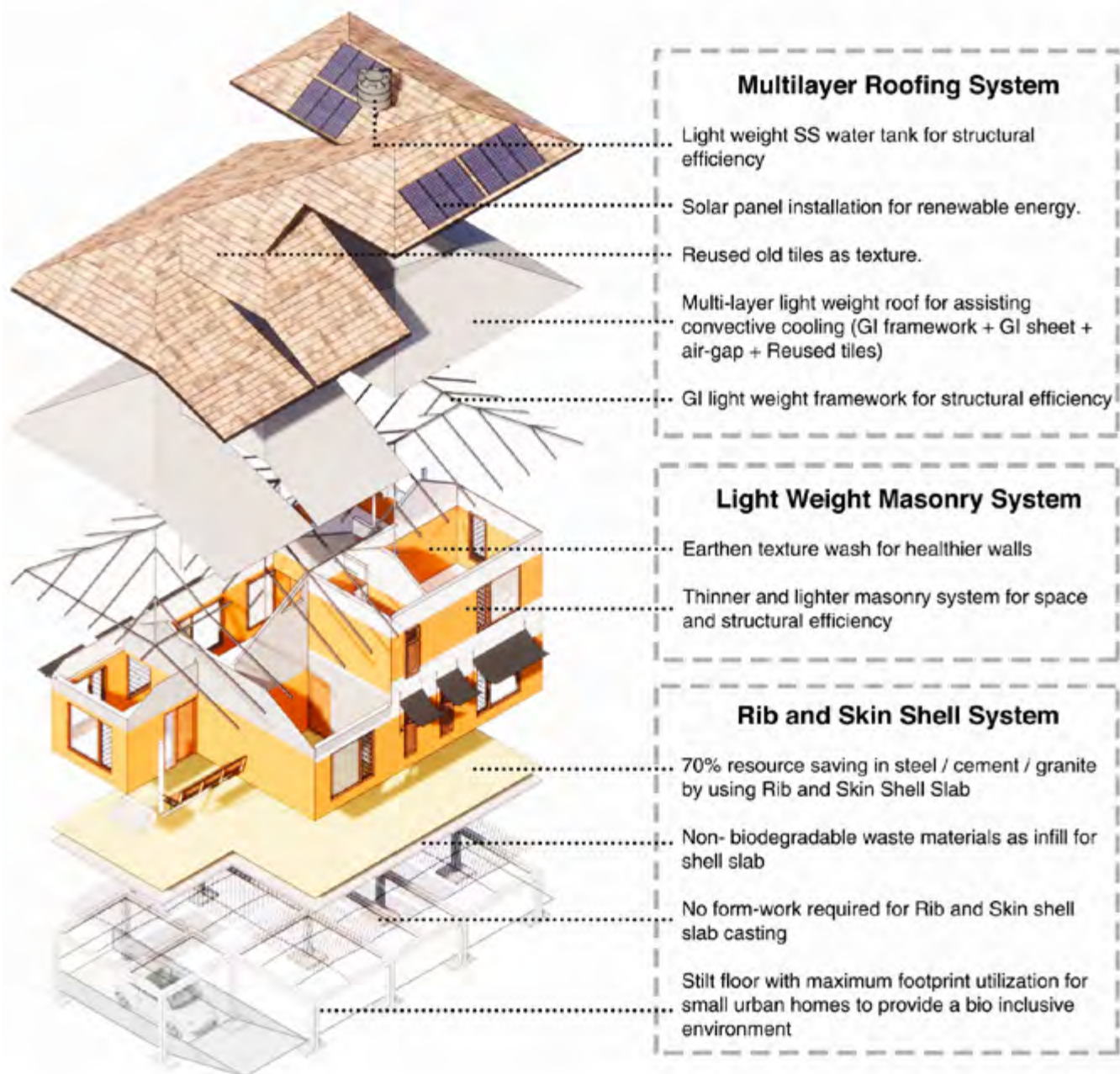
⁹⁶ www.csbne.com

⁹⁷ https://www.business-standard.com/article/current-affairs/india-s-urban-housing-shortage-rises-54-to-29-mn-in-2018-report-120122300948_1.html



RESULTS & LESSONS LEARNED

CSBNE has so far constructed five prototypes with areas ranging between 5,000-6,000 square feet. The modular planning and construction techniques result in material and time saving, requiring a smaller labour force on site. Uptake of the techniques is easy and fast because of their simplicity and localisation. Depending on site-specific contexts like accessibility the cost of constructing a building is at least 30% cheaper than a conventional building. This region-specific construction methodology can serve as a conceptual framework to address the affordable and sustainable housing scenario across India and internationally.





THE WORLD'S LARGEST HOUSING PROJECT FOR CLIMATE REFUGEES IN COX'S BAZAR, BANGLADESH

by Md. Akib Javed, Senior Research Assistant,
Center for Participatory Research and Development (CPRD), Dhaka, Bangladesh⁹⁸



CHALLENGE

Climate change is generally understood to be one of the potential causes of forced displacement and migration. Bangladesh, which is frequently cited as a 'ground case' of displacement and migration, is struggling with an increased number of displaced people, resulting from loss and damage caused by both slow and sudden onset climate events. Riverbank erosion generally makes about 50,000 to 2,000,000 people homeless annually.⁹⁹ Water logging caused by high tides, cyclones and sea level rise causes crop production failure in the southwestern and southcentral coastal areas, leading to displacement and migration.¹⁰⁰

While rural-urban migration, in the context of slow-onset events, is often called regular economic migration, avoiding mass displacement caused by high-impact disasters like tropical cyclones and floods is a major concern for enhancing climate resilience. In 1991, a severe cyclone caused a mass migration along the south-eastern coast. The cyclone forcibly dislocated around 20,000 people from a coastal island called Kutubdia to Cox's Bazar, a coastal resort town on the mainland. The migrants were forced to build their make-shift settlement, branded as Kutubdia Para, which again has been geographically highly exposed to following cyclones.



SOLUTION

To secure housing for climate-displaced people, the Bangladesh government has recently inaugurated a project called Khurushkul Ashrayan Project to permanently shelter the first 600 families on the outskirts of Cox's Bazar town. Each family has been given a 456 square-foot modern flat with basic amenities. This project is part of the government's long-term rehabilitation initiative. The project has aimed to ensure shelter for the victims of the 1991 cyclone Sidr, which cost the lives of almost 140,000 people and left millions to live a nomadic life. Under the Khurushkul Ashrayan Project, a total of 4,409 climate-displaced families would be re-housed at 139 five-story buildings on 253.59 acres of land at the cost of BDT 18 billion (approximately USD 210 million).

The housing is made in a well-developed pattern rather than the traditional compact housing for refugees. These multi-storey buildings are kept at a sufficient distance from each other to ensure proper ventilation and natural lighting. Moreover, ground spaces of all buildings are maintained vacant to minimise damage from flooding during cyclone-induced storm surges.

 COX'S BAZAR, Bangladesh

⁹⁸ <https://cprdbd.org>

⁹⁹ Prediction for Bank Erosion and Morphological Changes in the Jamuna River 2007, Centre for Environment and Geographic Information Services (CEGIS), Dhaka

¹⁰⁰ Climate Change and Migration: Bangladesh perspective (unpublished), Network on Climate Change, Bangladesh-NCCB, July 2012.



RESULTS & LESSONS LEARNED

This project provides housing for over 4,000 families, while also employing them in a nearby dry-fish centre. The structures are powered by renewable energy using solar panels and an advanced waste management system to ensure cleanliness and hygiene.

The houses are built in such a way so that they can withstand the extreme impacts of cyclones. They have been constructed at an elevation and the ground floors are kept vacant so that cyclone-induced storm surges or coastal flooding does not cause any damage to the inhabitants and properties. The project is a good example of climate-resilient urban housing, which can be replicated in other coastal regions and countries to bring climate justice to climate refugees who have so far been widely ignored.



Photo by Md. Akib Javed



CLIMATE BRIDGE FUND: BUILDING BASIC INFRASTRUCTURE FOR CLIMATE MIGRANTS IN BANGLADESH'S CITIES

by Dr. Md. Golam Rabbani, Head of Secretariat, Anindita Hridita, Operations Manager and
Tasveer Islam, Project Intern, BRAC, Dhaka, Bangladesh¹⁰¹



CHALLENGE

Impacts of climate change on migration have been shown to be an emerging risk across the globe. The World Bank estimates that the number of Bangladeshis displaced by various effects of climate change might reach 13.3 million by 2050, making it the country's top cause for internal migration. These figures are increasing daily. Physical exposure to climate-induced hazards, including rising temperatures, droughts, heavy rainfall, water logging, floods, cyclones, storm surges (particularly in the coastal zone) and sea level rise are increasing and widespread. They may result in damage to property, contamination of water sources, increases in climate-sensitive diseases, and loss of livelihoods.

The 8th Five Year Plan of the Government of Bangladesh clearly recognises the outmigration patterns from rural to urban areas mainly due to climatic hazards, and indicates the need to devote greater attention to such communities affected by climate change.¹⁰² The government prioritises the development of efficient systems in urban areas to address additional demands on basic services: employment opportunities, housing, water supply and sanitation, health, education, drainage, and other infrastructures and facilities. Besides, a great number of people suffer from climate-sensitive diseases such as dengue.

There is an enormous need to respond on the ground, but inadequate financing makes it difficult for local organisations, closest to the challenge, to address those climate change impacts. The Climate Bridge Fund is trying to bridge that gap and set a model for sustainable climate financing.



SOLUTION

The Climate Bridge Fund (CBF) is an innovative climate finance mechanism established by the Bangladesh Rural Advancement Committee (BRAC) in November 2019 with support from the Government of Germany through KfW. Its main focus is to support the implementation of small-scale adaptation-focused projects to improve the resilience of those being displaced by the impacts of climate change.

The Fund aims to increase the economic, social and climate resilience of people living in vulnerable conditions who have been displaced, or are at risk of being displaced, due to the impacts of climate change in Khulna, Barishal and Rajshahi city corporations, and Satkhira as well as Sirajganj Pourashabhas, which are hotspots of climate-induced migration in Bangladesh.

CBF has chosen four projects from its first call in 2020 to address challenges faced by climate migrants from 69 informal settlements of Khulna City Corporation and 106 informal settlements of Rajshahi City Corporation. The partners implementing the projects are WaterAid Bangladesh, Caritas Bangladesh and two programmes from BRAC.

101 www.brac.net

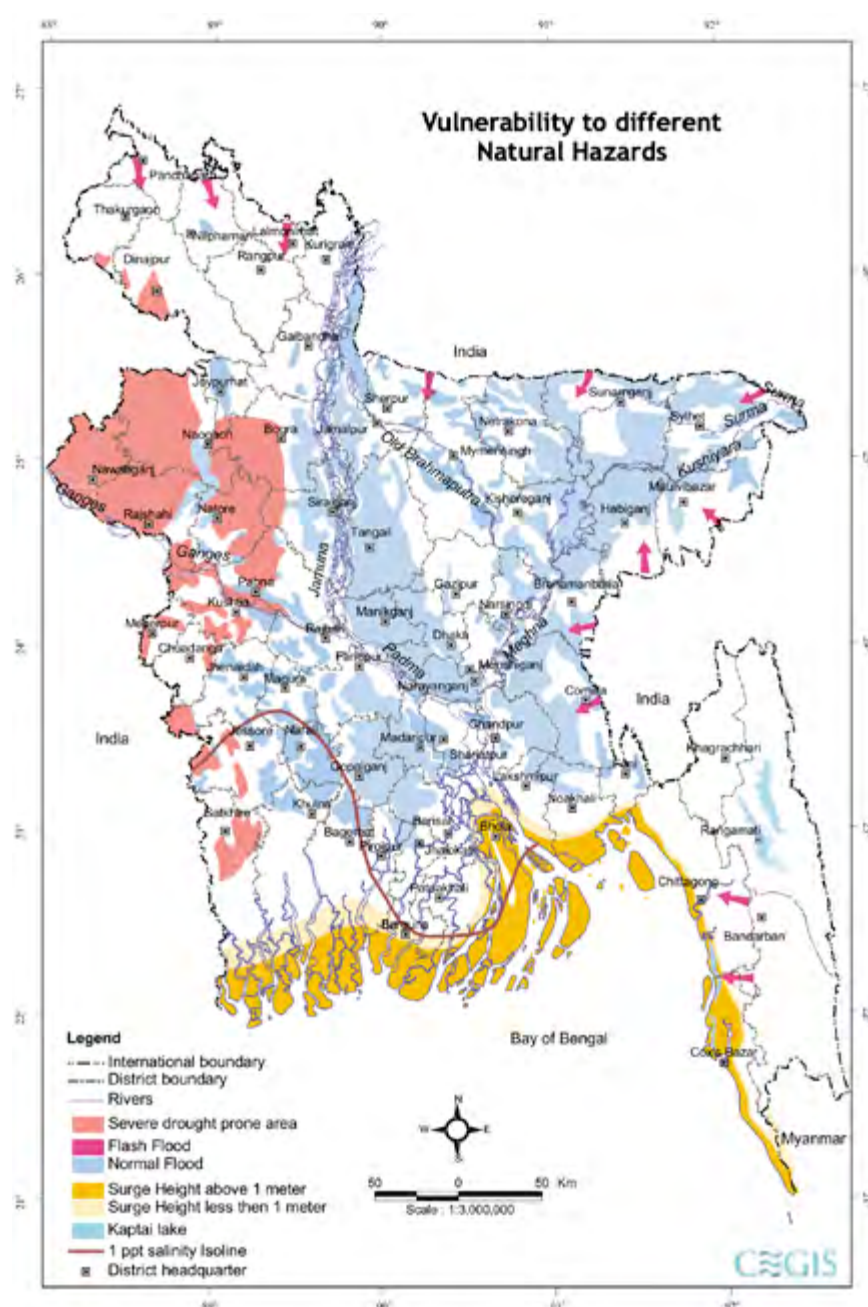
102 8th Five Year Plan (8FYP, 2020-2025), prepared by General Economic Division, Bangladesh Planning Commission of the Government of the People's Republic of Bangladesh



RESULTS & LESSONS LEARNED

The projects have taken up initiatives to demonstrate sustainable models of community-managed, improved and inclusive infrastructure and services including water, sanitation and hygiene facilities, shelter, footways and drainage. They have also created greater economic prospects for climate migrants living in ultra-poverty by strengthening their capacity through skills development training, transferring assets and connecting them to pro-poor microfinance services. Access to vital health services and commodities such as mosquito nets, soaps, water filters and umbrellas to help prevent climate-sensitive diseases such as dengue is another feature of the project.

All projects under the Fund are designed in consultation with the local authorities, which is one of the mandates of the Fund. The process helps to select the most vulnerable communities and to establish a sense of ownership within them, which will ensure the sustainability of the services.



Hazard exposure in Bangladesh (BCCSAP 2009)

2.4. CITIES AND ECONOMY

Urban agglomerations contribute more than 80% to global GDP.¹⁰³ Global economic growth is mainly driven by 600 cities, with almost three-quarters of them in emerging economies.¹⁰⁴ Innovation and new ideas on sustainable production and consumption patterns emerge in these economic powerhouses. Sustainability mostly depends on the pathway of future urban economic development.

In absolute terms, cities have a larger ecological footprint than urban areas because of their higher share in economic value generation.¹⁰⁵ In relative terms, however, i.e. at the level of per capita or per household consumption, a city dweller consumes fewer resources than a person with a similar standard of living from a rural or sub-urban area, i.e. dispersed, low-density setting.¹⁰⁶

Carbon footprints are, on average, 7% lower in European cities than in rural areas. This effect of urbanisation, however, is compensated by the 6% higher average income in cities.¹⁰⁷ While these patterns vary around the globe, the sub-urban population tends to have the highest carbon footprint because of combining high direct (transport, heating, electricity) and indirect (consumption-related) emissions. A city dweller, in contrast, accounts for relatively low direct and a rural dweller for lower indirect emissions.¹⁰⁸ Thus, a pathway to net-zero emissions will slightly differ for urban and rural areas. Apart from decarbonising the energy supply, the decarbonisation of goods

ranging from food to industrial goods, and thus, the decarbonisation of consumption patterns, is the other great part of the deal to become net-zero. The same applies to paths of sustainable development towards nature-neutral or, in the best case, even nature-positive production and consumption.¹⁰⁹ For the reasons given it can be assumed that cities will become the main trendsetters for such transformations, leading to a circular, zero-waste, zero-carbon and nature-positive economy, and the achievement of SDG 8 (*Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all*) and SDG 12 (*Ensure sustainable consumption and production patterns*).

However, to also become socially sustainable in the sense of the SDGs, cities must become inclusive, safe and resilient (SDG 11), poverty must be ended (SDG 1), and inequality reduced (SDG 10). Urbanisation has an important role to play in this regard: Burundi and Papua New Guinea, the two least-urbanised countries, are two of the poorest, while the richest countries are those with the highest urbanisation rates. Rapid urbanisation in the developing world coincides with rapid economic growth¹¹⁰ – but also leads to new economic fractures, with inequality rising since the 1980s and affecting more than two-thirds of the global population.¹¹¹ Urbanisation expands opportunities but divides deeper.¹¹² Addressing the latter is key for a pathway to urban sustainability in all its three dimensions.

