



ISSN NO. 2320-5407

Journal homepage: <http://www.journalijar.com>

INTERNATIONAL JOURNAL  
OF ADVANCED RESEARCH

# Innovations in Urban Climate Governance for Bengaluru

Master Thesis submitted to  
Technische Universität Berlin

*In partial fulfillment of the requirements*

*For the award of the degree of*

**M.Sc Urban Development**

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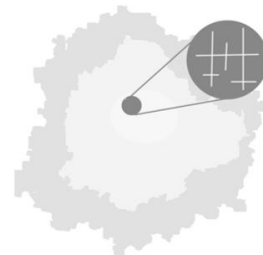
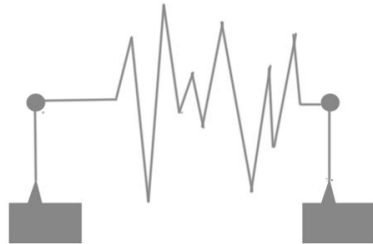
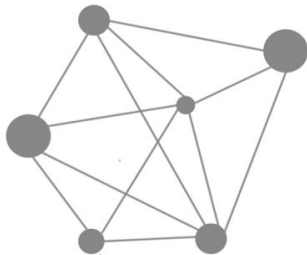
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# Innovations in Urban Climate Governance

for Bengaluru



**Nikhil Ravindra**



## Acknowledgements

I thank my supervisors and advisors for their continuous support and assistance. Their diverse experiences and inputs made this research a success.

I extend my thanks to interviewees from non-governmental organizations and governmental institutions who provided valuable information and; also, residents of the city of Bengaluru who contributed to the online survey. The references received from Dr. Kremena Burkhard, Dr. Manisha Jain (Leibniz-Institut für ökologische Raumentwicklung, Dresden) and Dr. Divya Gopal (TU Berlin – Institut für Ökologie) is gratefully acknowledged. I wish to extend my sincere gratitude to Ms. Susanne Stundner, Personal Advisor to Prof. Dr. Ottmar Edenhofer (Potsdam Institute for Climate Impact Research), Prof. Dr. Karsten Neuhoff and Mr. Heiner von Lüpke (German Institute for Economic Research).

Wishful thanks to the staff of Urban Development Department (Technische Universität Berlin, Zentralinstitut El Gouna) for their suggestions and my family, friends for their moral support.

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## Abstract

The thesis aims for effective climate governance and is based on research question **‘Why Bengaluru city’s governance is not able to effectively deal with planning and development related to urban area climate?’**. The biggest problem is administrative complexities associated with the current centralized top-down approach. This has led to **non-efficient local government practices, limited apprehension of urban civil society and restricted responses by non-governmental organizations** to deal with urban climate. Analyzes of the current institutional landscape through official websites and existing policies in India on climate governance; areas of action, responsible authorities and financing options at international, national and sub-national levels reveals the complicated structure of governance. The federal political system constraints on local climate policies has led to many major Indian cities including Bengaluru not having a local climate action plan and an authority. In addition, the city in 2017 has been named as the worst city for ‘Urban Governance’ among 23 major Indian cities by the ‘Survey of India’ agency. Online survey conducted on awareness levels, opinions and behavioral aspects of 180 Bengalureans (residents of the city) pertaining to climate action underlines the civil society’s knowledge and understanding. Further adding to the misery are in-person interview evidences of numerous planning and implementation gaps or challenges faced by 7 governmental and 6 non-governmental organizations. The solution to overcome all these challenges are incorporating innovative governance strategies within the current developments to **promote bottom-up approaches, knowledge sharing digital platform and climate interventions at neighborhood scale**; all of which would help in the creation of a climate friendly Bengaluru.

## Key words

Innovation, Urban Climate, Climate Governance and Action



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# 1.0 Background



## 1.1 Literature Review

### 1.1.1 Governance

Governance as defined by the **United Nations Development Programme (UNDP)** in its 1997 policy is “the exercise of economic, political and administrative authority to manage a country’s affairs at all levels. It comprises the mechanisms, processes and institutions through which citizens and groups articulate their interests, exercise their legal rights, meet their obligations and mediate their differences”. The **World Bank** in 1993 defined governance as “the methodology adopted in managing a country’s political, economic and social resources for development”. **Jon Pierre**, famous author on urban governance quotes “governance refers to sustaining coordination and coherence among a wide variety of actors with different purposes and objectives” (UNESCO, 2006, p. 3).

### 1.1.2 Climate Governance

**Climate Governance** is the modes and mechanisms defining institutions interests, power and resource handling methodology for effective climate change mitigation and adaptation responses (Worker & Northrop, 2018). **Urban Climate** is differences in climate parameters such as air temperature, humidity, wind speed and direction, and amount of precipitation in comparison to the surrounding rural areas (WMO, 2018), (Britannica, 2019). Several local factors contribute to this difference; urban planning and development (eg. urbanization, building structures), services (electricity, water, urban transport and waste management) and behavioral aspects (Ryu & Baik, 2012). **Urban Climate Governance** is defined as the formulation of climate goals through planning and implementation processes by public, private, civil society actors and institutions influence and authority. Due to the growing internationalization, urban climate governance is not limited to local scale but linked to broader scales or levels; and hence also referred to as **multi-level climate governance** (Scanu, 2015, p. 3).



Figure 1 Comic images on ‘assessing the impact of climate change’ (Ditchburn, 2007), (Witcox, 2015)



### 1.1.3 Innovation in Governance

Innovations in Governance are different from inventions and are more than mere ideas; they are new ideas and practices brought into implementation. It is a fundamental transformation of the organization's primary responsibilities and is defined to be **original and disruptive**. Reinvention or adaptation of an innovation in another context, location or time is also considered as innovation. A transitional shift is being observed with more governments shifting focus from vertically hierarchical governance system to a more hybridized horizontal system with associated forms called "**networked or polycentric governance**" (Moore & Hartley, 2008).

Recent literatures on innovations in climate governance emphasis on the ineffectiveness of international and national policies to deal with global climate change and the need for innovative elements directly or indirectly linked to **networked or polycentric governance, advanced communication and urban experimentations**. A strengthened decentralized system with bottom up approaches is a desired shift internationally for climate governance (Turnheim, Kivimaa, & Berkhout, 2018, p. 3), (Kern & Alber, 2009, p. 6). Some potential examples from both India and other countries are mentioned in the following figure for each of the three main elements of innovations in climate governance.



Figure 2 Three main elements of Innovations in Governance with International and National examples Developed by Author, based on (Turnheim, Kivimaa, & Berkhout, 2018, p. 3), (Kern & Alber, 2009, p. 6)

#### Polycentric or Networked Governance:

(Contipelli, 2018, pp. 9-10) highlights the need for climate change governance system to be **polycentric (networked)** in order to be an analytical means of global change. Polycentricity is the idea of having government authorities or units at different levels rather than a mono-centric approach. It works best only with the mutual and inter-related approaches of these units. This type of approach allows for cooperative mindsets to accomplish desired goals (Morris & Peht, 2016). '*Die deutsche Energiewende*' is one such international example which explores the dynamics of polycentricity by defining clearly the actors and institutions responsibilities for transformation to renewable energies in Germany (HAA, 2016). An example from India is Uttar

Pradesh, the first state in the country to have a '**Climate Change Authority at state level**' (Shukla, 2017).

### **Advanced Communications:**

One advanced form of communication is **e-governance or electronic governance**, which is a shift towards digitalization, especially the use of mobile phones. E-governance facilitates numerous options such as *G2G: Government to Government*, *G2C: Government to Citizens*, *G2B: Government to Business* and other forms of interactions. The best example is '**e-governance in Estonia**', which is the only country in the world where almost 100% of public services are available 24/7 via online platforms. By doing so it has reached unparalleled heights in terms of governance transparency (e-estonia, 2019). India in 2014 launched '**e-bhasha**' to make all government websites be available in 22 constitutionally recognized languages of the country (eBhasha, 2019). However, the progress of it is unclear and the goals mentioned have not been achieved.

### **Urban Experimentations:**

There is a need to focus on **developing technology, organizing the society and planning urban development** through urban experimentations. A recent survey conducted by Lund University in Sweden; funded by the United Kingdom Economic and Research council found that currently 630 urban climate change experiments are being carried out in 100 global cities (LundUniversity, 2019). One such evidence is from Maputo, the capital of Mozambique which has **unorthodox partnerships** by involving civic society associations to deal with climate (Broto, 2015, pp. 1-14). National example is that of Mumbai city's municipality which has proposed **micro-level plans to decentralize waste management** (Boyd & Ghosh, 2013, p. 932).

## **1.2 Case Study**

Case study is the city of Bengaluru (previously known as Bangalore), which is the capital for the state of Karnataka (located in the South-West of India). It is a **megacity with nearly 12.4 million population** (year 2019) and well known as the **Silicon Valley of India or Information Technology (IT) capital and Garden City**. The city has undergone tremendous transformations in the last two decades and The Forbes Magazine considers it as one of "**The Next Decade's Fastest Growing Cities**" (TY, 2019)

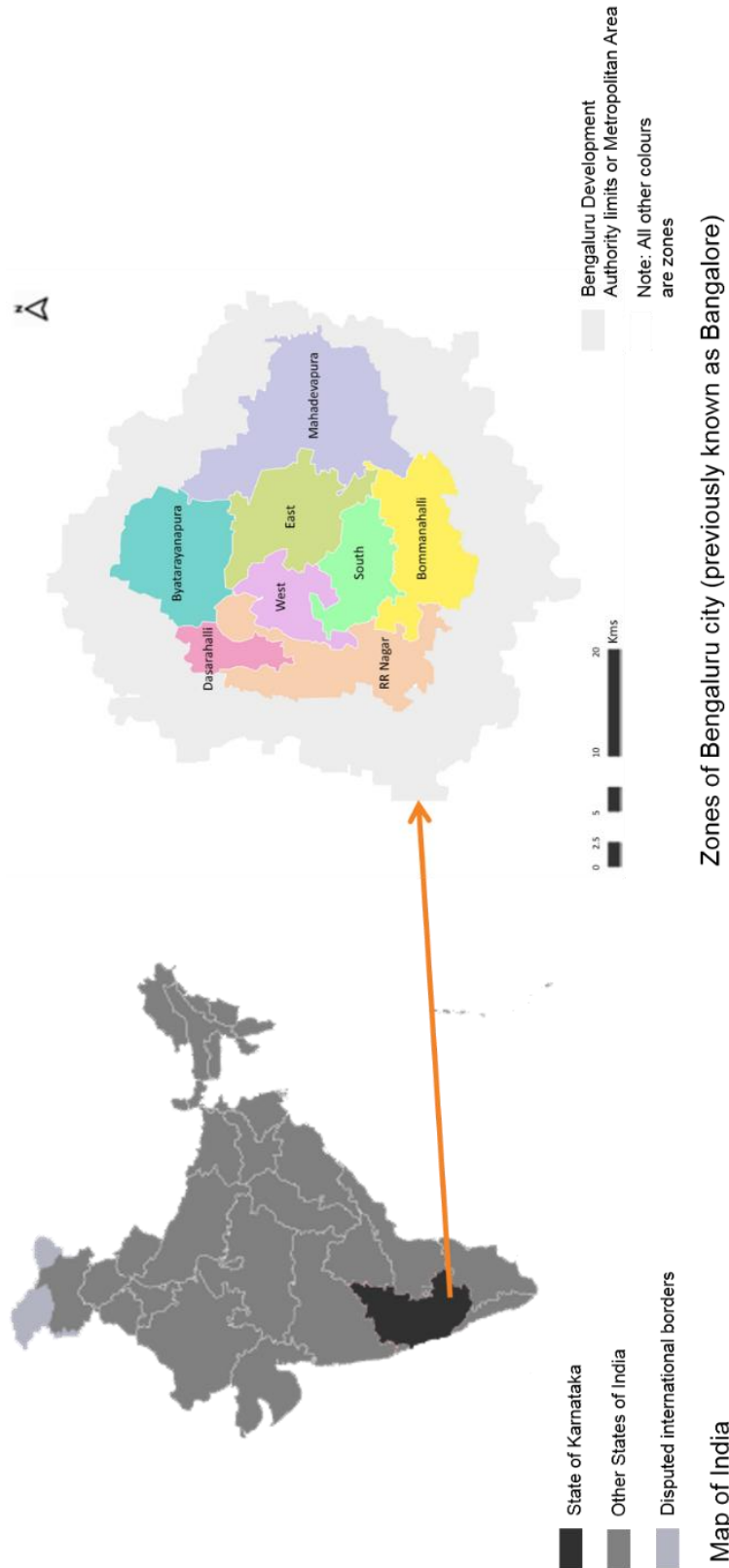


Figure 3 Bengaluru City Location and Zones of City Map Developed by Author, based on (mapsofindia, 2019)

When it comes to the climate and energy policy landscape for Bengaluru, the multi-level governance structure (table 1) make up or influence the system. In this report, **International level** refers to **International treaties or institutions** assessing the science related to climate change, **National level is the Government of India**, **State level is Government of Karnataka**, **City level** is referring to stakeholders for **Bengaluru city** and **Local level** is for the **198 wards** in the city. For the simplicity of understanding, the different levels have been colour coded with different colors to easily identify the levels to which each of the responsible institution or authority belongs to.

