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THE ENERGY AND
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Enabling Cities to Implement Innovative Sustainable Urban Solutions

Knowledge Product 2:
Urban Living Lab for Sustainable
and Smart Cities

April 2022



Green
Strategic
Partnership
IndiaDenmark



Project Urban
Living Lab

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Preface

In alignment with the Government of India's mission to build smart and sustainable cities in the country, a Memorandum of Understanding (MoU) was signed (on 16 January 2019) between the Royal Danish Embassy and the Imagine Panaji Smart City Development Limited (IPSCDL) to jointly establish an Urban Living Lab (ULL) in Panaji, Goa. To facilitate this, the Danish Ministry of Foreign Affairs, Royal Danish Embassy, New Delhi initiated the Urban Living Lab on Sustainable and Smart Cities in India project in 2019–20. This MoU is based on an earlier MoU on Sustainable and Smart Urban Development signed between the governments of Denmark and India in April 2018. The Project has been initiated in Panaji with the scope to extend to all the smart cities. As a Knowledge Partner to the ULL, The Energy and Resources Institute (TERI) is providing knowledge inputs for the implementation of ULL in Indian cities. The objective is to enhance the capacities of the existing smart cities through knowledge-sharing and integration of global sustainable solutions in the local context. In this regard, TERI is developing two Knowledge Products as outcomes of this Knowledge Partnership.

This first Knowledge Product, or KP 1 was conceptualized to identify global urban projects that utilize innovative approaches to address different urban challenges. It serves as a useful reference material for city authorities, policymakers, and multidisciplinary urban practitioners in smart cities to identify and develop global sustainable solutions across different sectoral and cross-sectoral themes. The Knowledge Product 2, or KP2, is co-developed by TERI and South Pole Carbon Asset Management Limited (on pro bono basis), and provides actionable guidance to Indian cities towards the implementation of sustainable urban solutions. The document also draws lessons from the ULL in Panaji and the experiences of other Urban Local Bodies (ULBs), development authorities, and smart cities across India to identify, pilot, and scale-up innovative sustainable urban solutions.

Acknowledgements

The Knowledge Product 2 is an outcome of the experts from the Transport and Urban Governance Division of TERI and South Pole. The team is grateful to the Danish Ministry of Foreign Affairs, Royal Danish Embassy (RDE), New Delhi for providing both guidance and financial support in developing the document. The team is thankful to Dr Anitha Kumari Sharma, Sector Counsellor, RDE for her guidance in developing this document. Thanks are also due to Mr. Ravi Dhawan, CEO, Imagine Panaji Smart City Development Limited (IPSCDL) and other cities that made a noteworthy participation in executing the Capacity Needs Assessment. Of mention are the Project Urban Living Lab (PULL) partners – Oxford Policy Management and Transitions Research – for providing their support and insights for this study. Additionally, the team also would like to thank the CapaCITIES project supported by Swiss Agency for Development and Cooperation for sharing case studies and best practices for this guidance document. We also extend our sincere thanks to the TERI Press and Communications teams for their efforts in carrying out editing, design, translation, and outreach of the document.

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Acronyms and Abbreviations

AMRUT	Atal Mission for Rejuvenation and Urban Transformation
CDM	Clean Development Mechanism
CLAF	City Level Advisory Forum
CNA	Capacity Need Assessment
CPI	Climate Policy Initiative
CRCAP	Climate Resilient City Action Plan
CSCAF	Climate Smart City Assessment Framework
FCCL	Fiscal Cost and Contingent Liabilities
GDP	Gross Domestic Product
GHG	Greenhouse Gas
IPCC	Intergovernmental Panel on Climate Change
LCCR	Low Carbon and Climate Resilient
MNRE	Ministry of New and Renewable Energy
NIUA	National Institute of Urban Affairs
NPK	Nitrogen, Phosphorus and Potassium or Potash
NPSV	Net Present Social Value
PIN	Project Idea Note
PLN	Perusahaan Listrik Negara
PPP	Public Private Partnership
PULL	Project Urban Living Lab
SATAT	Sustainable Alternative Towards Alternative Transport
SDG	Sustainable Development Goals
ULB	Urban Local Body
ULL	Urban Living Lab
UNFCCC	United Nations Framework Convention on Climate Change

1. Introduction to Module

1.1 Background

India is on the cusp of urbanisation with around 34% of the country's population currently living in cities and a rate of urbanisation higher than most South Asian countries. By 2030, it is expected that 40% of India's population will be living in urban areas, contributing to more than two-thirds of the country's gross domestic product (GDP). High rates of urbanisation, industrialisation, and economic development are exerting significant pressure on civic services and infrastructure across cities in India. Moreover, the mounting threats of climate change coupled with high levels of inequality in Indian cities are also adding to the pressure. It is estimated that India has already suffered infrastructure damages worth USD 48 Billion due to climate change impacts (CEEW, 2021), and could lose 3%–5% of its GDP annually by 2100 (ODI, 2021). The current quality of services and provision of infrastructure have, in turn, made cities both responsible for, and vulnerable to climate change. To overcome these challenges, there is a need to ensure that cities take a sustainable and resilient approach towards the development of their infrastructure - one that aims to generate positive social, economic, and environmental impact.

Development of sustainable urban infrastructure in cities would require significant investments. An assessment conducted by McKinsey Global Institute (2010) projected an investment need of INR 85 trillion (current prices) over the span of twenty years for the development of sustainable urban infrastructure. National Infrastructure Pipeline recently estimated that an investment outlay of INR 19 trillion would be needed for developing urban infrastructure between 2021 and 2025. This translates into an average annual investment between INR 2.3 and 2.5 trillion over the next decade. In addition to the investments, changes are required at a systemic level that require a shift in markets, policies, technologies, and practices, specific to the local context of implementation.

While funds can be availed through various public, private and institutional sources, most Indian cities are unable to/ lack the technical knowledge to access funding to finance and implement their sustainable urban development projects. The key reasons are shown in Figure 1.

To circumvent the specified barriers, project preparation facilities, innovative financial instruments, and funding mechanisms do exist; however, success is difficult to replicate as lessons learned and tools developed are not well documented. As a first step to address these hurdles, there is a need to build capacities of city officials to conceptualise and structure bankable sustainable urban development projects.

The concept of Urban Living Lab (ULL) is useful in such a scenario. The ULLs serve as spaces to review, rethink, and revise urban mechanisms and policies, thereby facilitating the adoption and integration of innovative sustainable, inclusive and climate-resilient solutions. India's first ULL, the Project Urban Living Lab (PULL) in Panaji, supported by the Danish Ministry of Foreign Affairs, Royal Danish Embassy, constituted a form of experimental governance where global sustainable solutions were tested in the local context. PULL extensively engaged with the local government, private actors, and policy

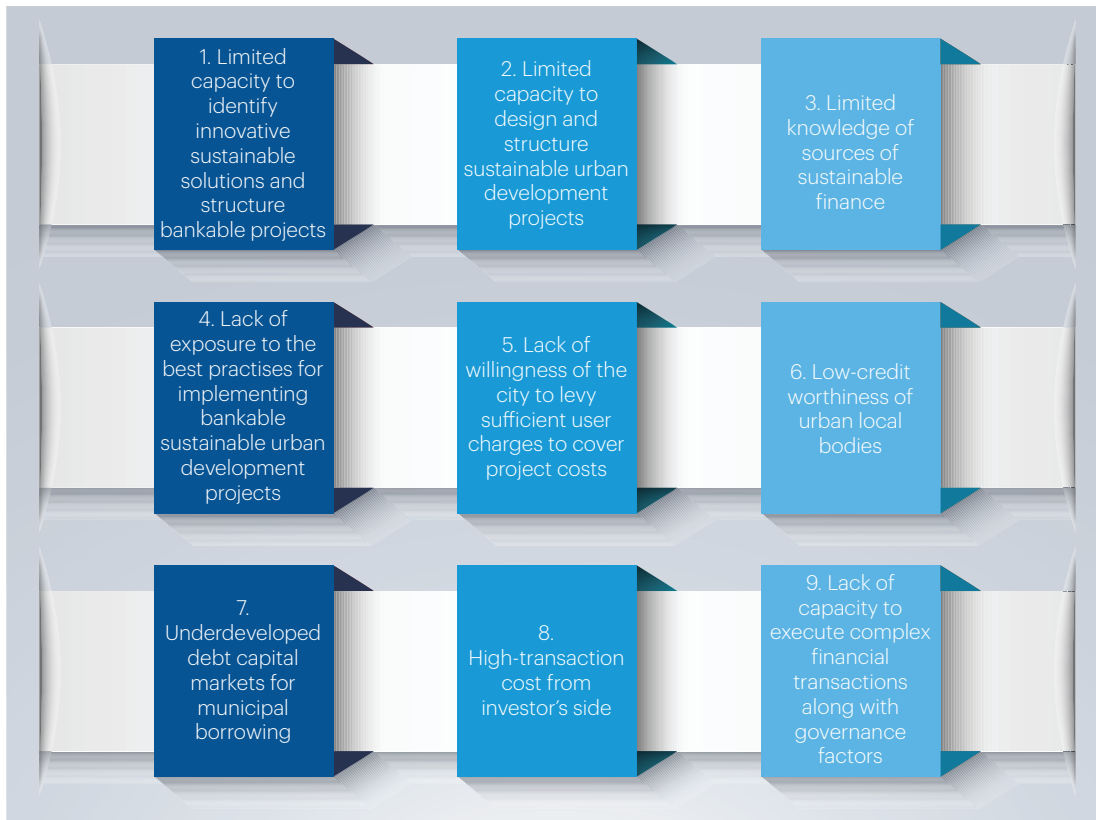


Figure 1: Key reasons for why cities are unable to access funding for financing and implementing sustainable urban solutions

Source: Survey findings

knowledge institutions to review, select, design, test, and fine-tune relevant global solutions towards achieving sustainability. Therefore, this pilot will act as an essential platform to understand the capacity requirements of local authorities for adapting and sustaining innovative global and local solutions in the urban context.

Against this background, the Knowledge Product principally focuses on providing actionable guidance to the target stakeholders to design bankable sustainable, climate-resilient urban solutions. At the same time, drawing lessons from the ULL in Panaji and the experiences of other urban local bodies, development authorities, public works departments, and smart cities across India to identify, pilot, and scale-up innovative sustainable urban solutions. It also maps the key sources of sustainable finance available to Indian cities.

Accordingly, the structure of the Knowledge Product has been developed on the basis of the following three sections:

- » **Section 1:** Introduction to sustainable urban development including different project cycles and need of sustainable finance in cities
- » **Section 2:** Design and implementation of sustainable urban development projects: guidance for each project preparation phase with case studies
- » **Section 3:** Sources and instruments of sustainable finance for cities

1.2 Methodology

The study used a mixed method approach in order to provide guidance to the target stakeholders to conceptualise and structure sustainable urban development projects. A Capacity Needs Assessment (CNA) in the form of a questionnaire was developed to assess the state-of-the-art practices and understand the institutional, operational, and financial capacity needs of smart cities with respect to implementing sustainable urban solutions, which was subsequently followed by stakeholder consultation with select cities. A total of 15 cities undertook the CNA. An overview of each of these cities is shown in Annexure 1. Moreover, the assessment was supported by technical field experience and in-depth consultations with cities such as Dehradun, Panaji, Rajkot and Coimbatore - that largely formed the basis for developing the framework of the document. Additionally, the framework roots itself in comprehensive literature review, innovative tools, and case studies that address challenges in different stages of project preparation, implementation, and scaling-up of sustainable urban solutions (Figure 2). This further helped in data triangulation for research validity and reliability.

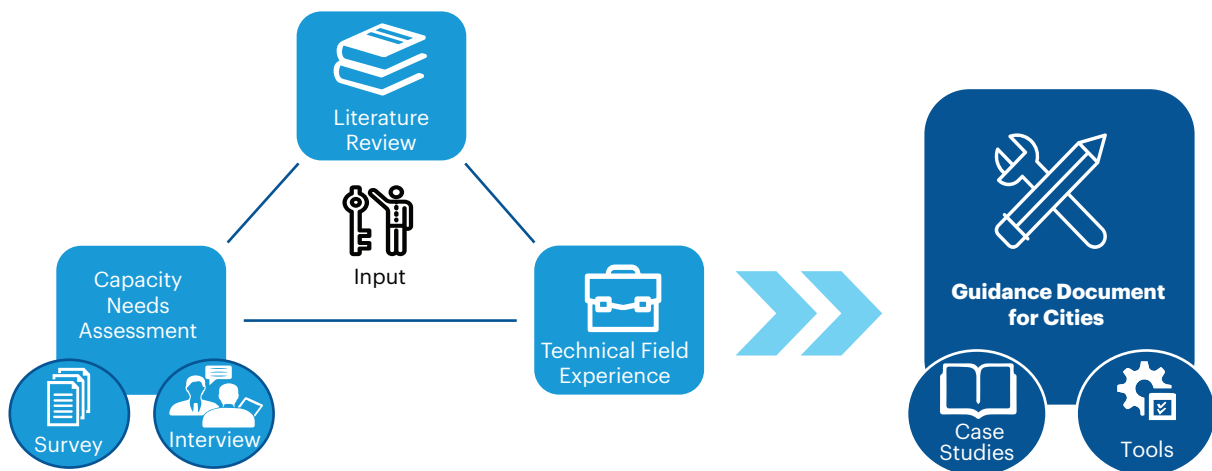


Figure 2: Methodology for preparation of the Knowledge Product

1.3 Target Audience

This document is targeted towards the smart cities, municipal administrations, Urban Local Bodies (ULBs), and development authority officials (engineers, commissioners, financial advisors, etc.) involved in taking decisions for financing sustainable urban development projects. It will also be useful for researchers in the academic fields and trainers from regional training institutes that provide capacity building around these themes.

1.4 Learning Outcomes

The developed document provides actionable guidance to cities towards implementation of global and local sustainable urban development solutions. Through this document, the target audience will be able to achieve the following objectives:

- » Emphasizing on the need for sustainable urban development and sustainable finance for cities.
- » Identifying and applying the tools to support project preparation process at each stage to be adopted by the city and ULB.
- » Understanding different sources of sustainable finance available to the city and map sources of sustainable finance to different stage of project preparation.