103 <https://www.worldbank.org/en/topic/urbandevelopment/overview#1>

104 https://www.mckinsey.com/~/media/McKinsey/Featured%20Insights/Urbanization/Urban%20world/MGI_urban_world_mapping_economic_power_of_cities_full_report.pdf

105 <https://news.colgate.edu/scene/2014/11/urban-legends.html>

106 Ibid.

107 <https://iopscience.iop.org/article/10.1088/1748-9326/ab443d>

108 <https://theconversation.com/suburban-living-the-worst-for-carbon-emissions-new-research-149332>

109 Ibid and also <https://www.eco-business.com/opinion/building-a-nature-positive-economy> or <https://www.project-syndicate.org/commentary/three-ways-to-boost-environmental-social-governance-performance-by-paul-polman-and-eva-zabey-2021-04>

110 <https://news.colgate.edu/scene/2014/11/urban-legends.html>

111 <https://news.un.org/en/story/2020/01/1055681>

112 <https://www.un.org/development/desa/en/news/social/urbanization-expanding-opportunities-but-deeper-divides.html>

2.4.1. THE URBAN CIRCULAR AND DIGITAL ECONOMY

A liveable net-zero carbon and nature-positive city that has ended poverty and reduced inequality is characterised by, among other things, the fact that it consumes few new resources due to the establishment of a circular economy, it no longer produces any waste, and digitalisation is very advanced and accessible to all population groups. Two cities that are quite advanced in many of these regards are Amsterdam (The Netherlands) and Copenhagen (Denmark).¹¹³

Cities account for 75% of all resources used and for 50% of global waste. City administrations and the private sector, in cooperation with science and citizens, can curb the use of finite natural resources, enforce zero-waste trajectories, waste recycling, reuse and repair, enhance the sustainability of products along their lifecycle, and switch to a circular economy, as the following examples show.¹¹⁴

The economic meltdown and disruption of supply chains during the COVID-19 pandemic, which has not yet ended, has revealed in a frightening way how vulnerable the urban economy in particular is; how vulnerable urban supply chains are; and what social abysses open up when the poorest, predominantly working in the informal sector, lose their livelihoods from one day to the next. Enhancing urban resilience to external shocks is urgently needed¹¹⁵ and decisive steps towards a circular economy as an integral part of the COVID-19 recovery phase is key for making that happen. More resource-efficient construction, less wasteful food and plastic packaging sectors, and a digital supply chain

management, among other things, are important investment opportunities to boost the circular economy. According to the World Economic Forum, Denmark, Finland, Germany, Sweden and The Netherlands are pioneers in pushing forward circular economy agendas.¹¹⁶ These approaches, however, cannot simply be adopted to emerging economies and their fast-growing urban agglomerations in particular: “Emerging economies need high economic growth, and with its normally high population, they are generating an enormous amount of waste and adding strain on its depleting resources.”¹¹⁷ While there is no silver bullet to create a circular city, the issue has gained a lot of traction in recent years, particularly in many cities in Africa, Asia-Pacific and Latin America. In order to reduce urban pollution, cut emissions, foster local production systems, enhance resilience, strengthen affordable and accessible infrastructure, and, very importantly, create employment, especially youth employment, many initiatives have been undertaken, and give cause for some optimism, that all types of cities, be they poor or rich, small or big, could become pioneering cities.¹¹⁸ Our selection of examples below shows a variety of options. Apart from the crucial role of digitalisation in reducing resource use in growing cities – thereby promoting approaches to establish the cradle-to-cradle principle in the smart city of tomorrow – a particular focus in the current phase of booming urbanisation should be placed on recycling concrete as the most-used man-made building material in the world (14 billion cubic metres per year), being responsible for overexploitation of many minerals and 7% of global carbon emissions (cement), exceeding India’s emissions.¹¹⁹

113 <https://www.climate-kic.org/wp-content/uploads/sites/15/2018/12/Municipality-led-circular-economy-case-studies-compressed-ilovepdf-compressed.pdf> and <https://www.acrplus.org/en/mobile/index.php/en/news/news-from-our-members/530-paris-call-to-cities-for-circular-economy>

114 See for instance at <https://www.acrplus.org/en/news/acr-news> and <https://ellenmacarthurfoundation.org/topics/cities/overview>

115 <https://www.frontiersin.org/articles/10.3389/frsc.2021.668263/full>

116 <https://www.weforum.org/agenda/2020/11/circular-economy-COVID-19-recovery-warwick/>

117 https://www.sciencedirect.com/science/article/pii/S0148296320303088?dgcid=rss_sd_all

118 https://circulareconomy.europa.eu/platform/sites/default/files/circular_cities_publication.pdf

119 <https://gccassociation.org/>

2.4.2. GOOD PRACTICE IN A ZERO-WASTE CITY

Zero-waste strategies reduce GHG emissions, provide a cleaner urban environment and more hygienic living conditions, and create jobs and income for the poorest people. Our three examples from Jessore (Bangladesh), Delhi and Mumbai (India) are of different scale and demonstrate a wide range of options.



SUSTAINABLE WASTE MANAGEMENT IN THE CITY OF JESSORE, BANGLADESH

by Rumana Sharmin, Senior Research Associate,
Centre for Participatory Research and Development (CPRD), Dhaka, Bangladesh¹²⁰



CHALLENGE

A first of its kind in Bangladesh, the Integrated Landfill & Resource Recovery Facility (IL & RRF) project started its operation in Jessore in 2019. In the light of poverty reduction and environmental sustainability, the city of Jessore turns into a smart city, which transforms a makeshift uncontrolled dump site into a controlled integrated landfill site with resource recovery facilities. This sustainable urban infrastructure project brings a major change in a city where 80% of waste is directly dumped into fields and ponds in an uncontrolled way, and the improvement of life is far reaching. Thereby, the IL & RRF project undeniably improves the quality of city life with health improvement of city dwellers, and ensures positive socio-economic impacts of the entire town as well.

The district of Jessore is located under Khulna Division. Jessore municipality encompasses an area of 14.72sq km with a population of 201,796. The urbanisation rate in Jessore is 34%, which is greater than the country's national average. It is estimated that the daily waste generation was 39 tons from Jessore municipality in 2012 while municipal waste generation is expected to reach 59 tons per day in 2021 and 74 tons per day in 2031. Food residues comprise the largest share of waste generation (84%) and the second contributor, plastics, makes up 5.4% of the generated wastes in Jessore. Given the context, a robust strategic plan to enhance urban infrastructure for effective waste management is an urgent quest for socio-economic development and environmental sustainability in the city of Jessore.



SOLUTION

The government of Bangladesh has adopted the City Regional Development Plan (CRDP) to stimulate growth and improve liveability in two densely populated and fast-growing city regions, Dhaka and Khulna. The total budget is estimated at USD 184.72 million for CRDP implementation, funded by the Asian Development Bank (ADB) (59.06%), the Government of Bangladesh (GoB) (27.07%), German financial cooperation through KfW (6.84%) and the Swedish International Development Agency (Sida) (7.04%). The project supports infrastructure and capacity-building development, energy-efficient, environmentally friendly urban services, more harmonised regional development planning, and stronger management capacity for municipalities.

In November 2016, construction of the country's first regional IL & RRF started in Jessore municipality with the aim of allowing smaller towns to use this facility. By employing the 3R principles of waste management – reduce, reuse, recycle – it is estimated that the proposed facility can divert 85-90% incoming waste from landfill, and convert it into resources (compost, biogas, energy and recyclables) under both aerobic and anaerobic processes while the remainder

will be transferred to a modern engineered landfill. The recycling plant has a mechanised waste sorting unit, composting and a mechanical dryer, a biogas plant with electricity generation units, faecal sludge treatment with a co-composting facility, and a controlled landfill unit with collection and treatment of leachate. The electricity generation from the biogas plant will make the entire plant self-sufficient in electricity. A bio-medical waste management facility aligned with the existing IL & RRF is also underway.

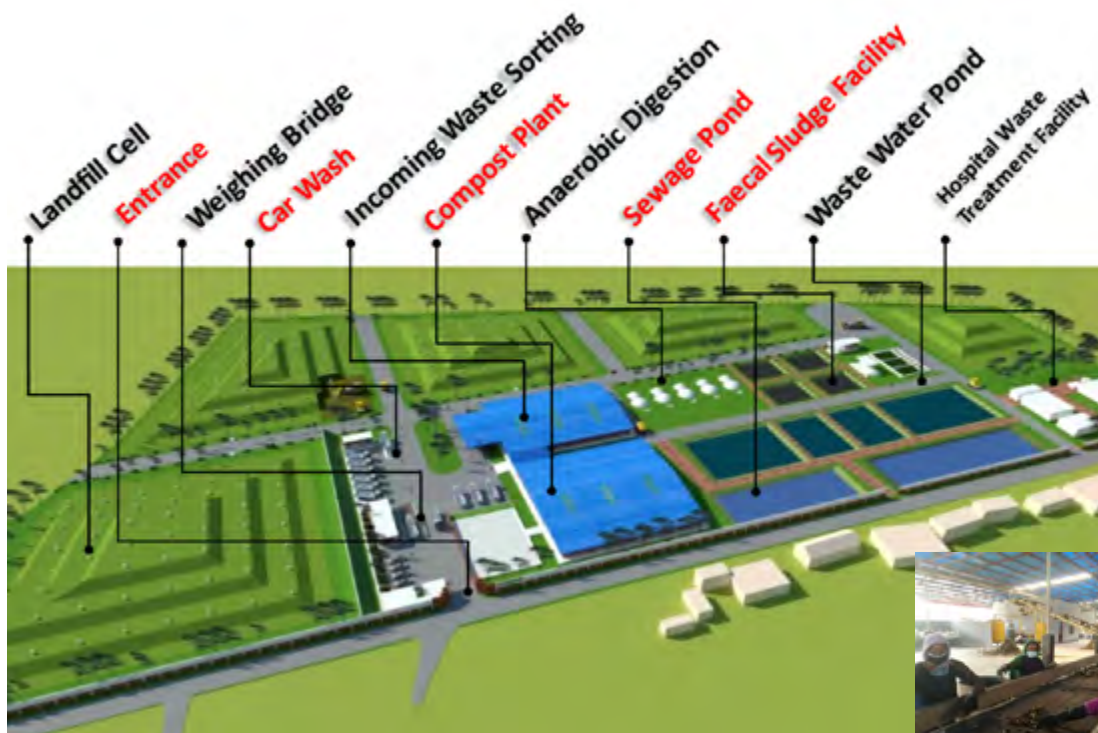


RESULTS & LESSONS LEARNED

The IL & RRF project prevents harmful environmental impacts through modern waste management. Most waste will be converted into resources like refuse-derived fuels (fuel in pellet form and plastic resin), compost and biogas. This will result in a reduction of surface water-, groundwater-, soil- and air pollution, and a 50% reduction of greenhouse gas emissions from waste management within five years. It is estimated that processing 2 tons of organic waste into 0.5 tons of compost would lead to an emission reduction of 1t CO₂eq. Replacing chemical fertilizer with the 0.5t of organic compost will save almost USD100. These 0.5t of compost will increase rice yield by 200 kg per 0.5 ha of cultivation.

Though a number of advantages can be achieved, there are still remaining challenges. A lack of legal regulations for solid waste management, source separation and recycling may delay the success. Inadequate incentives for private investments in the waste sector can hinder progress. The shortage of skilled labour is another hurdle. Given the context, a number of additional initiatives need to be considered, as for instance extended producers' responsibility in terms of reuse and recycling, the promotion of public-private and community partnerships in recycling initiatives, the strengthening of inter-ministerial co-ordination to enhance the recycling rate, capacity build-up for both municipal staff and private sector, easy access to soft loans, and the use of Nationally Appropriate Mitigation Actions (NAMA) to mobilise more climate finance for sustainable waste management.

Nevertheless, the city of Jessore has become a role model of sustainable waste management, and has been declared the first 'waste-free' town in the country. Ultimately, the regional project has set up an example of good practice that embraces the interests of relevant stakeholders to establish such types of recycling plants in other major cities. Finally, this kind of intervention fosters community and private-sector participation, enhances community awareness and waste minimisation, improves the urban environment and reduces the carbon footprint.



The Integrated Landfill and Resource Recovery Center, Jessore, Bangladesh



Waste management in formal way at Integrated Landfill and Resource Recovery Center, Jessore



CREATING A ZERO-WASTE SITE AT THE INDIAN INSTITUTE OF TECHNOLOGY, DELHI (IIT-D)

by Ira Sahai, Head of Alliances,

Chintan Environmental Research and Action Group, Delhi, India¹²¹



CHALLENGE

Inherent in the concept of circular economy are the ideas of waste reduction and keeping materials in continuous use. In an ideal scenario, materials will be considered waste only if they cannot either be decomposed into their constituent parts or be re-used in a beneficial manner. However, the waste management system in India (including New Delhi where Chintan is based) is far from this ideal. The landfills in and around New Delhi are testimony to this dismal fact. According to the recent Delhi Economic Survey 2020-2021, waste segregation is implemented only in 32% of the wards in the city. The mixed nature of waste that ends up in these landfills not only makes it difficult for the organic waste to decompose efficiently, but also decreases the recycle potential of inorganic waste such as plastics. Additionally, there are numerous health hazards that emanate from the toxic mix in the landfills, including emission of methane gas from accumulated waste and contamination of soil and groundwater through seepage from solid waste of landfills.

The challenge is to create a system where organic waste is dealt with through composting and only materials that have exhausted all their recycling potential be sent to landfills. It is this challenge that Chintan sought to address by creating a zero-waste site at the campus of the Indian Institute of Technology, Delhi (IIT-D).

 DELHI, India



SOLUTION

In January of 2019, partnering with IIT-D, Chintan opened a Material Recovery Facility (MRF) on its Delhi campus. The concept for this facility was based on a foundation of Chintan's previous work in advocating for and supporting responsible waste management. The primary goal of this project was to minimise the amount of waste that is being sent to landfills. Prior to the creation of this MRF, the IIT Delhi campus was sending 89 tons of unsorted waste to the landfill every month. The MRF was designed to ensure circularity in waste management by providing for composting of organic waste within the campus of IIT-D and identifying materials that can be recycled. The MRF was designed to work in the following manner: Waste was first collected in a segregated manner, via eight door-to-door rickshaws from faculty and staff residents' homes. A single tractor collected horticultural waste and a truck was used to collect the waste from hostels and dump yards. The organic waste was composted and the compost was thereafter shared with the residents of IIT-D. The inorganic waste was transferred to the MRF where it was manually segregated by waste category (e-waste, metal and glass waste, paper waste, and plastics). Standard work had been implemented into all portions of this process to provide optimal safety and efficiency. The segregated recyclables were sold to recyclers and only inert waste was sent to landfills.

¹²¹ <http://www.chintan-india.org/>



RESULTS & LESSONS LEARNED

Due to the working of the MRF, IIT-Delhi has been able to successfully divert 93% of the waste that was previously being sent to the landfill. In raw quantity, the MRF saves 984 tons of waste from reaching a landfill each year. Due to the presence of the MRF, only seven tons of inert waste goes to the landfill every month. The IIT-Delhi project provides livelihoods for 23 people, and provides clean environment for the 16,000+ staff and student population. According to a recent assessment by the Centre for Science and Environment (CSE) it was determined that it will cost the Municipal Corporation of Delhi \$200 for each ton of waste sent to a landfill. This equates to annual savings of USD 1.6 million. The MRF's design can be easily replicated all over New Delhi and other cities to bring about a circular economy in waste management and reduce the amount of waste being sent to landfills. Thus, waste can be converted into a resource, as has been proved by this model. It is likely to be viable in larger cities and metros, where there is more waste generated. There are many urban poor, waste pickers and others who can be trained to carry out this work and make a more decent living from it.



Material Recovery Facility
at IIT-Delhi



Informal waste workers
segregate waste at the
MRF into cardboard,
cloth, glass, metal, solid
plastic, paper, single use
plastic and inert waste.



THE MAKING OF ZERO WASTE METROPOLIS THROUGH CITIZEN INITIATIVES IN MUMBAI, INDIA

by Dr. Francin Pinto, Founder of the Garbage Concern Welfare Society,¹²² Mumbai, India

 **MUMBAI**, India



CHALLENGE

A World Bank report¹²³ highlights that India generates the most waste globally, approximately 2.7 billion tons of trash. Of this, only 5% is recycled and nearly 95% ends in open dumps. The open land-filling and dumping of untreated waste produces methane, a potent greenhouse gas (GHG). Open dumps not only create greater risk to the health of local populations but also lead to unaccounted fires and urban tragedies. In sum, unplanned, untreated waste management in urban India has resulted in annual losses of USD 80 billion, over a period of 20 years.¹²⁴



SOLUTION

A December 2017 decision of the Supreme Court of India triggered actions to initiate systems which would ensure that a maximum of waste was recycled by way of source segregation and on-site recycling. Garbage Concern Welfare Society (GCWS), which had been advocating for zero waste societies for a long time, effectively used this opportunity to deliver not only on managing waste, but creating green jobs for the poor including a start-up ecosystem. GCWS directly set-up on site waste processing systems in 43 locations in Mumbai.

GCWS follows a three-tiered process of initiating a waste management system in Mumbai. Stage I involves a waste audit using a GIS-based tracker which directly captures waste data (flat wise or floor wise), which is accessible through Google maps. Stage II involves a waste assessment to understand the nature of waste through lab testing, segregating and the use of organic waste shredding machines at the collection points itself. And finally, stage III involves waste transformation which enables innovative solutions to up-cycle waste within the community or create partnerships with other NGOs or social enterprises who use the waste as raw material.



RESULTS & LESSONS LEARNED

As a result of the intervention, 670,288 tons of waste have been diverted from landfills. The intervention has also skilled over 5,000 rag-pickers through the Green Manager Program (GMP), with a total of USD 83,906 being earned collectively. Over 1,000 Mumbai municipality workers have been trained in safe-handling of waste, such as segregation, aerobic composting, anaerobic composting, etc. More than 90 individuals were directly employed. Through this process, eight green start-ups have been hand-held to become sustainable businesses through the Green Entrepreneur Program (GEP). This model has the potential to be replicated across all Indian cities and towns.



Organic waste shredder machine that is set up at all the collection points

¹²² <http://www.garbageconcernindia.org>

¹²³ <https://datatopics.worldbank.org/what-a-waste>

¹²⁴ www.indiaenvironmentportal.org.in/content/418195/global-waste-management-outlook-2015

Topic: the Global Waste Management Outlook, launched by the United Nations Environment Programme (UNEP)

2.4.3. GOOD PRACTICE IN URBAN INFRASTRUCTURE FOR A CIRCULAR ECONOMY

Recycling plastic and construction waste significantly mitigates emissions and waste, reduces the consumption of valuable natural resources, creates employment, improves value creation and closes economic cycles. Our examples from Vietnam and Myanmar, as well as India, have potential for replication.



RECYCLING OF PLASTIC WASTE IN MYANMAR AND VIETNAM

by Jaume Marques, Associate of Climate & Development Advice,¹²⁵
Neckargemünd, Germany



CHALLENGE

Vietnam is the world's fourth largest producer of plastic waste, with an estimated yearly volume of 1.8 million tons of plastic waste, according to a study in the country.¹²⁶ Statistics show that over 700,000 tons of plastic waste end in water streams and in the sea on a yearly basis in Vietnam – with forecasts of 33 billion tons of plastic waste to be produced in the country by 2050. At the same time, the plastic recycling rate is minimal at 27%, costly and low in efficiency. Plastic is not only contaminating fields but also the rivers, which have seen an increment of plastic littering in the last 10 years.



SOLUTION

Evergreen Labs, through its ReForm Plastic Project (ReForm), creates a safe, valuable and sustainable product from originally non-valuable plastic in Vietnam and Myanmar. Low-value plastic waste is converted into plastic lumber, a material for sustainable urban infrastructure. ReForm encompasses many steps, from the collection of low-value plastics to shredding, cleaning, melting and moulding of simple designs with lasting durability. ReForm offers an innovative urban infrastructure solution from a circular economy approach, creating furniture, benches, bins, green walls and various construction materials from plastic bags, multi-layer packaging and food containers. To date, ReForm has converted around 100 tons of low and no-value plastic into plastic lumber and each facility has the potential to process 500 tons annually. ReForm is set up as a licence or franchise for rapid replication in rural and urban settings – four facilities are already in operation in Vietnam and Myanmar and five more will open within the next year. While ReForm operates at roughly break-even point, the economic benefit comes from turning plastic lumber into end-products – waste bins being the best-selling item with an annual turnover of nearly USD 200,000. ReForm reached profitability in 2021, after only approximately a single year of operation.



