State of Cities
Towards Low Carbon and Resilient Pathways
ICLEI South Asia: The South Asian arm of ICLEI – Local Governments for Sustainability, is a regional network of local governments that aims to achieve tangible improvements in regional and global sustainability through local initiatives. With a current membership base of over 100 local and regional governments, ICLEI South Asia has been supporting cities in the region as well as in other Asian countries on multiple aspects of sustainable urban development over the past 18 years.

Climate Centre for Cities (C-Cube): The Climate Centre for Cities has been established at NIUA to create synergy across all climate actions undertaken in Indian cities by various stakeholders. The Centre works with a range of stakeholders and partners to focus on strengthening capacities of cities to understand, implement and monitor and actions needed for addressing climate change impacts in their locally.

State of Cities
Towards Low Carbon and Resilient Pathways
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Foreword

India’s phase of demographic dividend, a period when its working age population is higher than its dependent population, is estimated to span from 2018 to 2055. Similar phases in the past have accounted for rapid economic development in other countries. The Government’s reforms have started to show perceptible change in emerging economic data. These underpinnings provide the perfect setting for rapid growth of the Indian economy in the coming two to three decades.

Rapid economic growth has been correlated with high degrees of urbanisation. The benefits of agglomeration bring people together into dense habitations, that we call cities, in order to increase productivity of their endeavours. Much of that can therefore be expected to happen in our country going forward. It is estimated that India’s urban population may almost double in the next 25 years and it would not be an exaggeration to expect 1 billion Indians living in its urban areas by 2050. That means our urban areas will add 38 residents every minute from now on till 2050, a staggering growth by any metric.

Managing this urbanisation well, thus, becomes a hugely critical endeavour in the overall scheme of things. If India has to achieve its Amrit Kaal goal of becoming a developed country by 2047 with a per capita income of 20,000 US dollars then its cities will have to do much of the heavy lifting. It is fair to assume that high amount of investments will flow into city development over the next few decades. It is here that the nature of this investment becomes critical.

In the last nine years, the government has taken many concrete steps in pushing the sustainability agenda forward. At COP26 in Glasgow, the PM announced India’s aggressive agenda on climate change through the Panchamrit action plan which envisages India becoming a net zero emission country by 2070 among other commitments. Indian cities are the core of this challenge.

The attempt made by the National Institute of Urban Affairs and ICLEI South Asia to capture the state of cities and highlight climate pathways and challenges in a unique graphical format through the ‘The State of Cities: Towards Low Carbon and Resilient Pathways’ report is laudable. I congratulate the team that has worked together to speak the language of climate change in cities that is understood by everyone.

This report is a pleasant visual delight and makes a successful effort to highlight the climate extremities that cities face globally through a simple yet visually appealing format champion. And finally it brings forth the measures being taken by Indian cities on climate change adaptation and mitigation. My best wishes to its readers!

Kunal Kumar
Joint Secretary, Ministry of Housing and Urban Affairs
Mission Director, Smart Cities Mission
‘State of Cities: Towards Low Carbon and Resilient Pathways’ report comes at a critical juncture when there is a growing demand for Indian cities to adopt resilient climate actions to attract investments for low carbon transitions. Drawn through our work with ICLEI South Asia, the report gives us an insight into 15 of India’s smart cities, and their future challenges and pathways. NIUA’s role as the U20 secretariat is to help cities understand their commitments and develop sustainable solutions to achieve inclusive prosperity.

At C-Cube, we intend to foster climate action in cities and help them reduce their carbon emissions. This, we achieve through a policy, programmes, projects and partnerships approach to climate action. This report is important for understanding where cities stand on GHG emissions, which sectors contribute to them, and how we can draw up climate action plans that support sustainable transitions in these cities. Our long-standing common partnership with ICLEI reinforces this commitment of moving towards just futures.

India’s ambition of transitioning to a net zero emissions development pathway is not possible without concerted and ambitious action from urban India. This report has brought forth comprehensive and insightful analyses of climate actions in select cities, shining light on the success stories and exemplary initiatives undertaken thus far. We hope the report encourages other cities and urban centres to embark on and accelerate their climate journeys; for meeting our global and national climate ambitions is possible only through cumulative transformative local climate action. It has been a humbling and incredible journey partnering with these pioneering cities and as ICLEI - South Asia, we will continue to be part of urban India’s climate-compatible development.

Hitesh Vaidya
Director, National Institute of Urban Affairs

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Head, Climate Centre for Cities (C-Cube), National Institute of Urban Affairs

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Executive Director, ICLEI South Asia

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Deputy Director, ICLEI South Asia
When we started thinking of this report, all we wanted to tell was A SIMPLE STORY. A story of Indian cities, its climate challenges, risks and solutions in the global context. One that talks to everyone and makes one ponder.

The best way of coming around a complicated concept is to understand it visually, we think. And therefore, we concluded that the language of climate change is a complex one, but when told through graphics could be fascinating.

This graphical report takes you through the story of cities globally, further looking through the Indian lens flowing to the current state of 15 Indian cities with their climate interventions. A first-of-its-kind attempt, each page explains the what’s, why’s and how’s in a minimalist way.

This report is not a prescriptive one, but one that makes you stop, think, and understand the story of cities in the climate crisis. This is one that goes beyond the realm of policymakers and city officials to all of the urban stakeholders who own their cities.

We hope you enjoy absorbing this visual story as much as we did putting it together.

Sayli Mankikar
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Hitesh Vaidya, Emani Kumar, and Victor Shinde for their encouragement and feedback.
City climate action plans not only drive local change but also have a profound impact on a global scale. As urban areas around the world adopt ambitious sustainability targets and implement innovative strategies, they become powerful catalysts for transformative action. By reducing greenhouse gas emissions, enhancing energy efficiency, and promoting sustainable practices, cities set an inspiring example for others to follow. Moreover, successful city initiatives influence national policies and international commitments, accelerating the global transition towards resilience. As the ripple effect spreads, city climate action plans become instrumental in shaping a more sustainable and resilient planet for generations to come.

The Global View
Greenhouse Gas (GHG) are water vapour (H₂O), carbon dioxide (CO₂), nitrous oxide (N₂O), methane (CH₄), and ozone (O₃) are GHGs present in the earth's atmosphere. An increased concentration of these causes global warming.

Net zero is the balance between the amount of GHGs produced and the amount removed from the atmosphere.

Adaptation Taking action to prepare for and adjust to both the current effects of climate change and predicted future impacts.

Mitigation A human intervention to reduce emissions or enhance the sinks of greenhouse gases.

Resilience The capacity to prepare, respond, and recover from the impacts of hazardous climatic events with minimal damage to societal well-being, the economy and environment.

Low-carbon transitions A shift from an economy heavily dependent on fossil fuels to a sustainable, low-carbon economy.

Gross Domestic Product (GDP) is the measure of the total market value of the goods and services produced by a country's economy during a specified period.

Internet of Things (IoT) The Internet of Things (IoT) refers to the billions of physical devices around the world that are now connected to the internet, all collecting and sharing data.

Intermediate Public Transport Intermediate Public Transport (IPT) refers to road vehicles used on hire for flexible passenger transportation, which does not follow a fixed time schedule.

Carbon sequestration A natural process of capturing and securing storage of carbon that would otherwise be emitted to, or remain in the atmosphere.

Energy audit An inspection of energy flows in a system to reduce the energy input without negatively affecting the output.

Urban biodiversity It refers to the variety of life that can be found in cities.
When Nature Tests the Urban Jungle: How Climate Change Impacts Cities Globally

With almost 68 percent of the global population residing in cities by 2050, urban areas find themselves on the frontline of climate risks. Soaring temperatures, devastating droughts, raging forest fires, and encroaching sea levels pose a grave threat to city infrastructure, livelihoods, and economies. Moreover, cities’ heavy reliance on fossil fuels intensifies greenhouse gas emissions, exacerbating the very climate change they face. Additionally, micro-regional challenges such as urban heat islands, water scarcity, food insecurity, air pollution, and mental health strains from vector-borne diseases burden city dwellers worldwide. To combat these challenges, empowering cities with policies, funds, and inclusive governance structures becomes imperative, placing cities at the heart of the conversation and driving climate resilience and action.

In 2022, Somalia experienced an extreme drought with one million people internally displaced.

70% of the cities are already dealing with the effects of climate change and nearly all are at risk.

Aggressive climate action can bring city emissions to net zero by 2050, but failing to act would double urban emissions in the same period.

In Florida, the sea level rise is already exacerbating saltwater intrusion and impacting groundwater supplies for the city.

In 2022, nearly 1.5 million people were without power across several US states as a powerful Arctic winter storm swept through.

In 2019, Cyclone Idai and Kenneth across Zimbabwe, Malawi, and Mozambique in Southern Africa left millions without food or basic services.