Table 1 Governance Structure in the climate policy landscape for Bengaluru

Levels	Description	Key Stakeholders	Roles
International Level	International agreements or institutions developing climate policies	United Nations (UN)	Initiator, facilitator and supporter
		Non-governmental International Panel on Climate Change (NIPCC)	Neutral
National Level	Government of India	Prime Minister	Initiator and supporter
		Ministry of Environment, Forest and Climate Change (MOEF)	Facilitator
		Ministry of Science and Technology (MST)	Facilitator
State Level	Government of Karnataka	Chief Minister	Initiator and supporter
		Environmental Management and Policy Research Institute (EMPRI)	Facilitator
City Level	Bengaluru city authorities	Municipality Commissioner	Supporter
		Municipality Mayor	Supporter
Local Level	Authorities for 198 wards	Corporators	Supporter

Developed by Author, based on (Neelakantan, 2018)

Each of the levels have numerous challenges. The major problems at the most important levels (national, state and city) have been discussed:

### 1.2.1 Problem Description at National Level

India is currently the **fourth largest emitter** of greenhouses gases in the world following China, United States of America and the European Union and it is mainly because of a very large population of nearly 1.37 billion (WPR, 2019). However, the per capita emissions are comparatively lower than the global average (Beermann et al, 2016, p. 1). Like other developing nations, India is facing the brunt of climate change being ranked as the **fourth most vulnerable country** as per 2017 German Watch Report (Eckstein, Hutfils, & Wings, 2019). Developing countries are most vulnerable due to their limited capacity in dealing with climate change impacts; India requiring an astonishing \$2.5 trillion until 2030 to deal with it (Rattani, 2018, p. 7).

To add to the misery, India is currently at the bottom in **green rankings** being ranked **177 out of 180 countries** going down from its 141<sup>st</sup> position two years ago as per the 2018 global 'Environmental Performance Index'. The biennial report by Yale and Columbia Universities noted that the **low ranking** is due to strain imposed by **population pressure** and **economic growth** of emerging nations (Mohan, 2018). To improve the green ranking and to achieve emission reduction targets, governance along with action plans and policies on climate change will play a vital role (Beermann et al, 2016, p. 3). In addition, the role and contribution of major India cities is crucial to keep the levels under check.



Figure 4 National Level Challenges related to Climate

Developed by Author, based on (Beermann et al, 2016, p. 1), (Mohan, 2018), (Rattani, 2018, p. 31)

India **lacks a clear-cut legislative responsibility** for climate policies and derives the responsibilities from various legal sources. The country, as a **minimal federalism** follows a centralized approach with the Union Government taking lead on policy-making including environmental policies (Joergensen et al, 2015).

In response to the developments from Intergovernmental Panel on Climate Change (IPCC), in 2007, the Indian Government set up the Prime Minister's council on Climate Change (PMCCC).

At National Level, the National Action Plan on Climate Change (NAPCC) with 8 missions and 4 principles; was mandated on June 30, 2008 by the PMCCC in coordination with other governmental departments (GOI, NAPCC, 2008, p. 2). Despite the efforts, the various ministries responsible for the 8 missions **lack coordination and cross sectoral knowledge sharing**. This is mainly because of the creation of sectoral programmes rather than common interests' linkages. In addition, **limited and overburdened staff along with lack of continuity** in institutions are other problems (Parvaiz, 2015). The progress of missions stated in the NAPCC is **uncertain and it seems rather broad** lacking specific objectives, and unrealistic with highly ambitious targets (Rattani, 2018, p. 31).



Figure 5 National Level Challenges related to Governance

Developed by Author, based on (Beermann et al, 2016, p. 1), (Mohan, 2018), (Rattani, 2018, p. 31)

### 1.2.2 Problem Description at State Level

A report from 2014 titled 'Transitioning towards climate-resilient development in Karnataka' by 26 experts from institutions in Karnataka, New Delhi and London argues that climate change is going to hit Karnataka state harder than other states (CST, 2014). Frequent droughts, an average increase of 1.5-2 degree temperature in most parts of the state by 2030, increased negative affects not just on crops productivity, but also on forest bio-diversity, hydrological processes and most importantly human health are some of the parameters Karnataka would suffer heavily in the coming years (Prashanth, 2014).

The PMCCC in 2009 directed all state governments including Karnataka to come up with respective State Action Plans on Climate Change (SAPCC) based on the national level principles. Due to incoherence and lack of coordination, three separate processes were initiated leading to three parallel climate action documents for the **state of Karnataka** – one by a consortium of non-governmental institutes **Bangalore Climate Change Initiative – Karnataka (BCCI-K)**, second by the Government of Karnataka, **Environmental Management and Policy Research Institute (EMPRI)** in collaboration with **The Energy and Research Institute (TERI)** and; third by a non-governmental organization **Centre for Sustainable Development (CSD)**

(Jogesh & Dubash, 2015). The first plan initiated in 2007-08 and includes GHG inventory by Centre for Study of Science, Technology and Policy (C-STEP); and a vulnerability assessment by Indian Institute of Science (IISc). The second plan was mandated in June 2009 and was an attempt to avoid external consultants and ensuring access to departmental officials. It covers seven sectors linked to climate change and they are agriculture and allied sectors; water resources, forestry biodiversity and wildlife; coastal zone, energy, urbanization and human health. The third report was initiated with a small grant of MOEF; with no clear reason as to why it was necessary (Jogesh & Dubash, 2015). Each of these plans have several pros and cons mentioned in Table 2.

Table 2 Pros and Cons of the three station action plans

Action plan by	Pros	Cons
BCCI-K	<ul style="list-style-type: none"> <li>- financial support of World Bank</li> <li>- supporting letter by State Planning Department</li> <li>- participation and feedback by some senior government officials</li> <li>- entry point for other policy-focused efforts</li> <li>- detailed agriculture chapter with specific actions</li> </ul>	<ul style="list-style-type: none"> <li>- less evidence on interaction with citizen groups or NGOs</li> <li>- more research oriented and less policy focused</li> </ul>
EMPRI	<ul style="list-style-type: none"> <li>- officially endorsed plan</li> <li>- policy gap analysis to study department wise list of actions</li> <li>- includes a GHG inventory</li> <li>- comprehensively provides suggestions for seven sectors</li> </ul>	<ul style="list-style-type: none"> <li>- low indication of foreign agencies involvement</li> <li>- recommendations are without any targets or timelines</li> <li>- no linkages with exiting national actions</li> <li>- no direct stakeholder engagement to discuss the draft</li> <li>- little description of IPCC or NIPCC</li> <li>- no vulnerability assessment chapter</li> <li>- no framework to prioritize action</li> </ul>
CSD	<ul style="list-style-type: none"> <li>- supporting letter by State Planning Department</li> <li>- suggests preparation of carbon reduction delivery plans by each governmental department</li> </ul>	<ul style="list-style-type: none"> <li>- less evidence on interaction with citizen groups or outside governmental departments</li> <li>- all recommendations are mitigation driven</li> </ul>

Developed by Author, based on (Jogesh & Dubash, 2015)



The plan which is officially endorsed is the second one which is the formal state plan prepared by EMPRI (an autonomous body under the Department of Forest, Ecology and Environment, Government of Karnataka) and TERI as a consulting body (Jogesh & Dubash, 2015), (Remadevi, 2019). It is result of the central government driven request; whereas the other two plans are additional parallel attempts for broader stakeholder engagement. In terms of **prioritization**, the advantage is a provision of a specific priority list; but however, the reason for prioritizing is unclear and the recommendations lack consistency. **Budgetary allocation** requirements are not interlinked with the proposed actions and as quoted by a consultant from EMPRI “we decided, let’s not put budgets for all actions, let the government approve NAPCC budgets and then we would allocate funds based on budgets approved.” Some of the recommendations for eg; restructuring of power tariffs in agriculture sector is a topic concerning several civil society groups and hence may not be feasible politically. The mechanisms for monitoring, evaluation and implementation is not mentioned systematically leading to confusion. **Instances of innovation** in this plan are very **limited**; being driven by immediate development rather than available science (Jogesh & Dubash, 2015). Further, climate action in Karnataka state has not been a prominent topic of discussion in comparison to other states such as Sikkim, Himachal Pradesh and Gujarat (Jogesh et al, 2014, pp. 1-11).

### 1.2.3 Problem Description at City Level

Recent environmental studies including the ward-wise vulnerability assessment of the city has concluded that more than **90% of the city’s area is vulnerable to climate change**. The city which was once known for its year-long pleasant climate or moderate weather is facing severe climate change effects such as **higher summer temperatures, urban heat island, seasonal shifts and flooding** (Basu M. , 2016). **Higher summer temperatures**; during the peak summer month of April 2017, the maximum temperature was recorded 36 degrees Celsius; a record 12.5% increase in comparison to April 1997. And the city recorded 60% decrease in rainfall over a decade; receiving merely 4mm rain in April 2017. Since 1973, the city has undergone tremendous levels of urbanization (refer to figure 6) which has led to an increased **urban heat island** effect. Drastic increase in built up areas has led to decrease in vegetation and water bodies.