ReForm bins created from collected plastic waste.
Source: Evergreen Labs

¹²⁵ <https://evergreenlabs.org>

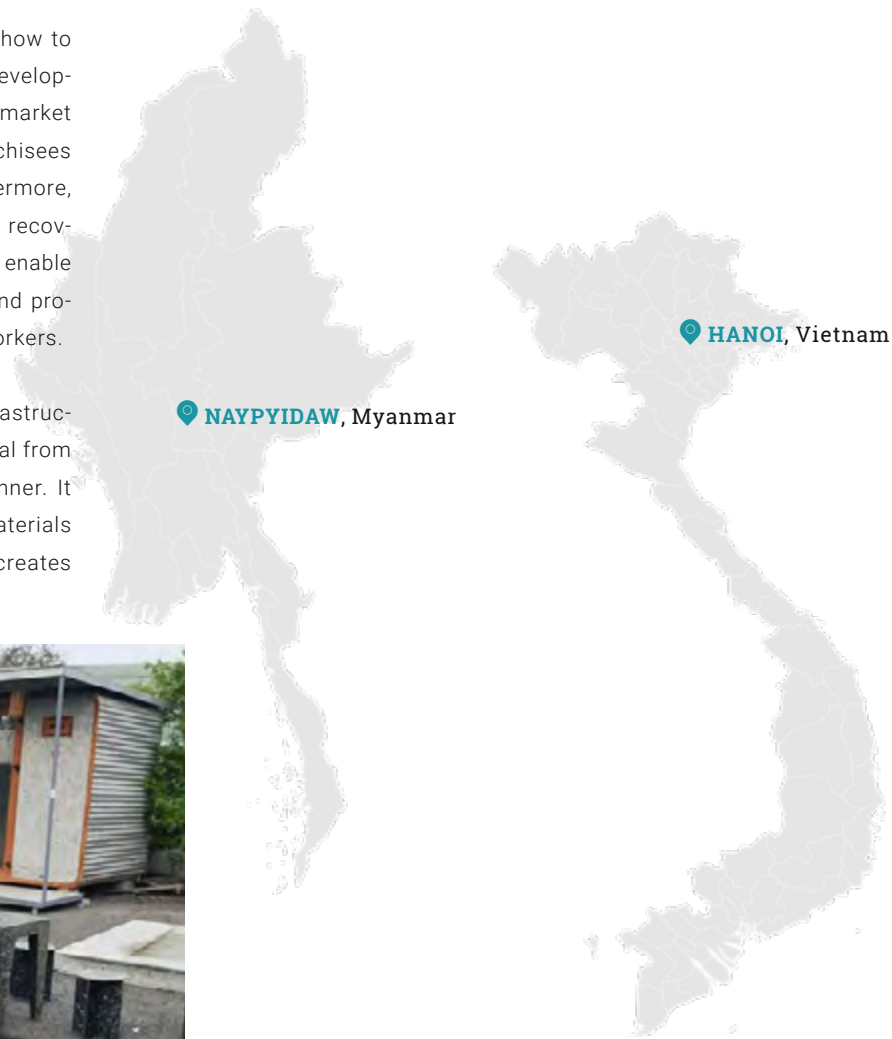
¹²⁶ Truong, T.H. and Vu, H.N., 2019. The Crisis of Plastic Waste in Vietnam is Real. European Journal of Engineering and Technology Research, 4(9), pp 107-111.



RESULTS & LESSONS LEARNED

ReForm transfers the technology and know-how to local operators and supports with product development and design, material compositions and market development, while giving freedom to its franchisees to develop and serve the local market. Furthermore, ReForm has established and piloted material recovery facilities as mid-point interventions, which enable local communities to segregate at source and provide additional income for informal waste workers.

ReForm contributes to sustainable urban infrastructure by creating valuable, long-lasting material from low-value plastic waste in an inclusive manner. It provides affordable and safe construction materials for sustainable and resilient buildings and creates environmental, economic and social value.



ReForm's material recovery facility in Vietnam.
Source: Evergreen Labs



SUSTAINABLE BUILDING WITH RECYCLED BRICKS IN AHMEDABAD, INDIA

by Keyur Mahendra Sarda, Director,
Kesarjan Building Center Pvt Ltd, Gujarat,¹²⁷ India



CHALLENGE

India has only very few effective systems in place to document the ecological costs of extracting natural aggregates like sand, stones, top-soil (for burnt bricks), etc., that are key raw materials for the construction industry. The regulations on use of extracted virgin natural aggregates as well as construction and demolition (C&D) debris are also weak.

A 2020 study¹²⁸ says India officially generates an estimated 150 million tons of C&D waste annually and recycles just 1% of this waste. Actual C&D waste quantity is significantly higher; with little or no effective policies in place to make C&D waste generators responsible for its safe disposal, a lot of it ends up choking natural drainage or is used to fill-up water bodies to reclaim them as land for development purposes. However, conventional methods of recycling C&D debris require high volumes of water and energy, making their adoption commercially unviable in India.



SOLUTION

Kesarjan Pvt Ltd in Ahmedabad has developed a unique process for manufacturing recycled exposed bricks by bonding in different combinations of fly ash, ceramic tile waste, lime sludge, brick kiln waste, pozzolana, cement and clay with recycled aggregates. These sustainable and low-cost exposed bricks have strong load-bearing application, achieving consistent strength of 7.5 MPa¹²⁹ in quality checks and also help to avoid plastering and use of plastic paints.

Kesarjan takes advantage of the existing informal system of recycling of valuables (organic and metal) from C&D waste. It crushes and segregates the inert homogenous waste containing materials like soil, bricks and mortar or concrete particles and sieves them as per particle size. The process has low energy requirements and saves precious water by avoiding washing.

One hundred percent of C&D waste gets utilised. Post processing, the recycled aggregates are also suitable for lean strength applications like making ready-mix mortar with good workability and water retentivity. They can replace aggregate in normal concrete applications like foundation bases, filling up voids, constructing slopes, etc.



Debris brought to the unit for recycling



Crushing and sieving facility



Brick bats crushed for the recycling



Debris sieved and segregated



Hydro-vibro press for moulding bricks and blocks

¹²⁷ www.kesarjan.com

¹²⁸ <https://www.downtoearth.org.in/news/waste/india-recycles-only-1-of-its-construction-and-demolition-waste-cse-73027>

¹²⁹ Megapascals: metric measurement for pounds per square inch



RESULTS & LESSONS LEARNED

Kesarajan currently produces approximately 5,000 bricks per day, diverting 1,500 tons of C&D waste from landfills annually and saving precious top soil. With additional investments, Kesarajan can scale up their capacity and process 90,000 tons of recycled aggregates per annum. The market exists and can be expanded further with policy support to get these recycled products into standard specifications.



Bricks manufactured from up to 85-90% recycled material



Innovative application of recycled hollow blocks in filler slab



The product range from the recycled aggregates and other industrial waste



Lime plaster with recycled aggregate in one of the Heritage Buildings in Ahmedabad





MIDAS TOUCH: TURNING PLASTIC WASTE INTO FUEL IN MUMBAI, INDIA

by Rishi Aggarwal, Director of Mumbai Sustainability Centre¹³⁰

in cooperation with Safai Bank – Empowering citizens in safe disposal of multi-layer plastics,¹³¹ Mumbai, India

 MUMBAI, India



CHALLENGE

India generates 62 million tons of garbage every year; 90% of this is estimated to end up in official or unofficial landfills that are already brimming to capacity. Every day, millions of pieces of multi-layered packaging (MLP) get added to this burden because it is not recyclable, considered to not have any economic value and hence not collected by informal waste sector workers. Noxious fumes from MLPs if burned at temperatures below 800°C release dioxins that add to severe air pollution.

The Waste Management Rules of 2016 in India law have made Extended Producer Responsibility mandatory for companies that use MLP, requiring them to securely collect and dispose of MLP waste generated from their products. However, systems to ensure such collection are nascent, with producers arguing that tracking individual pieces of waste after products are sold is challenging.



SOLUTION

Since July 2018, Safai Bank of India has put in place a simple and effective system that enables ordinary citizens (especially school children) to be part of its branches and deposit MLP waste generated by them. To make the process exciting, a 'net banking' interface is designed, where individual deposits are counted and recorded. The collection from various branches in a city get stored in a hub and transported to cement factories where it is shredded, mixed with coal and burned at above 1000°C in kilns. The calorific value of MLP waste is similar to coal, i.e. one ton of MLP emits the same heat as burning one ton of coal. Thus, Safai Bank allows ordinary citizens to be part of a solution that diverts MLP waste from landfills and helps cement plants to reduce their coal usage.

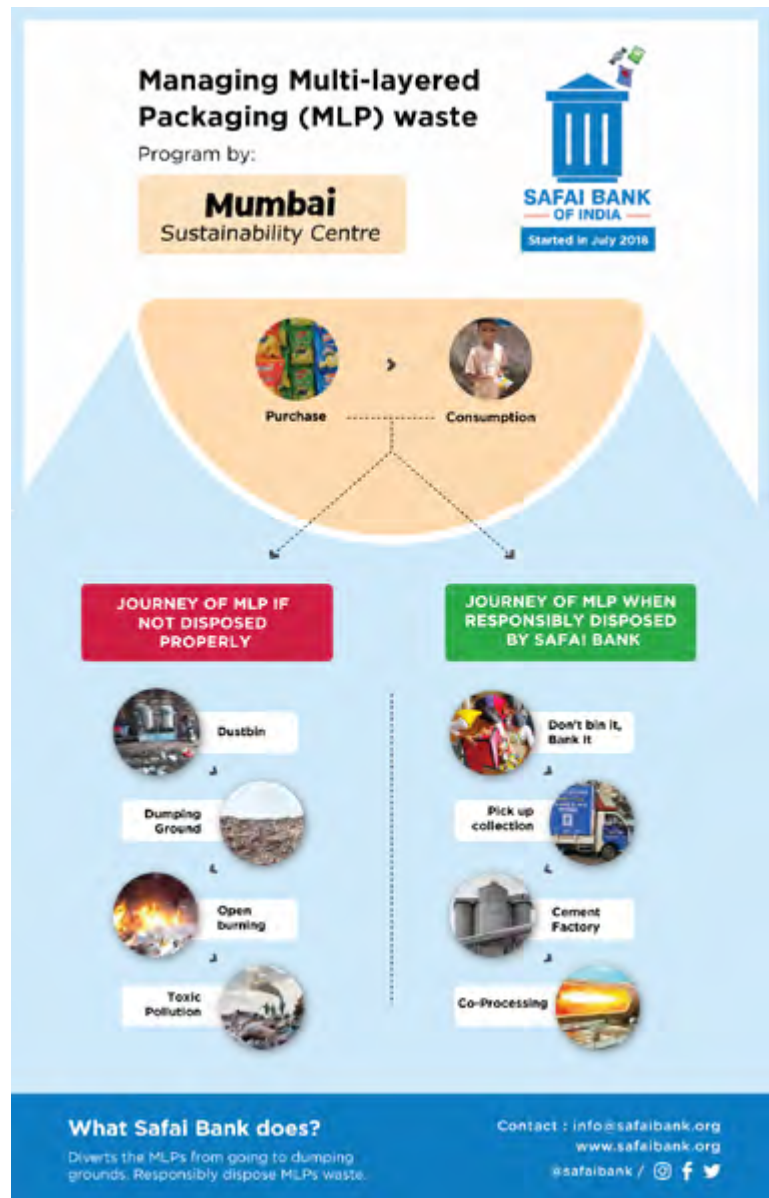
¹³⁰ <https://msc.org.in>

¹³¹ Safai is a Hindi language word meaning cleanliness; <https://safaiabank.org>



RESULTS & LESSONS LEARNED

The proof of concept has been established through its 227 branches in five Indian cities, where so far 3.8 million pieces of MLP waste have been successfully diverted to cement plants run by market leaders like ACC Ltd (pioneers) and Ultratech, through Nepra – a Producer Responsibility Organisation that acts as an intermediary. The model is easily scalable, demonstrating high acceptability, especially among school children, offering educational tools and development opportunities to help children understand materiality and chemistry, as well as influencing their consumption patterns when they realise the amount of junk they are generating.



2.4.4. GOOD PRACTICE IN SOCIALLY INCLUSIVE DIGITAL INFRASTRUCTURE

Digital infrastructure is no longer high-end but rather basic infrastructure, as the following example shows.



BREAKING THE DIGITAL DIVIDE: HELPING SMALL FISHERS IN MUMBAI, TOWARDS BUILDING RESILIENCE

by Devleena Bhattacharjee, Director of Numer8,¹³² entrepreneur and data scientist,
and Myron Mendes, Communication and Community Relations,
Indian Network on Ethics and Climate Change (INECC),¹³³ both Mumbai, India



CHALLENGE

Small-scale fisherfolk – over 120 millions of them globally and 40 million in India – are witnessing increased risk of climate change affecting fishing trips, increased cost of operations, decreased sales margins and delayed payment cycle. The disintegrated and complex nature of the seafood ecosystem has seen very little innovation over the years. Technology is available to large-scale marine fisherfolk, who go right into the middle of the ocean, engage in unsustainable fishing, and are the ones responsible for overfishing, which is illegal, and for unreported and unregulated fishing.

However, small-scale fisherfolk, fishing sustainably within territorial waters with boat sizes less than 12 metres, face combined challenges of declining revenues, increasing cost of operations and lower sales margins, while battling long-term livelihood issues like high-interest loans, and zero or no access to insurance.



SOLUTION

Numer8,¹³⁴ which has expertise in providing an end-to-end digitised platform for the marine seafood ecosystem, helps fisherfolk by providing tools to reduce fishing operational costs, and offering direct marketing, sustainability and traceability tracking for a fair-trade model and circular economy, while also providing extension services for the entire supply chain, as well as for consumers.



Fishermen of karanja Fishing Society using the app to track and update live data while at sea

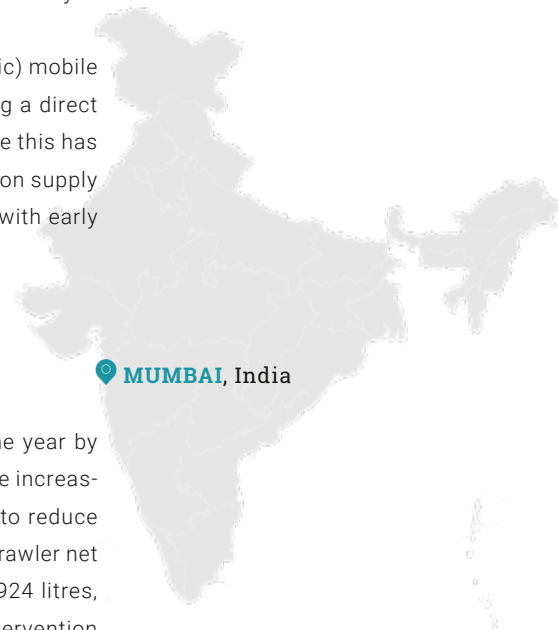
¹³² <https://www.numer8.in>

¹³³ <https://inecc.net>

¹³⁴ One of the world's leading companies in the field of digital platforms for fisheries. Numer8 is based in Prague and Mumbai and is supported by the United Nations World Food Programme, Federation of Indian Chambers of Commerce & Industry and the European Space Agency and Esri, and provides an end-to-end digitised platform for the marine seafood ecosystem.

Numer8 has also developed a fishing advisory app, which is a commercial off-the-shelf product that is globally available. For India, a supply ecosystem that is modified off-the-shelf has been designed by the firm. Currently, it is working with 40 fishing societies that include 1,537 boat owners and 17,000 fisherfolk, out of which 1,100 are active users of the app. Many of them belong to the Mumbai fisherfolk community.

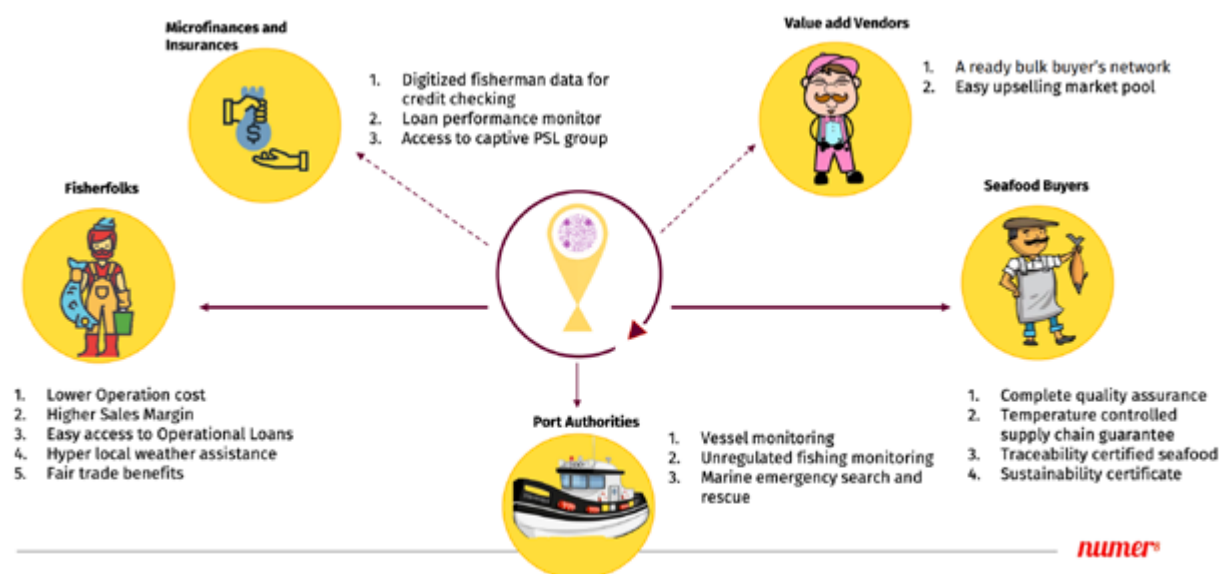
By using big data, the firm has created a fisherfolk-friendly (language specific) mobile app for fishing and weather advisory, along with a retail mobile app offering a direct marketplace for fisherfolk to sell their catch at higher margins. A process like this has ensured an end-to-end sustainable and traceable production and consumption supply chain management from sea-to-plate. The dashboard also helps fisherfolk with early warning systems for storms and cyclones.



RESULTS & LESSONS LEARNED

So far, this intervention has supported 1,100 fisherfolk over a period of one year by helping to reduce fisherfolks' operating costs (monthly) by almost 40%, while increasing their average monthly sales margins by 10%. The app has also helped to reduce fossil fuel consumption on a daily average (for gill net boats by 40% and for trawler net boats by 9.37%). The total amount of fuel saved by users of the app is 33,924 litres, which amounts to roughly 88.88 tons of reduced carbon emissions. The intervention has so far provided 7,400 tons of traceable seafood to 1,200 consumers and exporters in the city of Mumbai. The end-to-end sustainable supply chain management has offered livelihoods to 3,500 fisherwomen and 2,000 youth to create a better supply chain that is sustainable and climate friendly. The fisherwomen have shown an average monthly increase of income of USD 171 and have now been able to obtain loans. Through the early warning systems, notifications were sent to users regarding storms and cyclones, the most recent example being Tauktae.

The aim is for this technology to reach all fishing communities to create resilient and sustainable livelihoods, while creating responsible producers and consumers.