In 2022, floods in Pakistan in 2022 killed 1,739 people, and caused INR 1.2 trillion (USD 14.9 billion) of damage, and INR 1.25 trillion (USD 15.2 billion) of economic losses.

In 2022, Somalia experienced an extreme drought with one million people internally displaced.

In 2022, Somalia experienced an extreme drought with one million people internally displaced.
Cities around the world find themselves at the heart of the climate challenge. With rapid urbanisation, these bustling hubs become epicentres of energy consumption, waste generation, and greenhouse gas emissions. As populations grow, so does the strain on resources, exacerbating environmental issues and climate change. From towering carbon footprints to intensified air pollution, cities play a significant role in the global climate equation. Urgent action is needed to shift towards sustainable urban practices, harness renewable energy, and embrace eco-friendly policies. Only then can we douse the urban blaze and forge a path to a greener, more resilient future.

GLOBAL GHG EMISSIONS BY SECTORS

Electricity and heat production are the largest contributor to global GHG emissions.

In Brazil, the majority of emissions come from agriculture and land use change.

In the United States, transport is a much larger contributor to GHG than the global average.

Africa and South America are both fairly small emitters: accounting for 3-4 percent of global emissions each.

Asia is the largest emitter, accounting for 53 percent of global emissions. As it is home to a large percent of the world’s population, per capita emissions in Asia are slightly lower than the world average.
**GLOBAL GOALS**

Unite for Change: Rallying Together Towards a Global 2050 Target

With the urgency of climate change, the world is uniting in a collective endeavour to combat it. Nations, organisations, and individuals join forces for a common goal: achieving net zero emissions by 2050. This ambitious mission requires unprecedented cooperation, innovation, and determination. Governments must enact policies, industries must embrace sustainable practices, and we must make conscious choices. By harnessing the power of collaboration, we can overcome barriers, drive transformative change, and secure a sustainable future for generations to come.

### CLIMATE ACTION MILESTONES GLOBALLY

- **1979**: United Nations Conference on the Human Environment (Stockholm, Sweden)
- **1987**: Montreal Protocol adopted
- **1990**: Kyoto Protocol adopted
- **1992**: Rio Conference on Environment and Development (UNCED), the Earth Summit
- **1994**: UN Framework Convention on Climate Change (UNFCCC)
- **1995**: Kyoto Protocol adopted
- **1997**: The UN Conference on Environment and Development (UNCED) in Rio de Janeiro adopted Agenda 21
- **2005**: The first assessment report of the Intergovernmental Panel on Climate Change (IPCC)
- **2007**: The second assessment report of the IPCC
- **2009**: The third assessment report of the IPCC
- **2010**: The fourth assessment report of the IPCC
- **2012**: The fifth assessment report of the IPCC

### Sustainable Development Goals (SDGs)

SDGs are an urgent call for action by all countries in a global partnership. They recognise that ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth – all while tackling climate change.

- **2015**: The United Nations adopted the 2030 Agenda for Sustainable Development, including 17 SDGs
- **2016**: COP 21: Paris Agreement adopted
- **2019**: GCoM established
- **2021**: Conference of the Parties of the UNFCCC 26 (COP 26)
- **2023**: 768 cities joined UNFCCC’s “Race to Zero” campaign pledging to reach net zero emissions by 2050 and start implementing projects by 2022

### ROLE OF CITIES

Cities account for more than 50 percent of global population, 80 percent of global GDP and 2/3 of global energy consumption, and 75 percent of global GHG are derived from cities.

- **Cities are the hub of economic activities**
- **High population density**
- **High built density**
- **Increase in urban infrastructure**
- **Hub of economic activities**

- **Unleashing the full potential of urban areas**
- **Facing challenges**
- **Overcoming barriers**

### ROLES OF WOMEN

- **Women are not only resilient in the face of adversity but instrumental in driving sustainable solutions**
- **Bring invaluable perspectives, knowledge, and innovative approaches to climate action**

### SOURCES

Refer to page 70.
India has made significant strides in its action against climate change, positioning itself as a key global player in this issue. The country has committed to ambitious renewable energy targets, aiming to achieve 450 GW of renewable capacity by 2030. India’s efforts have resulted in a substantial increase in renewable energy deployment, with solar and wind power leading the way. Additionally, the government has implemented various policies and initiatives to promote energy efficiency and sustainable development. However, challenges remain, including the need for further investment in clean technologies and infrastructure. India’s commitment to addressing climate change is evident, but continued efforts and international collaboration are crucial to achieving a sustainable future.
India is making positive strides in climate action. It is looking at a climate action planning that focuses on reducing the effects of global warming and promoting sustainable development, getting cities into the fold. With the National Action Plan on Climate Change, urban areas are adopting clean energy sources, improving waste management, enhancing transportation systems, promoting sustainable urban planning, and creating green spaces. With this, India aims to reduce emissions, enhance resilience to climate impacts, and become future-proof.

**NATIONAL ACTION PLAN ON CLIMATE CHANGE (NAPCC)**

Released on 30th June 2008, it outlines a national strategy to adapt to climate change and enhance the ecological sustainability of India's development path. It stresses that maintaining a high growth rate is essential for increasing living standards of the vast majority of people of India and reducing their vulnerability to the impacts of climate change.

**INDIA'S NATIONAL DETERMINED CONTRIBUTION**

India at the 26th session of the Conference of the Parties expressed to intensify its climate action. The 5 goals were:
1. Reach its non-fossil energy capacity to 500 GW by 2030.
2. Meet 50 percent of its energy requirements from renewable energy by 2030.
3. Reduce the total projected carbon emissions by one billion tonnes from 2021 onwards till 2030.
4. By 2030, reduce the carbon intensity of the economy by less than 45 percent.
5. By the year 2070, India will achieve the target of Net Zero.
NUDGING CITY ACTION
Creating frameworks, tools, capacity building and financial support for cities

To unlock cities’ pivotal role in combating climate change, we must first gauge our position and identify gaps within sectors. This requires dynamic tools, comprehensive frameworks, and capacity-building initiatives. By up-skilling stakeholders and offering vital financial support, we can enhance understanding and drive meaningful transitions. Enter the Climate Smart Cities Assessment Framework (CSCAF) – a visionary guide diagnosing climate action gaps specific to Indian cities. Armed with knowledge and resources gained from CSCAF 1.0 and CSCAF 2.0, the CSCAF 3.0 unleashes urban potential and propels a collective sustainable journey.

CSCAF 2.0
In the quest for sustainable urban planning and climate-responsive development, a ground breaking self-assessment framework emerged—the Climate Smart Cities Assessment Framework (CSCAF). Developed by the Climate Centre for Cities (C-Cube) at the National Institute of Urban Affairs (NIUA), under the Ministry of Housing and Urban Affairs (MoHUA), CSCAF has reached its third iteration (CSCAF 3.0). Its stunning accomplishments include:

- Capturing cities’ climate preparedness
- Institutionalising climate actions
- Providing a vital climate action roadmap tailor-made for Indian cities
- Propelling cities towards low-carbon transitions
- Capturing cities’ climate preparedness
- Institutionalising climate actions
- Providing a vital climate action roadmap tailor-made for Indian cities
- Propelling cities towards low-carbon transitions

CLIMATE PERFORMANCE ASSESSMENT

1 STAR
Early stages of development, yet to consider climate actions

2 STAR
Initiated data analysis, established committees, etc

3 STAR
Have institutional mechanisms or are developing action plans

4 STAR
Allocated budgets and initiated implementation of projects

5 STAR
Have showcased successful implementation

THE CSCAF 2.0 FINDINGS

- Urban Planning, Green Cover and Biodiversity
  Assessments need to be conducted to understand the status of water bodies and open areas

- Energy and Green Buildings
  Switch to renewable sources of energy to champion sustainable energy sourcing
  Significant measures are needed to promote green buildings

- Mobility and Air Quality
  Need to create non-motorised facilities for walking, bicycling and small-wheeled transport
  Cities need to harness the availability of efficient public transport systems

- Waste Management
  Cities need to have landfills scientifically remediated
  Need to address the lack of scientific land availability and adopt relevant measures

- Water Management
  Cities need to conduct energy audits for water supply pumping stations and treatment plants
  Need to conduct energy audits for wastewater pumping stations and treatment plants

BRIDGING THE GAPS

Ahmedabad
- A holistic Solid Waste Management Plan with a 2,000 TDP waste to energy plant, a 200 TDP plastic treatment facility, and a 500 TDP bio-CNG plant
- Action in 10 cities that are a part of this status report to mitigate GHG emissions

Rajkot
- Public bicycling sharing system at 65 locations to promote NMT and enhance last-mile connections
- A biodiversity strategy and action plan with a city profile, institutional and legal frameworks, actions and strategies

Vadodara
Through Public Private Partnerships (PPPs), it developed transportation hubs and central bus stands for efficient public transportation

Siliguri
Transformative low energy AIMGaur building using LED lamps, low energy fans and power factor correction devices