2. Introduction to Sustainable Urban Development and Sustainable Finance

2.1 Need for Sustainable Urban Development

Cities are at the heart of creating a sustainable and equitable world. While serving as a catalyst for pressing urban challenges, cities also play a pivotal role in achieving ambitious sustainability goals envisioned under global agreements, such as the Paris Agreement, Sustainable Development Goals (SDGs) and the New Urban Agenda. These development agendas simultaneously highlight the inherent link between climate action and sustainable urban development. Crucial infrastructure in cities, such as buildings, power plants, roads, and water and sewerage systems, will be most significantly affected by urbanization and climate change impacts (rising temperatures, floods, landslides, heatwaves, and extreme weather events). Moreover, owing to the interdependent nature of physical infrastructure, disruptions of services in one infrastructure system will likely result in disruptions in one or more other systems, bearing sizeable repercussions in the social and economic processes of cities.

In order to transition to a climate-resilient, sustainable future, cities will require a substantial transformation around the planning, design, and management of urban development projects. They will also need sufficient/long-term investment in infrastructure projects, that are both resource and energy efficient, and at the same time, resilient to extreme climate change events. The new or renovated infrastructure built today will be in use for centuries ahead and can utilise numerous opportunities to advance the climate-resilient development pathways, especially in the context of developing countries. New infrastructure will be required to be designed to withstand extreme weather conditions and existing infrastructure will have to adapt and be retrofitted in the changing climatic conditions (Vallejo and Mullan 2017). The investments in sustainable infrastructure will also play a role in providing socio-economic opportunities while reducing overall capital costs.

2.1.1 Designing Bankable Sustainable Urban Infrastructure: Project Cycle

Designing of a sustainable infrastructure project is broadly organised into three stages: (i) project concept and pre-feasibility, (ii) feasibility and structuring, and (iii) implementation stage. At each stage, the city would need specific capacity to make decisions and embed sustainability, climate resilience, and bankability considerations into the project development process. The tools and frameworks which could help/ guide city officials at the first two stages are covered in the subsequent sections and are supported with case studies. Figure 3 shows the tools presented at various stages of project preparation.

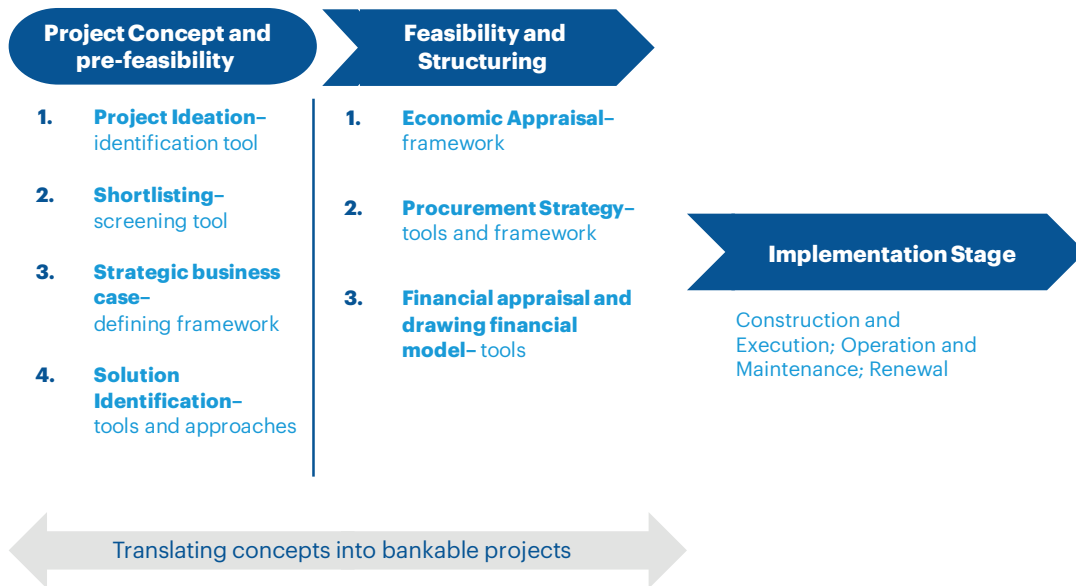


Figure 3: Tools at various stages of project preparation

Source: South Pole

2.2 Sustainable and Climate Finance

Sustainable finance covers multiple policies and institutional arrangements to attract investments to address all the aspects of sustainable development, namely, environmental, social, economic, and governance. Sustainable finance plays an important role in directing private sector funds into sustainable urban development projects. Under the environmental aspect of sustainable finance, initiatives that focus on investments related to mitigation and adaptation of climate change are referred to as 'climate finance'. Figure 4 depicts the hierarchy of finance terms under the broad umbrella of sustainable development.

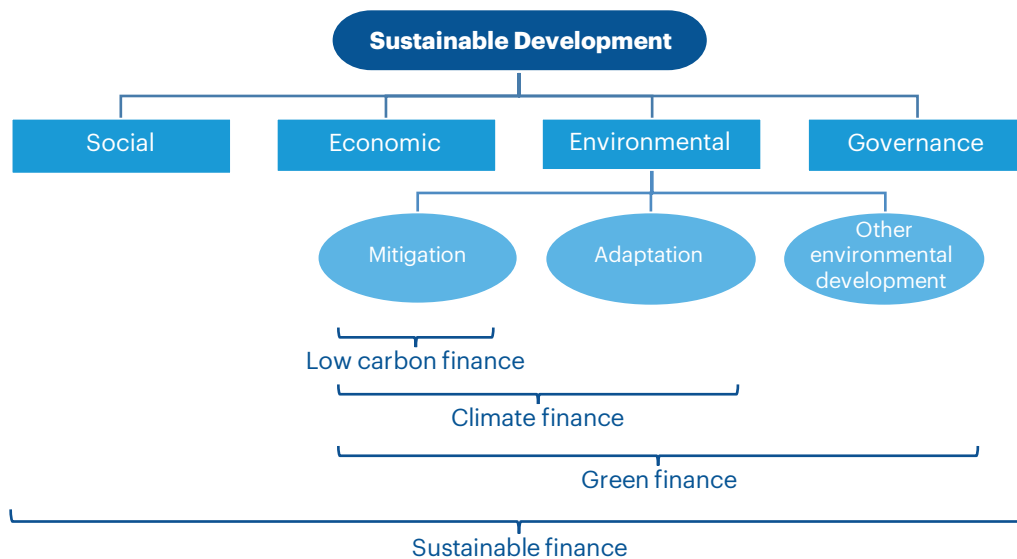


Figure 4: Sustainable and Climate Finance

Source: South Pole based on UNEP enquiry (2016)

2.2.1 Role of Sustainable Finance

Urban sustainable (and climate) finance is much needed by Indian cities to develop on a low-carbon, sustainable pathway. A major part of India's population is residing in urban areas. As explained earlier, cities are more vulnerable to challenges such as urbanization, inequality and climate change, hence, it makes it imperative that cities learn more about sustainable finance. The benefits of sustainable finance in cities are shown in Figure 5.

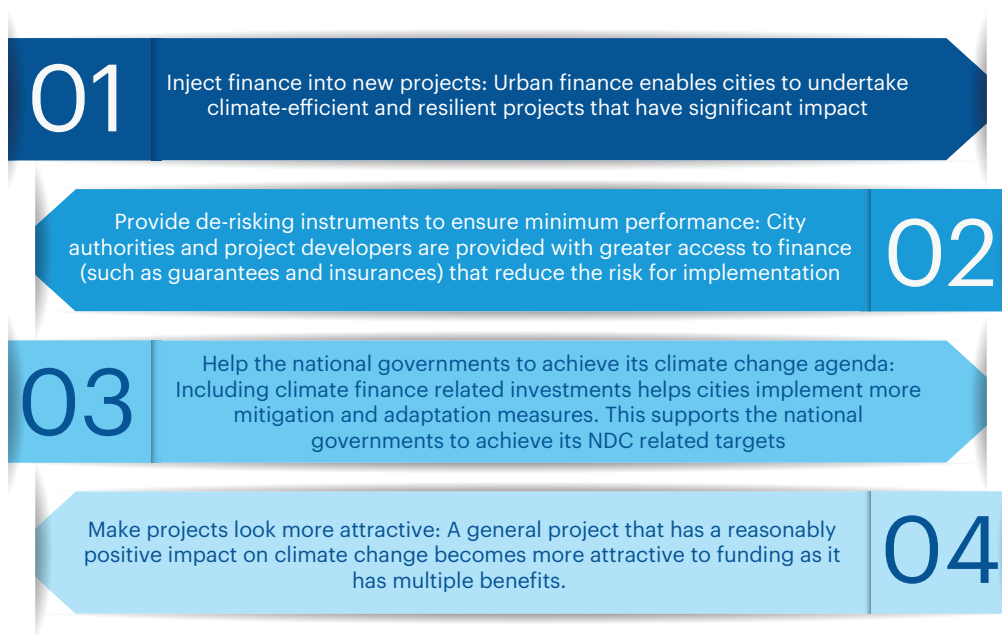


Figure 5: Benefits of sustainable finance for cities

3. Design and Implementation of Sustainable Urban Development Solutions

3.1 Project Concept and Pre-feasibility

Cities often lack capacities to translate the infrastructure gaps/ needs into well-defined project concepts that are strategically linked to national development agenda and climate change ambitions. In India, in most cases, city officials have limited knowledge of global/local sustainable solutions and visibility of climate risks while identifying the solutions. According to the Capacity Needs Assessment (CNA) survey conducted with city officials, 80% of the cities (N=15) use external support to understand the 'sustainability' of a project during its preparation (Figure 6). Frameworks, tools, and mechanisms to support cities at this stage are crucial towards development of a healthy pipeline of projects.

CNA Survey: How is the category "Understanding of the 'sustainability' of the project" managed within the ULB? (n=15)

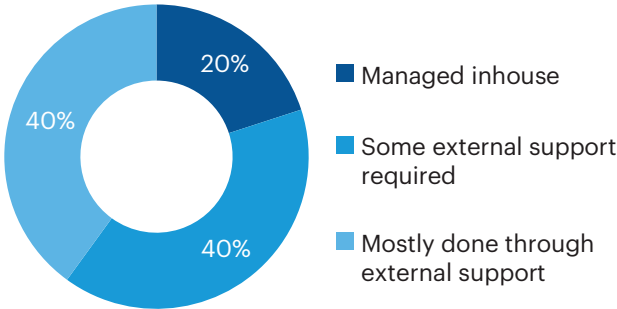


Figure 6: CNA Survey results for management of sustainability knowledge within the ULBs

Project ideas are usually identified from strategic plans like city development plan, comprehensive mobility plan, plans developed under national missions like Smart Cities Mission and Atal Mission for Rejuvenation and Urban Transformation (AMRUT), City Climate Action Plan (if applicable) or political commitments. Screening these projects and pre-feasibility assessment enable defining the project concept, technology, boundary, and scope. The key dimensions that should be covered during this stage generally include technical alternatives, market and demand assessment, high-level estimates of capital cost and operating, potential revenue stream and financing options for the project.

The following section covers frameworks, tools, and approaches that could help cities transition long-term strategies into well-defined project concepts to enable decision-making and facilitate evidence-based screening for sustainable urban development projects.

3.1.1 Project Ideation

The first step towards project ideation is defining the problem/ gap in the infrastructure service vis-a-vis a desired service level/ target (including O&M), as identified in various strategic plans. During this phase, it is important to have state-of-the-art knowledge on the sustainable global solutions and local solutions. Based on that, a list of project ideas can be generated by the city which then can further be screened, and the most promising ideas as per the departmental assessments can be shortlisted. Moreover, certain project ideas can be initiated by other stakeholders - such as citizens or local politicians - based on the on-ground requirements, and the city must make sure these ideas are also aligned with the long-term strategic objectives. For instance, 73% of the total cities which undertook the CNA survey (N=15) involve citizens in the planning and design stage of sustainable urban project development, and 60% of them in the decision-making stage (Figure 7).

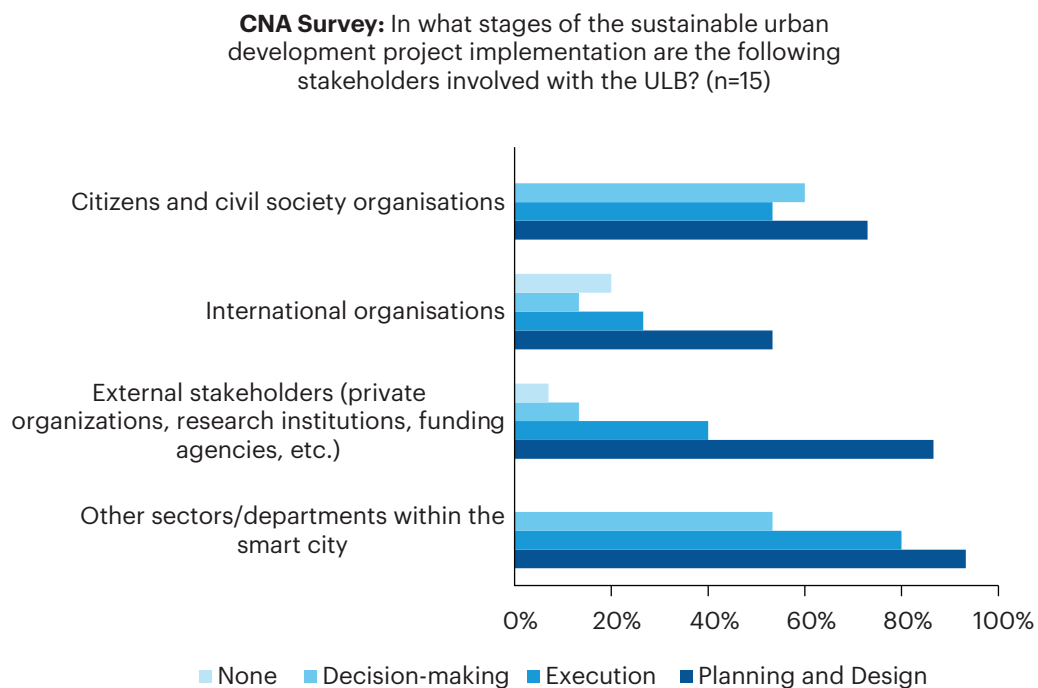


Figure 7: CNA Survey results for the involvement of stakeholders in different stages

For example, Dehradun has developed City Level Advisory Forum (CLAF), where stakeholders such as members of the legislature, industrial sector, public works department, invitees from the public, etc., all gather every month to discuss challenges and relevant project ideas to address them. A similar interdisciplinary committee has also been established to cater to the project ideation stage in the city of Panaji.

The shortlisted project ideas can be converted into project idea note (PIN). A draft framework for project idea note is presented in Table 1.