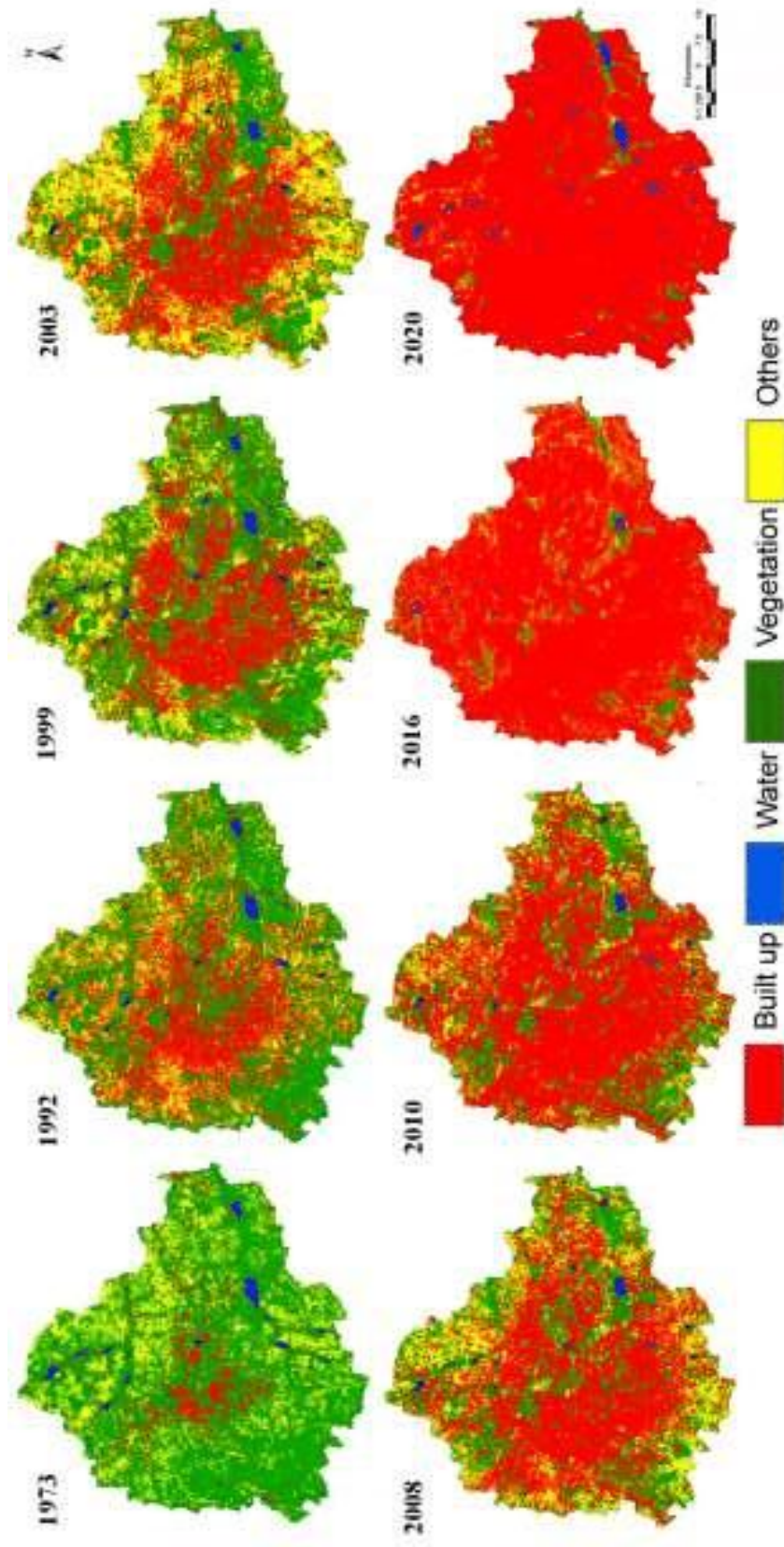


Figure 6 Urban Growth in Bengaluru (Aithal & Ramachandra, 2017)

**Seasonal shifts and flooding** in the recent years (evident from survey with locals) has caused negative impacts. All of these reasons call for a collective action to counter environmental and climate change impacts (Shah, 2018). Furthermore, from figure 7 it is evident that the **cleanliness factors** have declined drastically. There has been a tremendous raise in **pollution levels**, and this calls for urgent environmental strategies (KONSAM, 2018).

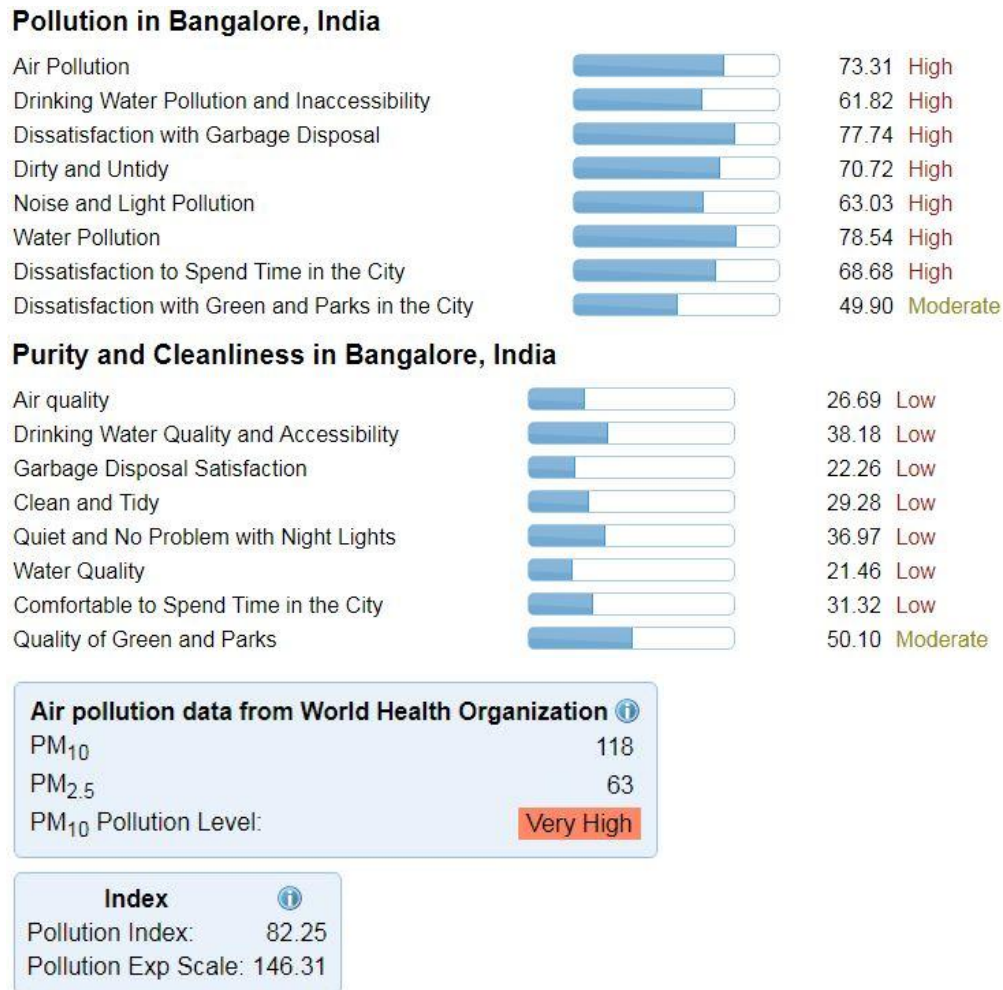


Figure 7 Pollution, purity and cleanliness levels in Bangalore (Numbeo, 2019)

The **Urban Sustainability Index (USI)** which considers economic, social and environmental sustainability is very low for the city as compared to global cities of London, Shanghai and Singapore. Bengaluru's average in 2013 was just 0.519 in comparison to 0.781 of the compared cities (Balachandra, 2013). The city in 2019 is an above average performer being ranked 5<sup>th</sup> for urban sustainability among 15 metropolitan cities of India (Patel, Rakshit, Ram, & Irfan, 2019).

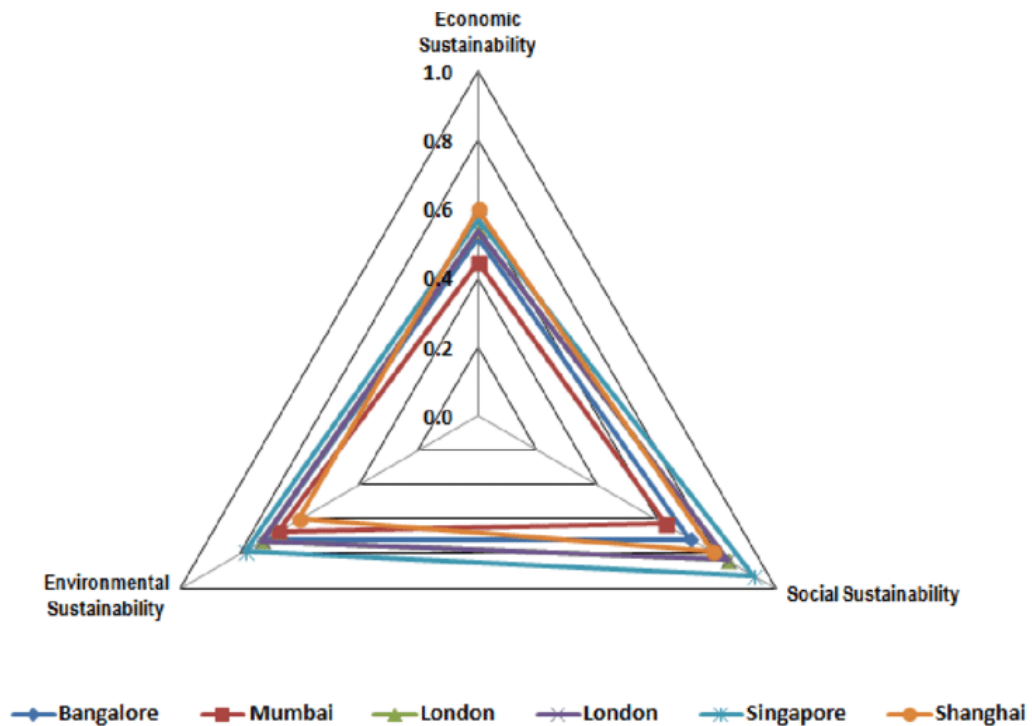


Figure 8 Urban Sustainability Index of Bangalore  
(Balachandra, 2013)

Despite the country's governance system being decentralized, most Indian cities including **Bengaluru City** have **no climate action plans** in place. Four major reasons for this are; **first**, climate resilience and adaptation figure low on the priority list which is more focused on daily development challenges such as education, infrastructure and health. **Second**, complexity associated with climate change cross-cutting through several departments such as public's health, water, environment, social justice leading to authorities lacking clarity. Climate resilience needs these **major considerations**: policy planning, infra resilience, and governance along with capacity building. **Third**, lack of clarity and guarantee on whether the current patchwork of policies will continue or not after a change in the ruling party or regime. **Fourth**, is the lack of simplified and transparent methodology for analyzing the cost-benefit and the associated indirect costs often leading to hinderance in decision making and investment planning (Sustainable Habitat Programme, 2018). **A climate action plan and a responsible authority** to address the topic with a long-term vision is urgently needed (Nagendra, 2016). The city has been given a deadline of 2020 by the **C40 global megacities network** to develop and implement a climate action plan in line with Paris Agreement Objectives (C40, 2018, p. 2).

The biggest challenge in the **Urban Governance** is that Bengaluru's elected mayor at the municipality- Bruhat Bengaluru Mahanagara Palike (BBMP) has no oversight on the multiple civic agencies that make up the city's governance system. In the year 2017, based on the assessment carried out by Survey of India's City system on the quality of laws, policies, institutions and institutional processes; Bengaluru has emerged the **worst city among 23 of India's biggest cities**. Bengaluru has been rated poorly on the quality of Urban Governance weighted on the following parameters: **a) Urban planning and design, b) Urban capacities and resources, c) Transparency, accountability and participation and d) Empowered and legitimate political recognition** (Chatterjee, 2018). Major reasons for the low score are that the mayor of municipality is indirectly elected for only a one-year term as per the **Karnataka Municipal Corporations Act of 1976** (KMCA, 2014). Also, the city has multiple civic agencies reporting directly to the state department, the finances are inefficient and highly opaque. In addition, it has no public domain for information and does not institutionalize public participation platforms (Chatterjee, 2018). The city plans to have a **Greater Bengaluru Authority**, and in that case, there will be 5 mayors for the city instead of just 1 mayor presently, more information can be found in Section 4.6.2.

