सत्यमेव जयते

Ministry of Housing and Urban Affairs
Government of India

City Climate Action Plan

TRAINING MANUAL

Climate Centre for Cities

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Supported by:

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

based on a decision of the German Bundestag

ClimateSmart Cities Assessment Framework

Urban Planning, Green Cover & Biodiversity

सत्यमेव जयते

Ministry of Housing and Urban Affairs
Government of India

City Climate Action Plan

TRAINING MANUAL

ClimateSmart Cities Assessment Framework

Urban Planning, Green Cover & Biodiversity

Climate Centre for Cities

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Supported by:
Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
based on a decision of the German Bundestag

City climate action plan
Training module

Developed by:
Climate Centre for Cities, NIUA in association with Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)

Author
Himanshu Panwar

Editors
Raina Singh, Vaishnavi. T. G. Shankar and Amanjot Kaur

Copyright © NIUA December 2021

Contact information

Climate Centre for Cities
National Institute of Urban Affairs
1st Floor, Core 4B, India Habitat Centre,
Lodhi Road, New Delhi -110003, India
Telephone: (91-11) 24617517, 24617543, 24617595
Website: www.niua.org, www.niua.org/c-cube

Photo Credits: worldsbetweenlines ; Patrick Hendry

Executive Summary

On one hand, cities are a significant contributor of carbon emissions aggravating climate change and on the other, cities are considerably impacted by climate disasters. The recently released Global Climate Risk Index 2021 ranks India as the 7th most affected country from climate related extreme weather events (storms, floods, heatwaves etc.). Further, studies indicate that poor planning and urban management are expected to cost Indian cities somewhere between $2.6 and $13 billion annually.[1] Cities are increasingly at the forefront of addressing both urbanization and climate change and to strengthen climate-sensitive urban development, a holistic understanding of the urban development from a climate lens is crucial. The ClimateSmart Cities Assessment Framework (CSCAF) launched in 2019 by the Ministry of Housing and Urban Affairs (MoHUA), Government of India aimed to address this gap. This first-of-its-kind assessment with 28 progressive indicators across 5 thematic areas helps cities to benchmark their development, understand the gaps and further prioritize climate relevant development.

With a focus on building local capacities to develop and adopt climate measures, the Climate Centre for Cities (C-Cube) at the National Institute of Urban Affairs (NIUA) initiated a series of training aligned to the thematic areas of CSCAF - Energy and Green Buildings, Urban Planning, Green Cover & Biodiversity, Mobility and Air Quality, Water Management, Waste Management. The focus of the training is to provide a step-by-step approach of conducting studies, assessments and stakeholder consultations, establishing committees, developing action plans and implementing relevant measures that not only makes the cities climate resilient but also helps them progress across the assessment of CSCAF.

The intent of this module on City Climate Action Plan is to inform about the relevance of formulation and implementation of climate action plan for cities. This manual embodies information on national circumstances, national GHG inventory, mitigation actions, and an analysis of the constraints, gaps, and related finance, technology and capacity building needs, including information on domestic Measurement, Reporting and Verification (MRV). The module developed by the National Institute of Urban Affairs (NIUA) and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) along with the Ministry

[1] *Mani, M. et al., 2018. South Asia's Hotspots: The Impact of Temperature and Precipitation Changes on Living Standards, Washington D.C.: World Bank Group.*

of Housing and Urban Affairs (MoHUA), Government of India, and lay out the benefits of applying this framework to improve livelihoods and living conditions in Indian cities.

Climate action planning provides city governments and their partners with the key course, novel thoughts, instruments, and a local area of training to address environmental change while meeting other long-term goals such as socio-economic development and environmental protection. Such plans aim to help cities to reduce greenhouse gas emissions and adopt low emission development trajectories, as well as adapt to the impacts of climate change and build local climate resilience, while aligning to the local development goals and plans. The module explains the process of formulation and implementation of climate action plan for cities which would help urban local bodies and smart city SPVs. To undertake the data collection, analysis and implementation of different related aspects of climate action plan, an institutional setup needs to be created which is discussed in the module. This institutional setup is responsible for developing the action plan in a comprehensive manner covering all sectors, including waste management, integrated water management, mobility and air pollution, energy and green buildings; biodiversity, green cover, disaster risk preparedness and urban planning. The module explains about how to propose actions for both climate change mitigation and adaptation based on a GHG emissions inventory and a climate change vulnerability assessment respectively, addressing all sectors listed above. Regular monitoring, reporting and verification (MRV) of the plan is essential to qualify and quantify the measures implemented for achieving accountability, and improved impact.

For carrying out the training to local stakeholders, key concepts of GHG emissions inventory and climate change vulnerability assessment needs to be explained and how analyzing those, actions can be proposed which can be implemented into the development plan or sectoral plans. The outcome of the training should be such that local government can be able to formulate the governing team which would be responsible for formulation of the plan and raising awareness about ongoing- changes in weather events. The learning should be a manner that they are able to identify the potential threats in the city due to climate change and develop measure to increase the adaptive capacity to increase the threshold limits and decrease the exposure.

Who is the training manual designed for?

What is the focus of the training manual?

How to make use of this manual?

What are the Learning outcomes of the training?

Scope and limitations of the training

The manual is designed primarily for urban local bodies and smart city SPVs, followed by town planning department/ urban development agencies/ infrastructure development agencies or state line departments (such as PCB, PWD, transport deptt, etc.) and other district administration departments related to energy use, pollution, waste, food security, resilience in water sector and water security, public health, drainage and sanitation..

The functions of the module is to dissipate the basic knowledge on how to carry out the assessment, formulate and implement the climate action plan for the city.

The manual can be used to determine the various steps involved in the process of formulation and implementation of city climate action plan. It contains the key concepts for data collection and tools for assessment of the emissions and climate change vulnerability. The tables mentioned in the exercise can be used to roll out the training session and the case study could be used to seek as an example.

The trainees get to learn about the following aspects:

- The relevance and composition of the institutional cell and advisory stakeholder committee for city climate action plan..
- Aspects involved in the assessment of city climate action plan.
- Tool for GHG emission inventory and process for climate vulnerability assessment.
- Monitoring and evaluation system
- Training exercise with the stakeholders
- Best practices related to city climate action plan.

The modules doesn't drive into greater depth of aspect wise calculations for GHG emission inventory. Keeping in mind the duration of the training, the exercise has been limited to identifying the key issues, exposure levels and discussing the threat related to it qualitatively and not quantitatively.

Contents

List of Figures

List of Tables

Abbreviations

ULBs	Urban Local Bodies
BURs	Biennial update reports
CH4	Methane
CO	Carbon monoxide
CO2	Carbon dioxide
COP	Conference of the Parties
GCF	Green Climate Fund
GEF	Global Environmental Facility
GHG	Greenhouse gas
ICA	International consultation and analysis
IPCC	Intergovernmental Panel on Climate Change
LUCF	Land use change and forestry
MRV	Measurement, reporting and verification
N2O	Nitrous oxide
NAMAs	Nationally appropriate mitigation actions
NC	National communication
NMVOCs	Non-methane volatile organic compounds
Non-Annex I	Parties not included in Annex I to the Convention
NOx	Nitrogen oxides
UNFCCC	United Nations Framework Convention on Climate Change

1

Introduction

1.1. Background

It is now clear that cities are at the forefront of urgently needed global action on climate change. They are playing a critical role in global efforts to bring down greenhouse gas emissions, while also reducing the vulnerabilities of people and assets and adapting to the impacts of a changing climate. Included as one of the key indicators in the ClimateSMART Cities Assessment Framework, the Local Governments are encouraged to develop a 'Climate Action Plan' for their city. The local government needs to assess potential future climate risks that the city is likely to face, either through secondary studies or through a primary assessment conducted by local or national institutes. Local governments would need to identify future risks to the various urban systems in the city due to such future climate risks, and through stakeholder consultations develop an action plan that would address such risks in each of these urban systems.

Climate action planning provides city governments and their partners with the key course, novel thoughts, instruments, and a local area of training to address environmental change while meeting other long-term goals such as socio-economic development and environmental protection. Such plans aim to help cities to reduce greenhouse gas emissions and adopt low emission development trajectories, as well as adapt to the impacts of climate change and build local climate resilience, while aligning to the local development goals and plans.

Developing a 'Climate Action Plan' provides local governments with an opportunity to address both climate change adaptation challenges and mitigation potential simultaneously. The Climate action plan process is based on the premise that mainstreaming of climate action planning is key to developing a vision of a climate resilient city. The success of the plan lies in the implementation of prioritized actions, which would also ensure mainstreaming environmental sustainability in city development.


We are running out of time
Act now before it's too late
BUY
MORE
GAS

1.2. Existing scenarios and gaps

The IPCC six Assessment Report (IPCC, 2021) predicts India and other tropical countries to have increased impacts of climate change particularly increased flood damage to infrastructure, heat related human mortality and increased drought related food and water shortage. Particularly, it has projected heat waves and humid heat stress to be more intense and frequent in South Asia during the 21st Century. It also says that both annual and summer monsoon precipitation will increase during the 21st Century. Several Indian cities are in coastal areas or geographically vulnerable regions prone to natural hazards. And the urban poor that settle in environmentally vulnerable areas of cities with limited access to basic services are particularly vulnerable to impacts of climate change and natural hazards. On the service-level benchmarks in many Indian cities, there is still high gaps, particularly on storm water drains, where many cities have coverage only about 30-50 per cent while the Ministry of Urban Development benchmark recommends, 100 per cent coverage (CSE, 2019). The per capita urban green space recommended by the Ministry of Environment, Forest and Climate Change (MoEFCC) is 15 sq m per person, but it is much less in many cities (CSE, 2019).