2.5. CITIES AND MOBILITY

Asia faces unique urban mobility challenges. Its cities are the densest on earth. Beijing is the size of Detroit, but has 29 times the population. The average South Asian city is twice as dense as the average European city and over four times as dense as the average North American city (OECD, 2020). Why is that? Scholars have observed that across history, people in cities have tended to commute no more than about one hour per day, limiting the extent to which cities could grow. Cities which only allowed for walking grew to a 5km diameter – the distance that could be traversed in an hour by foot. Venice, the quintessential walking city, is exactly that size. With the advent of the car capable of travelling at a speed of 40km/h, cities could start to have a diameter of 40km, with a corresponding decrease in density (West, 2017). The car gained widespread use in developed countries before it did in developing countries, forcing the latter to remain compact for longer as populations grew.

Now those cities are having trouble integrating cars into cities not made for them. In Indian cities, for example, almost $\frac{2}{3}$ of all travel is undertaken on foot or by bike. However, the small minority of people with private cars – only 4.34% of the population of New Delhi, for example – dictate city planning, and cause high levels of congestion and environmental damage (Misereor, 2020). But car drivers are often the ones who suffer most: the average Jakartan resident allegedly spends 10 years of their life in traffic (Mead, 2016).

Urban mobility challenges are thus foremost car challenges. As urban planner Avi Friedman put it, *“for development to be sustainable, planners must prioritize the needs of pedestrians over vehicles”* (Friedman, 2021, p. 150).

Cars create a cycle of automobile dependency and sprawl that has self-reinforcing effects and self-reinforcing damages (Litman, 2013). Increasing road space often leads to more cars on the road, which necessitates even more and wider roads. Roads often come at the expense of green space, which has countless environmental and community benefits. Green spaces are good at cushioning climate change impacts ranging from floods to heat waves. Cars are a major contributor to air pollution, especially in developing countries, where used cars make up a larger portion of the market (Cochrane, 2015).

The solution may seem obvious. Saying that cities are not walkable is like saying that farming, on the whole, is not organic. Most of farming still is organic, just as most cities still are walkable. The best that urban planners can do to improve their cities and mitigate emissions is to make cities more compact and develop infrastructure around any and all alternative transport modes to the car. But climate change is, to a large extent, here to stay, and for that reason adaptation and mitigation have become necessary. During Hurricane Katrina in New Orleans, for example, car ownership was strongly associated with surviving the disaster because urban infrastructure was not set up to provide alternative means of escape (Lovvorn, 2017). The same Jakarta that is struggling with some of the world’s worst traffic is also losing its urban infrastructure to the ocean faster than it can repair it (Kimmelman, 2017).

2.5.1. THE URBAN POST-FOSSIL MOBILITY

For cities to be successful in the future, several factors will have to be borne in mind.

De-carbonise freight and public transport: De-carbonising goods delivery and public transport can lead to many benefits for residents, as well as for the environment. With regard to public transport, Shenzhen, a rapidly growing megacity of 18 million, has become the world's first to have a fully electric fleet of 16,000 buses. Air pollution levels have declined dramatically (Keegan, 2018). In the process, the city has established BYD, one of the most competitive car battery and electric bus companies in the world. Zero-emission urban deliveries will mainly rely on electric vehicles, too.

Integrate the urban poor into mobility systems: Although the relative number of people in informal settlements worldwide is declining, in absolute terms it is increasing, especially in sub-Saharan Africa (UN-Habitat, 2016). Informal settlements are a problem worldwide, not only in least-developed countries. Hong Kong, one of the richest cities on earth, has large informal settlement populations housed in 'coffin cubicles', named as such because of their size (Lam, 2017). One of the main features of informal settlements is inadequate mobility infrastructure (Nuijss and Heinrichs, 2013). The one brilliant example of success in this respect is Medellín, a city which used to suffer from gang violence. Its Santo Domingo informal settlements on the outskirts of the city was integrated into the city with the now famous MetroCable system which has been widely emulated across South America. In Rio de Janeiro, however, a similar plan went awry because it was constructed in the wrong place and thus did not actually help residents (Apolitical, 2018). Brazil is recognised for pioneering bus rapid transit (BRT) in their cities, but its poorest communities on the peripheries have been left out of transport developments (Coalition for Urban Opportunity, 2017).

Make cities more compact: In compact cities, residents enjoy closer access to jobs, homes and amenities. The fate of Brasília, the car-centric modernist capital, is well known: built in the shape of an airplane, it only looked good from an airplane. For decades, the urban centre was not able to attract the residents it was intended

for (Waldek, 2020) and to this day, the unplanned, but human-scale outskirts remain the city's population centres. Unsurprisingly, many utopian city designs for tomorrow take walkability as their axiom. Saudi Arabia's controversial 'The Line' is a future smart megacity built along a single 170km entirely underground transportation super-highway that completely eliminates roads and cars. The highway links a chain of miniature cities in which almost everything can be reached within a five-minute walk, while preserving 95% of the natural environment in the area (Neom, 2021).

Integrate smart technologies into mobility systems, where possible: Songdo, a nearly complete smart city on the outskirts of Seoul, combines working, living and leisure in one place, reducing the need for extensive travel. Between the high rises are generous plots set aside for urban farming, which often are tended by the fishermen that lost their livelihoods when the city was built. The city has many sensors, which monitor and optimise everything from electricity usage to public transport and garbage removal (Songdo, 2021). Automated cars offer opportunities to declutter streets, and replace parking spaces with parks and roads with trees (Bobisse, 2019). But, as the examples of cable cars in Medellín and Rio de Janeiro show, the use of self-driving cars must be planned appropriately, as it can have the opposite effect (Ertrac, 2017).

Build mobility infrastructure to produce environmental co-benefits: Other future cities aspire to be good for the environment through design. Eko Atlantic, a large development in Lagos, Nigeria, is designed to be a hub for the growing African business elite. Although it does not directly do anything at all to help the city's large informal settlements populations, it is protecting the city from rising seas and storms by being built entirely on reclaimed land in front of a poor community that has been suffering from beach erosion (Eko Atlantic, 2021). Liuzhou forest city in Guangxi Province, China, is a very different concept of an experimental smart city. It tackles pollution by integrating one million plants into the fabric of the small city of just 30,000 on balconies, roofs and streets and is environmentally friendly by design. It is being tested as a model for the future urban living of the remaining millions of rural residents in China (Boeri Archetti, 2021).

2.5.2. GOOD PRACTICE IN URBAN INFRASTRUCTURE FOR A POST-FOSSIL MOBILITY

The following three practice examples show successful realisations of some of the transformative imperatives listed above. In the first example, the city of Bengaluru has succeeded in repurposing existing bus infrastructure and gaining funding to electrify its bus fleet. Much like the Shenzhen example discussed above, important economic and environmental benefits have accrued from this. The city went even further, however, by adding solar panels to the charging stations – in effect sourcing some of the required power locally, thus building further environmental co-benefits.

In the second example, Guangzhou has expanded public transport options by using an innovative bus rapid transit system that flexibly expands the metro system, while allowing for fast transport and keeping disruption to a minimum during installation. The establishment of an efficient, fast and dependable bus system has changed the face of the city and given further incentives for people to get out of their cars.

In the last example, a central street in Vinnytsia, Ukraine, was reconstructed likewise to reduce the number of cars on the road and allow for others users. Giving the street back to pedestrians has resulted in many community and environmental benefits.



REPURPOSING URBAN INFRASTRUCTURE FOR POST-FOSSIL MOBILITY IN BENGALURU, INDIA

by Pawan Mulukutla, Director Electric Mobility, WRI,¹³⁵ Bangalore, India



CHALLENGE

The current catalysis of electric vehicle (EV) adoption in India is attributed to three pressing needs of the nation: energy security,¹³⁶ pollution reduction¹³⁷ and positive climate action.¹³⁸ A country-scale drivetrain transition requires a few key ingredients, a crucial one of which is infrastructural augmentation. To that end, it is critical to optimise the USD 2.9 billion¹³⁹ macro-scale spending that the required infrastructure will entail in urban areas – to ensure that all pertinent infrastructural concerns receive equitable dues of policy interest and funding.



SOLUTION

Against the aforementioned challenge, repurposing existing infrastructure for accelerated EV adoption in Bengaluru (Karnataka, India) can be guaranteed to achieve the optimum use of infrastructural spending, by:

Establishing solar-powered charging infrastructure for e-buses: In Bengaluru, the city bus services are supported by 48 depots and 15,600 bus stops. The land and operations infrastructure available at these locations can be repurposed to transition the existing fleet to electric buses (e-buses), whereby only the establishment of e-bus chargers and ancillary switchgear is required. The bus stops can also be fitted with pantograph or inductive chargers to support en-route e-bus



Bus depot repurposed for e-bus operations by installation of floor-mounted DC (direct current) chargers. Source: Charge+Zone

 **BANGALORE**, India

¹³⁵ <https://wri-india.org>

¹³⁶ Snapshot of India's Oil & Gas Data: A Ready Reckoner – Petroleum Planning and Analysis Cell, India

¹³⁷ Ambient Air Pollution Attributable Deaths – World Health Organization

¹³⁸ <https://climateactiontracker.org/countries/india>

¹³⁹ Financing India's Transition to Electric Vehicles – Council on Energy, Environment and Water

charging between trips. The bus stops are sturdy and sheltered structures that can easily support the weight and form of off-board pantographs. Further, e-bus charging can be integrated with on-site solar energy generation through solar photovoltaic panels and battery energy storage systems.

Restrictive allocation of parking bays for EVs: Bengaluru is equipped with 3,300,000 equivalent car units (ECUs) of parking bays, for different vehicular segments. In line with the amendments made in 2019 to the Model Building Byelaws,¹⁴⁰ 20% of all ECUs in a city must be reserved for EVs. This allows for: restricting provision of land for vehicular parking, thereby freeing up to 825 hectares of space for recreational and ecological purposes; city-wide establishment of EV charging infrastructure at the reserved 660,000 bays; and disincentivised conventional-fuel vehicle purchases, due to limited parking space availability.

Leveraging existing digital infrastructure to plan for and monitor low-emission development: Bengaluru houses traffic-counting and over-speeding violation detection cameras at all major urban roads, in order to gather data on classified traffic volumes and traffic offences. The traffic volume and speed data generated from these devices can be used for optimised siting and sizing of EV charging infrastructure in the city. Further, the same data can be used for real-time monitoring of low-emission zones and congestion pricing areas (or road strips), especially as EVs in India have differently coloured (green) registration plates. Additionally, data from each vehicle's control unit can be fed to the city-level traffic information system¹⁴¹ for monitoring and managing low-emission zones, charging infrastructure, time-of-use (dynamic) power tariffs, and road congestion penalties. Also, EV charging infrastructure on high-volume roads can be financed through a combination of GIS-based property tax collection systems and land value capture mechanisms.



Bus depot with on-site solar energy generation. Source: PlugInIndia



Reservation of parking bays for EVs



RESULTS & LESSONS LEARNED

The proposed solutions are envisaged to reap manifold and multi-faceted benefits. First, the transit authorities are expected to save USD 0.1 billion in civil works costs for charging infrastructure establishment by repurposing their depots and stops. An estimated USD 1.6 billion in real estate costs may also be saved by the city authorities via restrictive allocation of parking bays for EVs. The accrued indirect macro-economic benefits from improved public health and lowered environmental damages total up to nearly USD 1.4 billion annually.¹⁴² The ecological benefits extend to reduction of 32 million tons of CO₂e per year, from deployment of EVs and solar-energy generation capacities.



Using a traffic monitoring and surveillance camera for data collection – to plan for EV charging infrastructure

¹⁴⁰ Amendments in Model Building Byelaws for EV Charging Infrastructure

¹⁴¹ Bengaluru's Traffic Information System

¹⁴² Financial Brief on Bengaluru Metropolitan Transport Corporation



GUANGZHOU BUS RAPID TRANSIT (GBRT), CHINA

by Li Wei, Chief Technical Officer,
Institute for Transportation & Development Policy (ITDP), Beijing, China¹⁴³



CHALLENGE

GBRT has revolutionised perceptions of bus-based travel. Before GBRT came into operation, there had been more than 80 bus routes operating along Zhongshan Avenue. The average operational bus speed during peak hours was around 13 km/h, even with curb-side bus lanes. Creating a transport system that carries more than 8,000 passengers per hour per direction is a challenge in itself. If the passenger demand is higher than that, then the city needs to think about other alternatives such as a metro system, which is 10 times more expensive than bus rapid transit (BRT). The planning and construction period for a metro line is 5-10 years, while it takes only one year for a BRT.

Zhongshan Avenue is one of the most important traffic arteries in Guangzhou. Construction work along this stretch would be like performing open heart surgery. How to select the right mass transit system to provide high-quality service for such a large passenger load corridor was a major challenge for Guangzhou's municipal government.

 **GUANGZHOU**, China



SOLUTION

After an extensive 4-year planning and design process by the Guangzhou Municipal Engineering Design and Research Institute in partnership with the Institute for Transportation and Development Policy (ITDP), GBRT – the second largest ‘metro replaced’ passenger-level BRT system in the world after the TransMilenio system in Bogotá, Colombia – opened in February 2010. GBRT innovatively designed a new operational mode called ‘delegated corridor + direct service’, which takes advantage of the ability of buses to operate both inside and outside the BRT corridor, greatly increasing the service coverage and reducing passenger transfer time compared to a traditional trunk-and-feeder system. It also avoids building terminals and interchanges with high land acquisition expenses in downtown Guangzhou.

With 22.9km median dedicated bus lanes, 26 BRT stations and 31 BRT routes, the GBRT system provides service to 850,000 passengers per day, which is three times more than other BRT systems in any other Asian city. Infrastructure development only cost around USD 110 million (724 million RMB) and its construction time was not more than one year.

The GBRT is not only a public transit project, but also an **urban street living environment** improvement project which greatly enhances city resilience. Continuous bike lanes, safe bike parking facilities, walking environment, parking management, public spaces, and waterlogging solutions were implemented or improved at the same time. The dedicated BRT lanes also operate as an urban emergency corridor, open to fire trucks, ambulances and police cars which execute emergency tasks.



RESULTS & LESSONS LEARNED

The GBRT is the first Gold Standard BRT system in Asia. According to the emission impact analysis¹⁴⁴ of the project, after implementing the BRT, the average bus operational speed increased by 84% and logged 30 million hours’ time saving per year. The direct socio-economic value from passenger time saving is more than 800 million RMB (USD 123 million). After establishment of the BRT, passenger volume increased by 39.6%, but energy consumption decreased by 4.3%. The estimated annual CO₂ emission reduction is around 86,000 metric tons.

The GBRT has a significant demonstration impact not only in China, but also for the world. It has won the *2011 International Sustainable Transport Development Award* and the UN 2012 Lighthouse Award. By 2020 more than 400 different city representatives from across the world had visited GBRT to replicate the model.



Guangzhou Bus Rapid Transit System,
Li Wei

144 Institute for Transportation & Development Policy (ITDP). Guangzhou, China Bus Rapid Transit Emissions Impact Analysis. May 2011. http://www.itdp-china.org/media/publications/PDFs/Guangzhou_BRT_Emissions_Impact_Analysis.pdf. Accessed 17 June 2021



RECONSTRUCTION OF THE ZAMOSTYANSKA STREET IN THE CITY OF VINNYTSIA, UKRAINE

by Viktoriia Prokopenko, Urban Planning Expert, Diana Stylik, Volunteer
and Iryna Bondarenko, Urban Planning Expert, Ecoaction¹⁴⁵



CHALLENGE

Vinnytsia is a city located in central Ukraine on the banks of the Pivdenny Bug River, with a population of nearly 370,000 inhabitants. One of the arterial streets in the district of Zamostya is Zamostyanska street, where major administrative buildings are located. The street has a tram line.

Before the reconstruction, the sidewalks were of bad quality, as well as the tram lines, which bothered pedestrians and slowed down the trams. There was no rainwater drainage system, and the wide green median in the middle of the road was neglected. Cars parked chaotically, which blocked the tram's movement and endangered the pedestrians' safety.



SOLUTION

The City Hall of Vinnytsia wanted the street to be safe for pedestrians and cyclists, equipped with fast trams and simply beautiful. City representatives understood that creating good conditions for pedestrians and cyclists would attract more people to use active mobility modes. During the reconstruction of the road, cycling lanes were added on both sides of the road, while the car lanes were reduced to one in each direction (initially there were two). The city located parking spots between sidewalks and bike lanes.

Some of the implemented solutions became innovative for Ukraine, like the reduction (not expansion) of the car lanes and elevated platforms at the tram stops. The bike lanes on the road (not on sidewalk) were also new for the city of Vinnytsia.

With the renovation of the tram lines, a seamless technology was introduced, which reduced the noise and vibrations of trams. The noise pollution problem has almost never been addressed in Ukrainian cities before, so this project did a good deed for all other cities.

145 <https://en.ecoaction.org.ua>



RESULTS & LESSONS LEARNED

The renovators of the Zamostyanska street succeeded in overcoming the resistance of drivers and showed that such projects can work out well in Ukraine. Moreover, they demonstrated that solutions for pedestrians, cyclists and passengers can be suitable for drivers too. For example, after the construction of the cycling paths, more parking lots have become available.

There were some negative comments from the community. While laying the drainage system, the need to saw trees occurred, which outraged some people. Thus, the local government planted 460 young maple trees in the median and along the sidewalks to address the problem. Some drivers complained about a lack of parking lots, and some even parked on the bike lanes. However, such situations happen less and less after the renovation. Altogether, a majority of the citizens are satisfied with the renovation and believe that the street has become safer.

This renovation has become an important pilot on the pathway to decarbonising urban mobility in Ukraine. The concept of the superiority of pedestrians, cyclists and public electric transport was completely unfamiliar in Ukrainian cities. Through this pilot project, the concept has been tested and implemented, and has become an inspiration for other cities in Ukraine.



Zamostyanska street before renovation.
Photo by Sergiy Dzvanko



Zamostyanska street after renovation.
Photo by the Agency of Local Development

2.5.3. URBAN PLANNING, GOVERNANCE AND FINANCE

Sixty percent of the area projected to be urban by 2050 is yet to be developed.¹⁴⁶ Whether this urban space is developed according to outdated urban planning ideas of the last decades, whether it is developed through uncontrolled growth, or whether it is developed as the green, social and climate-friendly city of tomorrow, the features of which we have shown on the previous pages, are decisive questions as to whether it will be possible to achieve the 1.5°C target and remain within planetary boundaries altogether.¹⁴⁷ Planning, development and governance with a clear vision to design a city that achieves the Sustainable Development Goals (SDGs) and the goals of the Paris Agreement are key prerequisites for successful urban transformation.

However, the challenges facing spatial planning extend far beyond the requirement to develop the sustainable, resilient and greenhouse gas-neutral city of the 21st century: cities form complex networks with their surrounding areas and other cities in order to fulfil their function as arteries of economic development. These networks can be organised in a centralised way, as in France with Paris at the centre, or in a multipolar way, as in Germany. In the face of the climate crisis, it is a central task of spatial planning to examine network structures with a view to their resilience and ecological footprint and to plan for the future in a form that best meets sustainability requirements. This, in turn, requires not only good planning but also responsible governance.