### 1.3 Research Question

The thesis research aims for **effective climate governance to deal with planning and development** in the city of Bengaluru. This is achieved by addressing one major dimension out of several other urban climate dimensions i.e. **law**; by proposing more effective strategies and policies. Based on the relevance's or challenges, the primary research question is '**Why Bengaluru city's governance is not able to effectively deal with planning and development related to urban area climate?**'. To answer this, the research objectives with secondary research questions and methodology are as follows:



Figure 9 Research Objectives  
(Author, 2019)

Table 3 Secondary research questions

Objectives	Secondary Research Questions	Main parameters	Outcomes
<b>Objective A</b>	<b>What</b> is the current executive system, areas of action, responsible authorities and financing options at all levels?	- governance structure - finance architecture	- targets and agreements - key stakeholders and main actors - principles and missions - sectors of action - climate finance
<b>Objective B</b>	<b>How</b> aware is the society on climate change topics and action plans? <b>What</b> are their opinions and behavior towards climate?	- awareness levels - perceptions or opinions - behavioral aspects	- civil society responses
<b>Objective C</b>	<b>What</b> are challenges faced in terms of funding, staff, priorities and governance?	- funding - staff availability - priorities - coordination	- gaps in planning and implementation - SWOT analysis
<b>Objective D</b>	<b>What</b> are the recommended innovative strategies?	- hypothesis - benchmarks - the vision, mission statement and proposal	- innovative strategies - governance structure - responsibilities - timeline - economic and legal feasibility - summary

(Author, 2019)

## Methodology

**Objective A** is achieved by collecting data from official departmental websites (eg. govt. of India, govt. of Karnataka), NAPCC, SAPCC and by conducting in-person interviews with governmental institutions. Methodology followed for **objective B** is circulation of google form for survey via online platforms WhatsApp, Facebook, LinkedIn and Instagram to reach out to the residents of Bengaluru (180#). **Objective C** results are through in-person interviews with governmental and non-governmental organizations (13#); and by collection of data from media coverage. Objective A, B and C leads to the SWOT analysis 1. Whereas, **Objective D** considers analyze outcomes of the other three objectives and making suggestions by literature review; and desktop research of successful local case studies and international benchmarks.



This leads to the summary converting weaknesses into strengths and threats into opportunities; followed by research limitations and overall conclusion.

## 1.4 Key Terms

An outcome of literature review, problem description and research question are the author's definition on the key terms used for the research:

**Innovation** as a process or action need not necessarily be a new approach; provided it's unique and suitable for the area of application. An idea built-up or borrowed from a different context to be applied for a new context is considered innovative as long as it is remodeled or altered to be apt for the situation.

**Urban Climate** is the change observed in local climate of an area due to urbanization and also the direct or indirect influence of regional and global climate. The change recorded is in terms of climate parameters such as temperature, wind and precipitation levels; and differs from the surrounding rural areas.

**Climate Governance and Action** is defined to be the combined effort exhibited by responsible stakeholders at multiple levels to bring about a positive climate change either at local, regional or global context. This involves governance processes, tools and techniques in order to suggest, implement and monitor climate adaptation and mitigation measures.

# 2.0 Objective A

## Analyze current multi-level institutional landscape

This section covers the present modes of climate governance, urban planning tools and types of actions undertaken in the intervention sectors by participating actors at various levels following the same colour code mentioned in table 1.

### 2.1. International Level

#### 2.1.1 United Nations (UN)

The UN is an international organization founded in 1945 whose headquarters is in New York City and is made up of 193 Members States. It enables dialogues between member states on global issues including climate change by hosting negotiations in order to solve problems together. In 2015, the members adopted the **2030 Agenda for Sustainable Development** committing to 17 Sustainable Development Goals. (UN, 2019) **Goal 13: Climate Action** mentioned as it is “take urgent action to combat climate change and its impacts” is highly relevant to India due to several reasons mentioned in figure 10.

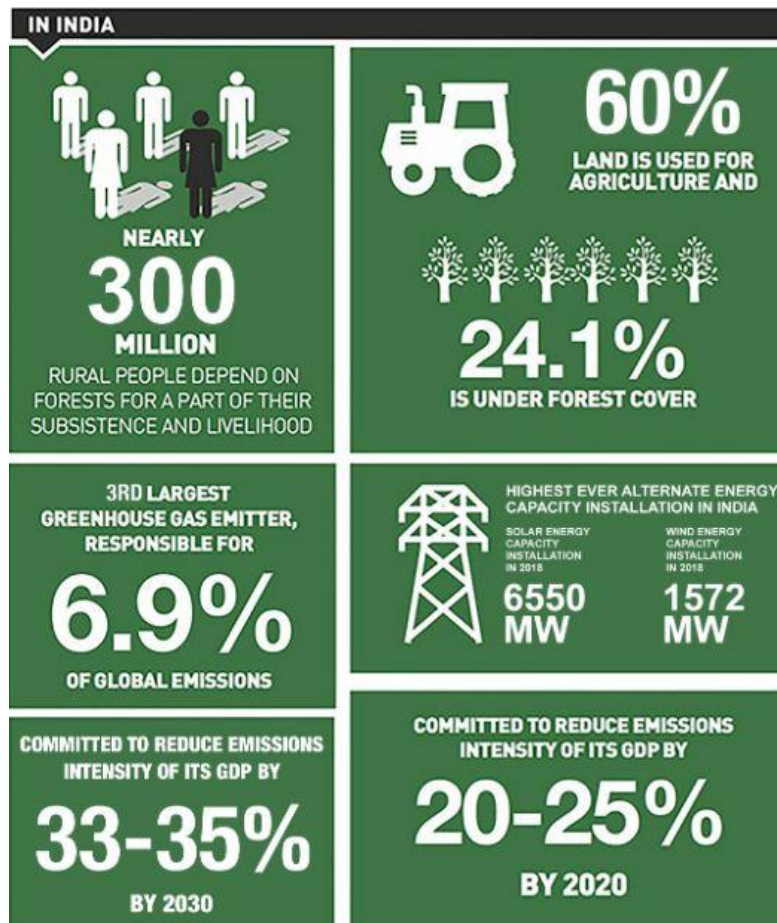


Figure 10 Goal 13 relevance to India (UN, 2019)



Various other programmes and framework, such as the **Climate Initiatives Platform (CIP)**, **One UN Climate Change Learning Partnership (UN CC: e-Learn)**, **United Nations Environment Programme (UNEP): Climate Action**, **United Nations Framework Convention on Climate Change (UNFCCC)** and **Intergovernmental Panel on Climate Change (IPCC)** are aimed at climate action (UN, 2019). CIP is a portal for information on international cooperative climate initiatives by non-state actors like business and cities (CIP, 2019). There is no mention of any initiatives from India or Bengaluru city. Whereas, UN CC: e-learn is a joint initiative by 30 multilateral organizations focusing on climate literacy and applied skills development supported by the Swiss Agency for Development and Cooperation (UNCC, 2019). As a “one-stop-shop” for climate change learning resources and services; online courses are offered for all in English and similar to CIP has no mention of Indian context.

#### **A. UNEP:**

UNEP has been in India since 2016 with their office located in New Delhi. As a leading global environment authority, it sets the global environmental agenda besides promoting sustainable development implementation process of the environmental dimension. It coordinates with the national level nodal ministry MOEF with no special mention of state or city level actions. The focus areas are mainly climate change, disasters and conflicts; and environmental governance (UNEP, 2019).

#### **B. UNFCCC:**

The UNFCCC constituting as a platform for most international climate agreements was signed in 1992 at the United Nations Conference on Environment Development. It has been ratified by 197 countries including India, since it came into force on March 21, 1994. The UNFCCC has **no enforceable requirements** from the signatories in order to reduce greenhouse gas emissions and requires the parties announcing goals of greenhouse gases(GHGs) concentration levels stabilization in the atmosphere. Whereas the **developed countries** because of superior capacity have agreed **to adopt national policies to mitigate climate change and submit detailed version of mitigations policies and projections**. This is done with an aim of returning to the anthropogenic GHGs emissions levels from 1990 (Kuh, 2018). **All developed and developing countries are required to submit national GHGs inventories** to the UNFCCC secretariat every two years. However **Least Developed Countries (LDCs)** and **Small Island Developing States (SIDs)** can submit at their own discretion (Gopalakrishnan, 2018).



GHGs inventories are estimates compilation of emissions or removal of GHGs from various sources or sinks during a specific time period and in a defined region (Krug, 2015).

India has so far signed two agreements under the UNFCCC: Cancun Agreement and Paris Agreement.

Figure 11 Governance structure UNFCCC at International level.  
Developed by Author based on (UNFCCC, 2019), (UNFCCCsecretariat, 2019)

### Cancun Agreement (2010):

It is an agreement made under the UNFCCC on December 11, 2010 held in Cancun, Mexico in order to not just reduce GHGs but, also help developing nations deal with climate change by supporting through finance, technology and capacity-building. Apart from this, the main objectives are mitigation and adaptation approaches, transparency of action and forests. India as a signatory has agreed to commit to a **maximum 2 degrees global temperature rise** above pre-industrial levels and establishment of a **technology mechanism by 2012** to boost climate-friendly innovation. Apart from it, **green climate fund** for financing projects is agreed to be established along with the setting up of the **adaptation committee** to promote stronger implementation (UNFCCC, 2019).

### Paris Agreement (2015):

As per the pledge to the United Nations (UN) Paris Agreement in 2015, India has made three commitments. First, the country's 'Intended Nationally Determined Contribution (INDC)' promises a **33-35% reductions in overall GHG emissions intensity by 2030** in comparison to the 2005 level, even though the country's emissions would increase by 90% during the same period of time. Second commitment is **at least 40% of all energy generated by 2030 would be from non-fossil fuel sources**. The third being rapid increase of forest cover by the same year end to **accommodate additional carbon sink equivalent to 2.5 to 3 billion tonnes of carbon dioxide** (Evison, 2015). A 2017 report by the International Institute for Applied Systems

Analysis says that India was not just well on course to achieve the targets but “likely to overachieve” it by 2020 (DTE, 2017).

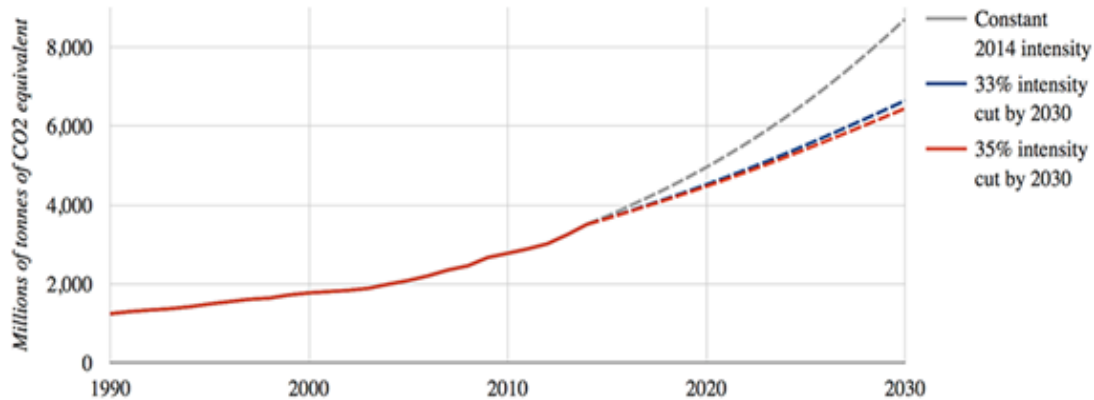


Figure 12 Estimated greenhouse gas emissions under India's INDC (Evison, 2015)

### C. IPCC:

IPCC is the UN intergovernmental body responsible for **assessing the science** related to climate change; which includes impacts, future risks, adaptation and mitigation approaches. It was created in 1988 to **provide scientific information to governments at all levels** in order to prepare climate policies. Created by the **World Meteorological Organization (WMO)** and the **UNEP**; it currently has 195 member countries, with several people from around the world contributing to its work and the overview of organizational structure for the same is in annex A2 (IPCC, 2019).