Table 1: Framework for project idea note

1.	Title of proposed project	
2.	Sector	
3.	Type of project	Part of strategic plan/ sourced otherwise
4.	Rationale	Baseline situation (current situation) envisaged situation post-project implementation
5.	SDG benefits	
6.	Alignment to Nationally Determined Contribution	
7.	Climate Smart City Assessment Framework (CSCAF)	
8.	Alignment to city strategic plans	
9.	Nature and extent of technical expertise required for project preparation	
10.	Climate change mitigation potential (How the project can reduce GHG emissions?)	.
11.	Climate change adaptation potential (Does the project have direct adaptation benefits and how project impacts long-term resilience of the infrastructure?)	
12.	Time-period of implementation	
13.	Sustainability/ scale-up potential	
14.	Mode of implementation (including external stakeholder engagement)	
15.	Leveraging government schemes/ financial model/ availability of budget for implementation with city	

Source: South Pole

3.1.2 Screening Tool

The second step involves screening the project ideas against broad parameters to prioritise the most relevant projects. The city can form an internal project screening committee to evaluate the project and shortlist the most favourable project idea post screening. At this stage the city should ensure that the project ideas align with the following broadly categorized parameters (Figure 8):

City-level Parameters

- » **Willingness of city leadership:** Whether the city's political and administrative leadership would support the project and the city would be able to meet minimum obligations required by the project.
- » **Economic driver of the city:** Whether the project is able to enhance the economic potential of the city.
- » **Strategic alignment:** Whether the project is aligned to long-term vision and plans of the city.

National Parameters

- » **Leveraging national schemes:** Whether the project is aligned with national level schemes and missions (AMRUT, Smart Cities Mission, etc.).
- » **Climate goals:** Whether the project is aligned with Nationally developed contributions (NDC) and commitments of national government- RE, net-zero among others

State Parameters

- » **Priority of state:** Whether the project idea aligns with the priorities of the state administration and in line with the state's broader policies.
- » **Leveraging state schemes:** Whether the project is aligned with a state policy or leverages state/national schemes.

Project Impact Parameters

- » **Climate change mitigation:** Whether the project idea would have direct/indirect result in reduction in GHG emissions.
- » **Climate change adaptation:** Whether the project idea would directly address adaptation activity or build resilience of the system for future climate change events, climate risks are accounted for in the project idea.
- » **SDG impact:** Out of 17 SDGs, which of the SDGs does the project idea address directly and indirectly.

Project-specific Parameters

- » **Associated risk: technology risk:** Whether the technology/ approach for the project is identified—if yes—is there a past precedence or a new innovative technology envisaged; if no: whether a call for proposals and pilot is planned.
 - » **Institutional risk:** Whether city has in past implemented similar projects; city's capability to host and honour contractual commitments under the project.
 - » **Project preparation:** Whether external technical support is required for project preparation—if yes— estimated cost of external support
 - » **Investment required:** High-level estimation of the project cost including the life cycle and O&M cost of the project, and potential sources of funding.
 - » **Revenue Model:** How the project intends to recover its investments: (a) own revenues, (b) city fees and taxes, (c) cost savings, (d) blended structure
-



Figure 8: Broad parameters for project screening

3.1.3 Defining Project's Strategic Business Case

The next stage after screening and shortlisting the project idea is to define the project's strategic business case. The main objective of this stage is to identify and agree on the project objectives, map the existing arrangements/ situation, and determine the business needs as well as the potential scope of the project. Furthermore, at this stage, the key service requirements along with benefits, risks and dependencies of the project are also defined. The key personnel requirements and outputs of this stage are indicated in Table 2. It is important to have the right organizational structure and adequate inter-departmental coordination in the early stages to be able to incorporate all aspects of the project cycle holistically.

Table 2: Key personnel requirements and outputs of a project's strategic business case

Key Personnel	<ul style="list-style-type: none"> » City engineers » Executive engineers for the nodal departments » City commissioner » Committee (appraisal) » Technical advisors » Financial advisors
Outputs	<ul style="list-style-type: none"> » Project objectives » Business needs and potential scope » Key benefits, risks and dependencies

Note: This is not a definitive list. The list is subject to change in accordance with the requirements of the project.

Table 3 shows an indicative framework with description of activities which the city may follow to define the strategic business case for a project:

Table 3: Indicative framework with description of activities which the city may follow to define the strategic business case for a project

Objectives (Outcome that the project seeks to achieve)	<p>Why is the city undertaking the project?</p> <p>Specifying the project objectives considering rationale, key outcomes and benefits. The objectives should be:</p> <ul style="list-style-type: none"> » Strategically aligned with the individual, city, state and national visions » Specific, measurable, attainable, result oriented and time bound (SMART) » Outcome or citizen focused rather than solution focused » Should address at least one of the following: effectiveness (improve service quality), efficiency and economy (optimise cost of service delivery), compliance (statutory requirement) and replacement (end of service contract - asset useful life)
Existing Arrangements (Current situation)	<p>How is service currently delivered to citizens?</p> <p>Throughput, turnover, and existing costs Current asset availability, condition and utilisation</p>
Business Needs (Opportunities and problems in current situation)	<p>Problems associated with and opportunities arising from the current arrangements</p> <p>Confirmation and continued need for existing city operations Level of demand for future operations and services, projections of climate change</p>

Table 3: Indicative framework with description of activities which the city may follow to define the strategic business case for a project

Project Scope (What is needed to address business needs)	Identifying the potential scope of the project is operationally feasible to satisfy the identified business needs. The city may use the following framework to define project scope:													
	<table border="1"> <thead> <tr> <th>Range</th> <th>Core</th> <th>Desirable</th> <th>Optional</th> </tr> </thead> <tbody> <tr> <td>Scope</td> <td>Essential changes</td> <td>Additional changes</td> <td>Optional changes</td> </tr> </tbody> </table>	Range	Core	Desirable	Optional	Scope	Essential changes	Additional changes	Optional changes	Service Requirements				
Range	Core	Desirable	Optional											
Scope	Essential changes	Additional changes	Optional changes											
Project Benefits (Anticipated benefits as a result)	The city should define the project benefits aligned with the defined project objectives. Benefits can accrue to the city corporation as an institution or to the households, individuals and businesses. They can be broadly classified as:													
	<table border="1"> <thead> <tr> <th>Benefit Classification</th> <th>Example</th> </tr> </thead> <tbody> <tr> <td>Direct economic benefits</td> <td>Optimising operating costs Increase in revenues</td> </tr> <tr> <td>Indirect economic benefits</td> <td>Reduction in future expenditure (building resilience) Better resource management</td> </tr> <tr> <td>Quantifiable</td> <td>Carbon sequestration - reduction in GHG emissions; Climate Smart Cities Assessment Framework (CSCAF) Citizen satisfaction Improved health and social outcomes - ease of living index</td> </tr> <tr> <td>Qualitative</td> <td>Reputation of the city Improved quality of life for citizens: ease of living</td> </tr> </tbody> </table>		Benefit Classification	Example	Direct economic benefits	Optimising operating costs Increase in revenues	Indirect economic benefits	Reduction in future expenditure (building resilience) Better resource management	Quantifiable	Carbon sequestration - reduction in GHG emissions; Climate Smart Cities Assessment Framework (CSCAF) Citizen satisfaction Improved health and social outcomes - ease of living index	Qualitative	Reputation of the city Improved quality of life for citizens: ease of living		
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Quantifiable	Carbon sequestration - reduction in GHG emissions; Climate Smart Cities Assessment Framework (CSCAF) Citizen satisfaction Improved health and social outcomes - ease of living index													
Qualitative	Reputation of the city Improved quality of life for citizens: ease of living													

Table 3: Indicative framework with description of activities which the city may follow to define the strategic business case for a project

Project Risks (Risks that might arise)	The city should identify the risks which are directly and indirectly associated with the achievement of project outcomes. A plan for mitigating the identified risks should also be prepared simultaneously. The key categories of the risk associated with project development include:	
	Category of Risk	Description
	Business Risk	Risks which remain with the city and cannot be transferred, such as political and reputational risks
	Service Risk	Risks associated with lifecycle design, build, finance and operation phases of project - may be shared with others
	External Risk	Non-systematic risks which affect the entire society, such as technology, catastrophe, legislation, general inflation risks and climate risks
Project Constraints (Limitations faced)	The city should specify any constraints specific to the project, including policy decisions, rules and regulations, organisational capacity, infrastructure life time and inter-departmental coordination, among others. It is important that the constraints are managed at the initial stages.	
Project Dependencies (Things must be in place or managed elsewhere)	The city should identify any dependencies outside the project scope on which the success of the project is dependent. These could include inter-dependencies on other programmes and projects (outside project scope but within city's scope) and external dependencies (outside project and city's scope), such as legislation, strategic decisions and approvals.	

Source: Adapted from UK Guide to project business case

3.1.4 Identification of Preferred Implementation Solutions

The purpose of this stage is to identify the best option/ solution for the delivery of the project – one that offers best value for money to the city and includes the wider social and environmental impact as well as economic value. This stage will help city officials and other stakeholders better understand the expected benefits arising out of projects. Identifying preferred implementation solutions can be achieved by identifying potential global/local service solutions that align with the project objectives and business needs. This can be done by identification of critical success factors of the project, identification of various alternatives and assessment of cost benefits and risk associated with the shortlisted options.

3.1.4.1 Indicative Frameworks to Identify Preferred Solutions

Several frameworks can be used to identify preferred solutions for the project delivery. Two of these frameworks – sandbox approach and operations framework - are elaborated in this section. The sandbox approach was used by Panaji for setting up an urban living lab, whereas the operations framework was used by the city of Rajkot to set up a captive solar plant (refer to: Section 5).

1. Sandbox Approach

The potential global and local service solutions can be identified by the city internally by referring to the best practices, research, and peer learnings or through innovative practices like the sandbox approach. The sandbox approach helps cities to prioritise urban solutions in the local context, by testing and fine-tuning solutions before their deployment at scale. This approach thus prevents a lock-in while also enhancing regulatory and institutional support from the local authorities and facilitating partnerships for new solutions (Figure 9). Under the sandbox, the city can set up an innovation secretariat including city officials and external experts. The role of innovation secretariat would be:

- **Demand Side:** Helping cities frame problems that external players can solve; design procurement to integrate global solutions and enable institutional collaboration.
- **Supply Side:** Guide external and local players to create solutions and approaches that fit in the local context.

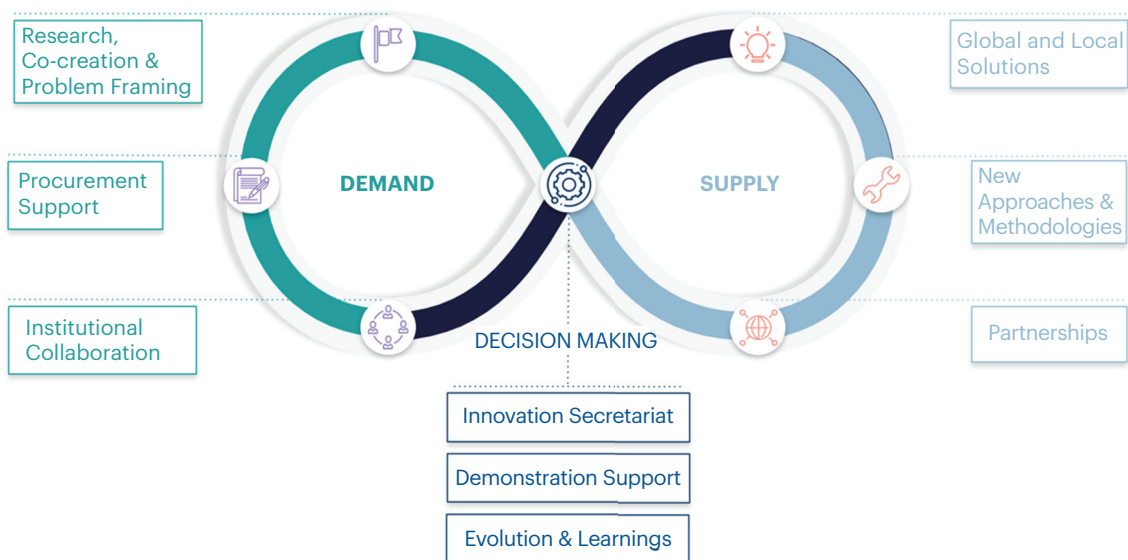


Figure 9: Illustration of PULL's Sandbox approach

Source: <https://urbanlivinglabindia.com/>

Case Study 1:

Project Urban Living Lab (PULL) Sandbox in Panaji

Project Urban Living Lab (PULL) in Panaji is a sandbox to test new approaches and global/local solutions for sustainable and liveable cities in collaboration with residents, policymakers, public bodies, businesses and academia. PULL has been set up under a Memorandum of Understanding (MoU) between the Royal Danish Embassy in India (RDE) and Imagine Panaji Smart City Development Limited (IPSCDL) and is implemented by Oxford Policy Management, Transitions Research, and TERI.

Since its inception in early 2020, PULL has focused on enrolling new approaches and global/local solutions to tackle some of Panaji's pressing urban challenges. These include:

- » **Mobility:** PULL has supported Panaji for the Cycles4Change challenge and has developed a cycling plan using cycling pilots, stakeholder consultations and best practices from Denmark.
 - 19.2 km of pop-up cycling lanes and dedicated cycling paths were piloted on over a period of four weeks.
 - A handlebar survey, citizen perception survey, and key stakeholder engagement meetings were conducted to understand shifts in behaviour, culture and policies needed to transform Panaji to a cycle-friendly city.
 - On-ground findings and ideas from successful examples informed the plan for the scale up of cycling infrastructure.

Based on the cycling pilot and the cycling plan that came out of it, the Government of Goa has earmarked resources for the development of a dedicated cycling corridor in Panaji. Additionally, comprehensive, data-driven safety audit at 600 locations in Panaji was conducted with Safetipin with the objective of addressing safety of women pedestrians by identifying inadequate infrastructure, street lighting, obstructions, and dead spaces in the city. This was complemented by a perception walk with women as a ground truthing exercise. Based on that, PULL developed a set of implementable recommendations to make streets safer and accessible for women.

- » **Water Resilience:** PULL has developed a rejuvenation plan of the St. Inez creek, which incorporates Nature-based Solutions (NbS) and activates formal mechanisms for multi-stakeholder governance of the creek. PULL has also developed a Flood Mitigation Plan for Panaji by conducting a mapping of storm drain network in the city, and analysis of rainfall and digital elevation model (DEM) data. These plans were developed by referring to global best practices and in discussions with international stakeholders from the water sector. PULL is also supporting city authorities in technically shaping its 24/7 Water Supply project.
- » **Data-driven Governance & Planning:** With the objective of helping Panaji inch closer to an evidence-based approach for decision making, PULL has conducted two data pilots in Panaji: safety audit of Panaji's streets and road network, and public bus-tracking system. Based on insights from the data pilots, the analysis of data availability and institutional capacities, PULL has developed recommendations to help Panaji inch closer to a data-driven approach, for which consultations with the municipal officials have been carried out.