Setting up climate adaptation and mitigation strategies at city level is crucial for India, given India's urbanisation prospects and towards achieving its international commitments on climate change such as Paris agreement and Sustainable Development Goals and national commitments of Nationally Determined Contribution (NDC). Targeting urban areas for climate mitigation will also be important to achieve the NDC Goal 3 on reducing emission intensity of GDP by 30-35 per cent from 2005 baseline by 2030. (CSE, 2019)

1.3. Definition: City climate action plan

City action planning can be defined as a process of developing a framework for identifying and implementing climate actions (mitigation as well as adaptation), which a city could undertake in conjunction with its developmental plans and policies to reduce its Greenhouse Gas (GHG) emissions and increase climate resilience. (ICLEI) A climate action plan builds on the information gathered from baseline GHG emission inventories and urban climate vulnerability assessments to identify priority actions that would help the city adapt to climate change impacts, while significantly reducing GHG emissions from city activities. This plan would also include implementation mechanisms that would ensure the financial viability of identified actions. This document summarises a city's vision for climate-resilient, low-carbon and environmentally sustainable development. This action plan would ideally inform other sectoral action plans with an aim to mainstream climate consideration into urban development processes.

1.4. Aligning with the ClimateSmart Cities Assessment Framework

The "ClimateSmart Cities Assessment Framework" serves as a tool for cities to assess their present situation and provides a roadmap for cities to adopt and implement relevant climate actions. The stages of preparing and implementing the city climate action plan

have been assigned into different performance levels; for instance, if an institutional mechanism and plan has been prepared by the city then it would be evaluated for level 2 and if the implementation has also been taken place then it would be evaluated for the level 3 and subsequently if there is an established system for regular monitoring and evaluating, it would be accessed for level 3.

Total score for this indicator is 100. Cities will be marked in 4 levels with scores ranging from 0 – 100. For level 2, cities will receive incremental scores ranging from 1-50 based on the measures undertaken and evidence(s) provided. For levels 3 and 4, cities will receive incremental scores ranging from 1-25 based on the measures undertaken and evidence(s) provided. (Table 1)

Figure 1: Components of a city climate action plan

Source: The City of Woodland's Climate Action Plan

Table 1: Comparison of different RE technologies

	1	2	3	4
Progression Levels	Climate Action Plan not considered	Institutional Mechanism Established and Plan prepared	Implementation	Regular Monitoring & Streamlining
Evidence/ Data sources	Climate Action Plan not initiated	• ULB Level Climate coordination cell established • City Level Stakeholder Committee constituted and consulted regularly • City level climate assessments - GHG Inventory or Vulnerability Assessment (as per indicator 4) - have been conducted • Mitigation and/or Adaptation Areas have been assessed for the city • Climate Action Plan (including mitigation and adaptation strategies) prepared for the city in a participatory manner	• Funds/ Municipal Budget of last financial year shows allocation • Implementation of measures initiated (with supporting evidence)	• Monitoring Reporting and Verification (MRV) system prepared and implemented • Relevant recommendations from the Climate Action Plan is incorporated in master plan

Figure 2 ClimateSmart Cities Assessment Framework

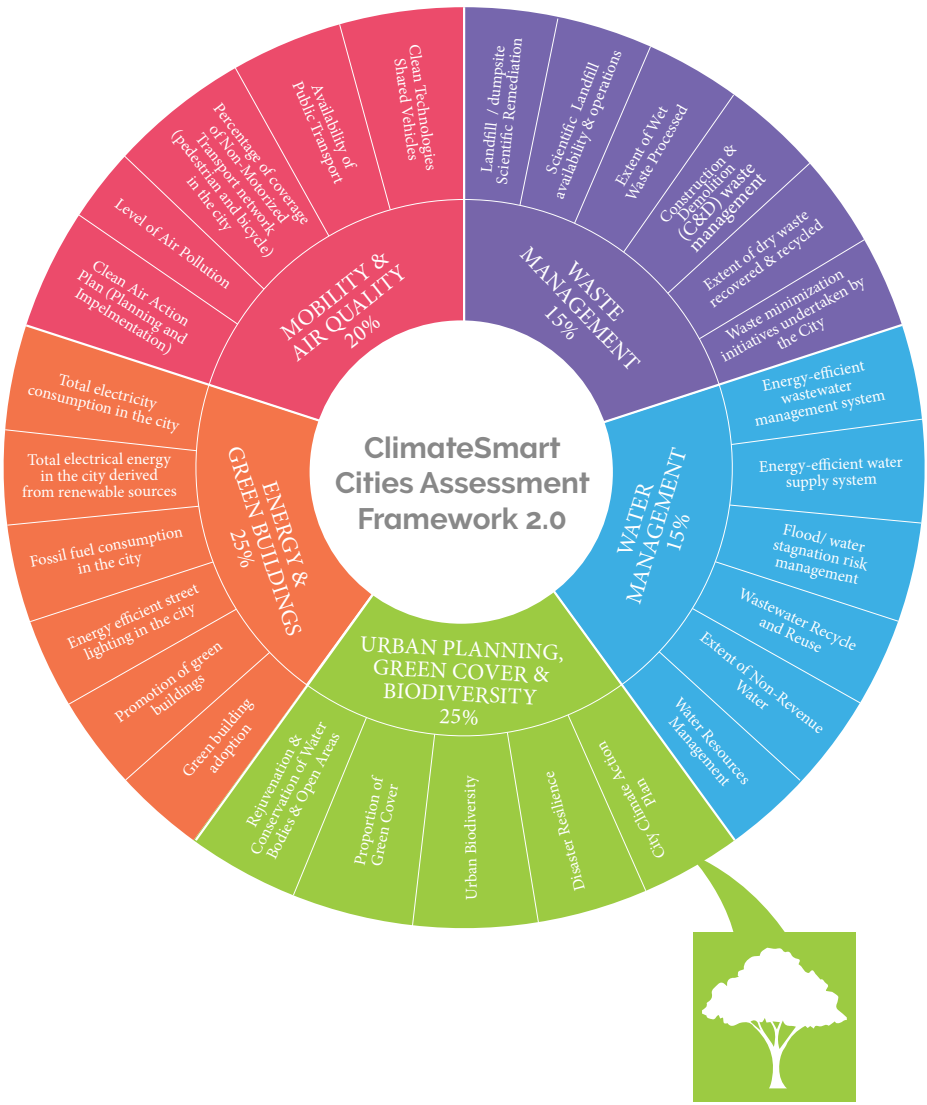


Photo Credits: Thaddaeus Lim_on Unsplash

2

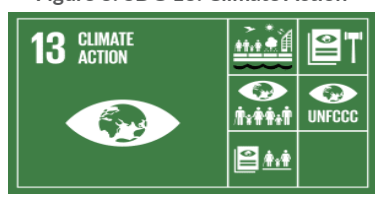
Policy & Institutional framework

2.1. International Policies

2.1.1. Sustainable Development Goal 13

SDG 13, on climate change, asks governments to 'take urgent action to combat climate change and its impacts'. The goal recognises that addressing and minimising the risks posed by climate change is integral to the successful implementation of the SDGs. Cities have the potential to drive regional, national and global development. They need to develop successful climate mitigation and adaptation strategies to address national and global sustainable development concerns, as articulated in the UN SDGs.

Figure 3: SDG 13: Climate Action



Some local government responsibilities are directly reflected in goal, requiring them to (ICLEI, 2015):

- Build inclusive approaches to achieve political, economic, environmental and societal objectives related to climate change mitigation and adaptation
- Develop comprehensive low emission development strategies, including plans for carbon neutral transportation systems, fostering smart grid networks, and exploring green growth in this context

- Measure and monitor progress and impacts of regularly conducted community-level greenhouse gas emission inventories according to the latest standards
- Amend building codes and zoning bylaws and adopt standards governing construction of buildings, and infrastructure that are more resilient to climate change risks
- Develop creative financing tools for mobilizing investments that help to overcome climate risks derived from a lack of basic infrastructure and environmental amenities for all, especially the poorest urban residents in cities.

2.1.2. Paris Climate Agreement

In 2015, 196 Parties came together under the Paris Agreement aiming at limiting warming to 1.5 to 2 degrees C above pre-industrial levels, for which nationally determined contributions (NDCs) were adopted. NDCs embody efforts by each country to reduce national emissions and adapt to the impacts of climate change. It requires each Party to prepare, communicate and maintain successive NDCs that it intends to achieve. Parties shall pursue domestic mitigation measures, with the aim of achieving the objectives of such contributions.

But the IPCC sixth assessment report shows that the world will probably reach or exceed 1.5 degrees C (2.7 degrees F) of warming within just the next two decades. Whether we limit warming to this level and prevent the most severe climate impacts depends on actions taken this decade. Only with ambitious emissions cuts can the world keep global

temperature rise to 1.5 degrees C, the limit scientists say is necessary for preventing the worst climate impacts. Under a high-emissions scenario, the IPCC finds the world may warm by 4.4 degrees C by 2100 — with catastrophic results.

2.2. National Policies

2.2.1. National Action Plan for Climate Change (NAPCC)

National Action Plan for Climate Change (NAPCC) is a Government of India's programme launched in 2008 to mitigate and adapt to the adverse impact of climate change. There are 8 national missions forming the core of the NAPCC which represent multi-pronged, long term and integrated strategies for achieving key goals in climate change.