Udaipur
- Implemented an automated SCADA based monitoring system for real time monitoring of the water supply system
- Implemented scientific closure and capping of an old dump site at Tithardi and constructed a sanitary landfill

Panaji
- Implemented an automated SCADA based monitoring system for real time monitoring of the water supply system
- A biodiversity strategy and urban plan with a city profile, institutional and legal frameworks, actions and strategies

Kochi
- An Open Green Space Improvement Plan through increase in vegetation cover, biodiversity parks and urban forests

Coimbatore
- Installed the use of power factor correction panels to reduce power loss at water at sewage pumping stations

Trivandrum
- An Open Green Space Improvement Plan through increase in vegetation cover, biodiversity parks and urban forests

Tirunelveli
- An Open Green Space Improvement Plan through increase in vegetation cover, biodiversity parks and urban forests

Sources: Refer to page 70
The climate challenge in India’s metro cities is unique. The growing GHG emissions add to the existing climate challenges in these urban agglomerates. These cities are witnessing the adverse impacts of rising temperatures, air pollution, water scarcity, and extreme weather events. While some cities have taken commendable steps towards sustainability, such as adopting renewable energy and implementing waste management systems, there is an urgent need for collaborative efforts and policy reforms to mitigate climate risks. Building resilience, enhancing green infrastructure, and promoting community engagement is vital for ensuring a sustainable and climate-resilient future for these cities.

**City View**

The climate challenge in India’s metro cities is unique. The growing GHG emissions add to the existing climate challenges in these urban agglomerates. These cities are witnessing the adverse impacts of rising temperatures, air pollution, water scarcity, and extreme weather events. While some cities have taken commendable steps towards sustainability, such as adopting renewable energy and implementing waste management systems, there is an urgent need for collaborative efforts and policy reforms to mitigate climate risks. Building resilience, enhancing green infrastructure, and promoting community engagement is vital for ensuring a sustainable and climate-resilient future for these cities.
WHERE CITIES STAND

Customising Action: Mapping Climate Strategy in Cities and Importance of Tailored Plans

Recognising the unique challenges faced by each city, customising climate action plans is critical. With diverse geographical, socio-economic, and cultural landscapes, a one-size-fits-all approach does not work. Indian cities need tailored plans, aligning strategies with local contacts. This targeted approach will ensure effective implementation and impact. By mapping climate strategies to their specific circumstances, cities will be resilient, drive sustainable growth, and pave the way for a greener future. Thus, customisation proves to be the key to unlocking transformative change.

VULNERABLE URBAN SYSTEMS

- **Wastewater**: Extreme risk level in three cities
- **Water Supply**: Extreme risk level in two cities
- **Solid Waste Management**: Extreme risk level in one city
- **Transport**: Extreme risk level in one city

CLIMATE PROFILES OF 15 CITIES

Climate Profile of 15 Cities

- **Ahmedabad**: 5.5 GJ, 0.5 tCO₂
- **Coimbatore**: 7 GJ, 1.5 tCO₂
- **Gwalior**: 5 GJ, 1 tCO₂
- **Kochi**: 8 GJ, 1.5 tCO₂
- **Nagpur**: 6 GJ, 2 tCO₂
- **Panaji**: 3 GJ, 0.5 tCO₂
- **Pimpri-Chinchwad**: 3.5 GJ, 1 tCO₂
- **Rajkot**: 3.5 GJ, 1 tCO₂
- **Shimla**: 2 GJ, 0.5 tCO₂
- **Siliguri**: 2.5 GJ, 0.5 tCO₂
- **Thane**: 2.5 GJ, 1 tCO₂
- **Tiruchirappalli**: 2.5 GJ, 0.5 tCO₂
- **Tirunelveli**: 3 GJ, 0.5 tCO₂
- **Udaipur**: 4 GJ, 1 tCO₂
- **Vadodara**: 4.5 GJ, 1 tCO₂

CLIMATE HAZARDS

- **Increasing temperature**: Heat waves estimated to increase in India by 75 percent in a business-as-usual scenario
- **Cyclones**: 77 cities in the coastal region of India are prone to frequent cyclones
- **Flooding**: Over 140 cities in India are prone to high risk of flooding
- **Landslides**: Over 12% of India prone to landslides

PREPARING CITIES AHEAD

While CSCAP 2.0 exhibits the level of city preparedness, ICLEI South Asia supported 15 Indian cities through donor-funded projects in real-time preparation of city-level greenhouse gas emission inventories. These inventories have provided valuable insights for local governments and communities, enabling them to identify targeted mitigation interventions and set emission reduction objectives.

The GHG inventories have allowed local governments and communities to define emission reduction objectives and improve and reinforce the integration of climate change initiatives at the city level.

REFERENCE: ICLEI South Asia
In Ahmedabad, a city bustling with economic activity and industrial prowess, climate action can safeguard the environment and future generations. By harnessing the potential of renewable energy sources, promoting sustainable manufacturing practices, and implementing efficient waste management systems, we can reduce carbon emissions and protect our air and water resources. Additionally, integrating green infrastructure into urban management systems, we can reduce carbon emissions and protect our economic activities, such as commerce and industries.

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Ahmedabad is in the process of preparing its Climate Resilient Action Plan and setting its climate resilience targets.

**CITY PERFORMANCE**
Climate Smart Cities Assessment Framework (ESGAP 2.0)
Ahmedabad city has allocated budgets and initiated the implementation of projects.

**MEASURES IN THE PIPELINE**

**ADAPTATION**

- **Water and Wastewater**
  - Development of water meter policy for efficiency and conservation
  - Conducting water augmentation & ground water recharge studies for improved decision making
  - Development of channels for detention and rejuvenation of existing wetlands
  - Stormwater Drainage
    - Improved stormwater management-enhanced percolation and channelising strategies to minimize water logging and run-off

- **Biodiversity**
  - Development of urban forest
  - Plantation of 1 million trees to increase the city's tree cover
  - Implementation of urban forest and biodiversity parks

- **Building**
  - 5 MW solar PV installation for municipal buildings
  - Installation of 8 & 4 MW wind power plant at Jamjodhpur
  - Promote renewable energy and energy efficiency through social media campaigns

- **Transport**
  - Utilization of renewable energy to charge electric public buses
  - Oil and Gas (NGV) buses
  - Parking demand assessment
  - Preparation of Ahmedabad Public Transport Policy

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**MITIGATION**

- **Climate Resilient Action Plan**
  - Prioritised routes for NMT
  - Preparation of Energy Conservation
  - Creation of awareness and implementation of orbital campaigns

- **Solid Waste Management**
  - Implementation of waste to energy plant of 500 TPD
  - Implementation of 200 TPD plastic, waste treatment facility
  - Installation of 500 TPD bio-CHP plant

**CITY SCALE CONSUMPTION**

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<th>Energy Source</th>
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<td>Municipal Street-lighting</td>
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</table>

**CITY SCALE GHG EMISSIONS**

<table>
<thead>
<tr>
<th>Source</th>
<th>City-wide</th>
<th>Per Capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>1.83 TCO₂e</td>
<td>0.00 TCO₂e</td>
</tr>
<tr>
<td>Commercial</td>
<td>0.00 TCO₂e</td>
<td>0.00 TCO₂e</td>
</tr>
<tr>
<td>Transport</td>
<td>0.00 TCO₂e</td>
<td>0.00 TCO₂e</td>
</tr>
<tr>
<td>Industrial</td>
<td>0.00 TCO₂e</td>
<td>0.00 TCO₂e</td>
</tr>
</tbody>
</table>

**CITY RESILIENCE**

- **Biodiversity**
  - Development of urban forest
  - Plantation of 1 million trees to increase the city's tree cover
  - Implementation of urban forest and biodiversity parks

- **Building**
  - 5 MW solar PV installation for municipal buildings
  - Installation of 8 & 4 MW wind power plant at Jamjodhpur
  - Promote renewable energy and energy efficiency through social media campaigns

- **Transport**
  - Utilization of renewable energy to charge electric public buses
  - Oil and Gas (NGV) buses
  - Parking demand assessment
  - Preparation of Ahmedabad Public Transport Policy

- **Solid Waste Management**
  - Implementation of waste to energy plant of 500 TPD
  - Implementation of 200 TPD plastic, waste treatment facility
  - Installation of 500 TPD bio-CHP plant

**CITY PROFILE**

- **City area**: 403.89 sq. km
- **Total population est. (2021)**: 11,690 million kWh
- **Electricity consumption per capita**: 2747 kWh
- **GHG emissions from all facilities**: 2.13 TCO₂e

**CLIMATE PROJECTIONS**

- **Increasing temperature** leads to extreme weather events such as floods, droughts and storms
- **Increased rainfall** leads to flash floods

**CLIMATE ADAPTATION**

- **Water and Wastewater**
  - Development of water meter policy for efficiency and conservation
  - Conducting water augmentation & ground water recharge studies for improved decision making
  - Development of channels for detention and rejuvenation of existing wetlands

- **Biodiversity**
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**CITY TARGET**

Ahmedabad is in the process of preparing its Climate Resilient Action Plan and setting its climate resilience targets.