Source: Project Urban Living Lab, 2021

2. Options Framework

In order to map the shortlisted options, the city can also use an options framework, as used in the case study of Rajkot in section 5 clearly defining the scope, service solution, solution delivery, service implementation and potential funding alternatives for different options, as shown in Table 4.

Table 4: Options framework to map the shortlisted options

Key Dimensions	Description
Scope	“What”, in terms of potential coverage of project (e.g., geography, number) To be assessed in alignment with business needs and service requirement
Service Solution	“How”, in terms of potential solution to deliver the identified scope To be defined by available technologies and best practices
Service Delivery	“Who”, in terms of the entity assigned to deliver the identified scope and solution (e.g., inhouse, strategic partner) To be defined by resources, competencies, and capabilities - internal or external to city
Service Implementation	“When”, in terms of phasing to deliver To be driven by deadlines, risks and economies of scale
Funding	“Funding” required for preferred scope, solution, service delivery and implementation To be driven by cost of public funding and value for money for alternate funding options

3.1.4.2 Evaluation of the Identified Option

The next step required is to define the critical success factors which are crucial to meet the project objectives. Each identified/ proposed option must be evaluated against the critical success factor matrix below for the project (Table 5).

Table 5: Evaluation matrix for critical success factors

Factor	Description
Strategic fit and business needs	How well does the option meet the project objectives and business needs?
Value for money	How well does the option optimise the value in terms of cost benefits and risks? - A high level assessment should be undertaken
Supplier capacity and capability	How well does the option match with the capacity and willingness of the supplier to cater to the service? Is a pilot required? - In case of a new innovative solution
Affordability	How well can the option be funded from available sources of financing? - Consider the innovative sources of funding at various stages (design, build and operational phases)
Achievability	How well does the option fit with the city’s capability to successfully deliver the project?

After carrying out the above-mentioned stages, the most preferred option should then be identified. Based on the assessment, the city must also consider undertaking a pilot exercise to test assumptions, in case the option selected is new and has significant past precedence/ information is unavailable.

3.2 Project Feasibility and Structuring

The next phase involves an assessment of the project feasibility and identification of project investment and financing alternatives. The CNA survey shows that majority of the cities (73%) manage the project feasibility assessment stage externally (Figure 10).

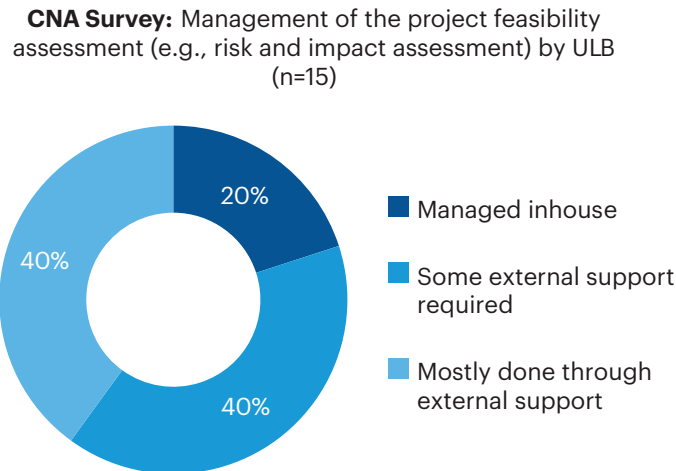


Figure 10: CNA Survey results for management of project feasibility by the ULB

During this phase, the identified solution is further detailed out with the evaluation of the technical design and configuration, financial and economic feasibility assessment, operational challenges, and the socio-economic impact of the project. Further, this stage typically covers following other aspects:

- » Value for money analysis and affordability considerations
- » Government support requirements and implications for fiscal costs and contingent liabilities (FCCL)
- » Project structuring and risk allocation
- » Consideration of the use of a PPP form of procurement and the associated project implementation arrangements
- » Broad terms of the bid process, documentation and contracting
- » Market attractiveness and bidder interest
- » Roadmap for implementation and O&M

The is achieved through following broad steps:

3.2.1 Economic Appraisal of Preferred Option

The first step of the project feasibility and structuring phase is to undertake an economic appraisal of the preferred option for determining the potential value for money. The focus of the economic appraisal is on the public value of the project, and all social, economic (including life cycle cost) and environmental costs, along with the impact on citizen welfare are taken into consideration.

The project team needs to estimate the cost and benefits for the preferred option to undertake the economic appraisal. In order to estimate the cost and benefits, the city may use the following framework presented in Table 6.

Table 6: Framework to estimate the cost and benefits of the project.

Estimating Costs	An overview of costs to be considered for economic appraisal:
	<ul style="list-style-type: none"> » Life cycle costs: Total cost throughout the lifetime of the project, including capital cost of project assets, operation and maintenance, replacement and disposal costs. » Revenue costs: Operational, running, management and overhead costs » Fixed, variable, semi-variable costs: Related to project operations » Opportunity costs: In relation to land, buildings and manpower, they should be assessed against the most valuable alternative use » Attributable costs: Cost of staff for project implementation from the public side » Inflation: General inflation » Climate Resilience Consideration: Inclusion of climate resilience considerations into project costs at various stages, i.e. (i) Construction stage: Inclusion of appropriate climate risk mitigation measures in capital cost estimates; (ii) Operations stage: Higher maintenance cost (due to more repairs- extreme climate events); Additional disaster response cost » Contingent Liabilities: Commitments to future expenditure if certain events occur should be included in the economic appraisals. For example, the cancellation costs for which a public sector body may be liable if it prematurely cancels a contract

Table 6: Framework to estimate the cost and benefits of the project.

Estimating Benefits	<p>An overview of benefits to be considered for economic appraisal:</p> <ul style="list-style-type: none"> » Direct benefits to the city, benefits to other public organisations and wider societal benefits: <ul style="list-style-type: none"> • Monetizable benefits in terms of additional revenues or cost savings for which cash can be realised - for low carbon solution, value of carbon credits should be included • Quantifiable but non monetizable benefits: For example, in case of solid waste management, the benefits would include: a) improved health of sanitation workers and overall citizens leading to less spending of state on health and better insurance premiums b) reduced GHG emissions c) enhanced aesthetic value because of better waste management, leading to higher real estate pricing d) Improved water quality as waste management can prevent underground water from getting contaminated • Qualitative but not readily quantifiable benefits (improved quality of life and other societal benefits) <p>The purpose of valuing benefits is to ascertain whether an option's benefits are worth its costs, and to allow alternative options to be compared in terms of their net social value.</p>
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Table 6: Framework to estimate the cost and benefits of the project.

Risk Appraisal	A risk assessment of the preferred option is critical towards economic appraisal as it has a direct impact on cost and benefits. Hence, the critical risks associated to the project should be identified and valued. Broadly, these risks may include:	
	Business Risk	Risk that the city cannot anchor the project needs for instance reputational risks
	Service Risk	Design risk: project design is unable to meet objectives
		Planning risk: project in unable to secure planning or policy permissions
		Build risk: construction is not completed in stipulated time
		Project intelligence risk: project preliminary investigation is not robust
		Environmental risk: project might have an adverse impact on local environment and raise objections (in terms of project life cycle)
		Procurement risk: related to the contract obligation or counterparty is unable to meet their obligations
	Generic risk	Operations risk: invariable increase in estimated operational cost
		Demand risk: invariable difference in actual vis a vis anticipated demand
		Technology risk; risk that changes in technology would impact service being offered using sub optimal technology
		Funding risk: unavailability of funding delaying the project, foreign exchange
		Residual value risk: relating to the end of life value of asset- For example in case of solar disposal of used asset
	Climate Risk	Impact on Costs: how climate risk scenarios impact maintenance, operational and replacement costs
		Impact on Benefits: how climate risk scenarios impact benefits of the projects
External Systematic Risk	Policy Risk: Significant change in the policy, regulations (change in law)	
	Political Risk: Change in political leadership resulting in change in priorities	
	Force majeure: natural and unavoidable catastrophes	
	Technology disruption risk: new technology that completely disrupts the project tech	

Table 6: Framework to estimate the cost and benefits of the project.

	<p>The above risk should be appropriately identified and included in the risk register. It is also important to value the above risk and incorporate it into the cost- benefit assessment. For valuation of the risk, a single point probability (a fixed percentage of contingency added to project) or advance methodology may be used by the city.</p>
<p>Recording Net Present Social Value (NPSV)</p>	<p>Net Present Social Value (NPSV) represents the social value of the project. NPSV along with the economic value (Net Present Value) are required to deduce the Total Net Present Value (TNPV) of the project.</p> <p>Following estimation of cost, benefits, and risk related to preferred project, the net present social value should be computed using the social discount rate: as proxy for an alternate public welfare return closer to the Government bond rate (minimum return).</p>

At the end of economic appraisal, the most preferred option with more positive Net Present Social Value (NPSV) should be taken to the next step. In case the NPSV is negative or significantly closer to zero, the preferred option should be reconsidered by the city.

3.2.2 Procurement Strategy

Following the economic appraisal, the next step is to set out the procurement arrangement for the different project activities and services. According to the CNA survey, project procurement in 50% of the cities (N=15) are managed in-house while 38% of the cities use external support (Figure 11). Some cities also have a separate procurement division in order to ensure that project procurement is implemented as per the national and state guidelines (CPWD, CVC, GFR Rules).

CNA Survey: Management of project procurement
(e.g., tender and contract management) (n=15)

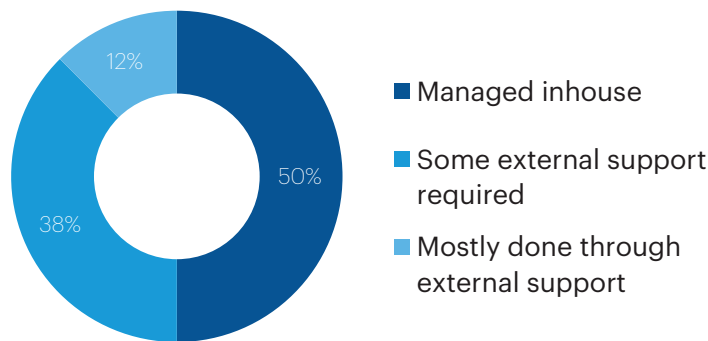


Figure 11: CNA Survey results for ways in which project procurement is managed by cities

It is prudent that procurement arrangements are identified during the preparation stage to secure long term public value for the project. The decision to involve the private sector in funding or service delivery is based on the alternate options assessment completed by the city. The city should consider the following considerations in Table 7 when evaluating the right project partner to undertake the different project activities,

Table 7: Considerations by the city for identification of right project partner for different project activities

Considerations	Description
Substantial operating content within the project	If the project has high operating content
Scope for additional/ alternate use of asset	If the project assets can be used alternatively- improving asset efficiency
Scope for innovation in design	If the expected outputs of the project can be achieved in a better manner through innovative design which is also cost effective
Long term financing availability	If the long term financing for the project can be mobilised at competitive rates
Risk primarily commercial in nature	If the risks associated with the project are primarily commercial or operational
Past Experiences	If the project partner in the past has showcased efficient delivery of similar projects

In order to define the procurement strategy and identify the best procurement routes, a city may follow the following framework (Table 8).

Table 8: Framework to define the procurement strategy and identify the best procurement routes

Determine procurement strategy	<p>The procurement strategy for different project activities and outputs should be developed taking into consideration the following:</p> <ul style="list-style-type: none"> » Local legislation for procurement – in line with state procurement guidelines » Choice of procurement method and stage at which supplier should be involved » Collaborative procurement – whether collaborative procurement practices make sense for the project (economies through aggregation)
---------------------------------------	--

Table 8: Framework to define the procurement strategy and identify the best procurement routes

Define the project activities, service streams and outputs	Summarise the project service streams, outputs and anticipated timelines. The city can use the following format to define the project service streams:			
	Activity	Output	Service level arrangement	Timeline
Potential risk apportionment	An important step in procurement is to identify the risks in different phases of the project, i.e. Design, Build, Funding and Operational (DBFO). The main objective here is to allocate the risk to the party which best manages the risk amongst the public and private sectors. The city should take in consideration the following factors while apportioning the risk:			
	» The project partner is better able to influence the outcome			
	» Understanding of each risk element is important for the city to assess its impact on service provider incentives and financing costs			
	» The project partner(s) to be considered for the risk they can manage better than the city, particularly in activities in which there is clear responsibility, measure and control			
	» Transfer of risks can also act as an incentive to the project partners to deliver activities efficiently and through innovative approaches			
	Below is an indicative framework of risk allocation that can be used by the city:			
	Risk Type	Public	Private	Shared
	Design Risk			
	Construction Risk			
	Implementation Risk			
	Performance or Availability Risk			
	Revenue Risk			
Termination Risk				
Technology				
Obsolescence risk				
Financing Risk				
Policy Risk				
Residual Value Risk				

Table 8: Framework to define the procurement strategy and identify the best procurement routes

Potential payment mechanism	<p>Defining the milestones for payment to service providers is equally important. The city should define the payment milestones so as to incentivise the service provider to provide value for money across the project life span and operations. Some of the generally used mechanisms at different phases of the project have been outlined below:</p>					
	<table border="1"> <thead> <tr> <th data-bbox="448 453 608 491">Phase</th> <th data-bbox="608 453 1382 491">Payment Mechanism</th> </tr> </thead> <tbody> <tr> <td data-bbox="448 491 608 657">Predelivery</td> <td data-bbox="608 491 1382 657"> <ul style="list-style-type: none"> » Fixed Cost: Fixed price of the items based on agreed Bill of Quantities (BOQs) » On agreed outputs: Payments made only when output benefit is realised by the city </td> </tr> <tr> <td data-bbox="448 657 608 1171">Operations and Maintenance Phase</td> <td data-bbox="608 657 1382 1171"> <ul style="list-style-type: none"> » Availability payment: Payment is linked with availability based on Service Level Agreements (SLAs) (e.g., 95% of the availability of buses) » Performance payment: Payment linked to achievement of a stipulated performance » Volume payment: Payment linked to achievement of transaction/ business volume » Incentive payment: Payment linked to implementation of a reform or improvement of business process - used in government schemes » Alternate revenues: Element of payment gives the private sector incentive to explore alternate revenue streams </td> </tr> </tbody> </table>	Phase	Payment Mechanism	Predelivery	<ul style="list-style-type: none"> » Fixed Cost: Fixed price of the items based on agreed Bill of Quantities (BOQs) » On agreed outputs: Payments made only when output benefit is realised by the city 	Operations and Maintenance Phase
Phase	Payment Mechanism					
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Operations and Maintenance Phase	<ul style="list-style-type: none"> » Availability payment: Payment is linked with availability based on Service Level Agreements (SLAs) (e.g., 95% of the availability of buses) » Performance payment: Payment linked to achievement of a stipulated performance » Volume payment: Payment linked to achievement of transaction/ business volume » Incentive payment: Payment linked to implementation of a reform or improvement of business process - used in government schemes » Alternate revenues: Element of payment gives the private sector incentive to explore alternate revenue streams 					
Contractual arrangement for the project	<p>It is important to identify the contractual frameworks which the city intends to use. The city can refer to the model contracts available in different contexts:</p> <ul style="list-style-type: none"> » Model agreements by NITI Aayog » Model agreements available at Smartnet NIUA » Model agreement available at PPP India portal, Ministry of Finance 					

Source: IADB Climate Resilient Infrastructure Framework, 2020

At the end of this stage, the city would be able to finalise the procurement and commercial strategy for the project, risk allocation matrix for the project and the structure of the project delivery mode.