#### 2.1.2 Nongovernmental International Panel on Climate Change (NIPCC)

NIPCC is an international panel of scientists and scholars accessing the science and economics of global warming. The organization does not believe that anthropogenic GHG emissions causes climate change but rather by ecological cycles. It has time and again offered “**second opinion**” of the evidences provided by IPCC, by **objectively analyzing and interpreting facts** without determining the agenda. NIPCC as a project has contributors from three independent nonprofit organizations: Science and Environmental Policy Project, Centre for the Study of Carbon Dioxide and Global Change; and The Heartland Institute (THI, 2019). It claims, “no direct relation between global warming and damage to biodiversity, human health or occurrences of natural disasters”. NIPCC suggestions to India is to **invest in clean technologies** stating it is important for **policymakers to consider different views** (Chandrashekar, 2011).

## 2.2 National Level (Government of India)

### 2.2.1 Executive Structure

India is a **sovereign, socialist, secular, democratic republic country** with a federal structure of parliamentary form having unitary features. The executive structure consists of law enforcers; with the President as the constitutional head of the country and decision maker. The **Prime Minister is the leader** of the executive system run by a **Council of Ministers** and also the **chief advisor to President**. The country is divided into **29 states and 7 union territories** (governed by the central government). Every state has their own Council of Ministers with the Chief Minister as the head, who advises the governor (GOI, 2018).

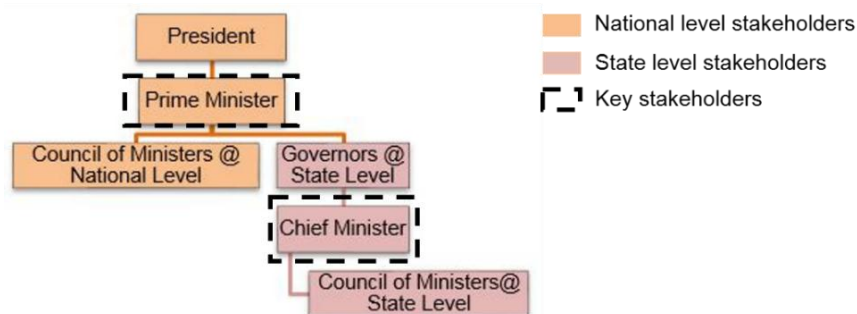


Figure 13 Overview of Executive Structure of India's Governance system  
Developed by Author, based on (GOI, 2018)

For climate change, the responsible council of minister at national level is the Prime Minister's council on Climate Change (PMCCC).

### 2.2.2 Prime Minister Council on Climate Change (PMCCC)

In response to the developments from IPCC, in 2007 the Indian Government set up the PMCCC comprising of a **core negotiating team, Ministry of Environment, Forest and Climate Change (MOEF) and; Ministry of Science and Technology (MST)**. Core negotiating team consists of technical support members and; MOEF founded in 1985, is the central government responsible for planning, promotion, co-ordination and overseeing for the implementation of climate policies and programmes in the country. It has submitted two inventories in the years 2015 and 2018 to the UNFCCC (MOEF, Organizational Structure, 2018). Under MST is the Department of Science and Technology (DST) established in May 1971; responsible as a nodal department for organizing, coordinating and promoting science and technology related activities in the country; including NAPCC (DST, 2019).

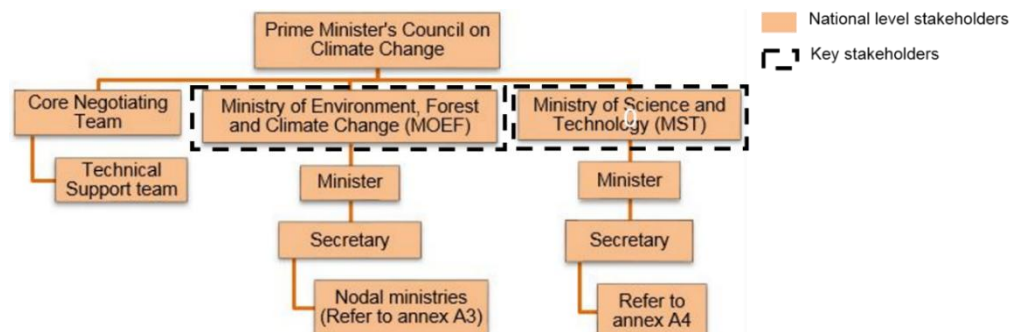


Figure 14 Overview of National Level Climate Governance structure  
Developed by Author, based on (GOI, NAPCC, 2008, p. 7), (DST, 2019)

### 2.2.3 National Action Plan on Climate Change (NAPCC)

#### Principles and Missions:

The NAPCC was mandated in coordination with other governmental departments and issued with **four principles**: inclusive and sustainable approach, qualitative changes, cost-effective strategies and appropriate technologies. **Eight missions** were listed in this plan namely; solar mission, enhance energy efficiency, sustainable habitat, water mission, sustaining Himalayan eco-system, “for a green India”, sustainable agriculture and strategic knowledge for Climate Change (GOI, NAPCC, 2008, p. 2).

Table 3 Responsible ministries for each mission

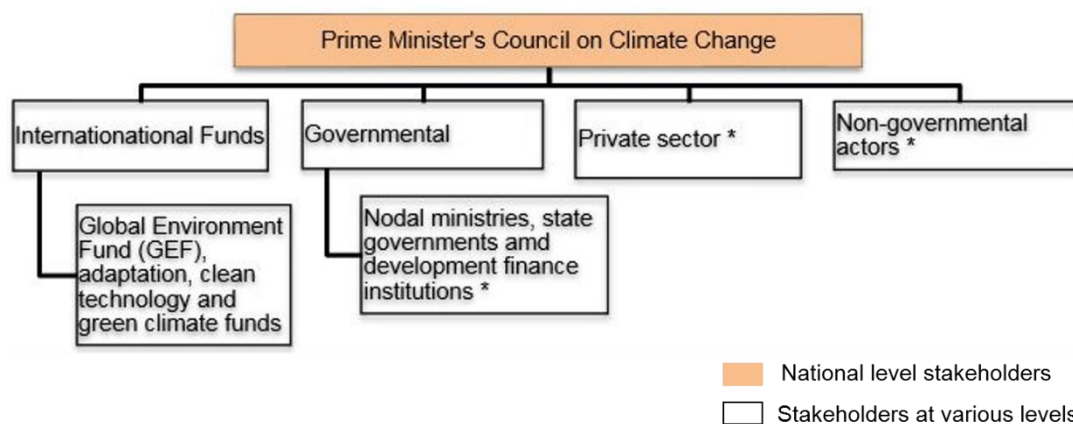
Missions	Responsible Nodal ministries	Selected Salient Features
National Solar Mission	Ministry of New and Renewable Energy	- new solar technologies
National Mission for Enhanced Energy Efficiency	Ministry of Power and Bureau of Energy Efficiency	- innovative & sustainable energy business models
National Mission for Sustainable Habitat	Ministry of Urban Development	- energy efficiency - solid waste management - public transportation
National Water Mission	Ministry of Water Resources	- water conservation - equitable distributions
National Mission for Sustaining the Himalayan Ecosystem	Department of Science and Technology (Climate Change Programme Division)	- safeguard Himalayan glacier - mountain eco-system

National Mission for Green India	Ministry of Environment, Forest and Climate Change (MOEF)	- ecosystem services - carbon sinks
National Mission for Sustainable Agriculture	Ministry of Agriculture	- new credits and insurance mechanisms - improving productivity
National Mission for Strategic Knowledge on Climate Change	Department of Science and Technology (Climate Change Programme Division)	- research and technology development

Source: Developed by Author, based on (Jha, 2014, pp. 36-37), (MoUD, 2017), (MoWR, 2008, p. 23)

### Climate Finance:

India receives finance for climate action for various sources: **international funds, governmental, private sector and non-governmental actors**. Some of the most prominent international funds are Global Environment Fund, adaptation fund, clean technology and green climate funds. **Governmental financing** could be from sectoral/nodal ministries, state governments or development finance institutions. **Private sector's involvement** could be through banks, government banked Non-Banking Financial Corporations and private businesses. **Non-governmental actors** are mainly international/national or sub-national organizations, civil societies and donors (Jha, 2014), (Singh, 2017, p. 11).



\* for further organization structure information, refer to annex A4

Figure 15 Climate Finance Architecture in India  
Developed by Author, based on (Jha, 2014), (Singh, 2017, p. 11)

For the year **2018-19**, the **total expenditure budget of MOEF is INR 2,675.42 crores** (1 crore = 100 million) which is the same as the revised budget for that year. This includes finance for the centre's expenditure, central sector schemes/ projects, other centre sector expenditure and

centrally sponsored schemes. The centre's expenditure covers the establishment expenses of various offices; the central sector schemes/ projects include the various national level programmes. Whereas other centre sector expenditure covers statutory and regulatory bodies; autonomous bodies and public-sector undertakings. Centrally sponsored schemes include transfers to north eastern areas, state governments and union territories in terms of grants-in-aid (MOEF, 2019). The expenditure of MOEF has been increasing very gradually over last 5 years which is highly debatable, provided the need to invest more. **For the year 2018-19, the grant-in-aid offered by the MOEF accounted to nearly 40% of the total expenditure totaling to a sum of INR 1,034.81 crores (MOEF, 2019).**

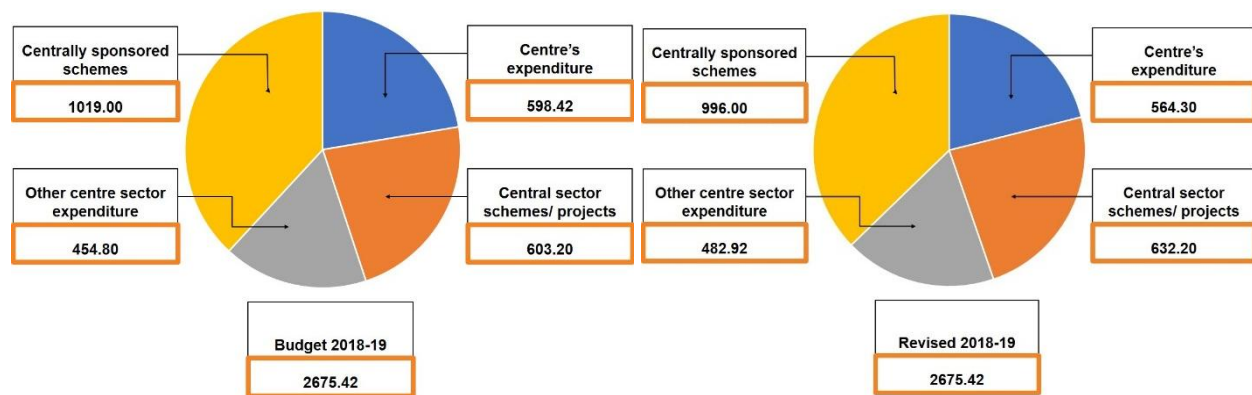


Figure 16 Expenditure (budget and revised) of MOEF for the year 2018-19  
Developed by Author, based on (MOEF, 2019)

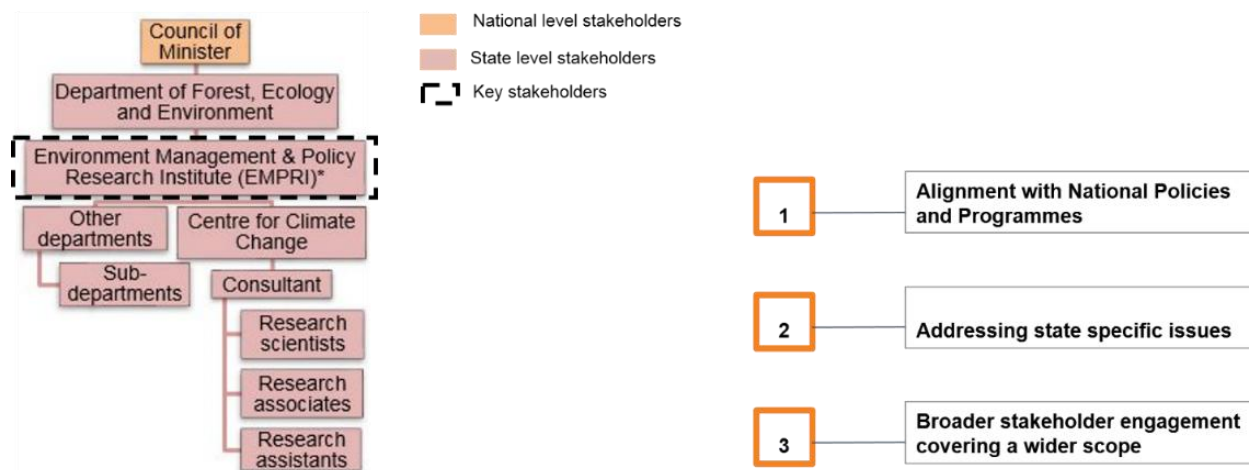
## 2.3 State Level (Government of Karnataka)

### 2.3.1 State Action Plan on Climate Change (SAPCC)

#### Executive Structure and Principles:

Following the guidelines set by the national level, the state government of Karnataka circulated a **State Level** plan called the SAPCC prepared by the EMPRI and TERI in November 2010 and the main governmental stakeholders at this level are as mentioned in figure 12. SAPCC was released with **3 principles**: alignment with National Policies and Programmes, addressing state specific issues and broader stakeholder engagement covering a wider scope than the NAPCC (EMPRI, 2018).