**MUNICIPAL SCALE**

- **Energy source**: Municipal operations
  - Municipal buildings
  - Commercial buildings
  - Municipal operations
  - Municipal facilities
  - Municipal vehicles
  - Municipal street-lighting

- **GHG emissions**: Municipal operations
  - Municipal facilities: 6.5 GJ
  - Municipal buildings: 1.55 GJ
  - Municipal vehicles: 0.47 GJ
  - Municipal wastewater: 0.88 GJ
  - Municipal street-lighting: 0.00 GJ

**CLIMATE RESILIENCE**

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**CITY SCALE CONSUMPTION**

<table>
<thead>
<tr>
<th>Source</th>
<th>City-wide</th>
<th>Per Capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipal Facilities</td>
<td>6.5 GJ</td>
<td>10.00 GJ</td>
</tr>
<tr>
<td>Municipal Buildings</td>
<td>1.55 GJ</td>
<td>0.00 GJ</td>
</tr>
<tr>
<td>Municipal Vehicles</td>
<td>0.47 GJ</td>
<td>0.00 GJ</td>
</tr>
<tr>
<td>Municipal Wastewater</td>
<td>0.88 GJ</td>
<td>0.14 GJ</td>
</tr>
<tr>
<td>Municipal Street-lighting</td>
<td>0.00 GJ</td>
<td>0.00 GJ</td>
</tr>
</tbody>
</table>

**CLIMATE PROJECTIONS**

- **Increasing temperature** leads to extreme weather events such as floods, droughts and storms
- **Increased rainfall** leads to flash floods

**CLIMATE ADAPTATION**

- **Water and Wastewater**
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In Coimbatore, a vibrant city nestled amidst the Western Ghats and the Noyyal River, climate change demands our immediate attention. As a hub for manufacturing, education, and healthcare, we have the power to drive sustainable change. By embracing renewable energy sources, promoting eco-friendly industries, and implementing robust waste management practices, we can reduce the carbon footprint and protect natural resources like the Noyyal river. Emphasizing green spaces, implementing cycling lanes, and investing in public transportation will create a cleaner and healthier environment for all.

**CITY PROFILE**
- City area: 197.64 sq km
- Total population est.(2023): 1.89 million
- Population density est(2020): 7,339 persons/sq km
- Total households est.(2020): 331,547 households
- Climatic condition: Hot and Dry
- Economic activities: Trade, Medical, IT, Commerce & Industries

**CITY SCALE CONSUMPTION** (2020–21)
- **Energy consumption (TWh)**
  - City-wide: 21.13 million GJ
  - Residential: 10.48 GJ per capita
  - Transport: 3.22 million TCO
  - Industry: 2.19 million kWh
  - Commercial: 1.60 TCO per capita
  - Municipal (water supply): 1.088 kWh per capita

**GHG EMISSION**
- Residential: 31%
- Industry: 23%
- Transport: 15%
- Municipal: 12%
- Commercial: 9%
- Waste: 8%
- Energy: 7%
- Municipal facilities: 6%
- Municipal buildings: 4%
- Municipal vehicles: 4%
- Municipal facilities: Street-lighting: 3%

**Highest energy consuming sector (33%)**
- Highest Emissions sector (33%)
- Municipal operations

**CITY SCALE GHG EMISSIONS** (2020–21)
- **GHG emission**
  - Residential (33%)
  - Commercial (15%)
  - Industry (23%)
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In Gwalior, a city rich in history and industrial development, the presence of three industrial belts and diverse industries such as dairy, textiles, and chemicals, calls for immediate prioritisation of sustainable practices. By promoting energy efficiency, encouraging renewable energy adoption, and implementing green initiatives in our industries, we can significantly reduce greenhouse gas emissions. Additionally, preserving our historical sites and promoting tourism will contribute to a greener Gwalior.

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Municipal operations are included in and are a subset of the city-scale information. All consumption and emission data from 2013-14

Reference: ICLEI South Asia

CITY PROFILE
City area: 289.55 sq km
Total population (2011): 1.11 million
Population density (2011): 3,833 persons/sq km
Total households: 246,000 households
Climate condition: Sub-Tropical
Economic activities: Tourism and industries (dairy, textile & chemical)

In Gwalior, a city rich in history and industrial development, the presence of three industrial belts and diverse industries such as dairy, textiles, and chemicals, calls for immediate prioritisation of sustainable practices. By promoting energy efficiency, encouraging renewable energy adoption, and implementing green initiatives in our industries, we can significantly reduce greenhouse gas emissions. Additionally, preserving our historical sites and promoting tourism will contribute to a greener Gwalior.

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Kochi, a popular tourist destination and the financial and commercial capital of the state commands that critical climate action takes place in the many adjoining industries that support tourism here. We need to promote sustainable practices in ship-building, seafood processing, chemical manufacturing, and IT industries to reduce our carbon footprint. Embracing renewable energy sources, implementing efficient waste management systems, and safeguarding our coastal ecosystem will contribute to a more resilient and environmentally conscious Kochi.

**City Profile**

- **City area**: 127.13 sq. km
- **Total population (2011)**: 6.6 million
- **Population density (2011)**: 5,015 persons/km²
- **Total households (2011)**: 1,70,311 households
- **Climate condition**: Mixed humid (tropical)
- **Economic activities**: Trade and commerce

**Climate Performance**

Kochi has initiated climate action, established committees for climate action. It’s Climate Smart Cities Assessment Framework (CSCAF 2.0)

**City Scale Consumption (2018-19)**

- **Energy**
  - 1.74 million GJ city-wide
  - 28.29 GJ per capita
  - GHG emission: 1.61 million tCO₂e city-wide
  - 2.62 tCO₂e per capita
  - Electricity: 523 million kWh city-wide
  - 847 kWh per capita

**Climate Projections**

- Increasing temperature:
  - Leads to extreme weather events such as floods, droughts and storms.
  - Increased short duration high intensity rainfall:
  - Leads to flash floods.

**Risk Status**

**Mitigation**

- **Energy efficient pumps for water treatment and water supply**
- **Use of solar PV for water treatment plants**
- **Deploy renewable energy in affordable housing**
- **Transition to e-bikes in public transport**
- **Deployment of Low Carbon Urban Freight Action Plan**
- **Introduction of electric loaders in the prominent market centres and develop charging infrastructure**
- **Install solar PV to meet 60% electricity demand in municipal buildings**
- **Implement energy efficiency retrofits**

**Adaptation**

- **Prepare Integrated Urban Water Management Plan**
- **SCADA in water management**
- **Desalination of sea water for water source enhancement**
- **Install water treatment and water treatment plants**

**Measures in the Pipeline**

- **Storm water Drainage**
  - Preparation of city-wide drainage and canal master plan
- **Waste**
  - Strategicising C&D waste management (reuse and recycling)
  - Enforcement of waste segregation at source
- **Water and Wastewater**
  - Installation of flood control pumps
- **Fire Safety and Rescue**
  - Installation of flood control pumps
- **Biodiversity**
  - Increase green cover in public spaces through fiscal incentives

**Risky Status**

- **High**
  - Extreme weather events
  - Flash floods
- **Medium**
  - Water supply
  - Water treatment
  - Energy supply
- **Low**
  - Waste
  - Biodiversity
  - Urban development

**City Scale Energy Consumption and GHG Emissions (2018-19)**

- **Transport**: 47% Energy Use, 12% GHG Emission
  - Municipal buildings
  - Residential
  - Industry
  - Commercial
  - GHS emission: 28.29 GJ
  - Energy use: 1.74 million GJ

Municipal operations are included in and are a subset of the city-scale information.

All consumption and emission data from 2018-19

Reference: ICLEI South Asia State of Cities
With a strong manufacturing base encompassing industries such as chemicals, cement, electronics, textiles, and more, Nagpur must prioritize sustainable practices. Implementing energy-efficient measures, promoting renewable energy adoption, and reducing emissions in industries are crucial steps. Additionally, encouraging sustainable agriculture and protecting natural resources are essential. By fostering a green economy, Nagpur can lead the way in positive climate change impacts and building a sustainable future for all of Maharashtra.

**City Profile**
- City area: 227.40 sq. km
- Total population (2011): 2.4 million
- Population density (2011): 12,379 persons/sq. km
- Total households (2011): 577,558 households
- Climate condition: Mixed humid (tropical)

Economic activities include:

- Heavy industries in transport and construction
- Engineering
- Textiles
- Chemicals
- Agriculture

**Climate Performance**
- Climate Smart Cities Assessment Framework (CSCAF 2.0)
- Nagpur has established institutional mechanisms in place and is developing climate action plans.