If we talk about green and zero-carbon urban and spatial development, it becomes immediately clear that green, resilient and zero-carbon infrastructure design is at the very core of the task.¹⁴⁸ Apart from providing the necessary links and ensuring mobility within and between urban areas, from providing accessible and affordable, high-quality public services, and from providing zero-carbon energy for electricity, industrial processes, mobility, heating and cooling, this new infrastructure must also be climate-adaptive, nature-positive and space-saving, as we have set out step-by-step in the previous sections.¹⁴⁹

A vital governance task is to develop zero-carbon plans at sub-national level also, that is, for cities and regions. Low-carbon development plans should be developed for all cities, according to the recommendation of the Global Commission on the Economy and Climate, and the Compact of Mayors could serve as a framework for it.¹⁵⁰ The German Advisory Council on Global Change, in its flagship report *Humanity on the Move: Unlocking the Transformative Power of Cities* (2016), also stressed the relevance of good urban governance and appropriate financing.¹⁵¹

The World Bank estimated the necessary annual cost investment volume for climate resilient and zero-carbon urban infrastructure at USD 4.5 to 5.4 trillion per year and called for new crediting approaches to deliver these investments.¹⁵² The Cities Climate Finance Leadership Alliance (CCFLA),¹⁵³ climate funds like Green Climate Fund (GCF)¹⁵⁴ or International Climate Initiative (IKI)¹⁵⁵ and development banks like AIIB¹⁵⁶ and ADB¹⁵⁷ have set up special programmes and earmarked funds or created instruments to leverage more private investment for this purpose, but the measures taken are still far from sufficient to provide the necessary investment.

Apart from investment volume and its sustainability, a more balanced approach is needed, overcoming the strong prevailing bias towards large cities. A large number of towns are rightly concerned about being left behind. Many of them emerge in developing countries around megacities as often rather unplanned satellite towns. For example, In India such 2,530 'census towns' were added within a decade. These census towns are typical sprawls with poor planning where access to services, amenities and opportunities are quite limited, and where 'zero-carbon' and 'climate resilience' remain largely unconsidered as urban planning goals.

In many urban agglomerations, especially in the Global South, urban governance is not yet streamlined. Instead, it is rather disjointed and siloed, with separate departments being responsible for urban development. In Indian cities for instance, the same stretch of land is dug and closed by different departments at

146 https://www.un.org/en/ecosoc/integration/pdf/fact_sheet.pdf

147 For the concept of planetary boundaries, see <https://www.stockholmresilience.org/research/planetary-boundaries/the-nine-planetary-boundaries.html>

148 https://www.researchgate.net/publication/294580768_Green_Cities_-_Urban_Planning_Models_for_the_Future

149 See also https://www.bmi.bund.de/SharedDocs/downloads/DE/veroeffentlichungen/themen/heimat-integration/raumordnung/leitbilder-und-handlungsstrategien-raumordnung-en.pdf?__blob=publicationFile&v=5 and

150 https://newclimateeconomy.report/2015/wp-content/uploads/sites/3/2015/09/NCE2015_workingpaper_cities_final_web.pdf

151 https://www.wbgu.de/fileadmin/user_upload/wbgu/publikationen/hauptgutachten/hg2016/pdf/hg2016_en.pdf

152 <https://openknowledge.worldbank.org/handle/10986/30611>

153 <https://www.citiesclimatefinance.org>

154 <https://www.greenclimate.fund/event/implementing-new-green-climate-fund-urban-strategy-africa>

155 https://www.international-climate-initiative.com/en/details/project/urban-pathways-supporting-lowemission-plans-for-basic-urban-services-in-the-context-of-the-new-urban-agenda-17_I_357-557

156 <https://www.aiib.org/en/about-aiib/who-we-are/infrastructure-for-tomorrow/green-infrastructure/climate/index.html>

157 <https://www.adb.org/what-we-do/funds/urban-climate-change-resilience-trust-fund>

different points in time during the year, to supply water or electricity, and to further develop roads. Digital technology (*Digital India*¹⁵⁸) has not been effectively and adequately leveraged for building urban resilience, as aimed for by *Atmanirbhar Bharat*.¹⁵⁹ Coherence, convergence, coordination and integration among departments could be greatly improved. Without better urban governance, informal settlements in cities will continue to grow, and the call for zero carbon and climate resilience will not become reality. Apart from these disfunctions, unsustainable land use will also continue. Land is a finite resource, including for and in cities. Sustainable infrastructure investments can greatly help to protect this limited resource. Only a space-saving and sustainable urbanisation will lead to a small carbon footprint and good quality of life. For instance, there are various ongoing land reclamation projects in Southeast Asia which will destroy ecosystems that people rely on, for example for their livelihoods, but such projects are pushed by influential urban developers who might even promote them as green and climate-smart. This form of power imbalance is quite pervasive and often not taken into consideration. Being very sensitive in this regard is especially relevant when working with profit-oriented partners.

A new dimension of urban planning in the 21st century, to be elaborated and then stringently avoided in governance and investment decisions, is the concept of 'carrying capacity', which in more simple words translates into limiting resource use and material growth. The GHG and ecological footprint of a city are two dimensions of its 'carrying capacity'.¹⁶⁰

158 India's overarching policy direction

159 India' <https://aatmanirbharbharat.mygov.in>

160 <https://www.nature.com/articles/s41598-017-15303-x>



3. TOOLSET FOR AIIB'S INFRASTRUCTURE INVESTMENT TO ADVANCE URBAN TRANSFORMATION



Infrastructure investments are indispensable for achieving the SDGs. They amount to USD 6 trillion per year and a great part of it is being invested in cities. How sustainable these investments are, if they are well aligned with the Paris Agreement and if they strengthen resilience against external shocks and natural disasters are key criteria to assess their transformative potential. Another key aspect is whether these investments improve the situation of the (urban) poor as the most vulnerable population groups. These requirements are well reflected in the Sustainable Development Goal (SDG) 11 'Sustainable Cities and Communities', particularly its target to '*substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels*'.¹⁶¹ The commitment to leaving no one behind has been gaining significant momentum since the New Urban Agenda was adopted in 2016,¹⁶² particularly in the context of the current global pandemic crisis.¹⁶³

In this chapter we will describe seven sustainable urban investment principles and their 31 criteria which have been derived from the analysis and case studies in the previous sections. The principles aim to capture all the elements that can advance urban transformation towards environmental, social and economic sustainability.

We will then show how these principles can be applied and mainstreamed by the AIIB across key policies, strategies and governance instruments. It needs to be emphasised that to make investments transformative and sustainable, it is not enough to look only at the Bank's Environmental and Social Framework.

The Asian Infrastructure Investment Bank (AIIB)

is the first multilateral development bank led by China. It started its operations in 2015, aiming at enabling its clients to **build infrastructure for tomorrow**. By December 2021, AIIB approved almost USD 32bn for 159 projects in 31 countries, including 11 urban projects (plus 3 urban projects in the approval process). AIIB committed to align its investments with the goals of the Paris Agreement and to contribute to the achievement of the SDGs.

As infrastructure is long lived and emission intense, it can determine the climate smartness and resilience for decades to come. Therefore, it is the type and quality of new infrastructure that will define whether it serves sustainable development pathways and the urban transformation.

We call our principles and criteria and the steps we suggest to apply them a 'toolset'. This toolset, of course, is only a first and preliminary draft. It serves as an instrument to initiate further discussions and deliberations with and among the Bank and multiple stakeholders. At a later stage, testing and piloting is needed. We make some first suggestions as to how this process could be kick started in the section 'Guidelines for implementation'.

It is important to stress that the toolset in this publication is first tested for AIIB but that it could and should be applied to other development banks and infrastructure investors, too.

¹⁶¹ <https://www.undp.org/content/undp/en/home/sustainable-development-goals/goal-11-sustainable-cities-and-communities.html#targets>

¹⁶² <https://habitat3.org/the-new-urban-agenda>

¹⁶³ <http://library.fes.de/pdf-files/iez/18168.pdf>

3.1. SUSTAINABLE URBAN INFRASTRUCTURE INVESTMENT PRINCIPLES AND THEIR CRITERIA

Sustainable urban infrastructure development has different climate, environmental, social, economic and governance aspects, as shown in the previous sections. Infrastructure investments, guided by sustainable urban planning, should enable:

- fast decarbonisation and the building of climate resilience
- efficient land use
- restoration and protection of biodiversity, ecosystems and their services
- social inclusion, equity and resilience to external shocks, for instance a pandemic
- circular economy, zero waste and sustainable consumption and lifestyles.

The operating space for sustainable infrastructure investments is provided by multilateral frameworks such as the Paris Agreement, the Agenda 2030 with the SDGs (especially SDG 11), the Sendai Framework for Disaster Risk Reduction, the New Urban Agenda, and the Convention on Biological Diversity, including its Post-2020 Global Biodiversity Framework.¹⁶⁴ More specific guidance on reporting standards on investments is, or will be, provided by the Task Force on Climate-related Financial Disclosure (TCFD)¹⁶⁵ and the Task Force on Nature-related Financial Disclosures (TNFD),¹⁶⁶ which has taken up work more recently.

Most development banks, including AIIB, have pledged to align their investments with these frameworks or at least some of them. Several development banks also contribute to or support the work of TCFD and TNFD. In 2016, multilateral development banks (MDBs), including AIIB, made a commitment to align their investments with the goals of the Paris Agreement with regard to: 1) GHG mitigation; 2) adaptation and resilience building; 3) scaling up climate finance; 4) strategy and policy development; 5) reporting; and 6) internal operations.¹⁶⁷ On 26 October 2021, AIIB pledged to fulfil its alignment commitment by mid-2023, and to achieve a climate finance share of its actual investments of at least 50% by 2025, equally balancing adaptation and mitigation.¹⁶⁸ To translate goals into metrics that

allow for result measurement, the AIIB is partnering with the asset manager Amundi,¹⁶⁹ has set up the AIIB-Amundi Climate Change Investment Framework in 2020,¹⁷⁰ and will apply it to AIIB's Asia Climate Bond Portfolio¹⁷¹ to mobilise climate action and to test the framework as a means to build Paris-aligned investment portfolios, based on measurable, reportable and verifiable result monitoring indicators (AIIB/Amundi, 2020).

To reiterate a definition, which we have put at the centre of our previous 2019 report¹⁷² on the AIIB's alignment with the Paris Agreement's temperature goal of 1.5°C with reference to Germanwatch/NewClimate Institute (2018), alignment is

“the process towards a situation where all investments are either supporting the necessary transformation towards greenhouse gas neutrality or have no significant impact on emissions. Any investment that would counteract achieving the Paris temperature goal would need to be phased out. Such assessments need to be based on science, namely on emission pathways consistent with reaching the Paris temperature goal.”

How can abstract goals and technical definitions of alignment with the goals of the Paris Agreement first be tailored sector-wise to urban infrastructure investments and at the same time be expanded to include the dimensions of sustainability that go beyond climate issues? And above all: how can this be done in a language that is comprehensible enough that it can be connected to the everyday reality of all those who are committed to sustainable urban development with very concrete projects and who have the needs, rights and interests of the poorest and most vulnerable in mind? Based on the sustainability requirements for urban infrastructure investments outlined in this publication, and the findings from our two previous reports on AIIB and climate change mitigation and AIIB and pro-poor climate resilience, we have derived seven principles for sustainable urban infrastructure investments.

164 <https://www.cbd.int/article/un-biodiversity-conference-part1-closes>

165 <https://www.fsb-tcfd.org>

166 <https://tnfd.global>

167 For more details, see <https://newclimate.org/2020/03/19/six-memos-on-the-multilateral-development-banks-paris-alignment-approach>

168 <https://www.aiib.org/en/news-events/news/2021/AIIB-to-Fully-Align-with-Paris-Agreement-Goals-by-Mid-2023.html>

169 <https://about.amundi.com>

170 <https://www.aiib.org/en/policies-strategies/framework-agreements/climate-change-investment-framework/.content/index/AIIB-Amundi-Climate-Change-Investment-Framework-FINAL-VERSION.pdf>

171 <https://www.aiib.org/en/news-events/news/2019/AIIB-and-Amundi-Launch-Innovative-USD-500-Million-Climate-Bond-Portfolio-to-Mobilize-Climate-Action.html>

172 https://www.researchgate.net/publication/332190222_Aligning_the_Asian_Infrastructure_Investment_Bank_AIIB_with_the_Paris_Agreement_and_the_SDGs_Challenges_and_Opportunities



1. Urban net-zero GHG principle

A key factor for successful decarbonisation is the avoidance of carbon lock-in in the form of long-lasting infrastructure and inefficient land and space use patterns that inevitably result in high emissions. Carbon lock-in occurs at the levels of wrong infrastructure and technology choices being made at the planning stage. Mitigation strategies are required for:

- physical infrastructure and spatial urban form (density, mixed use of urban neighbourhoods)
- energy and material use
- behaviour and lifestyle
- the restoration of urban carbon sinks.

Decarbonisation needs to be planned holistically and be target-oriented.¹⁷³ Investments should be made with priority on urban infrastructure projects that meet one or more of the following criteria:

- 1.1. **New settlements should be planned and implemented as people-friendly net-zero cities**, decoupling resource use from economic growth, and using 100% renewable energies. If a new settlement is not greenhouse gas-neutral, it must at least be shown how it can gradually become so by 2050. Adjusting architecture to climate conditions (e.g. through natural ventilation and shadowing) enhances energy efficiency.
- 1.2. **Building materials should be, as much as possible, carbon free**: That is, recycled materials, organic building materials such as wood and bamboo, ecological insulation materials, minerals and stones of regional origin, and high-tech green products such as CO₂-free steel and cement should be used wherever technically possible, socially acceptable and economically viable. Wood in particular will play a prominent role in the building turnaround and will experience a revival. This also applies to the construction of multi-storey high-rises. Replacing cement and steel in urban construction with wood, combined with a circular use of materials – in other words a material revolution – requires a revolution in architectural thinking and a revolution in urban planning.
- 1.3. **Retrofitting buildings at low cost, with high immediate emission effects should become a priority**, with a particular focus on participatory approaches for the benefit of inhabitants of informal urban settlements and other lower-income groups.
- 1.4. **Consistent and efficient use and expansion of accessible renewable electricity**: At the core of urban decarbonisation is electric transport, heating and cooling, powered by renewable energies and complemented by significant and measurable energy efficiency gains. Transportation and buildings make up the biggest proportion of urban energy consumption. Replacing fossil by renewable energy will thus reduce the urban carbon footprint significantly.
- 1.5. **Rapid expansion of an urban post-fossil mobility**, i.e. through the expansion and urban governance, spatial planning and investments towards the achievement of these transformative decarbonisation of public transport, the development of infrastructure for pedestrians and cyclists, the transformation of the city into a more compact city of short travel distances, the improvement of the modal split in the transport sector, including by using smart technologies, and by ensuring comprehensive access to urban mobility for the poor.
- 1.6. **Restoration of urban carbon sinks**, i.e. enhancing carbon sequestration by planting trees and building green corridors in urban environments, greening roofs and walls, restoring water bodies and enhancing organic soil fertility.

¹⁷³ By September 2021 almost 1,000 cities and regions, representing more than 828 million people had pledged to shift towards net-zero GHG emissions.



2. Urban climate resilience principle

In order to ensure the climate resilience of urban infrastructure throughout its lifetime and to better protect urban residents and livelihoods from climate risks, investments should meet the following criteria. The first two are mandatory, while as many of the other criteria as possible should be met.

- 2.1. **Do no harm:** Infrastructure investments must not undermine the climate resilience of people and ecosystems, especially not of the poor and climate-vulnerable people.
- 2.2. **Climate-proof infrastructure throughout the entire life span:** Infrastructure investments should be protected effectively during their entire lifespan against value loss caused by adverse climate change impacts. Of utmost importance is forward-looking adaptive spatial planning that takes into account future climate risks. Physical urban infrastructure, including energy, water, sanitation, digital, transport and building infrastructure, must be built in an adaptive way that factors in climate risks for the entire lifespan of infrastructure. By definition, it is planned, designed, built and operated in a way that anticipates, prepares for, and adapts to changing climate conditions, as formulated by OECD (2018).
- 2.3. **Enhance systemic climate resilience:** Infrastructure should be optimised so that it protects human- and ecosystems against climate impacts.
- 2.4. **Promote behavioural and participatory, locally led adaptation,** taking into account social dynamics and local knowledge, with a special focus on poor contexts. With regard to slum dwellers, cooperation with their associations and peer learning from successful participatory rural appraisal approaches as well as the adoption of locally led adaptation¹⁷⁴ to urban contexts is promoted with priority, especially in poor cities with a high percentage of slum dwellers.
- 2.5. **Effective and cost-efficient nature-based solutions are prioritised wherever possible,** including, inter alia, green infrastructure as mangroves for coastal protection, trees as wind breakers and for shading, parks for air cooling, cleaning and ventilation, green roofs and backyard greening for stormwater and flood management, as well as the restoration of urban eco-systems, waterbodies and landscapes to avoid erosion and to protect watersheds.
- 2.6. **Technical adaptation measures complementing green infrastructure:** Engineered measures include, inter alia, wave breakers, flood gates, river levees and slope stabilisation, but also air conditioning, insulation of buildings, and cool pavements or heat-resistant road surfaces.



3. Urban efficient land use and spatial planning principle

Land is among the scarcest resources in cities. The risk of land-use conflicts will further increase with accelerating urbanisation. Efficient land use is an indispensable condition for urban sustainability. It requires a correspondingly forward-looking spatial planning. Infrastructure investments should only be made in cities where such planning exists or is being developed. Key criteria include:

- 3.1. **Urban planning that focuses on high-density neighbourhoods with a mix of uses,** i.e. residential combined with economic and service functions, leading to cities of short travelling distances.
- 3.2. **Urban planning that focuses on a green city** by using nature-based solutions such as green and blue corridors rich in biodiversity, natural cooling and shading to clean the air and reduce air and surface temperatures, and green roofs for stormwater management.
- 3.3. **Urban planning that promotes horizontal and vertical urban gardening** for providing fresh vegetables and reducing freight transport to the city.

174 <https://www.wri.org/initiatives/locally-led-adaptation/principles-locally-led-adaptation>



4. Nature-positive city principle

The Global Goal for Nature, i.e. halting and reversing the catastrophic loss of nature, complements the net-zero GHG emission goal.¹⁷⁵ It is a prerequisite for biodiversity protection and plays a critical role in limiting climate change and for fostering resilience of urban eco- and human systems against external shocks. Urban infrastructure investments should contribute to this goal, inter alia by:

- 4.1. **Protecting and promoting biodiversity**, inter alia by creating a dense cluster of parks and waterbodies that offer and connect diverse ecological niches, minimise surface runoff, cool and ventilate the air, and improve air quality.
- 4.2. **Fulfilment of strict limit values for environmental pollution** such as air pollution control, noise, vibrations, water, groundwater and drinking water protection.
- 4.3. **Application of ambitious green urban building codes and quality seals** that promote environmentally friendly constructions, trees along the streets providing shade, green roofs that buffer precipitation, and greened walls that create urban habitats for insects, butterflies and birds.