Under the NAPCC, National Mission on Sustainable Habitat focusses on making cities sustainable through improvements in energy efficiency in buildings, management of solid waste & shift to public transport.

National Mission on Sustainable Habitat

It basically plans to make urban areas more climate friendly and less susceptible to climate change by a multi-pronged approach to mitigate and adapt to it.

- Development of sustainable habitat standards that lead to robust development strategies while simultaneously addressing climate change-related concerns.
- Preparation of city development plans that comprehensively address adaptation and mitigation concerns

- Preparation of comprehensive mobility plans that enable cities to undertake long-term, energy-efficient and cost-effective transport planning and
- Capacity building for undertaking activities relevant to the Mission

2.2.2. Other guidelines for climate action planning

There are various guidelines that the cities can adhere to for climate action planning under various national mission and policies with respect to different sectors:

- NMSH Advisory on adaptation and mitigation measures in field of water supply and sanitation developed by Central Public Health and Environmental Engineering Organization (CPHEEO) in 2014
- Protecting Health from Climate Change- A vulnerability and Adaptation Assessment developed by WHO in 2013
- Manual for storm water drainage systems developed by Central Public Health and Environmental Engineering Organization (CPHEEO) in 2019
- Manual on municipal solid waste management developed by Central Public Health and Environmental Engineering Organization (CPHEEO) in 2016
- Accelerate Action on Adaptation in the Transport Sector For Low Carbon & Sustainable Mobility in India (Decarbonisation of Indian Transport Sector) developed by Federation of Indian Chambers of Commerce and Industry (FICCI)
- Climate Vulnerability Assessment for Indian Himalayan region using a common framework (2018-19) developed by IIT Mandi and IIT Guwahati

2.3. Institutional Framework

At the international level the United Nations Framework Convention on Climate Change (UNFCCC) is the primary mechanism which coordinates the international efforts for implementing the climate change actions. The Ministry of Environment, Forests and Climate Change (MoEFCC) is the lead agency that plans, promotes, coordinates environmental and climate change policies and programmes in India. Following the development of a co-benefits based climate action plan, the Indian policy-making process primarily involved Ministry of Finance (MoF), Ministry of External Affairs (MEA) and Planning Commission to work closely with the MoEFCC in order to incorporate finance, development and environmental agendas into an effective climate policy. Similarly, a Climate Change Finance Unit (CCFU) is formed under MoF to facilitate and direct the international climate finance (Figure 1). Environment ministries and departments of Science and Technology at the state level and Union territories deal with the state specific climate change action plans through the guidance from MoEFCC. Also, research institutions and bilateral agencies and international organisations support MoEFCC in their respective capacity for the overall implementation of NAPCC. India has also constituted the Prime Ministers' Council on Climate Change as a High Level advisory group on climate change issues comprising Government Representatives and Non-Government Members.

Effective climate action planning inclusively engages multiple agencies, economic actors and community stakeholders. Such processes encompass a broad array of perspectives and interests, both within the city government and the larger community. At city level, two committees have to be formed in the process of climate action planning:

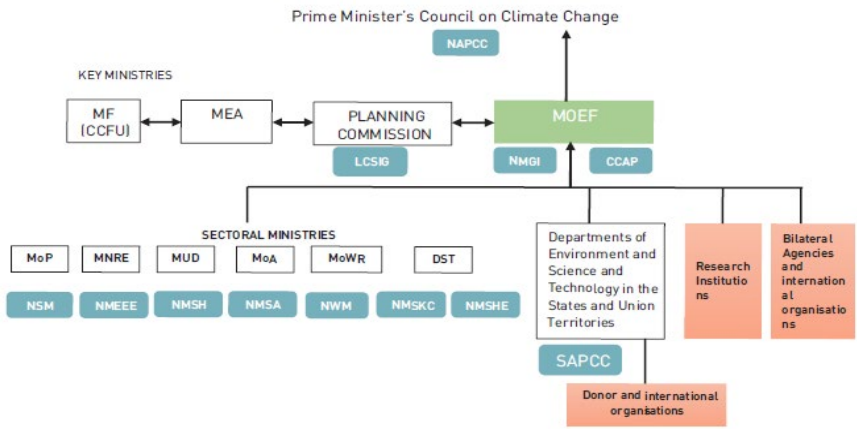
ULB level Climate Coordination Cell

It involves representatives from departments related to energy use, pollution, waste, food security, resilience in water sector and water security, public health, drainage and sanitation, local economic development, infrastructure, mitigation actions in transportation, and development planning. It would be involved in all steps of preparation of Climate Action Plan and support internal institutional capacity building.

City level Stakeholder Committee

The Climate Action Planning Process should be supported by consultations with other groups in the city such as government agencies, local NGOs, community leaders, university partners and private sector organizations, to appropriately share responsibilities and ensure ownership. It is formed by the Core cell.

Figure 4: Institutional arrangements for climate change policy in India



MOEF	Ministry of Environment, Forest and Climate Change
MF	Ministry of Finance
MEA	Ministry of External Affairs
MoP	Ministry of Power
MNRE	Ministry of New and Renewable Energy
MUD	Ministry of Urban Development
MoA	Ministry of Agriculture
MoWR	Ministry of Water Resources
MST	Ministry of Science and Technology

Key NodalAgency

Executive Body

Plans and Processes

Research institutions, NGOs, Bilateral agencies International Organisations

NSM	National Solar Mission
NMEE	National Mission on Enhanced Energy Efficiency
NMSH	National Mission on Sustainable Habitat
NMSA	National Missionon Sustainable Agriculture
NWM	National Water Mission
NMSKC	National Mission on Strategic knowledge for Climate Change
NMSHE	National Mission on Sustaining the Himalayan Ecosystem
NMGI	National Mission for a Green India
CCAP	Climate Change Action Programme
NAPCC	National Action Plan on Climate Change
SAPCC	State Action Plan on Climate Change
CCFU	Climate Change Finance Unit
EPLCSIG	Executive Panel on Low Carbon Strategy for Inclusive Growth

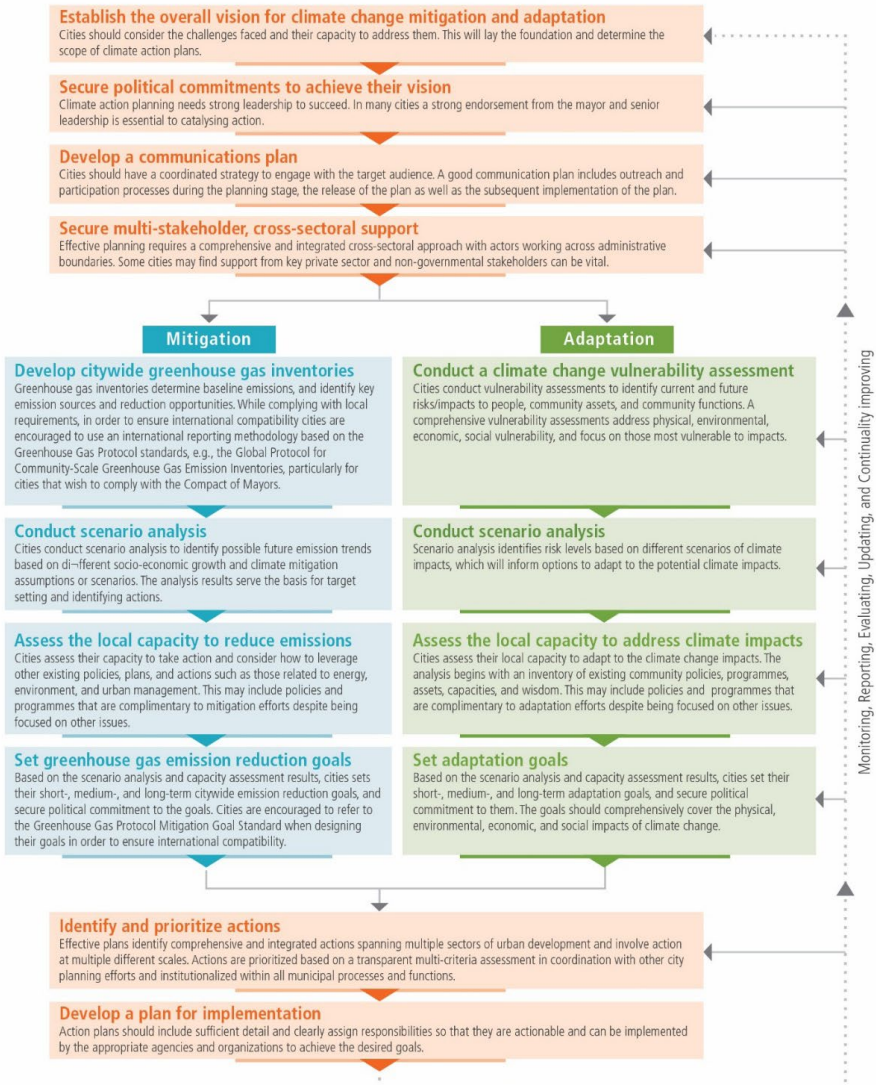
The 'Stakeholder's Committee' includes key decision makers and administrators from Municipal Corporation, Urban Improvement Trust, Town planning Department, Regional Transportation Office, Electricity Board, Public Health Engineering Department (PHED), Para State agencies representatives from Builder's Association, Industrial Association, Chamber of Commerce & Industries, Indian institute of town planners (ITPI), Local Architects, various educational institutions and Universities, various NGOs and visionaries form the city.

2.4. Methodology

Effective mitigation and adaptation planning should be evidence-based: grounded in a scientific understanding of climate change when possible, for which baseline studies need to be carried out of GHG Inventory for Mitigation and Vulnerability Assessment for Adaptation. The following process could be adopted for carrying out the studies (UN-Habitat).