3.2.3 Financial Appraisal and Model

The next stage, once the project delivery mode is identified, is to undertake the financial appraisal of the project to ascertain the funding and affordability of the project. In order to undertake the financial appraisal of the project, a financial model needs to be developed. The financial model provides an informed 'best guess' on the likely impact and outcome of the project. While drawing a financial model, the city may consider the following framework in Table 9.

Table 9: Financial appraisal model

Underlying Assumptions	Sheets and Schedules
General	» Interest Rate
	» Inflation
	» Taxation
	» Capital Charges- Depreciation and Amortisation
	» Discount rates
Cost	» Preparation and transaction cost
	» Construction phase cost: Related to machinery, equipment and civil costs; life cycle cost including maintenance and disposal
	» Operations phase cost: Related to Operation & Maintenance (O&M) and staff
	» Financial cost
	» Risk contingency costs
	Also includes scenarios on how climate events might impact these costs.
Revenues	» User fees assumption
	» Potential savings assumption
	» Emission reduction calculation in case of low carbon technologies, and carbon revenues assumptions
	Also includes scenarios on how climate events can impact project revenues.
Funding Assumptions	» Funding structure
	» Funding schedule
	» Calculating project returns for the different elements of financing and payback

Based on the financial model, a final assessment of the project is undertaken. Appropriate adjustments that make the project financially viable should be undertaken at this stage. A city can use different funding options for different stages of the project. The sources of sustainable finance which can be accessed by the city are outlined in the next chapter of the guidance document.

4. Sources and Instruments of Sustainable Finance for Cities

4.1 Sources of Sustainable Finance

This section maps the sources of sustainable finance that municipalities/ Urban Local Bodies (ULBs) can tap for funding climate-resilient, sustainable infrastructure development. The funding can be from public or private sources at the local, regional, national or international level. In most cases, for sustainable and climate-resilient infrastructure projects, a mix of funding sources is used. However, cities are often unable to access the funding sources. According the CNA survey, more than 50% of the respondents (n=15) said that funding specifically for the implementation of sustainable urban development projects is unavailable to them. Both public and private finance are required for sustainable and climate resilient development, and adequate technical means must be provided to the city to access them. Figure 12 and Figure 13 respectively provide a detailed list of public and private sources funding that are available.

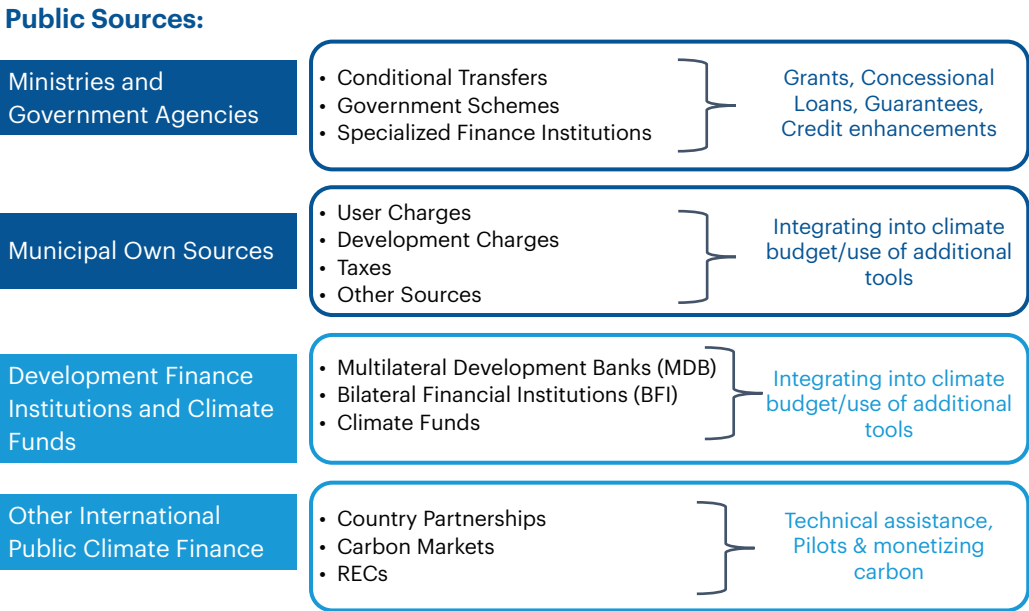


Figure 12: Public sources of sustainable finance for cities

ULBs in India majorly rely on financing from National and State Governments. According to the consultations with Panaji and Dehradun Smart City officials, several Government of India missions and schemes, such as the Atal Mission for Rejuvenation and Urban Transformation (AMRUT), Pradhan Mantri Awas Yojana (PMAY), Smart Cities Mission, etc. are utilised extensively in climate smart projects. For instance, all projects under Imagine Panaji Smart City Limited (IPSCDL) are funded through AMRUT and Smart Cities Mission.

In addition to the stakeholder consultations, research highlights the eight missions under India's National Action Plan on Climate Change (NAPCC), that have dedicated schemes to facilitate climate resilience. One of the eight missions is the National Mission on Sustainable Habitat, that specifically focuses on achieving climate resilient cities. Moreover, the National Adaptation Fund for Climate Change (NAFCC) has also been introduced to meet the cost of climate change adaptation for the vulnerable State and Union Territories of India. Other sources such as taxes, multilateral public finance (e.g. International Climate Initiative) and development charges are also powerful tools to finance climate sensitive development in cities.

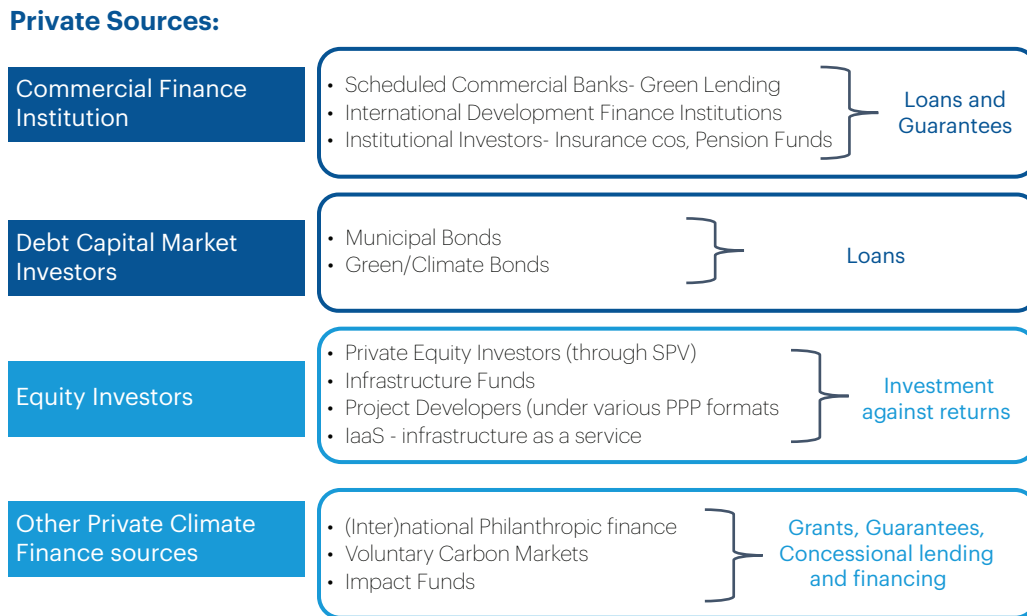


Figure 13: Private sources of sustainable finance for cities

Sustainable urban projects in cities are also financed by private sector actors and intermediaries. These include commercial banks, municipal bonds, equity and infrastructure funds, etc. (Figure 13). In the Indian scenario, private finance holds potential and opportunities for the governments to access sustainable finance. However, private finance is still at a nascent stage and the flow is predominantly directed towards renewable energy projects currently. There is a need for cities to tap into these financial pools

The Capacity Needs Assessment (CNA) survey results further support this by showing that majority of the funding sources for the development and implementation of sustainable urban development projects are not fully accessible, with 53% of the total cities (N=15) choosing commercial finance institutions and municipal bonds as 'least accessible' (Figure 14).

CNA Survey: How would you rate the access by the ULB to the following funding sources for development and implementation of sustainable urban development projects? (n=15)

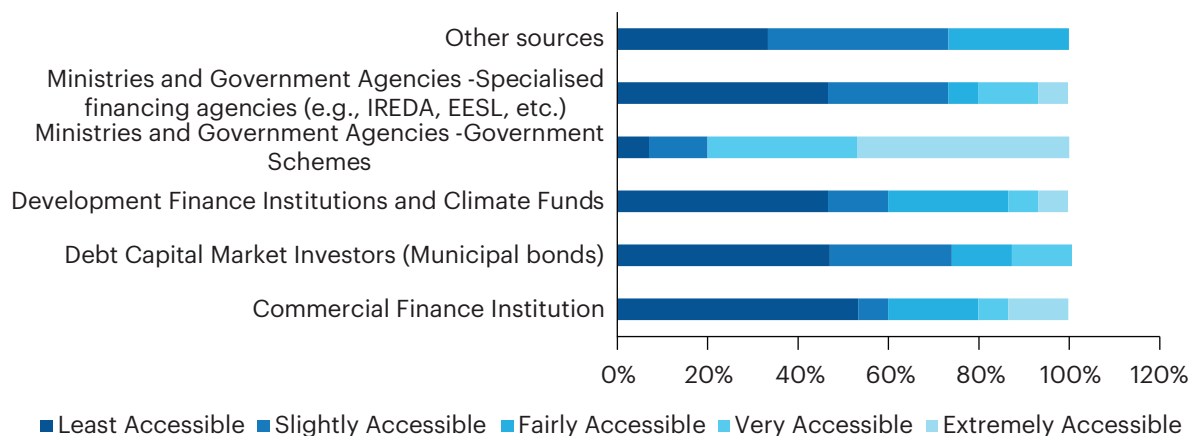


Figure 14: CNA survey result on the accessibility of different sources of funding for sustainable urban development projects

4.2 Private Sector led Sustainable Finance Instruments

Commercial finance institutions - Green Loans:

Green Loan is a loan issued by banks or financing institutions for the implementation of green projects or activities that are aligned with a set of defined green criteria. The characteristics of a green loan should be structured in alignment with the Green Bond Principles (GLP), which set out a clear framework of market standards and guidelines. The GLP provide a consistent methodology across the wholesale green loan market and broadly cover: a) use of proceeds; b) process of evaluation and selection of projects; c) management of proceeds; and d) reporting.

Green Municipal Bonds:

A green bond is a municipal bond specifically earmarked to be used for climate and environmental projects or activities that are aligned with a set of defined green criteria. They are similar to the other bonds; however, the only difference is that they adhere to the issuance of environmental or sustainable projects. Climate bonds are a sub-component of the green bonds and are issued for projects with a mitigation/adaptation impact. An issuer of green bonds typically needs to fulfil a certain credit rating standard and adhere to national green bond issuance regulations.

Although green bonds issuance may have additional transaction costs for issuers (i.e., for tracking, monitoring, and reporting the use of proceeds), the benefits of green bonds can offset such costs. These benefits include highlighting their green assets/business, good marketing, and diversifying their investor base as they can attract responsible investment specialist investors. Investors have huge demands for green bonds as they can fund green projects without taking any additional risks while simultaneously knowing the exact sustainable impacts of their investments. While the funds raised in India through green bonds have been limited, recently the first municipal green bond issue was successfully completed by Ghaziabad Municipal Corporation.

Impact Funds:

An impact fund is defined as a fund that aims to implement investments that generate a measurable, beneficial social and/or environmental impact in addition to a financial return (Leanza and Carbonaro, 2018). Investors and asset owners of impact funds range from corporations, governments, retail investors, foundations, to high-net-worth individual families. Players such as investment advisors, fund managers, banks, development finance institutions, venture funds, etc. manage the asset while the investment recipients include corporations, small-to-medium businesses, cooperatives, microfinance institutions and social enterprises (B Lab, 2016).

India is fast becoming a major destination for impact investments. Between 2010 and 2016, India attracted over USD 5.2 billion from over 50 impact investors. Between 2014 and 2016, 40% of these investments were used to fund clean projects such as wind, solar and small hydropower generation (McKinsey, 2017). The impact investment paradigm in India is led by names such as Aavishkaar group, Omidyar network, Elevar Equity, Unitus ventures, Acumen and so on (ORF, 2020).

Private Sector led Voluntary Carbon Markets:

With more and more private sector companies committing to net zero/ carbon negative, the demand for carbon credits in the voluntary carbon market has seen a sharp increase. This can be seen as an opportunity for Indian cities to raise additional financing through voluntary carbon markets by registering their low carbon and climate resilient infrastructure projects in globally recognized registries and obtaining carbon credits. These credits can then be sold in the voluntary carbon markets to private sector companies.

Table 10 shows an overview of the different sustainable finance instruments discussed above.