5. Urban circular economy and zero-waste principle

Economic sustainability in a resource- and climate-constraint world requires a transformation to a circular economy with zero waste. For this to happen, cities are pivotal: 75% of all resources are used in cities and cities produce 50% of global waste. City developers and investors as well as administrations and the private sector, in cooperation with science and citizens, are required to curb the use of finite natural resources. If designed in the right way, urban infrastructure can contribute decisively to this goal. Required infrastructure services include, inter alia:

- 5.1. **Infrastructure in the recycling and waste management sector enforcing zero-waste trajectories**, especially waste recycling, and enabling reuse and repair.
- 5.2. **Infrastructure that is durable** (for instance, using carbon fibres to extend the life of a bridge), and sustainable from cradle to grave.
- 5.3. **Infrastructure that enables the transition to an entirely circular urban economy** by providing the necessary digital,¹⁷⁶ transport and logistical, maintenance and refurbishment services.

175 <https://www.naturepositive.org>

176 <https://cdn.gihub.org/umbraco/media/3889/gi-hub-thought-piece-infrastructure-and-the-circular-economy-apr-2021.pdf>



6. Socially inclusive and resilient city principle

Inclusiveness, as well as resilience against all types of external shocks that goes beyond traditional coping strategies, are important dimensions of social sustainability. They rely on the availability, accessibility and affordability of respective infrastructure services. Urban infrastructure investments should comply with the following criteria:

- 6.1. **Inclusive urban infrastructure is people-centred.** It serves people's needs, is inclusive and ensures participation and common ownership.
- 6.2. **Infrastructure builds resilience and fulfils basic human rights** by providing access to clean drinking water and sanitation, electricity and housing, health, food and education. A particular focus is put on the needs of the most vulnerable populations, especially at times of external shocks, be they human-made or natural.
- 6.3. **Enhancing inclusiveness, resilience and capacity of vulnerable groups requires specialised small-scale financing channels:** Infrastructure investments must not be limited to mega projects in prosperous cities but should also be provided to Tier 2 and Tier 3 cities through specialised small-scale financing channels.



7. Urban pro-poor principle

Poor people, who form the majority in most cities in developing countries, require particular attention in urban infrastructure development. Infrastructure investments should duly take their needs and rights into account. Seven criteria should be adhered to:

- 7.1. **Measurable value for the poor:** Infrastructure investments should provide measurable client-value for poor and vulnerable populations in terms of their resilience.
- 7.2. **Transformation:** Infrastructure investments should facilitate the structural transformation to sustainable development pathways of poor people.
- 7.3. **Enabling policy frameworks:** Investors should engage with clients to support or incentivise the development of enabling policy frameworks that takes due note of the rights and particular needs of poor people.
- 7.4. **Accessibility:** Infrastructure services should be accessible for poor populations.
- 7.5. **Affordability:** Infrastructure services should be affordable for poor populations.
- 7.6. **Participation:** Due participation of poor populations in all phases of the infrastructure investment cycle should be ensured.
- 7.7. **Transparency:** Transparency should be ensured in all phases of the infrastructure investment cycle, including for poor populations through prior information.

3.2. GUIDELINES FOR IMPLEMENTATION

The seven sustainable urban infrastructure investment principles are formulated in a way that allows them to be applied as a **code of conduct for infrastructure investments to promote transformative pathways in urban settings**. They are not limited to AIIB or other multilateral or national development banks. The 31 criteria that accompany the seven investment principles provide further orientation towards what should be captured by the principles. These criteria can and should be further developed on a rolling basis. They are more specific than the principles, but do not claim to cover all relevant aspects that should be captured by the principles fully and comprehensively; they are derived from the main conclusions of the previous sections. Ways in which they can be implemented can be seen for many but not all of them in our good practice examples.

In the following sections we make further suggestions as to how these investment principles and criteria could be included, mainstreamed and applied at the five main levels of a development bank's governance instruments, policies and strategies:

- strategic planning and budgeting
- risk management
- sector policies (in our case: urban sector policy)
- project portfolio and single project level
- monitoring level.

We have chosen to take AIIB as an example, building on our previous assessments of AIIB, as pointed out before. AIIB is a member of the group of MDBs that have committed to aligning their investments with the Paris Agreement to catalyse low-emission and climate-resilient development.

At COP24 in Katowice (2018), six areas were laid out to bring this pledge into action: climate resilience, climate mitigation, climate finance, engagement and policy development support, transparency and reporting, and internal activities. At COP25 in Madrid (2019), the group of seven announced the first elements of an alignment framework, and shortly before COP26 (2021) in Glasgow, AIIB announced it would fully align its operations with the Paris Agreement by mid-2023, and would cumulatively invest \$50bn of climate finance by 2030.¹⁷⁷

Our paper is intended as a contribution, making suggestions for how to put this pledge into practice in the key sector of urban infrastructure investments so that urgently needed transformation gains traction by curbing emissions, enhancing resilience, protecting biodiversity and achieving the SDGs.

It is important to stress that AIIB should not only take up these principles and their criteria in its Environmental and Social Framework (last amended in May 2021), but should also mainstream and apply them across the five aforementioned levels of AIIB governance instruments, policies and strategies.

The same approach should be followed by other MDBs, national development banks, and all urban infrastructure investors and investees. In that respect, the following remarks on the subject might inspire and guide, at least in part, other infrastructure investors too.

These principles and criteria are the starting point of developing a framework for implementation. Further research, piloting and testing, and, most importantly, active involvement of the Bank's own experts is needed to make them operational. So far, we have been reluctant to define benchmarks and indicators for target achievement. It must be stressed that full compliance with all criteria will become a process that takes time. Developing benchmarks and defining intermediate targets on the way from gradual to full implementation of the principles and each of their criteria would be the responsibility of the AIIB, but also of other infrastructure investors, city governments, project developers and other stakeholders. The participation of civil society, urban residents and especially the most vulnerable population groups would have to be ensured in an appropriate, inclusive and, above all, transparent manner.

As first steps we propose a consultation between the Bank, us and other stakeholders interested in the approach in order to:

- review our analysis, approach and suggestions
- take stock of the Bank's own approaches
- identify gaps
- agree on principles and criteria to examine more closely in view of gaps, challenges and opportunities
- test principles and criteria in practice at as many of the aforementioned levels as possible. That would include the definition of verifiable quantitative indicators for result measurement.

¹⁷⁷ <https://www.aiib.org/en/news-events/news/2021/AIIB-to-Fully-Align-with-Paris-Agreement-Goals-by-Mid-2023.html>

3.3. SUSTAINABILITY CHECKLIST TO ASSESS URBAN INFRASTRUCTURE INVESTMENTS

In order to gain a relatively quick assessment of the likely positive, negative or neutral impact of infrastructure-related decisions on the future climate neutrality, climate resilience, ecology and socially and economically sustainable development of cities, a simple traffic light system is useful. It enables investors as well as urban developers and mayors to assess the transformative impact of decisions. In relation to the public, the traffic light system creates transparency.

The traffic light system is designed in such a way that it can be applied not only to specific projects but also to other relevant decision-making levels, for instance strategic planning, risk management, etc. (see above).

Our traffic light system is based on a checklist which entails the seven principles and 31 criteria. Each criterion is checked separately as to whether an infrastructure-related decision has a positive (green), rather negative (orange) or very negative (red) impact on urban transformation. If a decision has no impact on a certain criterion, which in reality is often likely to be the case, the traffic light remains off (grey). In cases where the impact cannot be assessed, for example because important information or data is missing, the traffic light jumps to a flashing yellow light. In these cases, missing information must be obtained before a decision can be made.

The colour of the traffic light for our seven principles results from the colour of the criteria assigned to them. If at least one-third of the criteria is rated red, the traffic light for this principle jumps to red. The traffic light for a principle can only be green if no criterion is rated red and less than one-third of the criteria are rated yellow. Criteria rated grey (not relevant) are not included in this calculation. If at least one-third of the criteria are assessed with a yellow flashing yellow light, the traffic light for the respective principle also jumps to flashing yellow light. The same rules apply to the resulting overall traffic light. In general, the rule is that all criteria are equally weighted and all principles are equally weighted. Weighting can be changed to calibrate the traffic light to specific circumstances.

The following figure is the checklist for our traffic light system, in which the individual ratings for all criteria are recorded.

In the following sections, we will apply the traffic light system to: AIIB's 'Sustainable Cities Strategy' – the Bank's sector strategy that is most relevant for our purpose; the project portfolio and single project level in this sector; AIIB's strategic planning and budgeting; the Bank's risk management; and monitoring.

For the sector strategy and the project portfolio as well as the single project level, the traffic light system is relatively easy to apply. For risk management, strategic planning and budgeting as well as monitoring, it is more difficult and requires greater flexibility.

It must be emphasised at this point that the application of our traffic light system to the AIIB is of a very preliminary nature, i.e. it only gives a first impression as it is not yet based on a well-founded analysis. In order to carry out an in-depth analysis, access to many documents not publicly available, as well as the participation of the AIIB, independent experts and other stakeholders, not least the project partners of the AIIB, are required. Above all, as described above, meaningful and measurable indicators must be defined for all criteria, as well as the threshold values for assigning the traffic light colours. In this respect, the results of a mature application of the traffic light system would certainly differ from our preliminary application.








Nevertheless, our traffic light system is meaningful, as it gives a first impression of how transformative (or not) the AIIB's infrastructure investments are in the urban sector.

Above all, however, our application example is intended to show what added value the introduction of such a system would have compared to the unsatisfactory status quo, which is essentially characterised by non-binding commitments related to singular aspects (e.g. commitments to the growth of renewable energies, long-term achievement of greenhouse gas neutrality, etc.). However, it remains difficult or impossible to verify whether pledges are actually being met, due to the lack of a monitoring system to measure progress. Also, a holistic evaluation that brings together a multitude of individual aspects, the totality of which only allows a judgement to be made on how transformative investments are, has not yet been systematically carried out.

Our traffic light system can contribute to closing these gaps. This is especially true if the evaluation scheme is further elaborated as discussed, continuously updated and the traffic light applied at regular intervals – just like a regular technical inspection that vehicles must undergo in order not to lose their registration.

CHECKLIST FOR SUSTAINABLE URBAN INFRASTRUCTURE INVESTMENT

Applicable at the levels of projects, project portfolios, sector strategies, strategic planning and budgeting, risk management, and monitoring.

Assessment category		Very Negative	Negative	Positive	Unknown
	Urban Net-Zero Principle				
	New settlements planned as net-zero				
	Carbon-free building materials				
	Low-cost low-carbon retrofitting				
	Green electricity				
	Post-fossil mobility				
	Restoration of carbon sinks				
	Urban Climate Resilience Principle				
	Do no harm to people's resilience				
	Built infrastructure climate resilient				
	Systemic resilience enhanced				
	Behavioural adaptation enhanced				
	Nature-based solutions prioritised				
	Technical adaptation advanced				
	Urban Efficient Land Use Principle				
	High-density city with mixed uses				
	Green-city approach followed				
	Urban gardening advanced				
	Nature-Positive City Principle				
	Biodiversity protection				
	Environmental pollution limited				
	Green building codes & quality seals				
	Circular Economy & Zero-Waste Principle				
	Recycling and zero-waste approach				
	Durable infrastructure				
	Support circular economy transition				
	Socially Inclusive & Resilient City Principle				
	People-centred infrastructure				
	Supportive to human rights				
	Specialised financing channel for vulnerable groups available				
	Urban Pro-Poor Principle				
	Value for the poor				
	Transformative to achieve SDGs				
	Enabling policy frameworks supported				
	Accessibility				
	Affordability				
	Participation				
	Transparency				
COMBINED TRAFFIC LIGHT COLOUR					

3.4. HOW TRANSFORMATIVE ARE AIIB'S URBAN INFRASTRUCTURE INVESTMENTS?

3.4.1. APPLYING THE SUSTAINABILITY TRAFFIC LIGHT TO AIIB'S SUSTAINABLE CITIES STRATEGY

AIIB's urban strategy 'Financing Solutions for Sustainable Cities in Asia' with its regional focus on Asia was adopted in 2018 (AIIB, 2018b), building on an AIIB study on sustainable cities that had been conducted by AIIB previously.¹⁷⁸ Infrastructure investments that support the rapid growth of cities, their inter-connectivity, their role as economic power houses and

trade hubs, and their liveability in the context of climate change is at the core of this sector strategy.

Remarkably, the strategy defines five objectives which fit quite well with our principles, including a declared focus on vulnerable populations (see table).

AIIB OBJECTIVES FOR URBAN INFRASTRUCTURE INVESTMENT AND HOW THEY CORRESPOND TO OUR PRINCIPLES¹⁷⁹

AIIB Objectives	Description	Corresponding principles of our approach
Green	Protect and enhance environmental sustainability (e.g., pollution reduction, climate mitigation, conservation and sustainable management of natural resources and biodiversity)	<ul style="list-style-type: none"> – Urban net-zero principle – Nature-positive principle
Resilient	Develop the ability to withstand both sudden shocks (e.g., natural disasters) and slow-onset impacts (e.g., through climate adaptation)	<ul style="list-style-type: none"> – Urban climate resilience principle – Socially inclusive & resilient city principle
Efficient	Deliver the best possible outputs with the least possible inputs (e.g., reduce congestion) and minimise waste generated during the process (e.g., heat, wastewater)	<ul style="list-style-type: none"> – Urban efficient land-use principle – Circular economy and zero-waste principle
Accessible	Provide households (especially low-income and vulnerable groups) and firms with easier access to infrastructure and social services	<ul style="list-style-type: none"> – Socially inclusive & resilient city principle – Urban pro-poor principle
Thriving	Contribute to sustained economic growth and job creation	

¹⁷⁸ See https://www.aiib.org/en/policies-strategies/operational-policies/sustainable-cities/.content/_download/sustainable-cities-study.pdf

¹⁷⁹ Objectives and their description taken from AIIB Sustainable Cities Strategy, p.2

The strategy emphasises client-drivenness (focus on subnational governments) and outcome-drivenness (as, for instance, supporting infrastructure projects that adopt a more holistic/integrated approach, such as by being part of a city masterplan and/or by considering strategic/efficient land use; environmental and social soundness and sustainability, in coherence with AIIB's Environmental and Social Framework; making best use of low-carbon technologies, renewable energy, cleaner construction, and energy efficiency; sustainable natural resources, biodiversity and land-use management; social inclusion).¹⁸⁰

With regard to implementation approaches and priorities, AIIB commits to work with cities of all sizes, from small to megacities. Sectoral investment priorities are:¹⁸¹

- Urban mobility (promoting low-carbon solutions where possible) as metro systems, bus rapid transit, infrastructure supporting electric vehicles, pedestrian and non-motorised transport facilities, multi-modal hubs, etc.
- Improving basic infrastructure and city resilience by providing better access, higher service quality, lower emissions and pollution, enhanced climate resilience, and the promotion of nature-based solutions where possible. Examples include: waste management, water supply, sewerage, wastewater treatment, urban drainage, flood protection, energy efficiency, green buildings.
- Promoting integrated development, including public and affordable housing with high social value, hospitals and schools, improving the living conditions of the poor, job creation, business and industrial development (promoting efficient land use). Examples include: industrial parks, commercial business districts, special economic zones, informal settlements upgrading, urban redevelopment/retrofitting, new district development.

In terms of strategic partnerships, AIIB stresses the intention to cooperate closely with urban initiatives like ICLEI, 100 Resilient Cities, Global Green Growth Institute and UN-Habitat.

In terms of indicator-based result monitoring, the strategy includes a first outline of a monitoring framework (see below).

The urban strategy draws attention to natural and climate disaster risks and sea level rise, and calls for developing the ability to withstand both sudden and slow-onset impacts through adaptation. A strong pro-poor component is included in the strategy as well. The provision of better access to infrastructure and social services for vulnerable people and low-income households also has high relevance. Altogether, the Sustainable Cities Strategy

shows significant coherence with our Sustainable Infrastructure Investment Principles at the level of general framing and objectives. While the strategy generally offers entry points for applying our traffic light system, it ultimately does not offer enough detail (e.g. reference to building standards and codes to be met; exclusion list for investments) and hard facts (e.g. concrete renewable energy targets, units of renovated or newly built low-cost houses) to apply our evaluation criteria. It may be argued that it is not the task of a sector strategy to go into details or that these will only develop over time. However, one might then expect the study on which the strategy is based to contain such details. However, this is also only the case to a very limited extent, as the study focuses very strongly on analysis of urbanisation trends and challenges, but not as much on possible solutions.

For the time being, the sector strategy thus remains too general and sometimes vague. For truly transformative investment decisions and for the identification of truly innovative projects in line with AIIB's own goals and principles, much clearer strategic guidelines are needed. The AIIB should make it a priority to develop these as soon as possible. The criteria offered by our approach can be very helpful.

For our assessment, we have decided to take a preliminary leap of faith by basing the assessment on the targets set out in the sector strategy with the assumption that these will be implemented ambitiously. In a subsequent assessment, however, this would have to be verified based on hard facts and data. The fact that the **traffic lights remain switched to flashing yellow** is due to the fact that, all in all, there is still too little information available and it therefore remains uncertain what transformative quality the projects selected on the basis of the sector strategy will have.

180 Ibid, p. 3-4

181 Ibid, p. 4-5

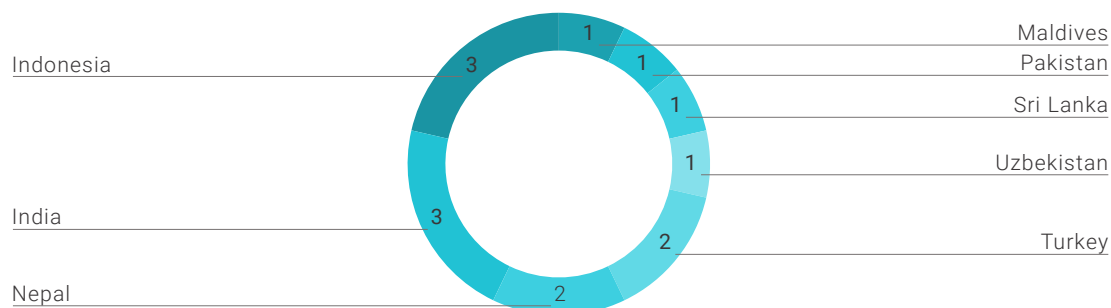
PRELIMINARY SUSTAINABILITY TRAFFIC LIGHT FOR AIIB'S URBAN SECTOR STRATEGY

Light green stands for very preliminary assessments based on the targets set out in the sector strategy and the optimistic assumption that these will be implemented in a very ambitious manner. In order to maintain this rating, robust data supporting the assumption must be provided very soon.