\* for further organization structure information, refer to annex A5

Figure 17 Overview of State Level Climate Governance structure related to SAPCC  
 Developed by Author, based on (EMPRI, Government of Karnataka, 2018)

**Sectors of Intervention:**

**Eight sectors of intervention** listed in this plan and as mentioned in the problem description section are GHG emissions, agriculture and allied sectors, water resources, forestry/biodiversity/wildlife, coastal zone, energy, urbanization and human health (GOK, 2013, p. 12). For each of the sectors of intervention, the responsible ministries and some selected salient features are as follows:

Table 4 Responsible ministries for each areas of action

Sectors of Intervention	Responsible Ministries	Selected Salient Features
GHG emissions	Karnataka State Pollution Control Board	- preparation of GHG inventory
Agriculture and allied sectors	- Karnataka State Department of Agriculture - Karnataka Fisheries Development Corporation - Department of Animal Husbandry and Veterinary Services - Karnataka State Horticulture Department	- promotion of certain crops for specific agro-climatic zones - application of biotechnology
Water resources	Karnataka Water Resources Department	- development of Water Resources Information System - Surface Water Assessment Tool
Forestry/Biodiversity/Wildlife	- Karnataka Forest Department	- establishment of



	- Karnataka Biodiversity Board	Western Ghats Task Force - protection of forests
Coastal Zone	Karnataka State Coastal Zone Management Authority	- integrated coastal zone management - coastal protection methods and education
Energy	- Karnataka Electricity Regulatory Commission - Karnataka Renewable Energy Department	- energy efficiency - focus on renewable energy sources
Urbanization	Karnataka Urban Development Department	- waste management across urban local bodies - traffic and transit management
Human health	Karnataka Health and Family Welfare Department	- quality medical care - free emergency care services

Source: Developed by Author, based on (GOK, 2013, p. 12), (EMPRI, Government of Karnataka, 2018)

### Finance:

The finance landscape for each of the responsible departments is complex. Depending on the type of interventions, finance is received from various sources such as **Government of India (GOI), MOEF, NAPCC missions, Karnataka state budgets, funds or schemes, fees from project proposals/industries**. The share or percentage of funds allocated by different sources and the duration of it is not constant, varying every year. It is released based on requests made by the respective departments.

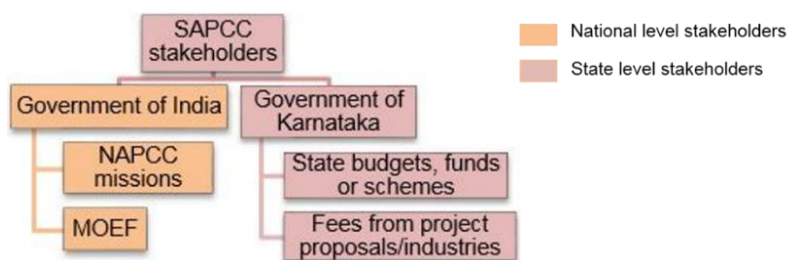


Figure 18 Climate Finance Architecture in Karnataka

Developed by Author, based on (GOK, 2013, p. 12), (EMPRI, Government of Karnataka, 2018, pp. 189-206)

The **total budget** allocated for environmental monitoring under the main account title: 3435-03-003-0-15- Environmental Monitoring Mathematics for the year 2018-19 is **INR 550.26 lakhs** (10 lakhs = 1 million). It is categorised into five types: leasing or outsourcing, charitable donation,

creation of assets, general operating costs and management costs. Despite the efforts, Karnataka budget requirements from 2017-22 is ranked 16<sup>th</sup> compared to top ranked states Tamil Nadu and Andhra Pradesh (EMPRI, 2019).

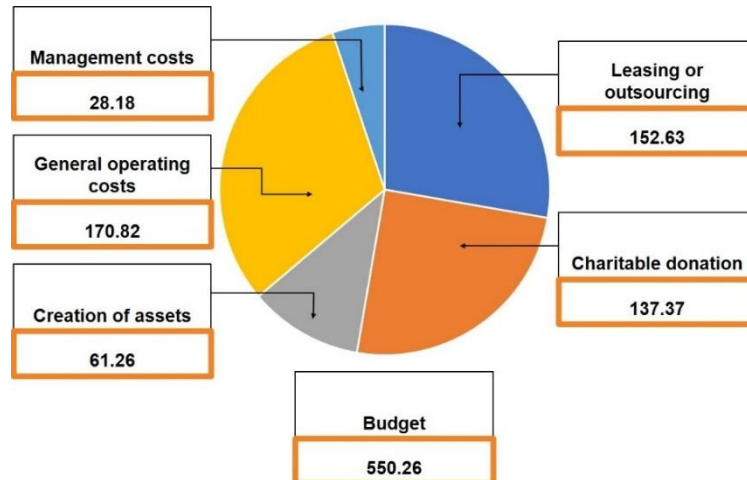
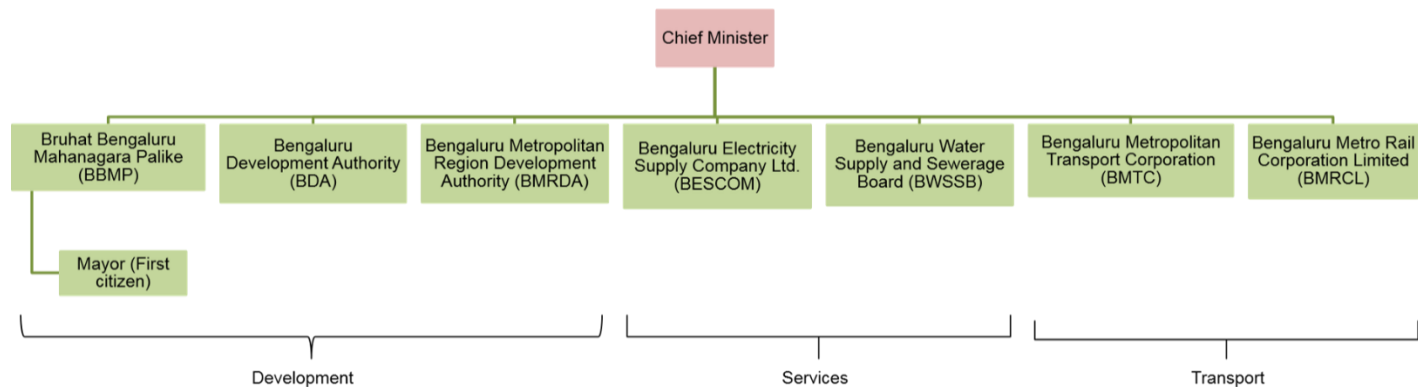


Figure 19 Climate Budget for Karnataka state 2018-19  
Developed by Author, based on (EMPRI, 2019)

## 2.4 City Level (Bengaluru City)

### 2.4.1 Executive System

Bengaluru city is made up of three districts known as Bengaluru Urban, Rural and Ramanagara district as shown in figure 22. **Bengaluru Urban district** is made up of numerous organizations who are involved in the city level and categorised into **development, services and transport sectors** as shown below:



\* for further organization structure information, refer to annex A6

Figure 20 Main actors at City Level (Bengaluru Urban)  
Developed by Author, based on (Murali, 2011), (BBMP, 2019), (BMRDA, 2017)

Figure 22 also highlights the development authorities: **Bruhat Bengaluru Mahanagara Palike (BBMP)**, **Bengaluru Development Authority (BDA)** and **Bengaluru Metropolitan Region Development Authority (BMRDA)** limits or boundaries; and the districts under BMRDA.

**Bengaluru Rural District** is one of the 30 districts of the state with the administration setup (fig.20) headed by the Chief Executive Officer (appointed by the State Government). Several departments that make up the administration are district urban development cell, district statistical office, pre-university education, agriculture, animal husbandry, human and child welfare and fisheries. The Chief Executive officer is supported by the Deputy Commissioner and Sub-Division office (BRD, 2019).



Figure 21 Main actors at City Level (Bengaluru Rural)  
 Developed by Author, based on (BRD, 2019)

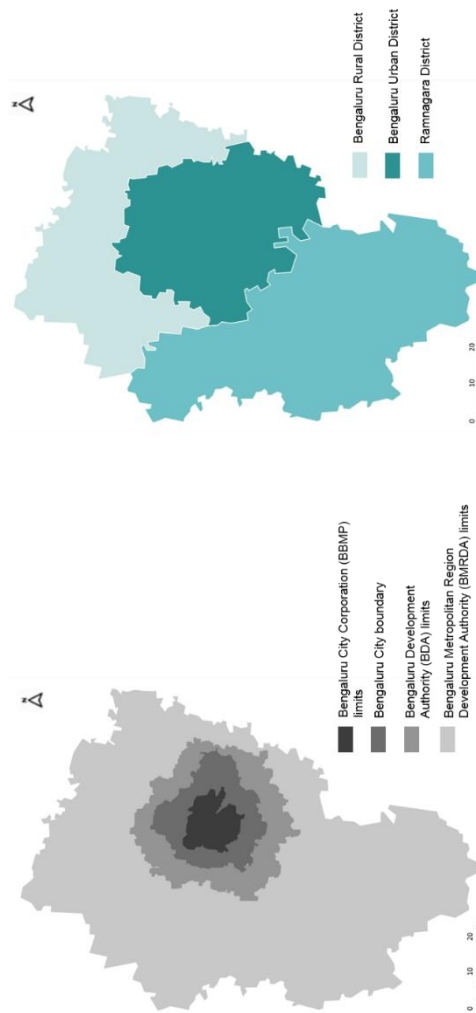


Figure 22 BBMP, BDA, BMRDA limits and BMRDA districts  
 Developed by Author, based on (Murali, 2011), (BBMP, 2019), (BMRDA, 2017)

The following sections focuses on the major district i.e. Bengaluru Urban District. **BBMP** is responsible for sustaining and managing the city’s **civic body and infrastructure**. The mayor and deputy mayor selected every year heads the BBMP council; which consists of 198 corporators from different wards (section 2.5). The Commissioner is the executive head, elected for 2 year tenure and plays a role similar to the Chief Minister and Prime Minister. The city is divided into 8 zones (refer figure 2) with each having a zonal administrator answerable to the Commissioner. Responsibilities of BBMP includes zoning and building regulations, hygiene, health, licensing, education, trade, water bodies, parks and greenery. A major climate intervention by BBMP is maintenance of green areas and waste management in the city (BBMP, 2019).