**City Scale Consumption**

### Energy
- **City-wide:**
  - Electricity: 1,822 million kWh
    - 678 kWh per capita
  - Gas: 3.03 million tCO₂
    - 1.13 tCO₂ per capita
  - Energy: 19.04 million GJ
    - 7.03 GJ per capita

### Water Supply
- 55% (2011)

### Waste
- 57%

### Solid Waste Management
- 56%

**City Target**
- 20% reduction in annual GHG emissions by 2025-26 from the 2011-18 baseline.

**Measures in the Pipeline**
- **Waste**
  - Strengthen 3R implementation with internet-of-things
  - Methanation

- **Transport**
  - Promote and develop non-motorised transit facilities
  - Electrification of public transport and promotion of e-mobility

- **Municipal Buildings**
  - Design and build new public buildings as green buildings
  - Installation of net-metered rooftop solar PV systems

- **Adaptation Measures in the Pipeline**
  - Strengthen 3R implementation
  - Installation of automated water supply systems
  - Decentralised wastewater treatment systems
  - Fiselal sludge management policy
  - Implementation of Local Biodiversity Strategy Action Plan
  - Conduct water audits
  - Solid waste management

**Risk Status**
- **Urban Biodiversity**
  - High
  - Stormwater management
  - Waste
  - Water supply
  - Transport
  - Municipal buildings
  - Health

**State of Cities**
- **Nagpur**
  - Resilience
  - Infrastructure
  - Social economy
  - Governance
  - Environment

**CLIMATE PROJECTIONS**
- Increased short duration high intensity rainfall
  - Leads to flash floods
- Increased temperature
  - Leads to extreme weather events such as floods, droughts and storms
- Urban biodiversity
  - Storm water management

**Mitigation**
- Waste
  - Compost and RDF plant for waste processing
  - Promote decentralised bio-methanisation
  - Scientific closure of landfill

- Transport
  - Encourage use of e-mobility
  - Public bicycle sharing in identified pilot areas

- Municipal Buildings
  - Design and construct all new public buildings as green buildings
  - Installation of net-metered rooftop solar PV systems

- Building
  - Adopt and implement existing guidelines for climate responsive homes
  - Optimize energy efficiency of homes and apartments
  - Expand benchmarking of energy consumption in commercial and public buildings

- Street Lighting
  - Cool roof programme
  - Roof top solar PV potential and scale-up implementation through demand aggregation
  - Solar PV systems at water supply facilities

**Climate Change Impacts**
- Leading cause of extreme weather events in the city
- Leads to floods, droughts and storms
A climate action plan for Panaji is essential, thanks to its coastal location and abundant mangroves on the backwaters entering the Queanr Creek, St. Vazires Creek, Mandovi River and Jui River, which are paying the price for climate change. Preserving and restoring these vital ecosystems is important. Implementing sustainable tourism practices, promoting renewable energy sources, and adopting climate-resistant agricultural techniques are necessary steps. Additionally, awareness about the importance of environmental conservation and reducing emissions will contribute to a sustainable future.

Municipal operations' information reflects the energy consumption and GHG emissions from all facilities and operations that the city government owns or controls, such as municipal buildings, and municipal vehicle fleet.

City-scale information reflects the energy consumption and GHG emissions from residential buildings, commercial buildings, public facilities, transportation, and industries. Municipal operations are included in the city-scale information.

Mitigation

1. Clean fuel alternatives for all modes of transport
2. Increased share of alternative fuel-based vehicles
3. Procurement of electric buses for public transport

Adaptation

1. Installing water level gauges to mark sea level rise
2. Automated SCADA based monitoring for real-time monitoring of the system
3. Rainwater harvesting in residential buildings and public institutions through awareness and incentives
4. Reuse of treated wastewater for other municipal purposes

Adaptation

1. Awareness generation on health issues and safety, and developing a public alert system on expected hazards
2. Maintenance of sand dunes by enhancing vegetation
3. Setting up decentralised waste processing units

All consumption and emission data from 2013-14

Reference: ICLEI South Asia
Pimpri-Chinchwad is a key industrial belt with engineering, automobile, pharmaceutical, and biotechnology industries in Maharashtra. This shows the amount of emissions produced by the town regularly. So, implementing energy-efficient technologies, encouraging renewable energy adoption, and reducing emissions in industries are vital steps. Investing in green energy-efficient technologies, encouraging renewable energy adoption, and operations that the city will contribute to a greener and more resilient city. Infrastructure, improving public transportation, and enhancing waste management systems will contribute to a greener and more resilient city.

City-scale information reflects the energy consumption and GHG emissions from residential buildings, commercial buildings, public facilities, transportation, and waste. Municipal operations are included in and are a subset of the city-scale information. All consumption and emission data from 2012-13 Reference: ICLEI South Asia.
As a significant industrial town with a strong manufacturing base, Rajkot could be a poster child on how promoting sustainable practices is crucial. Rajkot is in the process of updating its Climate Resilient Action Plan (3rd generation) and setting climate resilience targets.

**CITY PROFILE**
City area: 161.86 sq. km
Total population est.(2021): 1.26 tCO

**CLIMATE PERFORMANCE**

**CITY SCALE CONSUMPTION (2020-21)**
- **Energy**: 17 million GJ
  - Residential: 9.5 GJ per capita
  - Industrial: 1.26 GJ per capita
- **GHG emission**: 2.27 million tCO
  - Residential: 1.26 tCO per capita
  - Industry: 1.26 tCO per capita
- **Electricity**: 1,712 million kWh
  - Residential: 953 kWh per capita

**CLIMATE PROJECTIONS**
- Increased high intensity rainfall leads to flash floods
- Increasing temperature leads to extreme weather events such as floods, droughts and storms

**STATE OF CITIES**

**MITIGATION**

**MEASURES IN THE PIPELINE**

**RISK STATUS**

**STORM WATER**
Rejuvenation of existing natural drains through percolation strategies

**WASTE**
- Integrating energy efficient equipment and solar PV for treatment plants and pumping stations
- Waste to composting plant for processing of organic waste
- 100 TPD Waste to Energy plant
- Material recovery facility for charnelling dry waste
- Scientific capping of landfills at Nakrawad

**BUILDINGS**
- Adoption and implementation of Green Building Policy
- Solar Park in Smart city area and installation of rooftop solar PV on government buildings and affordable housing schemes
- Promoting energy efficient practices for lamps and tube lights

**TRANSPORT**
- Deployment of 150 E-buses for the electrification of public transport
- Solar PV based EV charging
- Introduce public bicycle sharing system at all locations to promote non-motorized transit and improve last-mile connectivity

**STREET LIGHTING**
- Actual 100% energy efficient street-lighting

**RAJKOT**
Rajkot city has allocated budgets and initiated the implementation of projects.

**CLIMATE SMART CITIES ASSESSMENT FRAMEWORK (ICSAF 2.0)**
Rajkot city has allocated budgets and initiated the implementation of projects.

**CLIMATE RESILIENCE**

**METEO CLIMATE**

**CLIMATE SMART CITIES ASSESSMENT FRAMEWORK (ICSAF 2.0)**
Rajkot city has allocated budgets and initiated the implementation of projects.
The capital town of Himachal Pradesh, Shimla, nestled in the majestic Himalayan ranges, is blessed with the catchment areas of the rivers Sutlej, Pabbar, and Giri. The city heavily relies on tourism as a major economic sector, alongside small-scale manufacturing industries. To combat climate change, Shimla must prioritize sustainable tourism practices, promote renewable energy adoption, implement efficient waste management systems, and protect its pristine natural resources.