Assessment category		Very Negative	Negative	Positive	Unknown
	Urban Net-Zero Principle				✓
	New settlements planned as net-zero				✓
	Carbon-free building materials				✓
	Low-cost low-carbon retrofitting			✓	
	Green electricity			✓	
	Post-fossil mobility			✓	
	Restoration of carbon sinks				✓
	Urban Climate Resilience Principle			✓	
	Do no harm to people's resilience			✓	
	Built infrastructure climate resilient				✓
	Systemic resilience enhanced			✓	
	Behavioural adaptation enhanced				✓
	Nature-based solutions prioritised			✓	
	Technical adaptation advanced			✓	
	Urban Efficient Land Use Principle				✓
	High-density city with mixed uses				✓
	Green-city approach followed			✓	
	Urban gardening advanced				✓
	Nature-Positive City Principle				✓
	Biodiversity protection				✓
	Environmental pollution limited			✓	
	Green building codes & quality seals				✓
	Circular Economy & Zero-Waste Principle				✓
	Recycling and zero-waste approach			✓	
	Durable infrastructure				✓
	Support circular economy transition				✓
	Socially Inclusive & Resilient City Principle				✓
	People-centred infrastructure			✓	
	Supportive to human rights				✓
	Specialised financing channel for vulnerable groups available		✓		
	Urban Pro-Poor Principle				✓
	Value for the poor			✓	
	Transformative to achieve SDGs			✓	
	Enabling policy frameworks supported			✓	
	Accessibility			✓	
	Affordability				✓
	Participation				✓
	Transparency				✓
	COMBINED TRAFFIC LIGHT COLOUR				

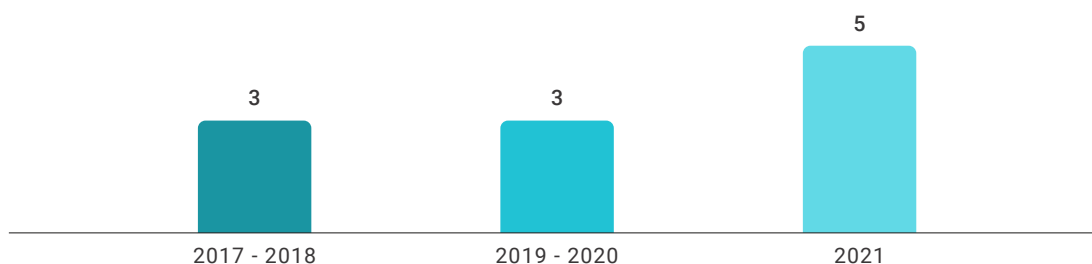
3.4.2. APPLYING THE SUSTAINABILITY TRAFFIC LIGHT TO AIIB'S PROJECT PORTFOLIO AND SINGLE PROJECTS

By the end of November 2021, the AIIB had approved 11 urban infrastructure projects (7% of the total project portfolio) and had three more in the project pipeline. The loan volume of the approved projects amounted to USD 1,664.9 million, and that of the proposed projects to a further USD 450 million. The regional breakdown including both, approved and proposed projects, is as follows:



In addition, one solid waste management project in Bangladesh is currently under preparation, with financial support from AIIB's Special Fund.¹⁸²

The share of approved urban projects is still comparatively small (rank 8 out of 11), but dynamically developing.



An overview of approved and proposed urban infrastructure projects is shown in the figure. We applied the sustainability traffic light system to projects in the portfolio, based on information publicly available on the AIIB website or on websites of public co-investors. The resulting traffic light colour is shown.

¹⁸² <https://www.aiib.org/en/projects/details/2020/special-fund/Bangladesh-Integrated-Solid-Waste-Management-Improvement-Project.html>

Year of approval	Country	Project title and thematic focus	Financing amount
2021	India	Chennai City Partnership: Sustainable Urban Services Programme strengthening water resource management, water supply and sewerage, waste management, public health and urban mobility, and enhancing climate resilience and environmental sustainability (Category B, Environmental and Social Systems Assessment has been conducted by World Bank)	\$ 150m
2021	Turkey	Istanbul Waste to Energy Generation Project: Building Europe's largest waste-to-energy plant to reduce landfills and to produce energy (Category A, IFC's Environmental and Social Safeguards applied)	\$ 100m
2021	Uzbekistan	Medium-Size Cities Integrated Urban Development Project: Improving functionality and livability in Tier 2 cities, inter alia by improving water and sanitation, public spaces and urban mobility, including for pedestrians, combined with institutional strengthening and capacity building (Category B, Environmental and Social Safeguard Policies of the World Bank applied)	\$ 100m
2021	India	Punjab Municipal Services Improvement Project: Improving water supply, COVID-19 crisis response and urban service delivery quality (including its gender sensitivity and workplace diversity) in Amritsar and Ludhiana (Category A, World Bank's Environmental and Social Safeguard Policies will be applied)	\$ 105m
2021	India	Kerala Solid Waste Management Project: Improving solid waste management in 93 urban local bodies across 14 districts in Kerala, i.e. development of regional solid waste management facilities, improvement of solid waste management infrastructure in participating cities, and capacity enhancement (Category A, World Bank's Environmental and Social Safeguard Policies have been applied) ¹⁸³	\$ 105m
2020	Maldives	Greater Malé Waste-to-Energy Project: Establishing a disaster- and climate-resilient regional waste management facility including a modern waste-to-energy plant, combined with capacity building, environmental monitoring and public awareness raising (Category A, ADBs Safeguard Policy Statement to be applied)	\$ 40m
2019	Sri Lanka	Support to Colombo Urban Regeneration Project: Improving housing conditions of low-income communities and improving land-use efficiency through affordable housing (5,500 units) and land-use re-development (Category A, AIIB's ESP applied)	\$ 200m
2019	Turkey	Istanbul Seismic Risk Mitigation and Emergency Preparedness Project: Improving resilience to potential earthquakes by enhancing institutional disaster risk management capacity and preparedness and by strengthening 100 public buildings (Category B, AIIB's ESF applied)	\$ 300m
2018	Indonesia	Mandalika Urban and Tourism Infrastructure: Providing new core infrastructure to a new tourist destination and improving infrastructure of neighbouring communities in Mandalika, Lombok (Category A, AIIB's ESP applied)	\$ 248.4m
2017	Indonesia	Regional Infrastructure Development Fund: Supporting the Regional Infrastructure Development Fund as a financial intermediary which lends to local governments to finance urban transport, water supply and sanitation, drainage, flood and hazard risk reduction, waste management, affordable housing and slum upgrading (Category FI, Environmental and Social Safeguard Policies of the World Bank will be applied)	\$ 100m
2016	Indonesia	National Slum Upgrading Project: Improving access to core infrastructure services in slums, institutional and policy development, capacity building for local governments and communities, and disaster response (Category B, Environmental and Social Safeguard Policies of the World Bank will be applied)	\$ 216.5m
-	Pakistan	Khyber Pakhtunkhwa Cities Improvement Project: Build/rehabilitate water supply, sewerage, waste management and green urban space in a climate resilient, gender responsive and participatory way in the cities of Peshawar, Abbottabad, Kohat, Mardan and Mingora (Category C, ADB's Safeguard Policy Statement has been applied)	\$ 200m
-	Nepal	Nepal Governance and Infrastructure Project for Urban Local Governments: Improvements in urban roads, stormwater drainage, drinking water, wastewater, waste management; institutional capacity building (Category B, Environmental and Social Safeguard Policies of the World Bank will be applied)	\$ 150m
-	Nepal	Urban Infrastructure Investment Project: Improving urban transport, waste management, waste water and drainage in municipalities in the Terai region (Category B, AIIB ESF will be applied)	\$ 100m
Total portfolio value:			\$ 2,114.9m

183 <https://documents1.worldbank.org/curated/en/788471589794618595/pdf/Environmental-and-Social-Management-Framework-Introduction-and-Environmental-Assessment.pdf>

According to our sustainability assessment, which is of very preliminary nature (due to the reasons given in the previous section), six (43%) out of 14 projects are likely to be transformative when viewed optimistically, whereas eight projects (57%) cannot be assessed in terms of their transformative impact because the publicly available information is simply far too general.

This again reveals a weakness of the AIIB, which we have already repeatedly pointed out in our two previous studies. The AIIB is much less transparent than many other development banks, which makes it very difficult to evaluate its projects. This becomes clear, for example, with regard to the accessibility of environmental and social assessment reports for their investment projects, which the AIIB is obliged to carry out according to its own mandate and the specifications of its owners. These reports, which are easily available for download from the websites of other development banks, are not accessible at the AIIB, or only with difficulty. As a result, environmental and social impact documents for AIIB-financed projects are usually available only when other multilateral development banks are represented in the donor consortium alongside the AIIB and disclose these reports on their websites. If, on the other hand, the AIIB is the sole financier and conducts these reviews according to its own standards, no such documents can be found on the AIIB website for any of the urban investment projects we briefly reviewed. We strongly recommend that the AIIB becomes more transparent in this regard. This could also lead to more projects being positively assessed by our traffic light. For the time being, it remains the case that our traffic light flashes yellow for many projects – because the projects cannot be assessed independently with regard to their contribution to the urban transformation towards sustainability, resilience and net-zero emissions, which the AIIB advocates for in its urban sector strategy.

Apart from these weaknesses in terms of transparency, and room for improvement in terms of net zero, the portfolio is appealing in that it places a high value on social sustainability, a focus on improving access to basic infrastructure (especially water, sanitation, affordable housing, solid waste management), climate resilience, revitalising existing cities and improving their liveability, and developing a better modal split. There are no real business-as-usual projects in this portfolio. This is encouraging and leads to many projects where our traffic light is put on 'green' for the time being.

Another positive aspect is that Tier 2 cities are very prominently represented in the portfolio, not only the booming metropolises.

Looking at our sustainability principles, it can be said that social inclusion, poverty eradication, resilience, zero-waste and to a certain degree efficient land use are better reflected in the portfolio than carbon neutrality, biodiversity and circular economy. We see these areas as those where there is the greatest need to catch up in the portfolio in order to clearly confirm the urban transformation.

In order to achieve a balanced portfolio with ambitious, innovative and pro-poor infrastructure projects, we recommend that the AIIB sets quantitative and qualitative targets for portfolio development in its urban sector strategy so that by 2025 all sustainability aspects of our traffic light are truly reflected in the portfolio. A disproportionate share of investments should benefit vulnerable and poverty groups.

For the investment decision on each individual project, we suggest applying our checklist and only approving projects for which the traffic light is 'green'.

3.4.3. APPLYING THE SUSTAINABILITY TRAFFIC LIGHT TO THE AIIB CORPORATE STRATEGY AND BUSINESS PLAN FOR 2021

The AIIB 'Corporate Strategy Financing Infrastructure for Tomorrow' (AIIB, 2020) was adopted in September 2021 when the Bank's five-year start phase had come to an end. It builds on the Bank's vision of a *"prosperous Asia based on sustainable economic development and regional cooperation"* and the mission statement of *"financing sustainable infrastructure of tomorrow"* (Ibid). The strategy covers the period through to 2030 and defines the thematic priorities to establish its market position. It includes targets for climate finance, cross-border connectivity and private sector financing, demonstrates impact orientation, and includes a corporate monitoring scorecard for future monitoring and reporting. A strategic review is planned for 2025. The corporate strategy is complemented by an annual Business Plans and Budget (AIIB, 2020b).

Considerable underinvestment in infrastructure in Asia, despite continuous economic and population growth is identified as a core problem, and is expected to continue due to the pandemic. Among others, climate change is being considered as one of the main risks to infrastructure investments:

"Climate change and other disasters are increasingly impacting Asia. Failure to adapt technologies, policies and regulations to anticipate and address these risks could create stranded assets or possible delays or damage to infrastructure projects" (Ibid, p. 3).

'Urbanisation' and 'sustainability', apart from demographics, technological innovation and regionalisation are highlighted as the dominant trends – and increasing public debt as a potentially dangerous obstacle in meeting the challenges ahead.

AIIB's commitment to sustainability covers the three dimensions of:

- financial and economic sustainability
- social sustainability and inclusion, i.e. *"addressing direct and indirect impacts, especially on displaced persons, vulnerable groups and community health and safety. Social sustainability promotes inclusive access to project benefits for all citizens—irrespective of age, gender, location, ethnicity and other socio-economic characteristics —and particularly to groups which are often marginalized, vulnerable or excluded from access to services"* (Ibid, p. 11)
- environmental sustainability, i.e. *"addressing direct and indirect impacts on the physical and biological environment such as water and air quality, biodiversity, local pollution, climate change and land and water use. Environmental and social sustainability is assured through the Bank's ESF which reflects good international practices"* (Ibid).

The last sentence highlights a core problem that the AIIB shares with many other players in the financial sector: Social and environmental sustainability is reduced to an aspect that is supposed to be solved at project level through appropriate minimum social and environmental standards, through repairs and, if necessary, compensation. In other words, social and environmental sustainability is treated as a downstream problem, but not as a core business of a bank, like economic and financial sustainability. It is therefore easy to lose sight of the fact that social sustainability ('well-being') is the actual goal of infrastructure development, that ecological sustainability ('environmental integrity') is a mandatory prerequisite for it, whereas profitability is not an end in itself but merely a means to an end.

Despite these mismatches, AIIB defines green infrastructure (next to connectivity/regional cooperation, technology-enabled infrastructure and private capital mobilisation) as a thematic priority:

"Climate change is one of the most pressing global challenges of this century. To achieve the desired steep reduction in global emissions and to adapt to climate change, infrastructure needs to be green. As a major contributor to global greenhouse gas (GHG) emissions, Asia's sustainable development pathway will be crucial for achieving the Paris Agreement objectives. Environmental improvement is also key for Asia's own future as it is expected to be hit hard by climate change and environmental degradation if existing trends continue. This calls for substantial investments in green infrastructure. Increasing attention and commitment of its members to adapt to and mitigate the impact of climate change and address local environmental problems have reinforced the need for AIIB to focus on this area. AIIB will prioritize green infrastructure and support its members [to] meet their environmental and related development goals by financing projects that deliver local environmental improvements and investments dedicated to climate action" (Ibid, p. 12).

To ensure respective impact orientation at portfolio level, AIIB pledges:

"...that every project (AIIB) finances is ordinarily aligned with at least one of its four thematic priorities and does not dilute itself in other areas that may fit better with the mandates of other institutions. AIIB reports on its climate financing and cross-border connectivity financing through dedicated target indicators in its Corporate Scorecard and will regularly report in detail the alignment of its operations with the Bank's four thematic priorities" (Ibid, p. 14).

This is a good first step but not yet enough to meet the enormous challenges in the context of climate change. In order to pass our sustainability traffic light, **it must be ensured that 'do no harm' is consistently implemented and that no project – even one that serves other thematic priorities such as regional cooperation – violates our sustainability principles.**

In relation to the SDGs, the AIIB assigns a sustainable development goal to each sector strategy (ibid, p. 156). In the case of the urban sector strategy, this is SDG 11 (Sustainable cities and communities). In terms of impact orientation, the corporate strategy suggests mapping its impact against SDGs, including the Bank's contribution to climate finance against SDG 13 (Climate action), the contribution to gender equality in Asia against SDG 5 (Gender equality), and likewise its contributions to achieving decent work and economic growth (SDG 8) and partnerships for the goals (SDG 17). Building up social infrastructure in the health (SDG 3) and educational sectors (SDG 4) have gained significant attention due to the COVID-19 pandemic: AIIB ramped up its respective investments significantly (8% of the project portfolio). If investments into resilient economic recovery programmes from the pandemic are added (11%), the Bank's now has almost 20% of its budget invested in fighting the pandemic and its socio-economic consequences. This is a remarkably high proportion, which demonstrates the Bank's rapid response capacity. With regard to sustainable supply chains, another current burning issue, AIIB has shown a similarly rapid response capacity.

As with regard to green infrastructure financing, the corporate strategy includes concrete targets, some of which correspond to recommendations we made in our two previous reports on the AIIB and climate mitigation and adaptation (Ibid, p. 18 f.). These targets include:

- supporting member countries' climate change efforts and NDC implementation in alignment with the goals of the Paris Agreement (adaptation and mitigation)
- supporting the transition to renewables in the energy and transport sectors
- improving energy efficiency
- investing in projects that bring about local environmental improvements, including biodiversity protection, enhancing ecosystem services, clean air, waste, water and sanitation management
- increasing the share of climate finance in the invest portfolio from 35% (2016-2018) to at least 50% in 2025
- supporting the greening of financial and capital market operations, including in cooperation with other public and private sector institutions
- exploring opportunities to access climate grants
- building up own capacity to better support its members in developing low-carbon and climate-resilient infrastructure investments

- mainstreaming green infrastructure and climate change priorities into decision making across its operations and apply the necessary tools and instruments (e.g., shadow carbon pricing and GHG emission accounting) in the economic analysis of its projects, continue tracking GHG emissions reductions via its Energy Sector Strategy and, over time, build capacity to measure GHG emissions of transport infrastructure.

Compared to the previous corporate strategy, which did not include a robust, i.e. specific, indication that the AIIB would prioritise climate and biodiversity protection as well as a sustainable development strategy targeting poverty groups, significant progress is evident. Not only is the reference to the Paris Agreement and the SDGs much clearer, but the defined targets, which are relatively concrete for a corporate strategy whose implementation will be verifiable in the future, are also welcome progress. The planned monitoring, which is to take place at the level of corporate strategy by means of a corporate scorecard, will play an important role in checking the achievement of objectives and the intended impact (ibid, p. 26 f.), which is to measure performance and, in the dialogue between management and board, help to identify the need for action at an early stage. It builds on the Key Business Indicators used so far and should also serve for annual reporting to the public. However, it is still not enough that no further measurable target achievement indicators have been defined for the scorecard besides the climate finance target (50% by 2025). More would be possible and necessary, including specific information on how to measure, report and verify the fulfilment of the alignment commitment with the Paris Agreement.

This shows that **although AIIB is moving in the right direction, it is not yet a sustainability and climate bank** that is fully committed to the goal of transformation, which is indeed recognised as necessary in the analytical part of the corporate strategy. More can and must be done here – if possible even before the review of the corporate strategy announced for 2025. The fast-closing window of opportunity that remains to limit global warming to well below 2°C does not allow for this postponement – especially not for infrastructure investments with their potentially massive log-in effects.

We **therefore recommend that AIIB sharpens its target achievement indicators and increases the targets for truly exemplary and innovative infrastructure investments, where our sustainability traffic light turns 'green', in its 2022 to 2025 Business Plans each year.** This would be in line with the spirit of the **Glasgow Climate Pact** and it would be an important contribution to help AIIB members implement paragraph 29 of the COP26 cover decision (-/CMA.3), which states:


"Recalls Article 3 and Article 4, paragraphs 3, 4, 5 and 11, of the Paris Agreement and requests Parties to revisit and strengthen the 2030 targets in their nationally determined contributions as necessary to align with the Paris Agreement temperature goal by the end of 2022 (...)."¹⁸⁴

Much to our regret, the climate – post-pandemic economic recovery nexus in AIIB's Business Plan and Budget 2021 was missing. We strongly recommend including it in the business plan for 2022.