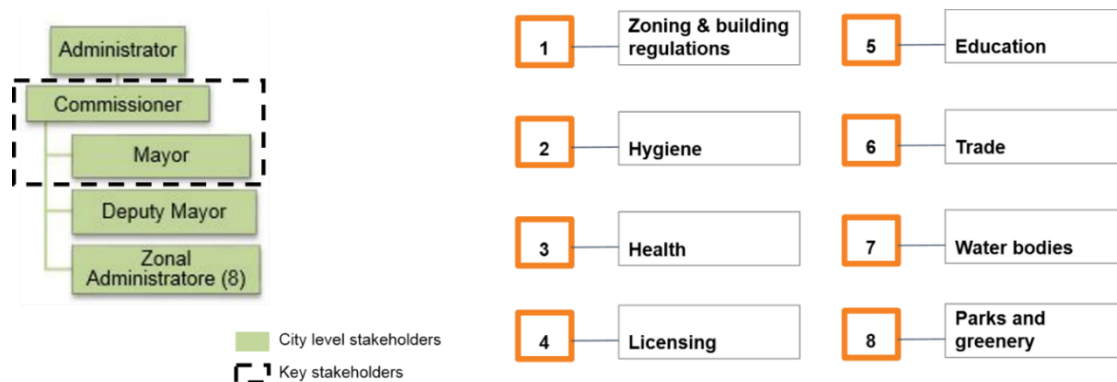


Figure 23 Main actors and Areas of action of BBMP  
 Developed by Author, based on (Murali, 2011), (BBMP, 2019)

**BDA** is divided into 8 main departments: land acquisition, town planning, engineering, allotment/general administration, finance, law, public relations and environment/ horticulture department. The town planning department is responsible for periodical preparation and revision of Comprehensive Development Plan for Bangalore Metropolitan Area, layout plans and approval of development plans (BDA, 2019).

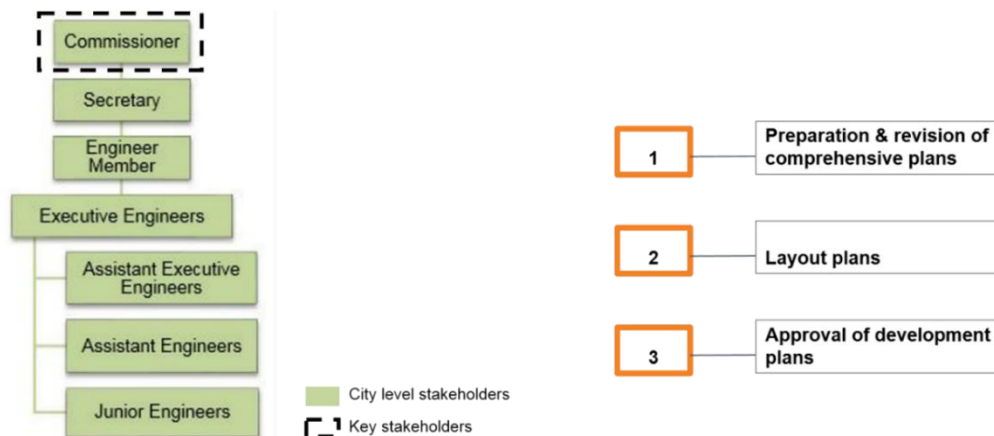


Figure 24 Main actors and Areas of action of BDA  
 Developed by Author, based on (BDA, 2019)

**BMRDA** was created under the BMRDA Act 1985, acting as an autonomous body for planning, supervising and coordinating orderly development in Bengaluru Metropolitan Region. Other functions include survey reports and preparing structured plans (BMRDA, 2017).

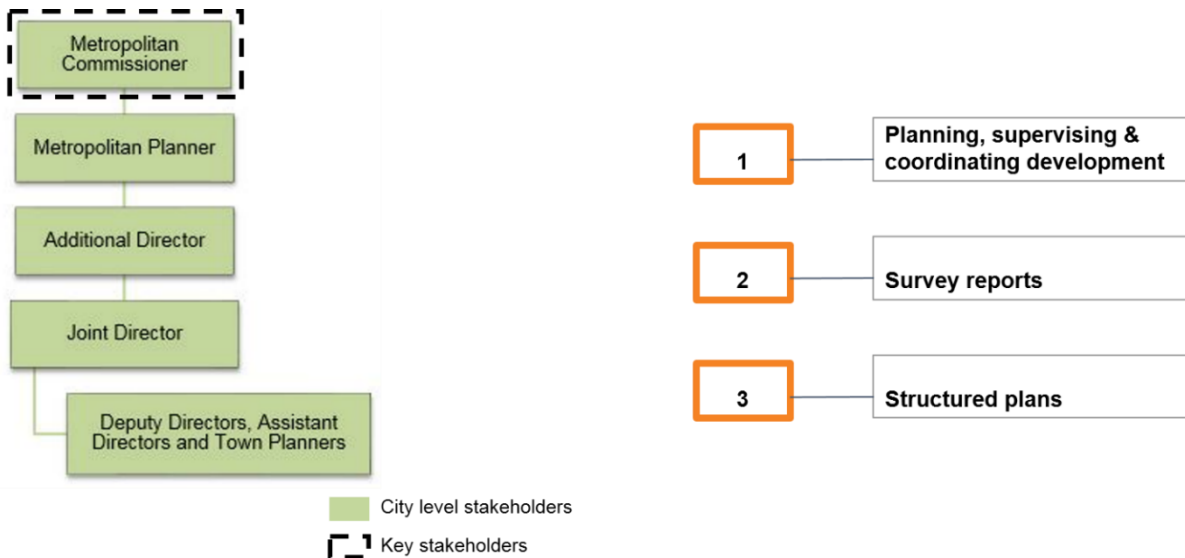


Figure 25 Main actors and Areas of action of BMRDA  
Developed by Author, based on (BMRDA, 2017)

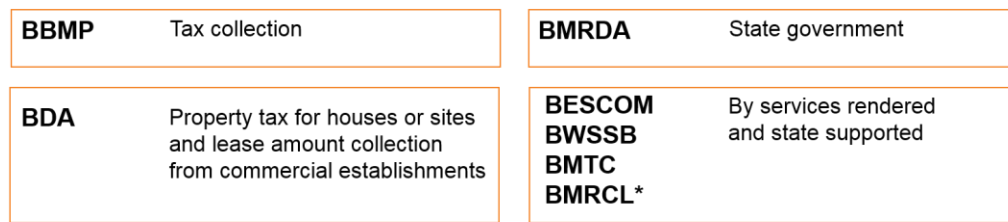
Both BDA and BMRDA Commissioners are appointed by the state government; and no clear climate interventions or related activities by these authorities were available. For BBMP, BMRDA organization structure and detailed BBMP, BDA, BMRDA limits or boundaries, refer to annex A6 and A7 respectively.

When it comes to services, **Bengaluru Electricity Supply Company Limited (BESCOM)** is responsible for power distribution in and around the city commencing operations from 1<sup>st</sup> June 2002. It is also responsible for augmentation and maintenance of required infrastructure and climate intervention example is promoting use of solar roof tops (BESCOM, 2019). **Bengaluru Water Supply and Sewerage Board (BWSSB)**, an autonomous body formed under the BWSSB Act 1964 for water supply and sewage disposal; first of its kind to be introduced in the country; and climate intervention example being promoting rain water harvesting (BWSSB, 2019). **Bengaluru Metropolitan Transport Corporation (BMTCL)**, earlier known as Bangalore Transit System (BTS) was formed in 1997 and is a passenger transportation provider under the state government. A climate intervention which did not succeed is electric buses introduction (BMTCL, 2019). **Bengaluru Metro Rail Corporation Limited (BMRCL)**, a joint venture established between Government of India and Government of Karnataka for the implementation and maintenance of the metro rail project. It usually faces hurdles coordinating with the other departments such as development and services related (BMRCL, 2019).

**2.4.2 Finance**

**BBMP** budget comes from the revenues gathered from tax collection and **BDA** revenues is from property tax for houses or sites and lease amount collection from commercial establishments. Whereas **BESCOM, BWSSB, BMTc and BMRCL** receive finance from the respective services rendered by them.

Apart from this, all of the organizations including **BMRDA** receive funds from the state government. BMRCL, in addition also receives funds from the central government. In certain cases, there has been attempts to get more funds through multi-lateral financial institution such as the BBMP recently eyeing for development funds from Asian Infrastructure Investment Bank (AIIB) (TNNcity, 2019).



\* BMRCL additionally receives central government funds

Figure 26 Finance structure at city level

Developed by Author, based on information collected from individual institution websites

For the upcoming year 2019-20, the state government has approved a budget outlay of INR 11,648.9 crores for the BBMP. Budget estimates of BDA in 2015-16 stood at INR 18.38 crores , whereas proposed budget estimates of BMRDA in the year 2017-18 was INR 22.80 crores. BESCOM's expenditure in 2013-14 was INR 12,090.79 crores which is much higher than developmental authorities due to increased emphasis on energy efficiency ; BWSSB budget for the upcoming year 2019-20 is INR 3,212 crores. BMTc budget is unavailable and BMRCL's cumulative financial progress till 31.03.2017 for phase 1 was INR 14,157.51 crores. Dedicated funds or percentage of reservation for environmental or climate change initiatives in unavailable for all the city level administration (BBMP, 2019), (BDA,2019), (BMRDA, 2019), (BESCOM,2019), (BWSSB, 2019), (BMRCL, 2019).

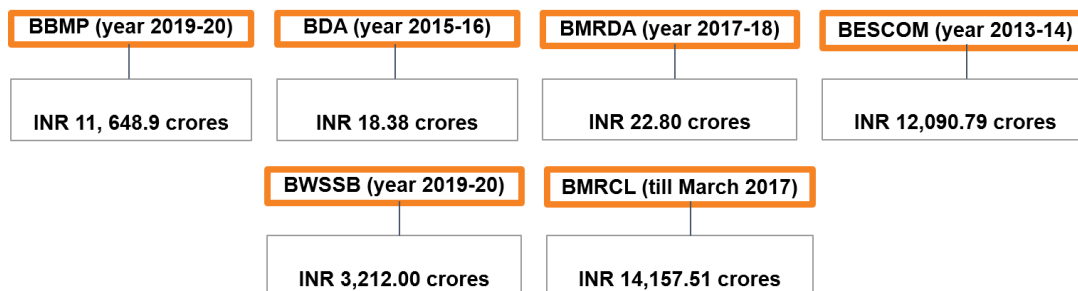


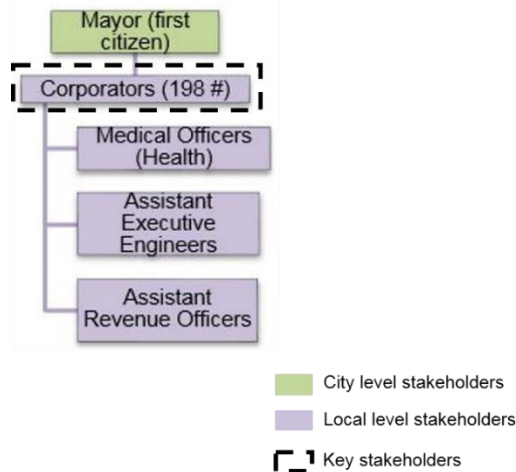
Figure 27 Overview of overall budget at city level

Developed by Author, based on information collected from individual institution websites

## 2.5 Local Level (At 198 wards)

### 2.5.1 Executive System and Finance

**198 wards** (figure 22 and table 3) in Bengaluru were formed as per the **74<sup>th</sup> Constitutional Amendment or Nagarapalike act**. Each of the ward is headed by a corporator who is elected



for a period of 5 years. As per the act to bring about greater decentralization, **ward committees(WCs)** are required to be formed in municipal corporations with more than 0.3 million population by combining 3-4 wards. WCs in the city were active between April 1999 and November 2001 and passively functioning during the remaining period which is a clear violation of the constitutional provisions. Seven members of each committee are not fully elected but nominated by the state government (Aras, 2018), (Chamaraj & Rao,

2005).