Photo Credits: Patrick Perkins on Unsplash

Figure 5: Process for preparation of City climate action plan



Source: Guiding Principles for City Climate Action Planning, UN HABITAT (2015)

2.5. Mitigation

Activities that help to reduce the rate or magnitude of climate change by reducing human generated greenhouse gas emissions or land use practices that contribute to climate change, such as deforestation. GHG emission inventory to be prepared for all sectors on the basis of the Global Protocol for Community Scale GHG Emissions (GPC). Other detailed GHG emission assessments using any other tools based on the IPCC global protocol will also be considered. GHG emissions from city activities shall be classified into six main sectors, including:

- Stationary energy
- Transportation
- Waste
- Industrial processes and product use (IPPU)
- Agriculture, forestry, and other land use (AFOLU)
- Any other emissions occurring outside the geographic boundary as a result of city activities.

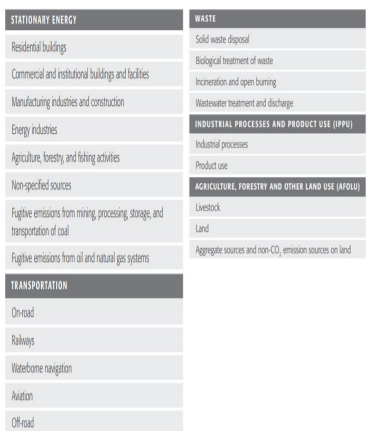
ClimateSmart Cities – Self Assessment Tool can be used to estimate emissions and prioritize actions.

Calculating baseline of emissions

For some activities, cities will be able to use direct measurements of GHG emissions (e.g., through use of continuous emissions monitoring systems at power stations) for most emission sources, cities will need to estimate GHG emissions by multiplying activity data by an emission factor associated with the activity being measured.

GHG Emissions = Activity data x Emission Factor

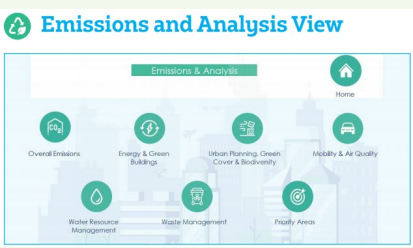
Figure 6: Sectors and sub-sectors of city GHG emissions

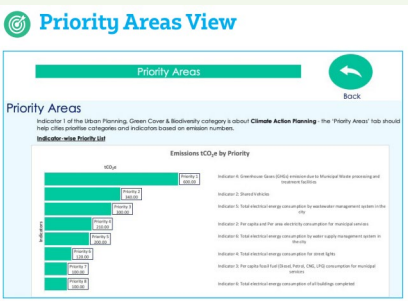


Source: Greenhouse Gas Protocol

The ClimateSmart Cities – Self Assessment Tool (CSC – SA Tool)

It is an Excel-based, emissions assessment tool that is based on the CSC Assessment Framework. It uses activity data, already being collated in the framework to estimate greenhouse gas emissions for activities mentioned under indicators across the five sectors. The tool follows the 'Global Protocol for Community-Scale Greenhouse Gas Emission Inventories' (GPC) to estimate indicator-wise GHG emissions. It also provides mitigation potential for the interventions mentioned in the framework. The mitigation potential is estimated based on the progression levels mentioned in the framework, thereby providing cities with quantifiable, emission-based evidence to identify lowhanging fruits. Access the tool here: *https://niua.org/c-cube/csc-sat/*

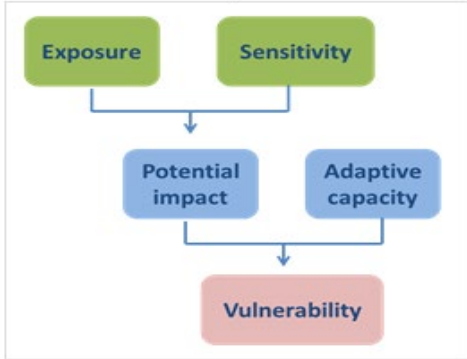




Energy & GHG Emission Projection

Stationary fuel and electricity consumptions can be projected by using Geometric mean of past four years for community sectors. Energy consumption from utility services/ facilities can be projected based on population growth (by taking average of population projection by arithmetical increase method, geometrical increase method and incremental increase method).

2.6. Adaptation



Adaptation is a process through which communities prepare to cope with an uncertain future climate. Improving the adaptive capacity of planning institutions and stakeholders. Addressing and managing the socio-economic impacts of climate change, particularly their effect on vulnerable populations. A city with more adaptive capacity is also a more resilient city, able to better withstand, manage and reduce climate change vulnerabilities. The Intergovernmental Panel on Climate Change (IPCC) identifies three components of climate change vulnerability: exposure, sensitivity and adaptive capacity. Manifold toolboxes and collections of methods to evaluate impacts, vulnerability and adaptation to climate change exist. It is recommended that a comprehensive vulnerability assessment and identification of gaps is undertaken based on the United Nations Framework Convention on Climate Change (UNFCCC) methodology

2.6.1. Baseline for Vulnerability Assessment

For carrying out the baseline of vulnerability assessment three aspects need to be studied; fragile urban systems, then the risks associated with those identified urban systems and lastly identifying the areas and actors for all the fragile urban systems.

Analysis of Fragile Urban Systems

Fragile Urban Systems are analyzed to identify systems which are already failing or are under great pressure and contributing significantly to city's total energy consumption and Greenhouse Gases (GHGs) emission based on stakeholder consultation and GHG emission inventory.

- Health
- Transportation (Public Transportation)
- Transportation (Road infrastructure)
- Water E. Sewerage
- Storm water drainage
- Solid Waste Management

Risk Assessment

The climate fragility statements are prioritized through a participatory assessment, based on the degree of risk that each expected climate impact poses for the identified fragile systems. The risk score for each climate fragility statement is defined as a combination of the likelihood of an event to occur and the consequences faced if the event occurred.

Climate Vulnerability Assessment

It helps to assess the city in terms of the geographical location, demography, infrastructure, socio economic condition, ecological condition and the impacts of climate change on these. It consists of identification of vulnerable areas and actors for all the prioritized fragile urban systems and analysis of their adaptive capacities. The following elements are considered

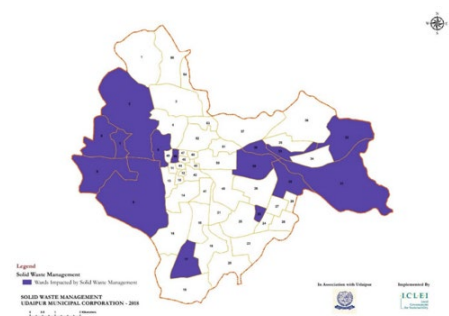
- Identification of Vulnerable Places
- Identification of Vulnerable actors and their adaptive capacity

2.6.2. Mapping & Assessment

The vulnerable areas are identified which are impacted by the lack of services or human activities and can be represented ward wise on the city map. It would be presented for all the sectors separately and a consolidated map would be prepared representing most vulnerable wards. In addition to the wards, for each fragile urban system, the relevant actors are to be identified who are responsible.

Figure 7: Wards most vulnerable to climate change in context to Storm Water Drainage

Figure 8: Wards most vulnerable in context to Solid Waste Management



Source: Udaipur Climate Action Plan, ICLEI

2.6.3. Strategies: Identification & Prioritization of Resilience Interventions

1. Define interventions:

Various mitigation and adaptation interventions are to be identified based on GHG emission inventory and urban system analysis in line with existing city planning. Mitigation and adaptation potential for each intervention along with financial aspect and implementation mode have to been identified in line with ongoing projects and future planning. Prioritization of Resilience Interventions, feasibility and impact assessment has to be done.

2. Screen and prioritize potential interventions

3. Set targets and deadlines

2.7. Analysis and formulation of actions for Climate action plan

Climate Action Plan (mitigation and adaptation) has to be prepared and implemented by the city. It should be developed in a comprehensive manner covering all sectors, including waste management, integrated water management, mobility and air pollution, energy and green buildings; biodiversity, green cover, disaster risk preparedness and urban planning. The plan has to propose actions for both climate change mitigation and adaptation based on a GHG emissions inventory and a climate change vulnerability assessment respectively, addressing all sectors listed above. The Guiding Principles for City Climate Action Planning from UN-HABITAT and the National Mission on Sustainable Habitat could be referred to, however the sectors to be covered under the plan should at least include all sectors as covered under the ClimateSmart Cities Assessment Framework. Regular monitoring, reporting and verification (MRV) of the plan is essential to qualify and quantify the measures implemented for achieving accountability, and improved impact.

Source: Curitiba, Brazil: the world's first sustainable city | UrbanizeHub

3

Implementation strategies

Climate change action planning is often, but not only, led by city governments. Effective climate action planning inclusively engages multiple agencies, economic actors and community stakeholders. Integrating climate action planning particularly into long term urban planning processes increases the effectiveness of urban responses to the climate challenge.