In the Business Plan and Budget 2021 (AIIB, 2020b), the main thematic focus is placed on the COVID-19 Crisis Recovery Facility.¹⁸⁵ In addition to a focus on the expansion of health infrastructure, this includes measures for resilient economic recovery as a second priority. As understandable and important as this priority is, it is at the same time regrettable that there is no link whatsoever between the second priority and green financing: the pandemic and climate crisis have much in common. Thus, with concerted targeting of economic recovery packages on net-zero, climate resilience building and nature-positive, investments in the future, prosperity, jobs and resilience, the transformation could get the boost so much needed.¹⁸⁶

What does this mean for our sustainability traffic light? On the level of a naturally abstract corporate strategy, the application of the sustainability principles, based on 1 to a maximum of 3 criteria per principle seems adequate to us. This means that other rather small-scale criteria fall out here or are taken into account in the strategy anyway, but not in relation to transformation as a topic. At the same time, it should be emphasised that the Corporate Strategy addresses sustainability and alignment with the Paris Agreement in general, but without sectoral breakdown (cities, transport, energy, etc.). The results of the modified application of the sustainability traffic light are summarised in the table.

PRELIMINARY SUSTAINABILITY TRAFFIC LIGHT FOR AIIB'S CORPORATE STRATEGY 2021-2030 & BUSINESS PLAN 2021

Assessment category		Very Negative	Negative	Positive	Unknown
	Urban Net-Zero Principle				✓
	New settlements planned as net-zero				✓
	Green electricity			✓	
	Post-fossil mobility			✓	
	Urban Climate Resilience Principle			✓	
	Built infrastructure climate resilient			✓	
	Systemic resilience enhanced			✓	
	Urban Efficient Land Use Principle				✓
	High-density city with mixed uses				✓
	Green-city approach followed			✓	
	Nature-Positive City Principle				✓
	Biodiversity protection				✓
	Environmental pollution limited			✓	
	Circular Economy & Zero-Waste Principle				✓
	Recycling and zero-waste approach			✓	
	Support circular economy transition				✓
	Socially Inclusive & Resilient City Principle				✓
	People-centred infrastructure			✓	
	Supportive to human rights				✓
	Urban Pro-Poor Principle			✓	
	Transformative to achieve SDGs			✓	
	Enabling policy frameworks supported			✓	
COMBINED TRAFFIC LIGHT COLOUR					

Selection criteria for using different colours applied as described in previous sections.

¹⁸⁴ https://unfccc.int/sites/default/files/resource/cma3_auv_2_cover%20decision.pdf

¹⁸⁵ <https://www.aiib.org/en/policies-strategies/COVID-19-Crisis-Recovery-Facility/index.html>

¹⁸⁶ https://www.climate-development-advice.de/userfiles/files/Publikationen/en_Build-Forward-Better-english-version_t3.pdf

APPLYING THE SUSTAINABILITY TRAFFIC LIGHT TO AIIB'S FINANCIAL RISK MANAGEMENT

The risk management framework (AIIB, 2019), together with its policies and directives, provides the instruments for financial risk management. The framework's principles are designed to provide the foundation for effective key risk management, including current and emerging risks to counterparty credit risk, operational and compliance risks. Given the relevance of climate-induced risks to infrastructure investment, it could be expected that these risks and how they might unfold in terms of credit risks would be captured in the risk management framework. However, we have already critically noted that this is not the case in our last study (Hirsch et al., 2020). In view of the now significantly increased climate risk sensitivity, as expressed in the new corporate strategy, it is surprising that the risk management framework has not also been adapted.

As we wrote before (ibid.), "Without factoring in analytical climate risk data, investments are exposed to higher risks. Therefore, from an outside perspective, it is difficult to understand, for instance, why project investees' and sovereign counterparties' susceptibility to climate risks are not reflected explicitly in AIIB's key risk indicators (KRI). Tellingly, credit rating agencies like Moody's or S&P have developed indicator-based tools that highlight the potential credit impact and relative susceptibility of rated sovereigns to climate risks over a number of years. Reinsurance companies translate the implications of well-developed climate risk models into financial metrics, and build their financial business on them. The AIIB, however, seems to lag behind (...)."

In addition to climate risks, premature depreciation of (operationally) CO₂-intensive infrastructure can also pose significant credit risks. This is particularly the case if carbon pricing picks up significantly. This is to be expected in the coming years, not least due to the net-zero targets of more and more major economies. The Glasgow Climate Pact cited above also sends a strong signal that the age of fossil fuels is coming to an end. For long-lived infrastructure, such as that financed by the AIIB, it is irrelevant whether the fossil age ends a few years earlier or later: the risk of stranded assets is significant and should therefore be taken into account in the bank's risk management.

We recommend that AIIB closes these blind spots in its risk management as soon as possible. The key risk indicators should be amended respectively, using metrics to quantifying physical climate risks, as well as the stranded asset risk of carbon-intense infrastructure. As a positive side-effect, this could lead to a more elaborated understanding of the economics of climate mitigation and adaptation, which would be very interesting for the Bank's clients. A similar approach should be taken at the level of project risk assessments.

As we have already explained with reference to the latter in the previous study (ibid.): "That way, the AIIB would become able to assess and quantify possible financial risks and losses caused by climate extreme and slow onset events to infrastructure investments. All monetizable climate risks and opportunities should be included in the economic assessment of the project. Results of the economic assessment should be disclosed in project summary documents. In addition, a qualitative assessment of non-monetizable climate risks and mitigation options as well as resilience opportunities, including for poor and vulnerable population groups, should be conducted and disclosed. That would help ensure the climate resilience of the infrastructure built (...). Since not all climate risks can be eliminated in a cost-efficient way, it is vital to financially cover residual risks by using risk financing tools such as risk insurance in order to be well for the eventuality of infrastructure being damaged by extreme weather events."

If biodiversity protection and ecosystem services are also increasingly translated into price signals on financial markets, which is to be expected, as approaches to nature-related financial disclosures (e.g. Taskforce on Nature-related Financial Disclosures – TNFD)¹⁸⁷ suggest, this would also become an issue for financial risk management. Similar arguments can be made for other environmental risks, (excessive) resource consumption and the financial risks of humanitarian disasters and social crises, exacerbated by high levels of vulnerability and insufficient crisis response capacity. The COVID-19 pandemic is a case in point.

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Thus, we recommend that AIIB includes all our seven sustainability principles into its financial risk management by translating them into key risk indicators.









Can the sustainability traffic light also be applied to the AIIB's financial risk management? We think so, and would again apply the criteria to be taken into account flexibly, and reduce them further compared to their application to the corporate strategy.

The result of our assessment is shown in the table. The traffic light is set to flashing, expressing the current position where the bank's financial risk management is blind to financial risks

resulting from a lack of sustainability. This does not necessarily mean that there are high financial risks in the listed areas. Whether or not these exist will only become clear once the blindness of risk management to sustainability-related risks has been overcome.

We recommend defining a key risk indicator for each sustainability principle. Each indicator, in turn, could be formed from a combination of several parameters. The criteria marked in *italics*, for which the traffic light is currently set to 'yellow', could be taken into account here.

PRELIMINARY SUSTAINABILITY TRAFFIC LIGHT FOR AIIB'S FINANCIAL RISK MANAGEMENT

Assessment category	Very Negative	Negative	Positive	Unknown
 Urban Net-Zero Principle				✓
<i>New settlements planned as net-zero</i>				✓
<i>Post-fossil mobility</i>				✓
 Urban Climate Resilience Principle				✓
<i>Built infrastructure climate resilient</i>				✓
 Urban Efficient Land Use Principle				✓
<i>High-density city with mixed uses</i>				✓
 Nature-Positive City Principle				✓
<i>Biodiversity protection</i>				✓
<i>Environmental pollution limited</i>				✓
 Circular Economy & Zero-Waste Principle				✓
<i>Recycling and zero-waste approach</i>				✓
<i>Support circular economy transition</i>				✓
 Socially Inclusive & Resilient City Principle				✓
<i>People-centred infrastructure</i>				✓
<i>Supportive to human rights</i>				✓
 Urban Pro-Poor Principle				✓
<i>Transformative to achieve SDGs</i>				✓
COMBINED TRAFFIC LIGHT COLOUR				

Selection criteria for using different colours applied as described in previous sections.

4. FINAL CONCLUSIONS AND POLICY RECOMMENDATIONS



THE URBAN CHALLENGE

Urbanisation is a global megatrend shaping the future of our world. More than half of the global population lives in cities. By 2050, the share of urban population will reach 75%, or 7 billion people. Already, urbanisation is accompanied by huge and manifold challenges. Far more than 1 billion people in cities of the world live in informal settlements, struggling for their human right to adequate housing.¹⁸⁸ The lack of access to basic infrastructure leads to high vulnerability, which has become abundantly clear during the COVID-19 pandemic. With continuous urban growth, infrastructure demands in terms of housing, mobility, energy, water and sanitation, health, food, education, connectivity, etc. will continue to rocket. At the same time, the growing debt of many countries, where there is already a high backlog demand for infrastructure investments, leads to investment blockades that threaten to widen the infrastructure gap further unless additional measures are taken.

Urbanisation is also extremely challenging for other reasons. It puts high pressure on natural resources, ecosystems and the climate. Cities account for 60% of greenhouse gas emissions and 78% of global energy consumption, as we have shown. In addition, 60% of the area projected to be urban by 2050 is yet to be developed. Depending on how the enormous amount of additional infrastructure will be built in the next 30 years, it can either pulverise the 1.5°C temperature goal or help to meet it. Cities are extremely fragile in the face of climate impacts such as heat waves, flooding, drought, storms and sea level rise. Even if global warming is limited to below 2°C, by 2050 at least 570 cities with 800 million inhabitants will be exposed to rising seas and storm surges.¹⁸⁹

¹⁸⁸ https://www.misereor.org/fileadmin/user_upload_misereororg/publication/en/climatechange_energy/report_local-struggles-for-housing-rights.pdf

¹⁸⁹ <https://www.c40.org/other/the-future-we-don-t-want-staying-afloat-the-urban-response-to-sea-level-rise>

THE VISION OF A SUSTAINABLE CITY AND TRANSFORMATIVE WAYS TO ACHIEVE IT

Despite all these challenges, solutions are possible. Given the right vision and decisive action, cities can become places where people can live a good life in dignity, resilient to the already unavoidable consequences of climate change, with intact urban ecosystems that are space-saving and emission-free. However, this requires an immediate change of direction, because this decade is the only one left to start achieving profound transformations in urbanisation just in time.

In this report we have described **six important transformative pathways** that must be taken:

- becoming zero-carbon and climate resilient
- turning cities that lose biodiversity and ecosystem services into green, nature-positive cities
- making cities socially inclusive and resilient by addressing the social and economic divides that were accelerated by the COVID-19 pandemic through pro-poor, rights-based and people-centred approaches
- reducing resource consumption and waste by transforming cities into circular, zero-waste and digitally smart economies
- decarbonising transport by switching to a post-fossil mobility
- re-directing urban governance, spatial planning and investments towards the achievement of these transformative pathways.

URBAN SUSTAINABILITY PRINCIPLES AND CRITERIA AS A COMPASS

Urban transformation needs direction, just as infrastructure investments need guidance and a compass. For this reason, we have developed a set of **seven sustainable urban investment principles**. The principles aim to capture all elements that can advance urban transformation towards environmental, social and economic sustainability. To ensure that these do not remain too abstract and that they can be implemented, we have developed 31 criteria based on the analysis of the transformative pathways and their implementation examples, which are assigned to the sustainability principles:

1. Urban Net-Zero Principle: new settlements planned as net-zero; carbon-free building materials; low-cost low-carbon retrofitting; green electricity; post-fossil mobility; restoration of carbon sinks
2. Urban Climate Resilience Principle: do no harm to people's resilience; build climate-resilient infrastructure; systemic resilience enhanced; behavioural and participatory, locally led adaptation enhanced; technical adaptation advanced
3. Urban efficient land-use and spatial planning principle: urban planning that focusses on high-density neighbourhoods with a mix of uses; urban planning that focuses on a green city by using nature-based solutions; urban planning that promoted horizontal and vertical urban gardening
4. Nature-Positive Principle: biodiversity protection; environmental pollution limited; green building codes and quality seals
5. Circular Economy & Zero-Waste Principle: recycling and zero-waste approach; durable infrastructure; support circular economy transition
6. Socially Inclusive & Resilient City Principle: people-centred infrastructure; supportive to human rights; specialised financing channel available for vulnerable groups
7. Urban Pro-Poor Principle: value for the poor; transformative to achieve SDGs; enabling policy frameworks supported; accessibility; affordability; participation; transparency.

Some of these principles and criteria were developed and explained in our [previous reports](#), others have been added. We consider them as an initial set that needs to be tested and further developed.

THE SUSTAINABILITY TRAFFIC LIGHT FOR URBAN INFRASTRUCTURE INVESTMENTS APPLIED TO THE AIIB

To further operationalise the set of principles and criteria, and to apply it as a tool set, we have developed a **sustainability checklist to assess urban infrastructure investments**. To show and visualise the results of their application, we also developed a **sustainability traffic light system**. The system provides a quick overview of the likely positive (green), rather negative (yellow) or very negative (red) impact of an urban infrastructure investment on climate neutrality, climate resilience, ecology, and socially and economically sustainable development of cities. If an investment has no sustainability impact, the traffic light remains off (grey). In cases where the impact cannot be assessed, e.g. because important information or data is missing, the traffic light jumps to a flashing yellow light.

The approach enables investors as well as urban developers and mayors to assess the transformative impact of decisions. With regard to the public, the traffic light system creates transparency. It is designed in such a way that it can be applied not only to specific projects but also to other relevant decision-making levels such as sector and corporate strategies, and financial risk management.

INFRASTRUCTURE FOR TOMORROW: AIIB SHOULD BECOME THE DEVELOPING WORLD'S CLIMATE AND SUSTAINABILITY BANK

Lean, Green, Clean: this is the motto under which the AIIB is investing to help shape the city of tomorrow. We have **applied the sustainability traffic light to the AIIB** sector strategy 'Sustainable Cities', its urban portfolio with all urban infrastructure projects currently approved and under review, and also to the new Corporate Strategy 2021-2030, the Business Plan for 2021 and the bank's Financial Risk Management System to see to what extent this aspiration is being met. The results show that the AIIB is definitely taking steps towards sustainability and climate friendliness. Positive changes in the portfolio and in the corporate strategy become particularly clear when the results of this study are compared with those of our two previous studies on [Paris Alignment](#) (2019)¹⁹⁰ and [Climate Resilience and Poverty Orientation](#) (2020).¹⁹¹

However, the steps taken so far are not yet sufficient and our analysis shows that the AIIB still lacks transparency for the public. Therefore, in many cases it is not possible to independently review and assess the positive or negative impact of the AIIB's investment decisions. Thus, our sustainability traffic light remains switched to flashing yellow with regard to the vast majority of review criteria. Where statements are possible, however, a cautiously positive picture is emerging, which is very welcome:

The traffic lights are **flashing yellow** for the urban sector strategy 'Sustainable Cities', but **preliminarily green** for the sub-item 'climate resilience building'.

- The traffic lights are **preliminarily green** for six urban projects, and **flashing yellow** for a further seven.
- The traffic lights are **flashing yellow** for the Corporate Strategy 2021-2030 and the Business Plan 2021, but again **preliminarily green** for the sub-item 'climate resilience building'.
- For the Financial Risk Assessment, the traffic lights are **flashing yellow**.

¹⁹⁰ https://germanwatch.org/sites/default/files/AIIB_Report_web_0.pdf

¹⁹¹ https://germanwatch.org/sites/default/files/framework_report_-_criteria_to_align_aiib_with_pa_climate_resilience_goal_2020-09-16.pdf

We conclude with a **set of ten policy recommendations for the AIIB**:

1. The AIIB should **organize a consultation process** to review the approach and suggestions of this paper; take stock of the Bank's own approaches; identify gaps; agree on principles and criteria to examine more closely in view of gaps, challenges and opportunities; and test principles and criteria in practice.
2. The **sector strategy** remains too general. For transformative investment decisions and for the identification of innovative projects in line with the AIIB's own goals and principles, much clearer strategic guidelines are needed. The AIIB should make it a priority to develop these urgently. The criteria offered by the approach offered in this study might prove helpful.
3. The order to achieve a **balanced project portfolio** with ambitious, innovative and pro-poor infrastructure projects, we recommend that the AIIB sets quantitative and qualitative targets for portfolio development in its urban sector strategy so that by 2025 all sustainability aspects are truly reflected in the portfolio. A disproportionate share of investments should benefit vulnerable and poverty groups.
4. For the investment decision on each **individual project**, we suggest applying our checklist and only approving projects for which the traffic light is 'green', or 'grey' for principles that are not applicable.
5. The **corporate strategy** should make it explicit that the principle of 'Do No Harm' is consistently implemented and that no project, even one that serves other thematic priorities such as regional cooperation, violates any of the sustainability principles.
6. In the **corporate strategy**, AIIB should sharpen its target achievement indicators and increase the number of targets for exemplary and innovative infrastructure investments in the 2022 to 2025 Business Plans each year. This would be in line with the Glasgow Climate Pact and it would be an important contribution to help AIIB members implement the Pact's request to Parties to revisit and strengthen the 2030 targets in their NDCs as necessary to align with the Paris Agreement temperature goal by the end of 2022.
7. In the **business plan and budget 2022**, a climate – post-pandemic economic recovery nexus should be included.
8. The AIIB should close the blind spots in its **financial risk management**. The key risk indicators should be amended, using metrics to quantify physical climate risks, as well as the stranded asset risk of carbon-intense infrastructure. We recommend that the AIIB includes all seven sustainability principles suggested in this study into its financial risk management by translating them into key risk indicators: one key risk indicator should be defined for each sustainability principle.
9. In terms of **stakeholder engagement and communication**, the AIIB should become more transparent, including wider disclosure of project-related documents of public interest.
10. Regarding the pledge to fulfil its **Paris alignment commitment** by mid of 2023, we recommend that the bank fully documents its implementation and makes it available for verification.

The AIIB is the first multilateral development bank led by China. It aims at supporting its clients in building infrastructure for tomorrow. The AIIB has a big stake in how sustainable this will turn out to be and whether the climate crisis can be ended. For this, it must quickly transform itself into a sustainability and climate bank. Implementing the recommendations of this study could be a necessary and decisive step in this direction.

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LAYA works with the Adivasi communities on a range of initiatives that demonstrate an alternate paradigm to sustainable development. To respond to the climate crisis, LAYA is constantly exploring and introducing climate-friendly, low emission technologies, which harness renewable resources to facilitate the wellbeing of Adivasis.

www.laya.org.in

INECC is a national network of organizations and individuals who connect on the issue of climate change from the perspective of marginalised communities and works to bring their concerns into policy dialogues regionally, nationally and internationally. Its byline is "People's Voices in Policy Choices".

www.inecc.net

CPRD

The Center for Participatory Research and Development (CPRD), one of the progressive think tanks in Bangladesh, is engaged in research and political advocacy aiming at directing global climate policies and associated investments towards achievement of the Paris Agreement goals with regard to climate justice, as well as reduced inequality and vulnerability.

www.cprdbd.org

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Greenovation Hub is an environmental Think-Do organization with a global outlook. We promote the development and implementation of sound climate and environmental friendly policies through conducting in-depth analysis and research, and fostering dialogues among stakeholders, in order to drive China's green transition towards a sustainable, equitable and climate resilient future, contributing to the reduction of global ecological footprint.

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