**City Profile**
- City area: 79.99 sq km
- Total population (2011): 5.56 million
- Population density (2011): 4,197 persons/sq km
- Total households (2011): 27,000 households
- Climate condition: Sub-Tropical
- Economic activities: Tourism

**Energy Consumption and GHG Emissions**

<table>
<thead>
<tr>
<th>Sector</th>
<th>Energy Consumption</th>
<th>GHG Emission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport</td>
<td>26.2%</td>
<td>24.2%</td>
</tr>
<tr>
<td>Residential</td>
<td>15.5%</td>
<td>8.9%</td>
</tr>
<tr>
<td>Industry</td>
<td>8.1%</td>
<td>8.1%</td>
</tr>
<tr>
<td>Commercial</td>
<td>14.9%</td>
<td>13.6%</td>
</tr>
<tr>
<td>Agriculture</td>
<td>6.9%</td>
<td>37.9%</td>
</tr>
<tr>
<td>Water and Wastewater</td>
<td>26.2%</td>
<td>3.7%</td>
</tr>
<tr>
<td>Electricity</td>
<td>13.6%</td>
<td>13.6%</td>
</tr>
</tbody>
</table>

**GHG Emission**
- Energy usage: 1.64 million GJ
- Residential: 9.14 GJ per capita
- Commercial: 1.24 tCO2 per capita

**Climate Projections**
- Increased temperature: Leads to extreme weather events such as floods, droughts and storms
- Increased short duration high intensity rainfall: Leads to flash floods

**Mitigation**
- Increased share of renewable energy usage
- Implementation of green building incentives through awareness and incentives across all sectors
- Implementation of green building incentives through awareness and incentives across all sectors
- Urban forestry initiatives
- Construction of sky buses
- Green tax for tourist cars

**Adaptation**
- Construction of sky buses
- Urban forestry initiatives
- Construction of sky buses
- Green tax for tourist cars

**Measures in the Pipeline**
- Development of Low Carbon Urban Freight Action Plan
- Decentralised wet waste processing units for processing of organic waste
- Construction of sanitary landfill for safe waste disposal
- Application of 3R Principles: reuse and recycling of waste at source through public sensitisation on the same
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SILIGURI, the third largest urban agglomeration in West Bengal, is situated on the floodplains of the Mahananda River and surrounded by dense forests at the foothills of the Eastern Himalayas in Darjeeling. The town faces the dual challenge of floods and deforestation. As a vital transport and tourism hub known for its tea industry, the city must prioritize sustainable practices, including fixed management strategies, afforestation efforts, and promotion of eco-friendly tourism.

**City Scale Consumption (2020-21)**

<table>
<thead>
<tr>
<th>Category</th>
<th>Energy Consumption</th>
<th>GHG Emission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipal facilities</td>
<td>22.52 GJ per capita</td>
<td>1.67 million tCO₂-e</td>
</tr>
<tr>
<td>Municipal buildings</td>
<td>23.52 GJ per capita</td>
<td>1.67 million tCO₂-e</td>
</tr>
<tr>
<td>Municipal vehicles</td>
<td>2.43 tCO₂-e per capita</td>
<td>2.43 tCO₂-e</td>
</tr>
<tr>
<td>Street-lighting</td>
<td>735 kWH per capita</td>
<td>507 million kWh</td>
</tr>
</tbody>
</table>

**City Target**

14.6% reduction in annual GHG emissions by 2022-23 from the 2015-16 baseline.

Siliguri is in the process of updating its Climate Resilient Action Plan (2nd generation) and setting climate resilience targets.

**City Profile**

City area: 0.69 sq. km
Total population est. (2021): 0.69 million
Population density est. (2021): 14,460 persons/sq. km
Total households est. (2021): 115,332 households
Climate condition: Subtropical humid
Economic activities: Retail, logistics, healthcare, tourism

**Climate Projections**

- Increased short duration high rainfall leads to flash floods
- Increased maximum and daily minimum temperatures

**Climate Performance**

Climate Smart Cities Assessment Framework (ICSAF 2.0)

Siliguri city has initiated data analysis, established committees for climate action.

**Measures in the Pipeline**

**Adaptation**

- Water and Wastewater
  - Implementation of traffic decongestion measures through infrastructure and policy guidelines
- Buildings
  - Transition to energy efficient public buildings
- Wind and solar power generation projects

**Mitigation**

- Waste
  - Waste segregation and collection
  - RDF palletisation activities
  - Green energy generation
- Stormwater drainage
  - Augmentation of sewerage and drainage network
  - Installation of portable pumping units at a lowest cost model
  - Restoration of degraded rivers for stormwater run-off collection
- Transport
  - Implementation of traffic decongestion measures through infrastructure and policy guidelines
- Buildings
  - Promotion of green buildings
- Wind and solar power generation projects
- Street Lighting
  - Implementation of automatic switching panels and powering through renewable energy

**Risk Status**

- Exposure to short duration high rainfall
- Increased maximum and daily minimum temperatures

**City Scale Mitigation**

- Transition to green energy generation
- Implementation of traffic decongestion measures through infrastructure and policy guidelines
- Implementation of traffic decongestion measures through infrastructure and policy guidelines
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- Implementation of traffic decongestion measures through infrastructure and policy guidelines
Mitigation

Thane, a major city in Maharashtra, relies heavily on consumer-related services, including the hospitality and IT industries for its economic development. However, rapid urbanization and industrialization have impacted its environment. To address this, Thane needs to prioritize sustainable practices, such as reducing carbon emissions, promoting sustainable practices, such as reducing carbon emissions, promoting economic activities, and preserving its natural resources.

CLIMATE PERFORMANCE

Climate Smart Cities Assessment Framework (CSCAF 2.0)

Thane city has established institutional mechanisms in place and is developing climate action plans.

CITY SCALE CONSUMPTION (2017-18)

<table>
<thead>
<tr>
<th>Sector</th>
<th>Energy Consumption (GJ)</th>
<th>GHG Emission (tCO2e)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport</td>
<td>5.82 GJ per capita</td>
<td>0.97 tCO2e per capita</td>
</tr>
<tr>
<td>Residential</td>
<td>13.06 GJ</td>
<td>2.29 tCO2e per capita</td>
</tr>
<tr>
<td>Industry</td>
<td>1.02 GJ per capita</td>
<td>0.12 tCO2e per capita</td>
</tr>
<tr>
<td>Buildings</td>
<td>1.671 GJ</td>
<td>0.11 tCO2e per capita</td>
</tr>
</tbody>
</table>

Energy

13.06 GJ (18%)

GHG Emission

2.29 tCO2e (67%)

City Target

22% reduction in annual CO2 emissions by 2025-26 from the 2017-18 baseline.

Thane's city-scale energy consumption and GHG emissions from municipal operations (2017-18)

Thane's city-scale energy consumption and GHG emissions from municipal operations (2017-18)

METEOROLOGICAL DATA

- Average temperature: 28°C
- Average rainfall: 1200 mm
- Average humidity: 75%

CLIMATE PROJECTIONS

Increased annual average rainfall

Increased minimum temperature

Leads to extreme weather events such as floods, droughts, and storms.

CITY PROFILE

City area: 128.23 sq. km
Total population (2011): 1.88 million
Population density (2011): 14,261 persons/sq. km
Total households (2017): 390,974 households
Climatic conditions: Mixed humid (tropical)

ECONOMIC ACTIVITIES

- Consumer-related services
- Hospitality
- IT industry

POPULATION DENSITY (2011)

14,361 persons/sq. km

TENURE

- Residential: 58%
- Non-residential: 42%

LOCAL GOVERNMENT

- Municipal corporation
- Urban Local Bodies
- State government

SUSTAINABLE DEVELOPMENT

- Buildings: 47.82%
- Transport: 36.91%
- Waste: 9%
- Energy: 0.90%

NATURAL RESOURCES

- Water supply: 62%
- Waste management: 34%
- Energy: 4%

THANE CITY TARGET

22% reduction in annual CO2 emissions by 2025-26 from the 2017-18 baseline.

RENEWABLE ENERGY

- Solar panels
- Wind farms

INFRASTRUCTURE

- Road network
- Drainage system
- Water grid

INNOVATION

- Green building codes
- Smart city initiatives

FINANCIAL MEASURES

- Energy audit
- Retrofitting
- Renewable energy certificates

THANE: A CASE STUDY IN SUSTAINABLE GROWTH
Tiruchirappalli, the fourth largest city in Tamil Nadu, has been thrust into global limelight due to its climate action initiatives. The city has initiated data analysis, established committees for climate action, and has launched a suite of projects to enhance sustainability, reduce embodied carbon, and implement waste management systems.

**City Profile**
- **City area:** 107.23 sq km
- **Total population:** (2021): 1.02 million
- **Population density:** 2021: 1,016 persons/sq km
- **Total households:** (2021): 356,416 households
- **Climate conditions:** Hot and dry

**Economic Activities:** Trade, commerce, industries and transport hub

**Transport**
- **Municipal vehicle fleet:** 1,155 million kWh per capita
- **Municipal facilities: Street-lighting:** 1,125 kWh per capita

**Energy Consumption and GHG Emission**
- **GHG emission:** 9.18 million GJ
  - **Transport:** 36%
  - **Residential:** 36%
  - **Industry:** 18%

**Climate Projections**
- **Increased temperature** leads to extreme weather events such as flood, droughts and storms
- **Increased rainfall** leads to flash floods

**Climate Performance**
- **Climate Smart Cities Assessment Framework (ESCAP 2.0)**

**Mitigation**
- **SCADA for improving efficiency of water supply through regular monitoring and implementation of optimum O&M.**
- **Waste**
  - Preparation of heliport solid waste management action plan with sustainable long-term vision and processing methods
  - 75 TPD legacy waste treatment
  - 25 TPD plastic waste treatment facility through NRSC (Resource Recovery Centre)
  - 30 TPD C&D Plant using the DEPOT concession framework
  - Binning of legacy waste

**Adaptation**
- **Water and Wastewater**
  - Water augmentation and ground-water recharging for improving decision making on resource management and development
  - Integration of wastewater network and channelisation during the development