Table 10: Overview of some sustainable finance instruments

Instrument	Green Loans	Green Bonds	Impact Funds	Voluntary Carbon Markets
Entity	Private sector banks, NBFCs	Through Debt Capital Markets	Impact Fund	
Instrument Type	Loans (at commercial rates)	Bonds	Equity/ Concessional Loans	Carbon Finance (Others)
Sectors/ projects	Renewable energy, environmental education, low carbon transport, waste to energy	As stated above	Clean energy, energy efficiency, waste to energy, e-mobility	As stated above

Table 10: Overview of some sustainable finance instruments

Instrument	Green Loans	Green Bonds	Impact Funds	Voluntary Carbon Markets
Climate smart activity	Mostly mitigation activities - with cash flow attached	Mostly mitigation activities - with cash flow attached	Mostly mitigation activities - with cash flow attached	Mitigation and adaptation activities
Eligibility	Minimum credit rating, cash flows, sinking fund, project qualifying under bank's green lending terms	SEBI Requirements for issue of municipal bonds, SEBI (Issue and Listing of Debt Securities by Municipality) Regulations, 2015 Green Bond Principles and Climate Bond Standards	Company/ project with a social outcome attached	As per the methodologies and pre-conditions of standards
Process	Loan application to be made through Bank/ NBFC relationship manager	Project identification, draft instrument structure (with or without credit enhancements), instrument rating, appointment of merchant banker	Developers/ urban solution providers can directly apply	Project Identification, project idea note, registration, issuance
Project Size	Dependent on case to case basis	Dependent on case to case basis	Dependent on case to case basis	Dependent on case to case basis
City Access	Direct - support in form of guarantees may be required	Direct - support in form of guarantees may be required	Indirect - through solution provider/ developer	Direct - through sales of generated carbon credits
Cost of financing	10-15% (dependent on credit ratings) plus one-time 0.5% arrangement cost	8-13% plus 2-3% one-time arranger fees	-	-

Table 10: Overview of some sustainable finance instruments

Instrument	Green Loans	Green Bonds	Impact Funds	Voluntary Carbon Markets
Relevance to Urban Climate Finance	With easy accessibility and a consistent methodology to identify a loan as 'green', green loans help in fostering communication and awareness of sustainable finance among ULBs or SPVs, thereby helping in financing sustainable activities.	Green Bonds are stable and provide a low cost, long-term investment source, which is required in developing sustainable urban development projects; they also enable refinancing existing loans	Impact funds can become potential funding partners to the private sector developer/ solution providers of the city. While such funds do not directly invest in cities but through financing, the private sector in the development of low carbon infrastructure can play a key role in the urban sustainable finance landscape	Global private sector through voluntary carbon markets can provide much needed viability finance for cities to implement emerging low carbon technologies, nature-based solution and solutions with high social impact
Barriers	Lack of creditworthiness, no pipeline of bankable projects, and limited operational capacities of city officials	Lack of creditworthiness, no pipeline of bankable projects, Additional transaction cost, and limited operational capacities of city officials	Impact funds generally invest into the solution providers and social enterprises. Hence, finance cannot be directly accessed by cities	While there is an overall demand for carbon credits, the demand and pricing range varies significantly from project category, sectors and wider impact created by the project beyond emission reduction/ carbon removal, i.e. SDG benefits and impact of livelihood

4.3 Mapping Sustainable Finance for Project Stages

The above section maps the available public and private sources of urban sustainable finance along with the facilities providing technical assistance. Table 11 below summarises the above sources/ instruments/ facilities as per their applicability at different stages of project preparation and implementation.

Table 11: Sources of urban sustainable finance mapped through project stages

Project Stages		Potential Sources
Project preparation stage- (a) concept and prefeasibility (b) feasibility and structuring (c) procurement (stages covered under this report)		» Government Transfers (TA)
		» Municipal own source revenues
		» National development banks (grants/ TA)
		» Bilateral/ Multilateral development bank (grants/ TA)
		» Climate fund (grants/TA)
		» Multi-donor project preparation facilities » Philanthropic programs
Implementation Stage:	Construction and Implementation	» Government transfers, own revenue source (if possible) » Specialised financial institutions (loans, equity, guarantees, credit enhancements) » Bilateral/ Multilateral development banks (loans with sovereign guarantees) » Climate fund (grants for adaptation projects, concessional loans- through Implementation entity) » Private finance (Loans, green bonds, impact funds, PPP)
	Operations & Maintenance/ Debt Service	» Own revenue source/ assigned revenues
	Refurbishment / Renewal	» Specialised financial institutions (refinancing) » Private finance » Municipal own sources

5. Application of Tools to Case Study

This section uses a live case study where the frameworks discussed at different stages of project preparation are applied to the city of Rajkot in India.

Case Study: Setting up a Captive Solar Plant to Power Institutional Consumption of Rajkot Municipal Corporation

How different project preparation tools and frameworks were applied by Rajkot towards designing a ‘bankable’ sustainable infrastructure project?

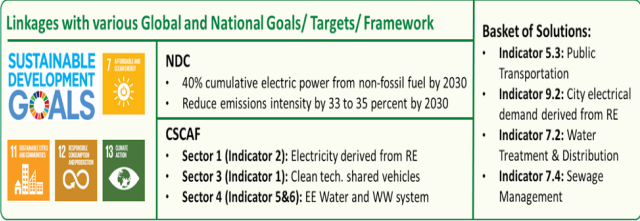
Background: The city of Rajkot based has identified its own energy consumption as a major contributor to GHG emissions (Climate Resilient City Action Plan, 2019). The city has set a goal to reduce its GHG emissions by 14% over 2015 levels and is evaluating multiple sustainable urban solutions to not only reduce its emissions but also optimise the cost. One of the proposed ideas identified through stakeholders’ workshop was the development of captive solar projects to replace institutional energy consumption. The case study below showcases how the city applied various project preparation frameworks outlined in this guidance document towards successfully designing a bankable project- at the same time building capacities of city officials in the project preparation.

Stage I: Project Concept and Pre-feasibility Stage

A. Project Idea Note:

1	Title of proposed project	Setting up captive solar plant to replace existing institutional grid energy consumption
2	Sector	Renewable Energy
3	Type of project	Project identified under City Climate Action Plan
4	Rationale	<p>Baseline Situation: The annual institutional electricity consumption of Rajkot Municipal Corporation is around ~60 mil units supplied by the DISCOM through a grid which is mostly powered by thermal energy, significantly contributing to GHG emissions. Additionally, the city incurs significant expenditure towards electricity consumption.</p> <p>Envisaged Situation: Transitioning the consumption of the city by setting up captive solar plants financed through future energy savings.</p>



5	SDG Benefits	
6	Alignment to Nationally Determined Contribution	
7	Climate Smart City Assessment Framework (CSCAF)	
8	Alignment to city strategic plans	The project is in-line with GHG emission reduction target approved by the city board under climate resilient city action plan 2019.
9	Nature and extent of technical expertise required for project preparation	External consultant may be required for preparation of Detailed Project Report (DPR) and procurement process
10	Climate change mitigation potential (how project can reduce GHG emissions)	Total annual electricity consumption of Rajkot is 50 million units, translating to ~ 55,080 tCO ₂ e GHG emissions per year, i.e. 2.7% of city emissions. By replacing a portion of electricity consumption to solar, the project would reduce GHG emissions.
11	Climate change adaptation potential (Does project have direct adaptation benefits and how project impacts long-term resilience of the infrastructure?)	The project would help in building long term resilience of the city municipal services by reducing dependency on conventional fuel-based electricity.
12	Time Period of implementation	6-8 months
13	Sustainability/ scale up potential	The project can be implemented in phases and can be scaled up to replace marginal electricity consumption of Rajkot Municipal Corporation (RMC) in future.
14	Mode of implementation (including external stakeholder engagement)	The project can be implemented by the city's climate budget.
15	Leveraging Government Schemes/ financial model/ availability of budget for implementation with city	The project would support the target of Government of India towards development of 500 GW of renewable Energy capacity by 2030 and State RE Policy.

B. Screening assessment:

Sector	Renewable Energy
Project	Development of captive solar plant for Rajkot Municipal Corporation
1. Willingness of the City	Yes- the project idea was primarily discussed in the city's budget committee meeting
2. Economic Driver of the City	NA
3. Alignment with the strategic objectives	Towards achievement of target set under City's Climate Resilient City Action Plan
4. Priority of the State	State: Renewable energy targets
5. Leveraging Government Schemes	Yes- State renewable energy policy has conducive incentives
6. Climate Mitigation potential	Yes, Climate mitigation project, reduced thermal energy emissions (+++); Operations of the Rajkot Municipal Corporation emitted 55,080 tCO ₂ e, contributing to 2.7% of the city's total GHG emission. This project would reduce 0.97 million tCO ₂ e (to be confirmed at later stage) to be mitigated on average annually, through shifting to solar for captive consumption
7. Climate Adaptation potential	NA
8. SDG Impact	Goal 7- Affordable & Clean Energy Goal 11- Sustainable Cities & Communities
9. Maturity of Technology & Similar Projects- associated risk	Low /Mature- Similar projects being implemented across India
10. Nature and Extent of Technical Expertise Required	Feasibility Report developed during Phase 1, project structuring and financing support to be provided by an external project team.
11. Potential amount leveraged by City*	INR 50 Cr. (Project Cost to be financed by envisaged Savings)
12. Revenue Model	Savings in electricity expenditure of RMC
Priority (1-3) (1 being highest)- based on screening workshop qualitative assessment on above parameters	1

C. Strategic business case for the project

Objectives	<p>Why is the city undertaking the project?</p> <ul style="list-style-type: none"> » Reduce the GHG emissions on account of institutional consumption of power by Rajkot municipal corporation from grid (mostly powered by coal) » Effectiveness: Provide an effective long term solution to city municipal corporation energy demands » Efficiency and Economy: Optimise the per kWh cost incurred towards own energy consumptions, so that resources can be diverted to expand service provision for citizens. 												
Existing arrangements	<p>How is service currently delivered to citizens?</p> <ul style="list-style-type: none"> » Power supplied by local distribution company through grid against a tariff prescribed by energy regulator 												
City's future Needs	<p>Problems associated with and opportunities arising from the current arrangements</p> <ul style="list-style-type: none"> » GHG emissions from the grid powered energy consumption and the increasing expenditure associated with the prices » With increase in population and areas under RMC it is estimated that there would be a YoY increase of 6% in institutional energy consumption-also city is transitioning the public transport towards e-buses which would significantly increase the energy demand » There is a need for an effective and self-sustainable solution to meet energy demand of corporation at most optimised cost 												
Project Scope	<p>A self-sustainable solution towards meeting the energy demand for the city:</p> <table border="1" data-bbox="448 1272 1361 1633"> <thead> <tr> <th>Range</th> <th>Core</th> <th>Desirable</th> <th>Optional</th> </tr> </thead> <tbody> <tr> <td>Scope</td> <td>Powering municipal building with rooftop solar</td> <td>Replacing the day time institutional energy consumption of RMC</td> <td>100% RE for institutional energy consumption of RMC</td> </tr> <tr> <td>Service Requirements</td> <td>Cost efficient RE solution on net metering basis</td> <td>Cost efficient RE solution to supply reliable energy to municipal services-feeding to RMC</td> <td>Cost efficient RE solutions along with banking/battery storage</td> </tr> </tbody> </table>	Range	Core	Desirable	Optional	Scope	Powering municipal building with rooftop solar	Replacing the day time institutional energy consumption of RMC	100% RE for institutional energy consumption of RMC	Service Requirements	Cost efficient RE solution on net metering basis	Cost efficient RE solution to supply reliable energy to municipal services-feeding to RMC	Cost efficient RE solutions along with banking/battery storage
Range	Core	Desirable	Optional										
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Service Requirements	Cost efficient RE solution on net metering basis	Cost efficient RE solution to supply reliable energy to municipal services-feeding to RMC	Cost efficient RE solutions along with banking/battery storage										

Project Benefits (Anticipated benefits as a result)	Benefit Classification		Particulars
	Direct benefits	economic	Savings in expenditure towards electricity consumption by Rajkot Municipal Corporation
	Indirect benefits	economic	Emission reduction (ER) can be monetised in form of carbon credits- can be sold in voluntary carbon markets Economic benefits in terms of health of citizen (per unit health cost of thermal power is too high)
	Quantifiable benefits		Carbon sequestration - reduction in GHG emissions; Climate Smart Cities Assessment Framework (CSCAF) Citizen satisfaction Improved health and social outcomes - impact of thermal power on health
	Qualitative benefits		Reputation of the city towards RE 100
Project Risks	The initial risk assessment for the project:		
	Identified Risks		Mitigation Strategy
	Business Risk	Willingness of the city's leadership and other stakeholder	Taking the city's leadership on board since project inception- involving DISCOM at appropriate stage
	Service Risk	Risks associated related to plant quality and output	To be transferred to private sector with defined service level arrangements and guaranteed plant output
	External Risk	Risk associated with increase in project cost due to dumping duties Risk associated with change in State RE policies Risk associated with extreme climate events	Appropriate cushion in the project contingency for increase in capital and regulatory charges Design of the plant should consider resilience to such events

Project Constraints	At present the Gujarat RE policy stipulates that the power generated through solar should be consumed between 0700 to 1800 hrs or else would be sold to DISCOM at a fixed rate. Given the policy provision (constraint) only day time consumption alternative is considered.
Project Dependencies	The project would be dependent on the grid infrastructure for power evacuation any impact on grid infrastructure or change in open access role can have direct impact on the project.

D. Solution Identification

Project	Business as usual	Do Minimum	Preferred way forward	Do Maximum
Service Scope	1.0 Continue grid based power	1.1 Rooftop solar for buildings	1.2 Cover day time HT consumption of municipal services	1.3 Cover entire power consumption of city
Service Solution	2.0 power supplied by distribution company	2.1 Rooftop solar under scheme of DISCOM	2.2 Ground mounted captive solar plant	2.3 Mix of wind plus solar OR solar plus battery storage
Service Delivery	3.0 Current Arrangement with distribution co	3.1 Private contractor empanelled by DISCOM	3.2 RESCO or CAPEX model based on economic appraisal	3.3 Design, build, finance and operations by international contractor
Implementation		4.1 Immediate	4.2 In two phases	4.3 In three phases
Funding		5.1 Public funding	5.2 Mixed public and private funding	5.3 Private funding

The preferred way forward was identified based on the project requirements and constraints to develop a captive solar plant in two phases (a) 4 mw plant (b) 6 mw plant to power daytime HT consumption of municipal water and electric buses of Rajkot Municipal Corporation.