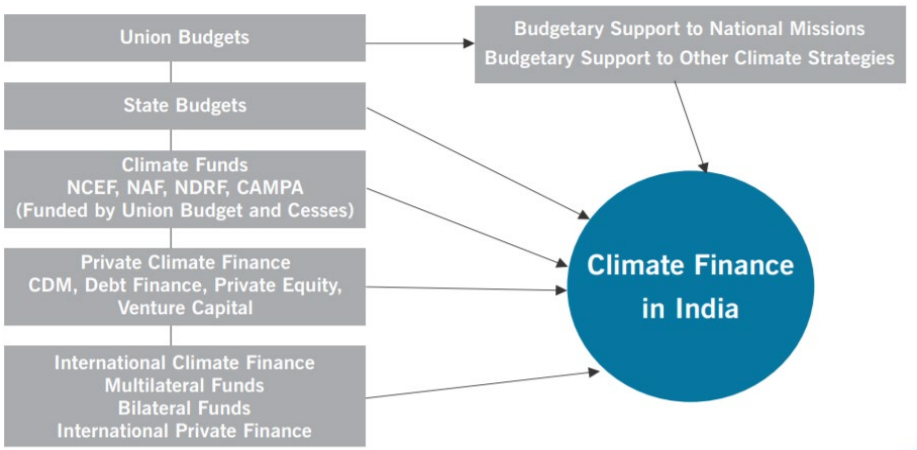
3.1. Funding & Implementation

The climate finance landscape in India on a whole is highly fragmented with the central government, state governments, private sector and civil society actors all playing significant roles in low emission and climate resilient development. Government of India finances climate action through Climate Funds (routed through the Union Budget); Direct Budgetary Allocations, and Mechanisms aimed at leveraging private climate finance. Other Climate funds are National Clean Energy Fund (NCEF), National Adaptation Fund (NAF), Compensatory Afforestation Funds and National Disaster Response Fund (NDRF).

Climate Finance in India can be distinguished into public and private. Budgetary process is the main source of public climate finance in India, with most of the money coming as sectoral funding for ministries of water, agriculture, power, renewable energy etc., as resources for adaptation and mitigation are built into ongoing policies and programmes (Planning Commission 2013). Other sources for public finances are taxes, subsidies, etc. Whereas in private finance, projects earn saleable certified emission reduction (CER) credits that can be traded in carbon markets (Case Study: Indore).

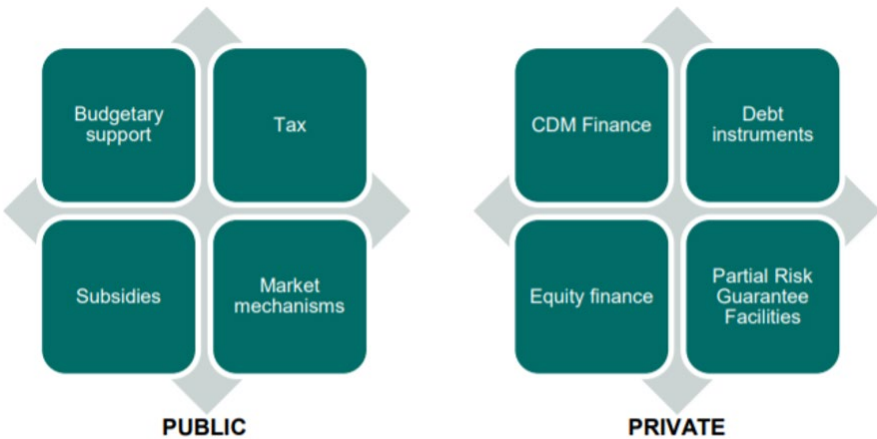
The developed strategy should be translated into concrete action plans which, among others, establish the roles and responsibilities of all relevant stakeholders as well as the timelines, milestones and targets, and also the level and type of resources needed. In relation to strategic plans focusing on climate change, it may be advisable to differentiate between climate change mitigation and adaptation plans, even though there may be

Figure 9: Climate Finance Architecture in India



Source: Centre for Budget and Governance Accountability (CBGA), 2017

Figure 10: Sources of Climate finance in India



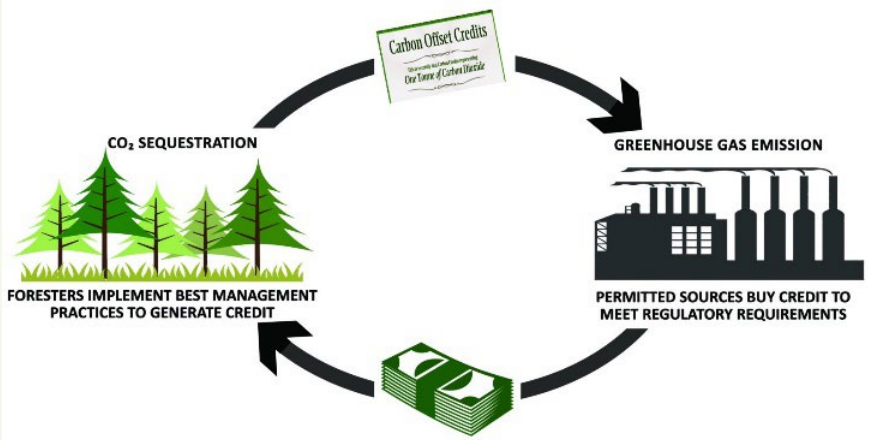
overlap between them and both may generate broader developmental co-benefits. The implementation of the strategic plan should be supported by institutional reforms aimed at facilitating the process of turning the plan into concrete outputs and outcomes. This means that before the implementation phase starts, the institutional and governance context should be re-assessed to work around potential political and mainstreaming deadlock. (UN-Habitat, 2015) Climate action plans at city level should be implementable and should have necessary financial, institutional and policy support and should have clear cut short and long term implementable action. The financing needs for climate actions is

best taken by mainstreaming climate change risks in urban development planning itself, as a first stage, the master plan development process should consider the hazard, risk and vulnerability.

Carbon credits: Case of Indore city

A carbon credit is a permit that allows the company or cities that holds it to emit a certain amount of carbon dioxide or other greenhouse gases. One credit permits the emission of a mass equal to one ton of carbon dioxide.

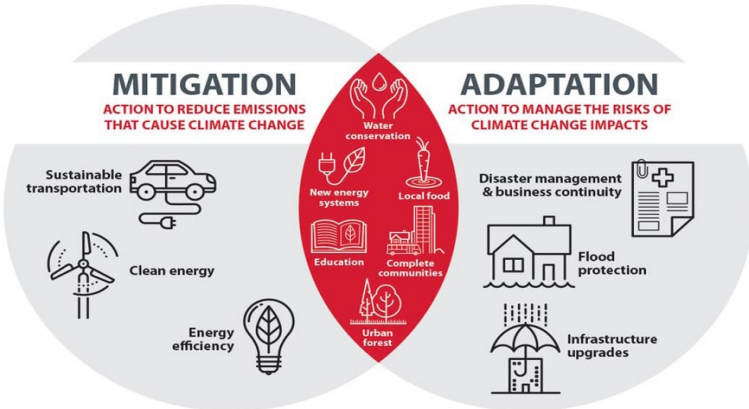
Indore city generated a revenue of Rs. 50 lakh by selling credits against 1.70 lakh tonnes of carbon dioxide recieved from the United Nations Framework Convention on Climate Change (UNFCC) under the Verified Carbon Standard (VCS) programme. The gross earnings received from the projects of IMC was paid at a rate of $0.05 per tonne.



The developed strategy should be translated into concrete action plans which, among others, establish the roles and responsibilities of all relevant stakeholders as well as the timelines, milestones and targets, and also the level and type of resources needed. In relation to strategic plans focusing on climate change, it may be advisable to differentiate between climate change mitigation and adaptation plans, even though there may be overlap between them and both may generate broader developmental co-benefits. The implementation of the strategic plan should be supported by institutional reforms aimed at facilitating the process of turning the plan into concrete outputs and outcomes. This means that before the implementation phase starts, the institutional and governance context should be re-assessed to work around potential political and mainstreaming deadlock. (UN-Habitat, 2015) Climate action plans at city level should be implementable and should have necessary financial, institutional and policy support and should have clear cut short and long term implementable action. The financing needs for climate actions is best taken by mainstreaming climate change risks in urban development planning itself,

as a first stage, the master plan development process should consider the hazard, risk and vulnerability.

Figure 11: Building Climate Resilience



Source: Calgary City Climate Resilience Strategy

3.2. Regular Monitoring & Streamlining

The existing framework for MRV under the Convention for developing country Parties consists of several elements. Some of these elements are implemented at the international level and others at the national level. At the international level, the MRV framework for non-Annex I Parties (mostly developing nations like India) includes:

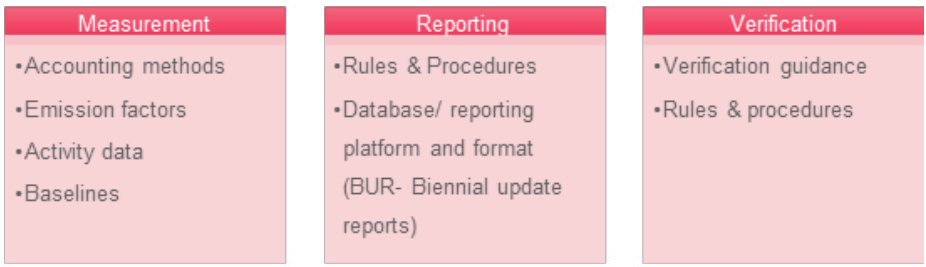
- Guidance on reporting through national communications and BURs;
- Guidance on setting up domestic MRV frameworks;
- A process for consideration of information submitted by non-Annex I Parties in their BURs through ICA;
- For those non-Annex I Parties that voluntarily implement REDD-plus activities and wish to take the opportunity of a results-based payment, international guidance on MRV for REDD-plus activities applies.