**Water Supply**
- **Highest GHG Emitting Sector:** Water supply (54%)
- **Highest Energy Consuming Sector:** Municipal facilities: Water supply (54%)

**Municipal Operations**
- **Highest GHG Emitting Sector:** Transportation (36%)
- **Highest Energy Consuming Sector:** Residential (36%)

**City Scale Consumption**
- **Electricity**
  - 1.155 million kWh per capita
  - **Transport**
  - 8.95 GJ per capita

**City Scale Information**
- **Hot and dry**
- **Increasing rainfall**
- **Increased temperature**

**Climatic Condition:**
- **Population density est. (2021):** 206 persons/sq km
- **City area:** 167.23 sq. km
- **All consumption and emission data from 2020-21**

**State of Cities**

**Biodiversity**
- **Preparation of Local biodiversity strategy and Action Plan (LBASP)**
- **Prepared detailed Natural Assets Map for informed decision making process to increase green solid blue cover**
- **Development of urban forest and biodiversity parks in available vacant lands**

**Watershed Management**
- **Preparation of Stormwater Management Plan (ESCAP-India)**

**Wastewater**
- **Preparation of Stormwater Network Master Plan**

**Waste**
- **Preparation of holistic solid waste management action plan with sustainable long-term vision and processing methods**

**Integrate water**
- **Integration of wastewater network and channelisation during the development**

**Energy Efficiency**
- **Wastewater Treatment**
  - **50 TPD C&D Plant using the DEPOT concession framework**

**Green Cover**
- **Integration of carbon sequestration potential for enhancing Myanvar forests in four locations**

**Mitigation**
- **SCADA for improving efficiency of water supply through regular monitoring and implementation of optimum O&M.**

**Adaptation**
- **Water and Wastewater**
  - Water augmentation and ground-water recharging for improving decision making on resource management and development
  - Integration of wastewater network and channelisation during the development

**Water Supply**
- **Highest GHG Emitting Sector:** Water supply (54%)
- **Highest Energy Consuming Sector:** Municipal facilities: Water supply (54%)

**Municipal Operations**
- **Highest GHG Emitting Sector:** Transportation (36%)
- **Highest Energy Consuming Sector:** Residential (36%)
Tirunelveli, the sixth-largest city in Tamil Nadu, boasts of diverse service-sector activities, including cement manufacturing, agricultural trading, banking, tourism, agri-machinery, and information technology. So, the city’s environmental footprint is substantial. To address this, Tirunelveli needs to prioritize sustainable practices, such as promoting green technologies, adopting renewable energy sources, and implementing efficient waste management systems.

# Mitigation

Tirunelveli city has initiated data analysis, preparing its Climate Smart Cities Assessment Framework (CSCAF 2.0). The city’s efforts to reduce its GHG emissions and improve energy efficiency are driven by its commitment to sustainable development.

## City Profile

- **City area**: 108.65 sq km
- **Total population** est.(2020): 0.55 million
- **Population density** est.(2020): 5,085 persons/sq km
- **Total households** est.(2020): 0.46 million

**Climatic conditions**: Warm and Humid

**Economic activities**: Agriculture, agro-machinery, and information technology

**Highest GHG emitting sector**: Municipal operations

**Highest Energy consuming sector**: Industrial

**Water supply (66%)**

### City-Scale Information

#### Economy

- Total economic activity: 0.8 billion USD
- Total households est.(2021): 1.2 million
- Total population est.(2021): 4.8 million

#### Population

- Population density est.(2021): 5,085 persons/sq km
- State of Cities

### Climate Performance

- **Climate Projections**
  - Increasing temperature leads to flash floods
  - Increased rainfall leads to flash floods

### Mitigation

#### Water and Wastewater

- SCADA for improving efficiency of water supply through real-time data
- Technology up-gradation for recycling infrastructure and improved sewage management to minimise operational costs

#### Urban Biodiversity

- Promote electric mobility in the city for private vehicles and integrate battery-operated vehicles for municipal use

#### Waste

- Preparation of holistic solid waste management action plan with incorporated principles of reduce, reuse, and recycle
- Promote source segregation to improve operational efficiency of underutilised micro-composting centres

#### Buildings

- Installation of 5 MW solar PV plant at Ramayanpatti for captive consumption by municipal facilities

#### Transportation

- Preparation of Comprehensive Mobility Plan
- Preparation of Integrated Rapid Transit System for multi-modal connectivity

### Adaptation

- Storm Water Management Plan
- Rainwater harvesting system
- Stormwater drainage network improvements to minimise water logging issues

### Science and Society

- Early Flood Warning System for Thamirabarani river

### City Scale Consumption

#### Primary Energy Consumption and GHG Emission 2020-21

- **GHG emission**
  - Municipal facilities: 0.66 million tCO2e
  - Electricity: 448 million kWh
  - Transport: 810 kWh

- **Energy consumption**
  - Municipal facilities: 8.16 GJ per capita
  - Electricity: 1.2 GJ per capita
  - Industry: 1.1 GJ per capita
  - Transport: 0.6 GJ per capita

#### City Scale Mitigation

- **Municipal facilities**: Municipal facilities for captive consumption by PV plant at Ramayanpatti
- **Waste**: Waste management action plan with incorporated principles of reduce, reuse, and recycle
- **Public transport**: Electric mobility in the city for private vehicles and integrate battery-operated vehicles for municipal use

#### City Target

Tirunelveli is in the process of preparing its Climate Resilient Action Plan and setting climate resilience targets.
UDAIPUR

City PROFILE
City area: 66 sq. km
Total population est. (2020): 533,100
Population density est. (2020): 6,939 persons/sq. km
Total households est. (2020): 70,591 households
Climatic condition: Semi-arid with a hot dry summer and freezing cold winters
Economic activities: Maritime industry, tourism

CITY SCALE CONSUMPTION (2020–21)

<table>
<thead>
<tr>
<th>Sector</th>
<th>Total GHG Emission (million tCO2)</th>
<th>GHG emission per capita (tCO2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>11.6</td>
<td>2.19</td>
</tr>
<tr>
<td>Commercial</td>
<td>775</td>
<td>11.8</td>
</tr>
<tr>
<td>Industry</td>
<td>775</td>
<td>11.8</td>
</tr>
<tr>
<td>Agriculture</td>
<td>11.6</td>
<td>2.19</td>
</tr>
<tr>
<td>Transport</td>
<td>15.4</td>
<td>2.35</td>
</tr>
<tr>
<td>Municipal</td>
<td>16.4</td>
<td>2.53</td>
</tr>
<tr>
<td>Total city-wide</td>
<td>81.8</td>
<td>12.6</td>
</tr>
</tbody>
</table>

Energy consumption
- Residential: 11.6 million GJ (36%)
- Commercial: 7.75 million GWh (22%)
- Industry: 7.75 million GWh (22%)
- Agriculture: 11.6 million GJ (36%)
- Transport: 15.4 million GJ (45%)
- Municipal: 16.4 million GJ (45%)

Udaipur is in the process of updating its Climate Resilient Action Plan (2nd generation) and setting climate resilience targets.

CLIMATE PERFORMANCE
Climate Smart City Assessment Framework (ICSAF 2.0)
Udaipur city has institutional mechanisms in place and is developing climate action plans.

MEASURES IN THE PIPELINE

- Water & Wastewater
  - Rainwater harvesting in residences and institutions
  - Actions for storage and treatment of urban runoff
  - Mandate for rooftop water harvesting and rainwater recycling for state-owned buildings of plot size > 300 sq.m
  - Rejuvenation of traditional sluice gates and canals along with water quality check of natural bodies
  - Analysis of available water resources to identify alternate sources for the city
  - Strategic planning for sewage management through setting up of treatment plants in the city
  - Waste
    - Zero waste strategies in 100% of schools
    - Stormwater Drainage
      - Mapping of water logging areas and geo-tagging to propose interventions with regular monitoring mechanisms
      - Conservation and restoration of natural drainage patterns in the city
    - Biodiversity
      - Preparation of Local Biodiversity Strategy and Action Plan (LBSP)
      - Development of Miyawaki Action Plan (LBSAP)
    - Water (NRW) to 30%
      - SCADA system
      - Replacement of traditional auto-rickshaws across the city by electric powered IPT
      - Replace existing diesel bus fleet with electric buses
      - Green Mobility Zone
    - Transport
      - Installation of 500 cycles with 50 docking stations
      - Transition to electric waste collection vehicles
      - Replacement of traditional auto-rickshaws across the city by electric powered IPT
      - Replace existing diesel bus fleet with electric buses
      - Green Mobility Zone
      - Program on city area
    - Buildings
      - Encourage rooftop solar PV adoption in residential, commercial, institutional, and industrial buildings
      - Promotion of solar water heaters in households
      - Adoption of energy efficient devices and appliances in municipal buildings

RISK STATUS

 mitigation:
- Rooftop solar PV installation on parking lots
- Sludge management for new solid waste treatment plant for power
- Focused sludge management and anaerobic digestion strategies to promote recycling and energy

- Electric vehicle charging infrastructure
- Replacement of all water supply and wastewater pumps with energy efficient technology for implementation of LEED
- Implement measures to reduce water loss (OWW) to 22%
- Construction of waste to composting and RDF plant with a capacity of 100 TPD
- Material recovery facility and composting of non-recyclable waste to composting plant for dry and wet waste processing
- Installation of Waste to bio-methanation plant
- Scientific closure and capping of old dump site at Tithardi and construction of sanitary landfill at Tithardi and construction of bio-methanation plant
- 20 TPD biogas plant producing compressed biogas to power LPG

- Municipal operations
- Municipal government operations information reflects the energy consumption and GHG emissions from all facilities and operations that the city government owns or controls, such as municipal buildings, and municipal vehicle fleets.