Stage II: Project Feasibility and Structuring				
A. Economic appraisal				
Preferred Option	Public Sector Funding		Private Sector Funding	
	Undiscounted (In Cr.)	Discounted (In Cr.)	Undiscounted (In Cr.)	Discounted (In Cr.)
Cost in appraisal of public value				
1. Direct cost to city				
1.1 Capital (Lifecycle cost of equipment - including dumping costs and robust civil infrastructure considering extreme climate events- INR 4.7 Cr per mw +10% dumping cost)	₹20.68	₹20.68	₹22.18	22.18
1.2 Revenues (O&M cost - preventive maintenance, staff salaries & repairs, transmission and distribution and insurance costs)	₹51.95	₹18.22	81.13	30.97
2. Indirect public cost				
2.1 Capital				
2.2 Revenues				
3. Wider Social Costs				
2.1 Capital				
2.2 Revenues				
4. Total Risk Costs				
4.1 Estimate risk costs (Considering service risk and climate risk and other contingencies- based on single probability analysis 8% of risk premium over project cost)	₹1.65	₹1.65	₹1.77	₹1.77
5. Total costs (1+2+3+4)	₹74.28	₹40.55	₹105.09	₹54.92
Benefits in appraisal of public value				

6. Direct Benefits to City				
6.1 Monetizable Benefits	₹94.75	₹40.39	₹77.70	₹33.12
(savings in electricity expenditure)				
6.2 Non monetizable Benefits				
7. Indirect public benefits				
7.1 Monetizable Benefits	₹1.65	₹1.07	₹1.65	₹1.07
(Carbon credits- emission reduction based on current grid factor- 6200 tCO ₂ e/year for 10 years @ EUR 2.5- 4)				
7.2 Non monetizable Benefits				
8. Total Wider social benefits				
8.1 Monetizable Benefits	₹35.40	₹12.80	₹35.40	₹12.80
(Externality cost of coal powered power on environment and public health)- INR 1.40/ unit- Base year and 2% thereon				
Source: World development perspectives, 2021				
8.2 Non monetizable Benefits	3- SDG Impact			
9. Total Value of benefits (6+7+8)	₹131.80	₹54.26	₹114.75	₹46.99
Net Public Value/ Net Present Social Value (9-5)	₹57.52	₹13.71	₹9.66	-₹7.93
Benefit cost ratio (9/5)	1.77	1.34	1.09	0.86
Based on economic appraisal setting up a captive solar plant through public funding would be a Value for money alternative for Rajkot Municipal Corporation (given additional regulatory charges on third party and well-established technology) accruing the most benefits to the public sector.				

B. Procurement Strategy

Procurement Strategy	<ul style="list-style-type: none"> » Identify procurement strategy as per VFM assessment: » Funding: Public sector based on economic appraisal » Technical Design by external consultant (best suited-external expertise) » Construction: Engineering Procurement Construction (EPC) » Operations: SLA based operations contract » Procurement type: National Contractor (given the sector is well established)
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Project activities, service stream plan and payment mechanism	Activity	Output	Service level arrangement	Timeline	Payment Mechanism
	Technical design	BOQ and technical design	On submission of technical design	3 months	Fixed on output
	Construction	Setting up the plant as per design	Design, drawing and inspection by independent engineer	6 months	Fixed cost for equipment Final payment based on quality of civil work as per design
Operations	Energy output of the plant	Minimum assured energy output monitored through dashboard	Quarterly monitored	Performance Payment as per guaranteed output	

Risk allocation matrix	Risk Type	Public	Private	Shared
	Design Risk	✓		
	Construction Risk			✓
	Implementation Risk	✓		
	Performance or availability Risk		✓	
	Revenue Risk		✓	
	Termination Risk			✓
	Technology obsolescence risk	✓		
	Financing Risk	✓		
	Policy Risk	✓		
	Residual value risk	✓		
Contractual Framework	Standard contract adapted with the inputs from technical consultants, including climate resilient considerations.			

C. Financial appraisal

Financial Appraisal Output:

The pro forma cash flows for the project were calculated for the project period of 25 years. In order to compute the cash flow, the baseline expenditure of the RMC for consumption of the power from DISCOM was estimated. The table below shows the key assumptions to estimate the electricity expenditure of Rajkot in no project scenario:

Sl. No	Particulars	Unit	Value	Source
a	Average electricity price (adjusted to demand charge)	INR/ Unit	6.30	Electricity bills of RMC
b	Annual increase in electricity charges	%	0.67% to max 3% over 25 years	Electricity tariff trends
c	Electricity expenditure of RMC (1st year) (under no project scenario)	INR Cr.	4.48	Annual output (6.9 mil units)* average electricity price (a) or (a)*(1+B) (second year onwards)

Funding: The cash flows from the project were computed for two scenarios: (a) 100% funding from RMC and (b) 30% funding from RMC & 70% debt @11.5% (alternate).

Cash flows from the project = (electricity expenditure of RMC in no project scenario) - (total operating expenditure of the project/ + interest cost of debt (alternate scenario))

Below table shows the proforma cash flow for both scenarios and payback period assessment:							
#	Electricity Expenditure in NO Project Scenario	Operating Expenditure	Scenario 1-70% Debt			Scenario 2-100% RMC Budget	
			Interest Cost	Cash Flows to Project	Cumulative Cash flows	Cash Flows to project- 100% RMC Equity	Cumulative Cash flows
0				-20.09	-20.09	-19.95*	-19.95
1	4.48	1.27	1.32	1.88	-18.21	3.20	-16.75
2	4.52	1.25	1.18	2.09	-16.12	3.27	-13.47
3	4.63	1.31	1.03	2.28	-13.84	3.31	-10.16
4	4.74	1.39	0.89	2.47	-11.37	3.35	-6.81
5	4.85	1.46	0.72	2.67	-8.70	3.39	-3.42
6	4.97	1.56	0.54	2.87	-5.83	3.41	-0.01
7	5.09	1.65	0.36	3.08	-2.75	3.44	3.43
8	5.21	1.74	0.20	3.27	0.52	3.47	6.90
9	5.33	1.84	0.05	3.44	3.96	3.49	10.39
10	5.46	1.95	0.00	3.52	7.47	3.52	13.91
11	5.59	2.05	0.00	3.54	11.02	3.54	17.45
12	5.60	2.17	0.00	3.43	14.45	3.43	20.88
13	5.74	2.30	0.00	3.44	17.89	3.44	24.32
14	5.88	2.43	0.00	3.44	21.33	3.44	27.76
15	6.02	2.58	0.00	3.44	24.77	3.44	31.20
16	6.17	2.73	0.00	3.43	28.21	3.43	34.64
17	6.32	2.90	0.00	3.42	31.62	3.42	38.05
18	6.47	3.08	0.00	3.40	35.02	3.40	41.45
19	6.63	3.26	0.00	3.37	38.39	3.37	44.82
20	6.79	3.31	0.00	3.48	41.87	3.48	48.30
21	6.95	3.35	0.00	3.60	45.47	3.60	51.91
22	7.12	3.40	0.00	3.73	49.20	3.73	55.63
23	7.29	3.45	0.00	3.85	53.05	3.85	59.48
24	7.47	3.50	0.00	3.97	57.02	3.97	63.45
25	7.65	3.55	0.00	4.10	61.12	4.10	67.55
A	Payback period	In years		7.15		6.00	
B	IRR			13%		17%	
<i>*included additional cost of raising financ</i>							
Status: The project budget has been approved by Rajkot Municipal Corporation and the procurement is in process.							

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Annex I

List of Cities Covered through the Capacity Needs Assessment Survey

S. No.	Name of the City (ULB)	Population (Census 2011)	Municipal Expenditure (2020-21) Rs. Crore	City Profile
1.	Agra	22,62,000	592	Agra is a tourist destination with 6 Tehsils and 15 Blocks and the only Indian city with 3 UNESCO heritage sites. Moreover, about 40% of its total economy depend on industry (Directly or Indirectly).
2.	Shimla	1,69,578	224	Shimla is a hill stations located in the northern side of the sub-continent and is the capital city for the state of Himachal Pradesh. Apart from serving as a tourist destination, it also serves as an important administrative and educational centre in the region.
3.	Pune	31,15,431	1,265	Pune is the second-largest city in the state of Maharashtra after Mumbai, and is an important city in terms of its economic and industrial growth. It is also an educational epicentre, winning itself the title of "The Oxford of the East".
4.	Thane	18,18,872	935	A metropolitan city, Thane is one of the few industrially advanced cities in the state of Maharashtra and is ranked 3rd in that domain. According to census 2011, it is also the third most populous district in the state and 15th most populous in India.
5.	Kanpur Nagar	2,765,348	693	Kanpur is a metropolitan city, administratively divided into 6 zones and 110 wards. It is the biggest city of the State of Uttar Pradesh and is the main centre of commercial and industrial activities.

S. No.	Name of the City (ULB)	Population (Census 2011)	Municipal Expenditure (2020-21) Rs. Crore	City Profile
6.	Patna	37,41,652	1,499	Patna is the capital city of the state of Bihar in India and is ranked amongst the fastest developing cities in the country. Having a rich cultural and historical heritage, it is also the principal administrative, industrial and educational centre of Bihar.
7.	Bhopal	1,798,218	1,083	Bhopal is the capital of the Indian state of Madhya Pradesh and the administrative headquarters of Bhopal district and Bhopal division. Known as the City of Lakes for its various natural as well as artificial lakes, it is also considered as one of the greenest cities in India.
8.	Panaji	40,017	582	Panaji is the famous capital city of Goa and the control centre for the Northern district of the state. It also serves as the administrative as well as tourism capital for the western state of Goa.
9.	Dehradun	5,69,578	324	Nested in the mountain ranges of the Himalaya, Dehradun is one of the oldest cities of India and the provisional capital of the state of Uttarakhand. The most populous city of the state, it is also an educational, administrative and tourist hub of the region.
10.	Ghaziabad	17,29,000	425	A growing satellite town, Ghaziabad is known as the educational and industrial hub of North India. With 5 zones and 100 wards it falls under the National Capital Region (NCR) in the state of Uttar Pradesh.
11.	Udaipur	4,51,100	97	Udaipur is known as the City of Lakes and is a popular tourism site due to its Rajput palaces, and scenic nature. It is also known for its handicrafts and rich mineral sector. Situated in the state of Rajasthan, it is divided into 55 wards and is the 6th largest city among cities having more than 1 lakh population in the state.

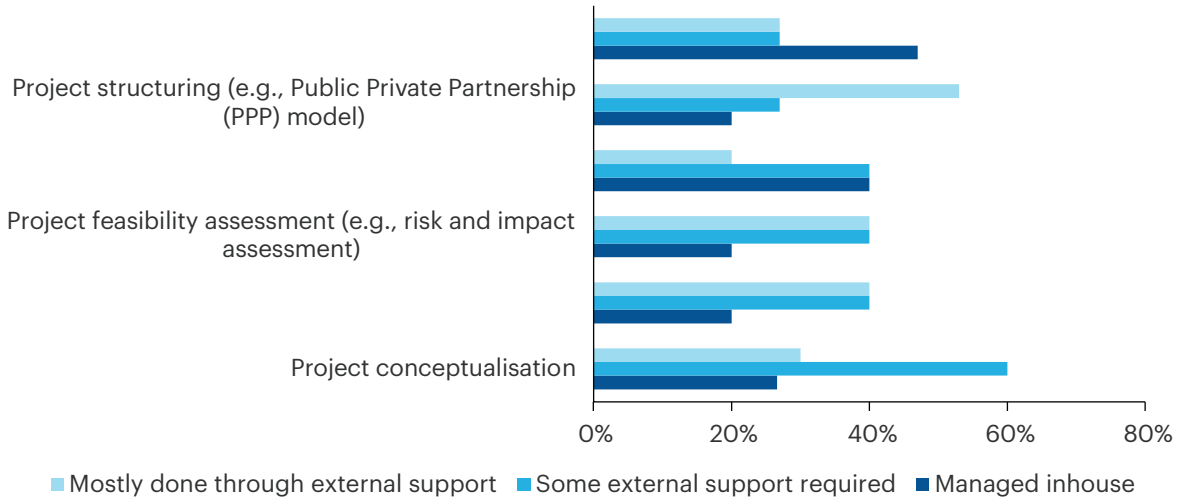
S. No.	Name of the City (ULB)	Population (Census 2011)	Municipal Expenditure (2020-21) Rs. Crore	City Profile
12.	Indore	19,94,397	1,756	Indore is the largest city in the state of Madhya Pradesh. The city is a hub of industrial, technological and educational activities and therefore regarded as the commercial capital of the state. It has a diverse economic portfolio, majorly supported by pharmaceutical companies, food processing sector, IT, textile textiles and machinery industry.
13.	Kochi	6,02,046	874	Kochi is the largest urban agglomeration of Kerala and 2nd largest in the western coast. Apart from being an IT Hub and an industrial capital, the city is also famous for its tourist destinations.
14.	Chandigarh	10,55,450	445	The first planned city of the post independent India, Chandigarh as Union Territory serves as a joint capital for the state of Punjab and Haryana. Designed by the famous French architect Le Corbusier, the city functions as an administrative as well as IT hub.
15.	Srinagar	12,36,829	-	Srinagar is the largest city and the summer capital of the Union Territory of Jammu and Kashmir. It is a world famous tourist attraction with its economy largely dependent on Tourism and trade,

Annex II

Capacity Needs Assessment - Survey Results

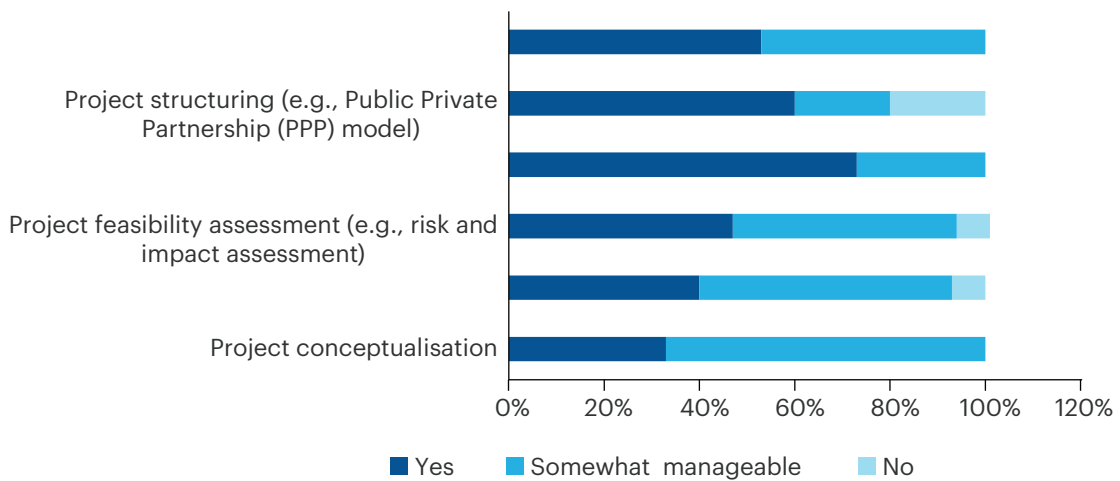
How are different stages of sustainable urban development project preparation and implementation managed by the ULB staff?