At the national level, Parties are expected to implement the international guidelines for domestic MRV frameworks and to prepare and report information according to the guidance on reporting through national communications and BURs, including information on GHG emissions and removals by sinks, mitigation actions and their effects, and support needed and received.

Like many other developing countries, India is yet to evolve a robust domestic MRV system based on in-depth scientific and technical research. So far multiple efforts have been made at the Central and State levels to establish MRV systems for specific programmes

and projects for specific parameters and not GHG mitigation directly. PAT (Phase-I, II, III & IV), RPO and other demand side management programmes are some of the mitigation programmes which have seen significant success in their implementation.

Figure 12: Elements of MRV framework



Measurement

It applies both to efforts to address climate change and to the impacts of these efforts, including the level of GHG emissions by sources and removals by sinks, emission reductions and other co-benefits. Such measurement occurs at the national level. Initially, it referred to the measurement of GHG emissions by sources and removals by sinks through the national GHG inventories, which are reported in national communications.

Reporting

It is implemented through the national communications and BURs. Parties are required to report on their actions to address climate change in their national communications, which include information on the GHG inventories, adaptation, mitigation actions and their effects, constraints and gaps, support needed and received, and other information considered relevant to the achievement of the objective of the Convention.

Verification

It is addressed at the international level through ICA (International consultation and analysis) of BURs (Biennial update reports), which is a process to increase the transparency of mitigation actions and their effects, and support needed and received.

MRV takes on a different meanings depending on the user and context:

1. **MRV of GHG emissions**
   National level: GHG emissions and removals associated with a country
   City level: GHG emissions and removals associated with a city (or state/region)
   Company level: GHG emissions and removals associated with the operations of a company
   Facility level: GHG emissions and removals associated with a single facility (e.g., cement factory or power plant)

2. **MRV of mitigation actions including NAMAs(Nationally Appropriate Mitigation Actions)**
   - Mitigation goal: Progress toward meeting a goal and assess whether the goal has been achieved.
   - Mitigation policy or action: GHG and/or non-GHG effects of a policy or action before implementation (ex-ante) or after (ex-post), relative to a baseline scenario
   - Mitigation project: GHG effects and/or non-GHG effects of a project before implementation (ex-ante) or after (ex-post), relative to a baseline scenario

Photo Credits: Milind Kaduskar on Unsplash

4

Exercise: Mapping of Urban Fragile System

Climate change action planning is often, but not only, led by city governments. Effective climate action planning inclusively engages multiple agencies, economic actors and community stakeholders. Integrating climate action planning particularly into long term urban planning processes increases the effectiveness of urban responses to the climate challenge.

4.1. Introduction to the Exercise

Urban systems may include 'core systems', such as water and food, essential for the survival of the city, and 'secondary systems' such as education and social services, which rely on the core services. The exercise examines urban systems to identify fragile systems and thereafter mapping them wardwise based on their cumulative values. Fragile urban systems are basically the systems or services in your city which are already weak or under great pressure. The output of exercise is to prioritize wards which needs to be made resilient by developing and maintaining. Resilience is defined as: "The ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organisation, and the capacity to adapt to stress and change (IPCC, 2007)." In this exercise, we would be focusing on primary urban systems mainly, water supply, health, drainage, solid waste infrastructure and transportation of the city. (Although during the session only one of these would be undertaken, keeping the time constraint in mind). This handout consists of steps for the exercise to give an overview about the hands-on exercise that would be the part of training session.

4.2. Objectives

- Analyzing status of urban infrastructure.
- Identification of the urban systems that are highly vulnerable to impacts of climate change
- Generating awareness about the applications of GIS as a tool for city planning exercise.
- Prioritizing areas to increase the adaptive capacity of the city by increasing threshold limits and decreasing exposure.

4.3. Data Required:

GIS Shapefiles of City ward maps, Basic understanding of conditions of urban infrastructure in 1-2 wards

4.4. Steps Involved

1. Identifying wards with poor condition of urban systems

Condition of urban systems defines the city's exposure to tackle climate change related impacts. So, they needs to be properly maintained and upgraded timely. Figure 1 shows a table to rate city's infrastructure status ward wise depending upon its current condition based on the perception and knowledge about that particular ward.

Procedure: An excel file with the format for rating the city's infrastructure would be attached. Based on that score, the ward which for each of the urban system depending upon it's condtion.

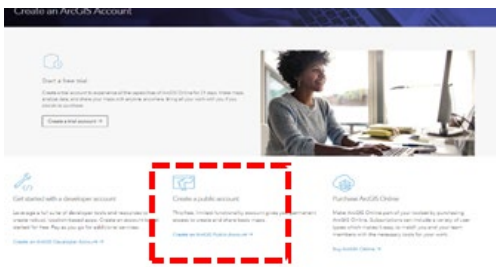
2. Signing-Up on ArcGIS Online platform

The exercise would be conducted on ArcGIS Online platform and so all the participants should have an account on it. It is advisable to make an account well before the training exercise. Account can be created by following steps

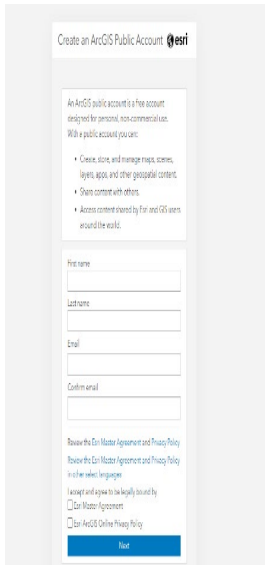
- Step:1 Open https://www.arcgis.com/index.html website, and
- Step:2 Choose option “Create Public account” for sign-up. (Other options are either on trial basis or paid, so choose this option only).
- Step:3 Type-in email address and other mentioned details for signing up.

Step 1

Step 2



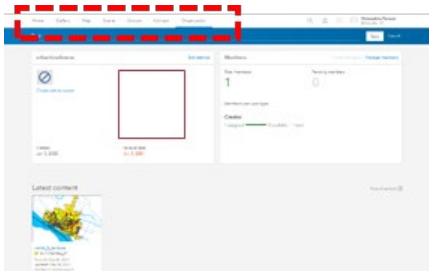
Step 3

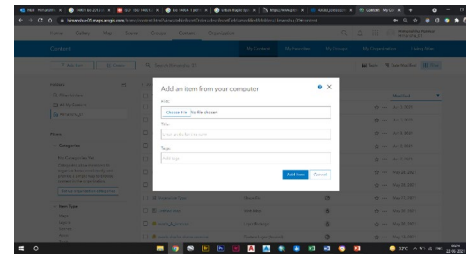


3. Importing shapefiles on ArcGIS online

The city’s landuse shape file would be uploaded on the ArcGIS platform to make map for depicting the status of each ward. Once the shapefiles are uploaded on the portal, it gets stored in the content library and can be used as data set for making maps or adding to other maps.

Procedure: Go to “Content” from the top bar (figure 16). Click on “Add items” button on the top-left corner. Select “From Your Computer” and the choose the shapefile to upload. The shapefile should be in ZIP format. Add a reference “tagline” for the shapefile. And click on “Add item”



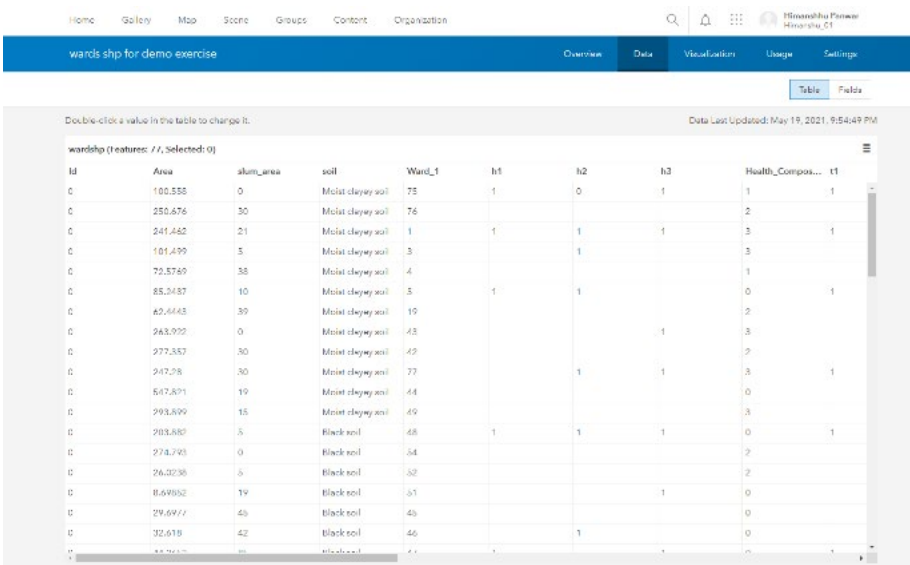


4. Edit Data Attributes

As ward wise shapefile is uploaded, its attributes needs to be changed based on the ratings that were given in the excel file for identification of urban fragile system ward wise. Manually, data needs to be entered in the table.

Procedure: Open the layer to edit properties, Click on Data Tab (see figure 17) and from right corner, select "Add fields". Name it according to the urban fragile system that participants are working on. Fill ratings in front of each ward,that was analysed in step 1.

Figure 13: Editing Data in the attribute table



5. Mapping

As the shapefile is ready with the attributes, now it needs to be mapped. Mapping would be done to represent the data which is presented in the attributes. In the mapping console the wards would be denoted by different colours based on layer attributes.