- All consumption and emission data from 2020-21

Reference: ICLEI South Asia
VADODARA

City Profile
City area: 202.33 sq. km
Total population est. (2023): 2.94 million
Population density est. (2020): 11,502 persons/sq. km
Total households est. (2020): 613,682 households
Climatic condition: Hot and dry

Economic activities: Producer of dolomite and large-scale industries

CHALLENGES
- Climate change
- Water scarcity
- Urban sprawl
- Pollution

SITUATION
- Vadodara is in the process of preparing its Climate Resilient Action Plan and setting climate resilience targets.

CLIMATE PERFORMANCE
Climate Smart Cities Assessment Framework (CSCAF 2.0)

Vadodara city has allocated budgets and initiated the implementation of projects.

Mitigation
-Biodiversity
-Preparation of Local Biodiversity Strategy and Action Plan (LBSPA)
-Development of Biodiversity (Para 66) at Government of India level

-Water and Wastewater
-Preparation of water audit under smart water management project for ICMR Phase 2

-Transport
-Preparation of comprehensive transport and mobility plan

-Waste
-Preparation of holistic solid waste management action plan including refund and tax increment package

MEASURES IN THE PIPELINE
-Installation of solar plants on municipal buildings
-Construction of 50 TPD plastic waste processing plant
-Construction of 1000 TPD RDF waste processing plant
-Construction of new landfill site at Mangalpara

CITY SCALE CONSUMPTION (2020-21)

<table>
<thead>
<tr>
<th>Sector</th>
<th>Energy Use</th>
<th>GHS Emission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>26%</td>
<td>12%</td>
</tr>
<tr>
<td>Commercial</td>
<td>27%</td>
<td>17%</td>
</tr>
<tr>
<td>Industry</td>
<td>9%</td>
<td>13%</td>
</tr>
<tr>
<td>Transport</td>
<td>26%</td>
<td>10%</td>
</tr>
<tr>
<td>All others</td>
<td>20%</td>
<td>12%</td>
</tr>
</tbody>
</table>

All consumption and emissions data from 2020-21

Vadodara is in the process of preparing its Climate Resilient Action Plan and setting climate resilience targets.

City Target
-Vadodara city has allocated budgets and initiated the implementation of projects.

City Scale Information
-All information reflects the city-scale consumption and emissions from municipal operations, commercial buildings, public facilities, transportation and waste.

City Scale Energy Consumption and GHS emissions from municipal operations (2020-21)

-832 kWh per capita
-1,845 million kWh
-18.11 million GJ
-8.09 GJ per capita
-1.19 tCO₂ per capita
-2.66 million tCO₂ e per capita
-18.11 million GJ

Vadodara is in the process of preparing its Climate Resilient Action Plan and setting climate resilience targets.

CLIMATE RESOURCES
-Preparation of water audit under smart water management project for ICMR Phase 2

-Construction of 1000 TPD RDF waste processing plant
-Construction of new landfill site at Mangalpara

City Target
-Vadodara is in the process of preparing its Climate Resilient Action Plan and setting climate resilience targets.

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City Target
-Vadodara is in the process of preparing its Climate Resilient Action Plan and setting climate resilience targets.
The global climate challenges looming over cities has been established. But the way ahead is for cities to define the path they would be embarking on. While contextualisation sits at the core of climate action solutions, there are some common steps that cities could walk on to derive their individual paths which is laid down here.

Way Forward
PLANNING CLIMATE ACTION

Enabling cities to walk on greener pathways

**Commit to Act:**
- Pledge to reduce GHG emissions and enhance resilience, set up systems, and identify stakeholder groups.

**Assess for Impact and Risk:**
- Identity, quantify, and create GHG emission inventories that are then aligned with local strategies and actions.

**Set Goals and Targets:**
- Deduce potential resilience interventions by setting realistic goals.

**Develop an Action Plan:**
- Create an action plan to address climate mitigation and adaptation, and align with potential funds.

**Implement:**
- Develop institutional arrangements and capacity to implement the projects within timelines and funds.

**Monitor and Report:**
- Annually evaluate data to assess the climate actions, emission reductions, and impact.

**Collaborate and Validate:**
- Connect with similar cities to validate learnings, scale and share experiences for building better.

**Update the Plan:**
- Draw up evidence-driven data insights, and emerging opportunities, to review, revise, and update the strategy.

A CYCLICAL PATH:
A healthy city climate action plan follows a process of assessing results and revisiting the drawing board to redraw steps.
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>3R's</td>
<td>Reduce, Reuse, Recycle</td>
</tr>
<tr>
<td>C&amp;D</td>
<td>Construction and Demolition</td>
</tr>
<tr>
<td>CNG</td>
<td>Compressed Natural Gas</td>
</tr>
<tr>
<td>COP</td>
<td>Conference of the Parties</td>
</tr>
<tr>
<td>C-SCAF</td>
<td>Climate Smart Cities Assessment Framework</td>
</tr>
<tr>
<td>DBFOT</td>
<td>Design, Build, Finance, Operate and Transfer</td>
</tr>
<tr>
<td>ECBC</td>
<td>Energy Conservation Building Code</td>
</tr>
<tr>
<td>ESCO</td>
<td>Energy Service Company</td>
</tr>
<tr>
<td>EVs</td>
<td>Electric Vehicles</td>
</tr>
<tr>
<td>FSTP</td>
<td>Faecal Sludge Treatment Plant</td>
</tr>
<tr>
<td>GCoM</td>
<td>Global Covenant of Mayors</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>GHG</td>
<td>Greenhouse Gas</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic Information System</td>
</tr>
<tr>
<td>IEC</td>
<td>Information, Education and Communication</td>
</tr>
<tr>
<td>IoT</td>
<td>Internet of Things</td>
</tr>
<tr>
<td>IPT</td>
<td>Intermediate Public Transport</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technology</td>
</tr>
<tr>
<td>LBSAP</td>
<td>Local Biodiversity Strategy and Action Plan</td>
</tr>
<tr>
<td>LED</td>
<td>Light Emitting Diode</td>
</tr>
<tr>
<td>MDPE</td>
<td>Medium-Density Polyethylene</td>
</tr>
<tr>
<td>NAPCC</td>
<td>National Action Plan on Climate Change</td>
</tr>
<tr>
<td>NbS</td>
<td>Nature-based Solutions</td>
</tr>
<tr>
<td>NMT</td>
<td>Non-Motorised Transport</td>
</tr>
<tr>
<td>NRW</td>
<td>Non-Revenue Water</td>
</tr>
<tr>
<td>O&amp;M</td>
<td>Operation and Maintenance</td>
</tr>
<tr>
<td>PPP</td>
<td>Public Private Partnership</td>
</tr>
<tr>
<td>RDF</td>
<td>Refuse Derived Fuel</td>
</tr>
<tr>
<td>RE</td>
<td>Renewable Energy</td>
</tr>
<tr>
<td>RESCO</td>
<td>Renewable Energy Service Company</td>
</tr>
<tr>
<td>RRC</td>
<td>Resource Recovery Centre</td>
</tr>
<tr>
<td>SAPCC</td>
<td>State Action Plan on Climate Change</td>
</tr>
<tr>
<td>SCADA</td>
<td>Supervisory Control and Data Acquisition</td>
</tr>
<tr>
<td>STP</td>
<td>Sewage Treatment Plant</td>
</tr>
</tbody>
</table>


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City Climate Alliance:
The City Climate Alliance is a coalition of partners committed to climate action. The alliance is an aggregator for capturing climate actions, innovations and transitions. The coalition aims at building a partner community for climate action through knowledge sharing and exchange on national and international platforms. The alliance also contributes to policy acceleration, creating repositories of climate action and supporting capacity building for just climate transitions.

Want to Collaborate with City Climate Alliance?
Reach out to us at cityclimatealliance@niua.org

We sit within NIUA as a cross sectoral umbrella bringing all ideas, systems, projects, and institutions together for climate action in cities.