How are different stages of sustainable urban development project preparation and implementation managed by the ULB staff (N=15)?



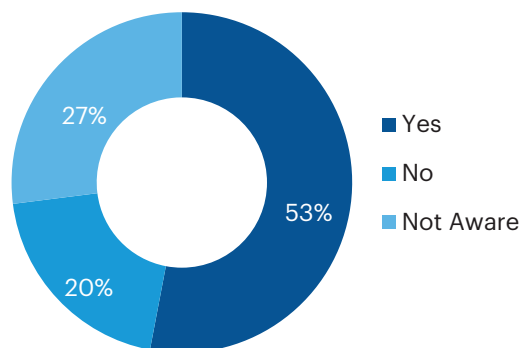
Do you have sufficient time to execute each of the following categories of sustainable urban project preparation and implementation?

Do you have sufficient time to execute each of the following categories of sustainable urban project preparation and implementation (N=15)?



Has the ULB implemented/is in the process of implementing a global sustainable urban project in the smart city?

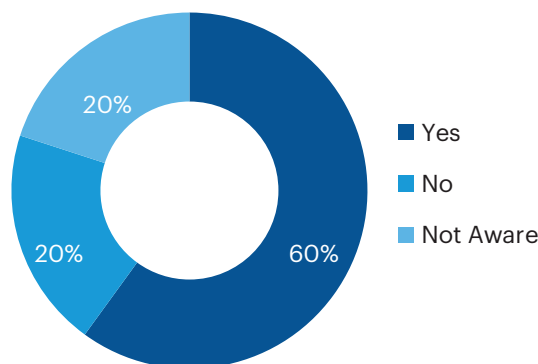
Has the ULB implemented/is in the process of implementing a global sustainable urban project in the smart city (N=15)?



SNo.	Smart City	Examples of global sustainable urban projects as per CNA
1.	Pune	Adaptive Traffic Management System
2.	Thane	Station Area Traffic Improvement Scheme; New Sub-Urban Station; Pedestrian Improvements (Soft Mobility)
3.	Kanpur Nagar	Solid waste management plant
4.	Indore	Smart roads
5.	Kochi	Sustainable Urban Transport (SUT); Sustainable Urban Development - Smart Cities (By GIZ); Ecologistics; Cities4forests; Tumi; Interact-Bio; Climate Smart Cities
6.	Patna	E-bus pilot of 20 buses in city; 6 Smart School pilot for education for all; Roof top solar farming on different govt. buildings for energy of optimization; Smart solid waste management
7.	Agra	Projects under CITIIS
8.	Chandigarh	Integrated Command Control Centres (ICCC); Public bike sharing project
9.	Srinagar	Srinagar riverfront development project

Are there any established Monitoring and Evaluation (M&E) procedures at different stages of the implementation of sustainable urban development projects?

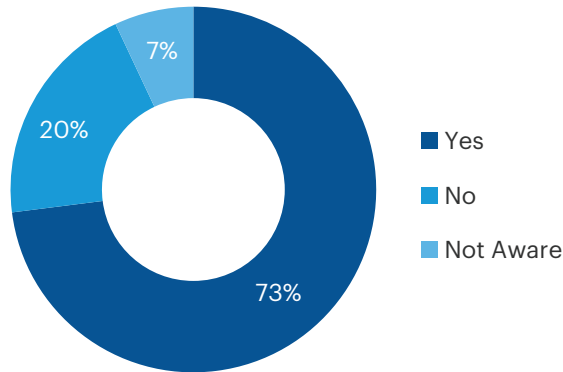
Are there any established Monitoring and Evaluation (M&E) procedures at different stages of the implementation of sustainable urban development projects (N=15)?



SNo.	Smart City	M&E Procedures as per CNA
1.	Thane	Monthly/Bi-weekly Progress review meetings are held under the chairmanship of Municipal Commissioner and Chief Executive Officer to monitor the progress of projects and necessary measures are taken to resolve the issues.
2.	Bhopal	M&E on milestone and SLA basis
3.	Indore	Projects are monitored regularly on a weekly basis through review meetings and MIS
4.	Dehradun	M&E is part of procurement
5.	Kochi	Project specific steering committees are formed to monitor the progress of the projects
6.	Chandigarh	External technical committee and internal technical committee for M&E
7.	Srinagar	Weekly meetings/ updates and reviews; Monthly high-level meeting; Regular site visits.

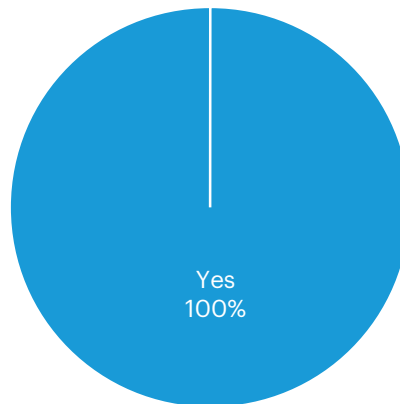
Does the ULB have a practice of implementing a pilot sustainable urban development project before scaling it up to the city level?

Does the ULB have a practice of implementing a pilot sustainable urban development project before scaling it up to the city level (N=15)?



Is there interest within the ULB to pilot global sustainable solutions, adapt best practices, and utilize innovative approaches to address the smart city's urban challenges?

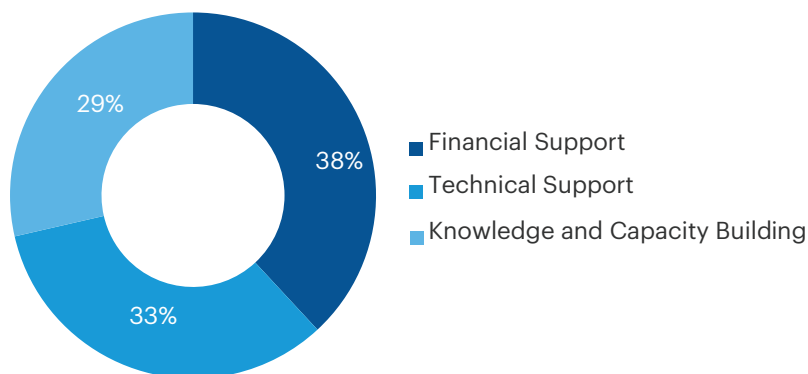
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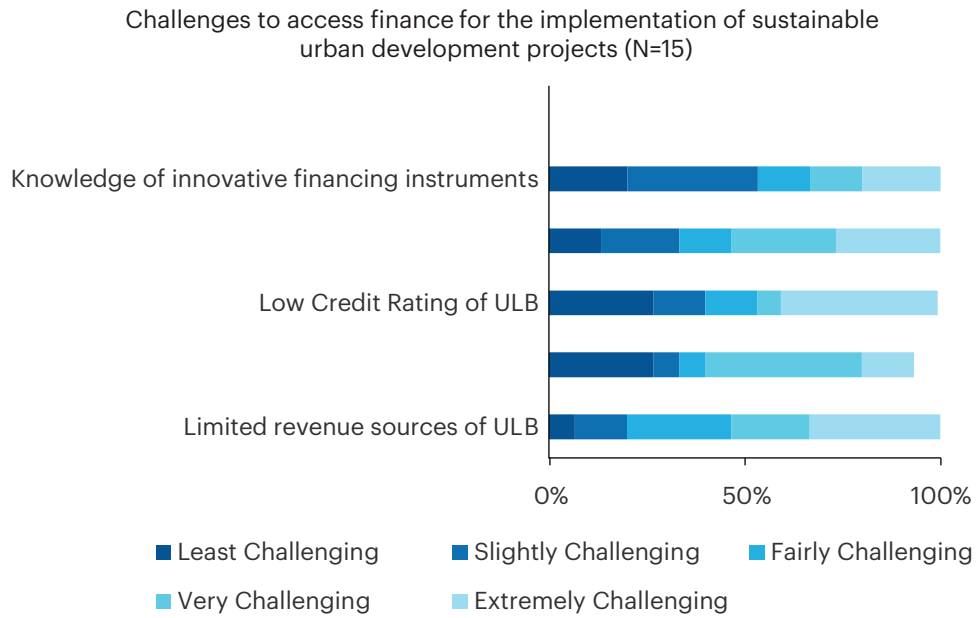
SNo.	Smart City	Key focus areas under which sustainable urban solutions can be piloted in the city
1.	Agra	Solid waste management, Mobility
2.	Shimla	Mobility
3.	Pune	Mobility, Technology
4.	Thane	Energy Optimization, Mobility, Artificial Intelligence, Internet of Things, Robotics, Block Chain and other sustainable IT based solutions, Flood Management System, SCADA system for sewerage works etc.
5.	Kanpur Nagar	Air Quality Index, Mobility, Solid waste management.
6.	Patna	Mobility, Education for all, Solar energy, Solid waste management
7.	Bhopal	Mobility, Environment, Employment Generation, Energy Conservation, IT Enablement
8.	Dehradun	Mobility, Education, Heritage culture, Environment, Tourism
9.	Kochi	Mobility, Urban development, Biodiversity, Waste management, Energy optimization, Flood management
10.	Panaji	Mobility, Flood management, Water body rejuvenation
11.	Chandigarh	Waste Management, Mobility
12.	Srinagar	Urban Mobility, Revival of Old City, Flood Management

What support would the ULB require to pilot global sustainable solutions? Please indicate your inputs and suggestions.

What support would the ULB require to pilot global sustainable solutions? Please indicate your inputs and suggestions.



Please rate the following challenges to access finance for the implementation of sustainable urban development projects.



If there are any other challenges faced by the ULB, please mention:

Interdepartmental coordination, Technical expertise and exposure, Lack of capacity building

Annex III

Capacity Needs Assessment - Survey Design

Title of Survey – Capacity Needs Assessment for Implementing Global Sustainable Solutions in Smart Cities

Profile of Respondent

- » Name:
- » Contact Details:
- » City:
- » Name of ULB:
- » Department in ULB:
- » Designation:

Organisational Structure and Capacity Needs Assessment of ULB

1. a) Is there a designated department/team/committee within the ULB responsible for implementing strategies/action plans for sustainable urban development projects?
(Yes/No/Not Aware)
b) If yes, please state its composition under the following categories:
 - Total members:
 - Technical staff (urban planners, engineers, etc.):
(Numerical Ranges; 0-50, 50-100, 100-500, 500+)
2. Is there a project identification and prioritisation process followed by the ULB for sustainable urban development projects?
(Yes/No/Not Aware)
3. a) Which division/official of the ULB staff handles the following categories of sustainable urban development project preparation and implementation:
 - » Project conceptualisation:
 - » Understanding of the 'sustainability' of the project (e.g., socio-economic benefits):
 - » Project feasibility assessment (e.g., risk and impact assessment):
 - » Project procurement (e.g., tender and contract management):
 - » Project structuring (e.g., Public Private Partnership (PPP) model):
 - » Project financing (e.g., raising finance from external sources):
(Short answer)

b) How are different stages of sustainable urban development project preparation and implementation managed by the ULB staff?

(MCQ)

Category	Managed inhouse	Some external support required	Mostly done through external support
Project conceptualisation			
Understanding of the 'sustainability' of the project (e.g., socio-economic benefits)			
Project feasibility assessment			
Project procurement			
Project structuring (e.g., Public Private Partnership (PPP) model)			
Project financing (e.g., raising finance from external sources)			

c) Do you have sufficient time to execute each of the following categories of sustainable urban project preparation and implementation?

- » Project conceptualisation:
- » Understanding of the 'sustainability' of the project (e.g., socio-economic benefits):
- » Project feasibility assessment (e.g., risk and impact assessment):
- » Project procurement (e.g., tender and contract management):
- » Project structuring (e.g., Public Private Partnership (PPP) model):
- » Project financing (e.g., raising finance from external sources):

(Yes/No/Somewhat manageable)

Category	Planning and Design	Execution	Decision-making	None
Other sectors/departments within the smart city				
External stakeholders (private organizations, research institutions, funding agencies, etc.)				
International organizations				
Citizens and civil society organizations				

4. In what stages of the sustainable urban development project implementation are the following stakeholders involved with the ULB?
(MCQ)
5. a) Has the ULB implemented/is in the process of implementing a global sustainable urban project in the smart city?
(Yes/No/Not Aware)
b) If yes, please name the projects:
(Short answer)
6. a) Are there any established Monitoring and Evaluation (M&E) procedures at different stages of the implementation of sustainable urban development projects?
(Yes/No/Not Aware)
b) If yes, please elaborate on the procedures:
(Short answer)
7. a) Is the ULB aware of any global sustainable projects implemented in the smart city by other organizations/departments?
(Yes/No/Not Aware)
b) If yes, please specify the project or the organizations:
(Short answer)
8. Does the ULB have a practice of implementing a pilot sustainable urban development project before scaling it up to the city level?
(Yes/No/Not Aware)
9. a) Is there interest within the ULB to pilot global sustainable solutions, adapt best practices, and utilize innovative approaches to address the smart city's urban challenges?
(Yes/No)

b) If yes, please highlight the key focus areas under which sustainable urban solutions can be piloted in the city (e.g., mobility, flood management, energy optimization, etc.)?

(Short answer)

10. What support would the ULB require to pilot global sustainable solutions? Please indicate your inputs and suggestions.

(Short answer)

11. Is there any availability of budgets/funds specifically allocated by the ULB (e.g., climate budget) for the pilot or implementation of sustainable urban development projects?

(Yes/No/Not Aware)

12. How would you rate the access by the ULB to the following funding sources for development and implementation of sustainable urban development projects? [Which sources have you already used?]

- » Commercial banks:
- » Municipal bonds:
- » International funding agencies:
- » Specialised financing agencies (e.g., IREDA, EESL, etc.):

(Likert Scale)

13. a) Please rate the following challenges to access finance for the implementation of sustainable urban development projects.

(Likert scale)

- » Limited revenue sources of ULB:
 - » Ability to structure bankable sustainable infrastructure projects:
 - » Low Credit Rating of ULB:
 - » Lack of upfront public capital:
 - » Knowledge of innovative financing instruments:
- b) If there are any other challenges faced by the ULB, please mention:

(Short answer)

14. What support would the ULB require to strengthen capacities of the ULB (e.g., technical, networking, financial, etc.)? Please indicate your inputs and suggestions.

(Short answer)