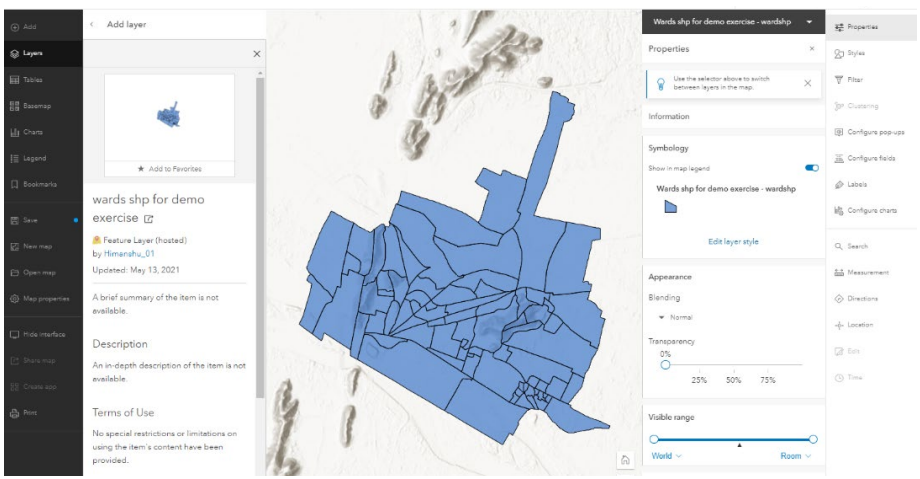
Procedure:

A) Importing Content in Map:

1. Click on Map tab on the top bar, to open Map console and choose “Open in new map viewer” if the window is not showing something similar to figure 4.
2. In Layers tab on left, click “Add layer”
3. Choose your layer and click “ Add to map” (see Figure 19)

Figure 14: Mapping Console

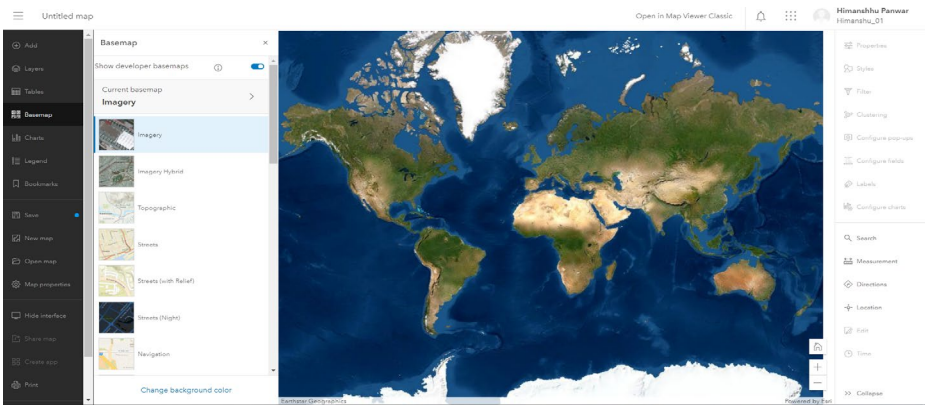
Figure 15: Adding layer into the map



B) Add Basemap in Map:

1. From the left bar, Select “Basemap” (figure 20)
2. Select “imagery” to add the satellite imagery on the background of the map layer

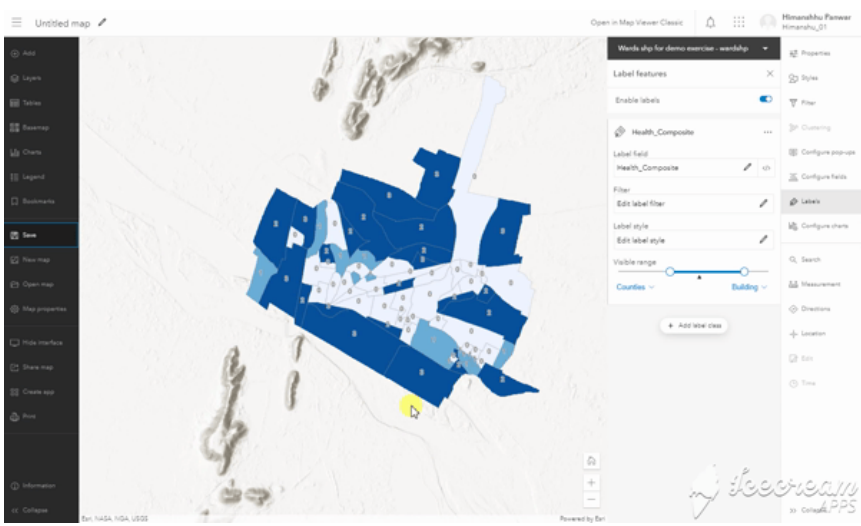
Figure 16: Adding basemap into the map



C) Representing attribute data on map: (figure 21)

1. Go to “Styles” tab right bar
2. Select “+ Field”
3. From drop down menu select the field, you want to represent
4. Select “ Counts and Amounts(Color)” style
5. Add “Labels”, Labels from right tab and select field to use for labelling

Figure17: Map after adding style for depicting data



D) Export Map

1. Go to “Save”, for saving into contents
2. To export, go to “Print” on left tab
3. Editing size and click “Export”

Key Learnings from the exercise

- Representing data on maps to analyze the current status of urban system spatially.
- Identifying areas where interventions need to be done.
- Basic understanding about applications of GIS

The way forward

The exercise can be replicated for all wards for all urban systems to develop a composite map for the city, for proposing interventions to increase resiliency to tackle impacts of climate change. Institutions, buildings, etc. could be identified in those particular ward where issues are maximum and separate proposals could be made for increasing the efficiency of the urban infrastructure.

Photo Credits: Vaishnav Chogale on Unsplash

5

Case Study: Siliguri Climate Action Plan

5.1. Background

Source: ShareAlike 3.0

Siliguri is located on an important link connecting the states in North East India and the neighboring countries with rest of India. It is the second most important city of West Bengal, after Kolkata, and hence, is the second administrative capital of the State.

- Population: 513,264 (Census 2011)
- Area: 41.9 sq.km
- No. of wards: 47 wards
- Gender Ratio: 946/1000 males
- Literacy rate: 77%

5.2.1. Vulnerability Assessment

The baseline situation analysis of the urban systems in the city has been carried out in Siliguri. Vulnerability of each of these systems, with respect to climate change impacts of increase of temperature and increase of short duration high intensity precipitation, were assessed and climate risk was analysed. All the urban systems of Siliguri, viz, water supply, solid waste management, transportation, drainage and sewerage were identified as vulnerable urban systems. Vulnerability of wards and actors was analysed for each of these urban systems. Vulnerability maps were then prepared and overlaid together to identify the vulnerability hotspots.

Figure 18: Climate Risks

Climate risk and vulnerability assessment of fragile urban systems in Siliguri

Fragile Urban Systems	Climate Risks	Climate Fragility Statements	Risk*
(Water Supply)		• Increased demand for water will pose additional stress on the supply system	High
		• Increased chances of groundwater pollution	Medium
(Sanitation and Sewerage)		• Increased chances of greater 'knock-on' impacts on health	High
		• Overflow of sewage lines and dilution of waste water will impact efficient of waste water treatment	High
(Storm Water Drainage)		• Increased chances of greater 'knock-on' impacts on health due to contamination of potable water during flood events	High
(Solid Waste Management)		• Increased rate of waste decomposition in open dumps creating health hazards	High
		• Increased instances of water logging and impacts on health due to choking of drains	Extreme
(Transport)		• Increased use of private vehicles may lead to more traffic congestion and increased GHG emissions	Extreme
		• Increased road maintenance cost and increase in traffic congestion due to damage to roads	Extreme

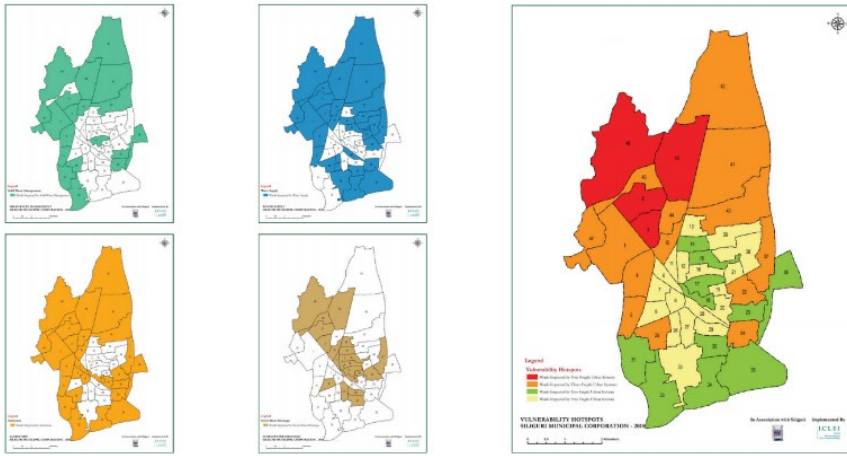
*** Risk Score (likelihood x consequence)** – Low: 1-4; Medium: 5-10; High: 11-20; Extreme: 20-25

temperature increase; rainfall increase

Source: ClimateResilient Cities Action Plan - Siliguri

Climate Projections: Siliguri will witness an increase in unseasonal rain during the winters, with an overall increase of short duration high intensity rainfall. The average temperatures along with daily maximum and daily minimum temperatures of the city are expected to increase.

Figure 19: Maps of city representing vulnerability assessment

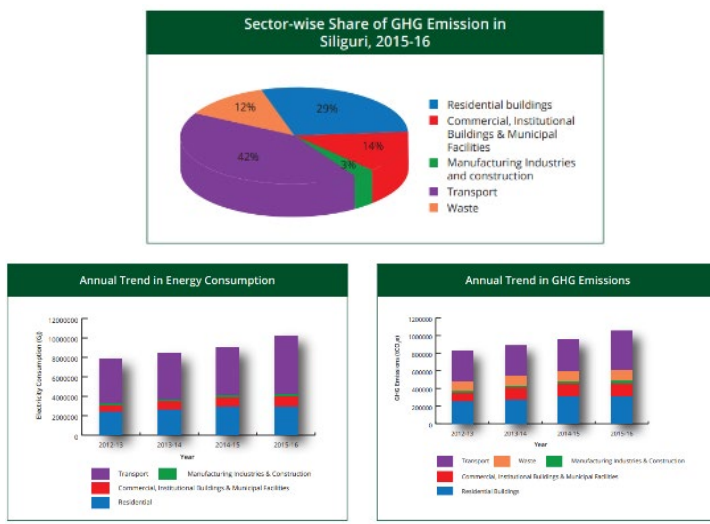


Source: ClimateResilient Cities Action Plan - Siliguri

5.2.2. GHG Emissions Inventory

The GHG emissions inventory for the city has also been developed. The inventory for 2015-16 shows that the total GHG emission for Siliguri amounted to 1.06 million tonnes of carbon dioxide equivalent (tCO2e), which translates to an average per capita GHG emission of 1.88 tCO2e. This is higher than the average per capita GHG emission for India in 2010 of 1.56 tCO2e.

Figure 20: Annual trends of energy consumption & GHG emissions



Source: ClimateResilient Cities Action Plan – Siliguri

5.2. Action Plan

A basket of climate adaptation and mitigation actions has been detailed in the Climate Resilient City Action Plan of Siliguri. While the CapaCITIES project focuses on the sectors of water, transport, sanitation and sewerage, buildings and solid waste, the Climate Resilient City/Action Plan addresses economy wide sectors. A snapshot of the Climate Resilient City Action Plan is illustrated on the next page.

Table 2: Aspect wise interventions

Sector	Example of Resilience Interventions	Total Mitigation Potential (tCO_2e)	Overall Resilience Impact
Buildings	Solar PV systems Energy efficient fixtures Tax incentives Green building designs	57261.75 (37% of total)	Reduction of GHG emissions, improvement in ambient micro climate conditions, and increase in social adaptive capacity through promotion of climate actions
• Residential		44218.32	
• Commercial and Institutional		12850.03	
• Municipal Corporation		193.40	
Water Supply	Reduction in proportion of non-revenue water from 78% to 20% Installation of captive Solar PV plants at Jhankar, Shaktigarh, and Pareshnagar I water pumping stations and Intake point through RESCO mode	5633.45 (4% of total)	Improved water resource management, reduced water scarcity, better health and lower GHG emission. Reduction in NRW will ensure water savings which can be used to serve to additional consumers in the city or provide more water to the existing consumers.
Street lights	Replacement of existing street lighting with LED lamps through ESCO Solar PV Systems	2376.21 (2% of total)	Reduced GHG emissions with better visibility and improved safety

Sector	Example of Resilience Interventions	Total Mitigation Potential (tCO_2e)	Overall Resilience Impact
Transport	Introduction of 30 electric buses to replacement diesel operated city buses Measures for providing infrastructure for traffic de-congestion	2108.44 (1% of total)	Reduction of GHG emissions from public and private vehicles, improved air quality, and reduced traffic congestion
Solid Waste Management	Scaling up Sunya to whole Siliguri Improved waste processing at end point – composting, recycling, RDF pelletisation etc Policy mandates	86472.49 (56% of total)	All waste generated within city will be treated which will reduce the GHG emissions and improve socioeconomic co-benefits through improved health and livelihood of vulnerable sections.
Total		154173.99	

The Climate Resilient City Action Plan (2018-2023) for Siliguri proposes actions with an annual GHG emission mitigation potential of 14.6% by 2022-23, over the 2015-16 (financial year) baseline.

List of Additional Materials

1. **Technical Documents:**
   - India First Biennial Update Report to the United Nations Framework Conventionon Climate Change; MOEFCC; 2015 *https://unfccc.int/resource/docs/natc/indbur1.pdf*
   - India Second Biennial Update Report to the United Nations Framework Convention on Climate Change; MOEFCC; 2018 *https://moef.gov.in/wp-content/uploads/2019/04/India-Second-Biennial-Update-Report-to-the-United-Nations-Framework-Convention-on-Climate-Change.pdf*
   - Global Protocol for Community-Scale Greenhouse Gas Emission Inventories, An Accounting and Reporting Standard for Cities; Greenhouse Gas Protocol *http://c40-production-images.s3.amazonaws.com/other_uploads/images/143_GHGP_GPC_1.0.original.pdf?1426866613*

2. **Methodology**
   - Developing a City Climate Action Plan Using ClimateResilient CITIES Methodology; ICLEI *https://www.niua.org/csc/assets/pdf/imp-document/Advisory%20on%20City%20Climate%20Action%20Planning%20and%20eco-Climate%20Budget.pdf*
   - Nature-based approaches for climate change mitigation and adaptation, Ecologic Institute*https://www.ecologic.eu/sites/default/files/publication/2014/eco_bfn_nature-based-solutions_sept2014_en.pdf*
   - Guiding Principles for Climate City Planning Action; UNHABITAT, 2015 *https://unhabitat.org/sites/default/files/download-manager-files/English%20Publication.pdf*
   - User Guide for Climate Smart cities- Self Assessment Tool; MoHUA; 2020 *https://www.niua.org/csc/assets/pdf/tools/Tool_userguide.pdf*
   - Toolkit for planning for climate change, A strategic, values-based approach for urban planners; UNHABITAT; 2014 *https://www.zaragoza.es/contenidos/medioambiente/onu/1319-eng-res2_Planning_for_Climate_Change_Toolkit.pdf*

3. **Finance**
   - Climate Finance Architecture in India; Centre for Budget and Governance Accountability (CBGA) 2017 *https://www.cbgaindia.org/wp-content/uploads/2017/12/Climate-Finance-Architecture-in-India.pdf*

4. **Monitoring**
   - Nationally determined contributions and MRV systems in India - opportunity for innovations; WRI INDIA; 2018 *http://gms-eoc.org/uploads/resources/1283/attachment/21%20Mar-3-Chirag%20Gajjar-Nationally%20Determined%20Contributions%20and%20MRV%20systems%20in%20India.pdf*

   - Handbook on measurement, reporting and verification for developing country parties;UNFCC;2014*https://unfccc.int/files/national_reports/annex_i_natcom_/application/pdf/non-annex_i_mrv_handbook.pdf*

   - Strengthening National MRV Systems – Options and approaches for India, MRV Framework for Utility -Scale Solar Policies and Actions; Initiative for Climate Action Transparency; 2020 *https://www.teriin.org/project/initiative-climate-action-transparency-icat-strengthening-national-mrv-systems-options-and*

5. **Case Studies**
   - City Resilient Action Plan for Rajkot; 2018 *https://www.capacitiesindia.org/wp-content/uploads/2020/10/CRCAP_Rajkot_July-2018.pdf*
   - City Resilient Action Plan for Udaipur; 2018 *https://www.capacitiesindia.org/wp-content/uploads/2020/10/CRCAP_Udaipur_June2019.pdf*

References

1. *CSE. (2019, February). Down to earth. Retrieved from https://www.downtoearth.org.in/: https://www.downtoearth.org.in/blog/energy/there-s-need-for-city-level-climate-actions-63107*
2. *Dubash, J. (2016). Evolution of Institutions for Climate Policy in India. Economic & Political, 44-54.*
3. *Hamilton, J. I. (2014). PLANNING FOR CLIMATE CHANGE. UNHABITAT.*
4. *ICLEI. (2015, November). The importance of all Sustainable Development Goals (SDGs) for cities and communities. Urban Issues.*
5. *ICLEI. (n.d.). Developing a City Climate Action Plan. ICLEI.*
6. *IPCC. (2014). Climate Change 2014: Impacts, Adaptation, and Vulnerability. Cambridge: Cambridge University PresS.*
7. *Jha, V. (2014). The coordination of climate finance in India. CPR.*
8. *Mekhala Sastry, K. M. (2020). Drivers of Climate. TERI.*
9. *Mousumi Pervin, S. S. (2013). A framework for mainstreaming climate resilience into development planning. IIED.*
10. *Singh, D. (2017). Climate Finance Architecture in India. Centre for Budget and Governance Accountability (CBGA).*
11. *Swiss Agency for Development and Cooperation SDC. (2019). Climate Resilient City Action Plan- Udaipur-CapaCITIES.*
12. *UNFCC. (2014). Handbook on Measurement, Reporting and Verification.*
13. *UN-Habitat. (2015). Guiding Principles for City Climate Action Planning. Nairob: United Nations Human Settlements Programme (UN-Habitat).*
14. *Vani Rijhwani, A. K. (20202). MRV Framework for Utility-Scale Solar Policies and Actions.*
15. *Wee Kean Fong, M. S.-B. (2014). Global Protocol for Community-Scale Greenhouse Gas Emission Inventories.*
16. *WRI. (2019). Nationally determined contributions and MRV systems in India - opportunity for innovations. Retrieved from http://gms-eoc.org/uploads/resources/1283/attachment/21%20Mar-3-Chirag%20Gajjar-Nationally%20Determined%20Contributions%20and%20MRV%20systems%20in%20India.pdf*

Notes:

Notes:

Ministry of Housing and Urban Affairs
Government of India

CITY CLIMATE ACTION PLAN