Figure 28 Executive structure of wards  
Developed by Author, based on (ICST, 2019)

The **Chairman** who heads the WCs is usually one of the ward's **corporator** and the remaining members consists of **women, members of Resident's Welfare Association (RWA) and backward classes** (scheduled castes or scheduled tribes) (ICST, 2019).

Wards in general receives **funds or finance from the municipal corporation BBMP**. It is distributed and allocated based on the functions and requirements. The areas of budget allocations are for **roads, pedestrian infrastructure, recreational activities, sanitation, solid waste management, community infrastructure and services and administrative expenses** (ICST, 2019). The allocation of funds is based on the criteria whether the ward falls into core area or newly added areas. Each ward belonging to the core area receives INR 2 crores per year; whereas each ward in the newly added area gets INR 3 crores per year by the BBMP for developmental activities. The corporators have time and again emphasized on the need to allocate funds based on the size of the ward and not the current criteria of whether or not the ward falls in an old or new area. An attempt to redraw the boundaries based on population has been made; however, the corporators (especially representing larger wards) wants the government to redraw the boundaries based on area of extent instead of population (Reddy,



2019). (Ravichander, 2019), an urban expert suggests considering several parameters such as population growth rate, extent of commercial or public activities for redrawing the boundaries.

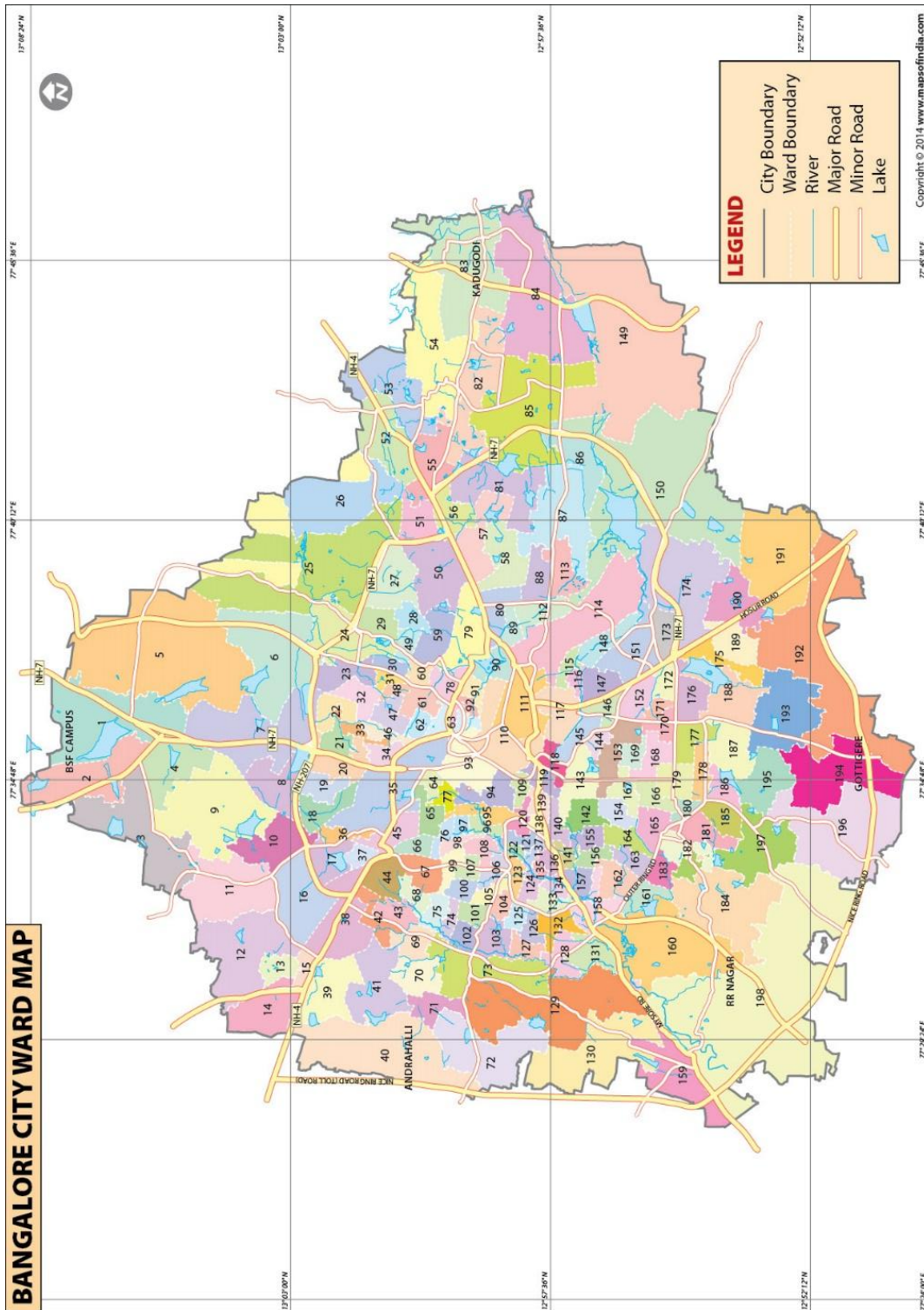


Figure 29 Wards (198#) of Bengaluru (mapsofindia, 2019)



Table 3 List of 198 wards of Bengaluru City

Ward No.	Ward Name	Ward No.	Ward Name	Ward No.	Ward Name	Ward No.	Ward Name	Ward No.	Ward Name	Ward No.	Ward Name	Ward No.	Ward Name	Ward No.	Ward Name	Ward No.	Ward Name	Ward No.	Ward Name
1	Kempasandra	57	Nagapura	89	Jogupalya	155	Hanumanth Nagar	23	Nagavara	89	Jogupalya	155	Hanumanth Nagar	45	Malleswaram	111	Shantala Nagar	177	J P Nagar
2	Chowdeshwari	68	Mahalakshimpuram	90	Halsoor	156	Srinagar	24	HBR Layout	90	Halsoor	156	Srinagar	46	Jayachamarajendra Nagar	112	Domlur	178	Saraki
3	Atturu	69	Laggere	91	Bharathi Nagar	157	Gali Anjenaya Temple ward	25	Horamavu	91	Bharathi Nagar	157	Gali Anjenaya Temple ward	47	Devara Jeevanahalli	113	Kanena Agrahara	179	Shakambhi Nagar
4	Yelahanka Town	70	Rajagopal Nagar	92	Shivaji Nagar	158	Deepanjali Nagar	26	Ramamurthy Nagar	92	Shivaji Nagar	158	Deepanjali Nagar	48	Muneshwara Nagar	114	Agaram	180	Banashankari Temple ward
5	Jakkuru	71	Hegganahalli	93	Vasanth Nagar	159	Kengeri	27	Banasavadi	93	Vasanth Nagar	159	Kengeri	49	Lingarajapura	115	Vannarpet	181	Kumaraswamy Layout
6	Thansandra	72	Herohalli	94	Gandhinagar	160	Rajarajeshwari Nagar	28	Kammanahalli	94	Gandhinagar	160	Rajarajeshwari Nagar	50	Benniganahalli	116	Niasandra	182	Padmanabha Nagar
7	Byatarayanapura	73	Kottegepalya	95	Subhash Nagar	161	Hosakerehalli	29	Kacharkanahalli	95	Subhash Nagar	161	Hosakerehalli	51	Vijayanapura	117	Shanthi Nagar	183	Chikkalaandra
8	Kodigehalli	74	Shakthi Nagar	96	Okalipuram	162	Girnar	30	Kaigondanahalli	96	Okalipuram	162	Girnar	52	K R Puram	118	Sudham Nagara	184	Uttarahalli
9	Vidyaranyapura	75	Shankar Matt	97	Dayananda Nagar	163	Katriguppe	31	Kudhal Nagar	97	Dayananda Nagar	163	Katriguppe	53	Basavanapura	119	Dharmaraya Temple	185	Yelchenahalli
10	Dodda Bommasandra	76	Gayithri Nagar	98	Prakash Nagar	164	Vidyapeeta ward	32	Kaval Bairasandra	98	Prakash Nagar	164	Vidyapeeta ward	54	Hudi	120	Cottonpete	186	Jaganahalli
11	Kuempu Nagar	77	Dattatreya Temple	99	Rajaji Nagar	165	Ganesh Mandir ward	33	Manorayanapalya	99	Rajaji Nagar	165	Ganesh Mandir ward	55	Devasandra	121	Binnipete	187	Putenahalli
12	Shethalli	78	Pulkeshinagar	100	Basaveshwara Nagar	166	Karasandra	34	Ganganaahalli	100	Basaveshwara Nagar	166	Karasandra	56	A Narayanapura	122	Kempapura Agrahara	188	Bilehalli
13	Mallasandra	79	Sarvagna Nagar	101	Kamakshipalya	167	Yediyur	35	Aramane Nagara	101	Kamakshipalya	167	Yediyur	57	C V Raman Nagar	123	Vijayanagar	189	Hongasandra
14	Begalokunte	80	Hoysala Nagar	102	Vasathavathi Nagar	168	Pattabhiram Nagar	36	Mattikere	102	Vasathavathi Nagar	168	Pattabhiram Nagar	58	New Tippasandra	124	Hosahalli	190	Manganmanapalya
15	T Dasarahalli	81	Vijana Nagar	103	Kaveripura	169	Byrasandra	37	Yeshwanthpura	103	Kaveripura	169	Byrasandra	59	Maruthi Seva Nagar	125	Marenahalli	191	Singasandra
16	Jalahalli	82	Garudachar Playa	104	Govindaraja Nagar	170	Jayanagar East	38	HMT Ward	104	Govindaraja Nagar	170	Jayanagar East	60	Sagayapuram	126	Maruthi Mandir ward	192	Begur
17	J P Park	83	Kabugodi	105	Agrahara Dasarahalli	171	Gurappanapalya	39	Chokkasandra	105	Agrahara Dasarahalli	171	Gurappanapalya	61	S K Garden	127	Muddalipalya	193	Akere
18	Radiakrishna Temple Ward	84	Hegadur	106	Dr Raj Kumar Ward	172	Madhala	40	Dodda Bidarakalu	106	Dr Raj Kumar Ward	172	Madhala	62	Ramaswamy Palya	128	Nagarbhavi	194	Gottigere
19	Sanjaya Nagar	85	Dodda Nekkundi	107	Shivanagara	173	Jakkasandra	41	Peenya Industrial Area	107	Shivanagara	173	Jakkasandra	63	Jaymahal	129	Jhana Bharathi ward	195	Konankunte
20	Ganga Nagar	86	Marathahalli	108	Sriramanandir	174	HSR Layout	42	Lakshmi Devi Nagar	108	Sriramanandir	174	HSR Layout	64	Rajmahal Guttahalli	130	Ullalu	196	Anjapura
21	Hebbala	87	HAL Airport	109	Chickpete	175	Bommanahalli	43	Nandini Layout	109	Chickpete	175	Bommanahalli	65	Kadu Malleshwar Ward	131	Nayandahalli	197	Vasanthpura
				110	Sampangirama Palya	176	BTM Layout	44	Marappana Palya	110	Sampangirama Palya	176	BTM Layout	66	Subramanya Nagar	132	Attiguppe	198	Hemmgapura

\*to be read in conjunction with figure 22  
Source: (mapsofindia, 2019)

## 2.6 Current Developments

### 2.6.1 Smart City Mission

Launched in 2015 by the Ministry of Urban Development (Government of India) as an **urban renewal and retrofitting project** to develop 100 cities including Bengaluru. Each of the city will create a **Special Purpose Vehicle (SPV) headed by a Chief Executive Officer (CEO)** and initially funded by both centre and state government. After which the company has to raise funds through debt or equity (UUD, 2019). The vision for Bengaluru city is as follows:

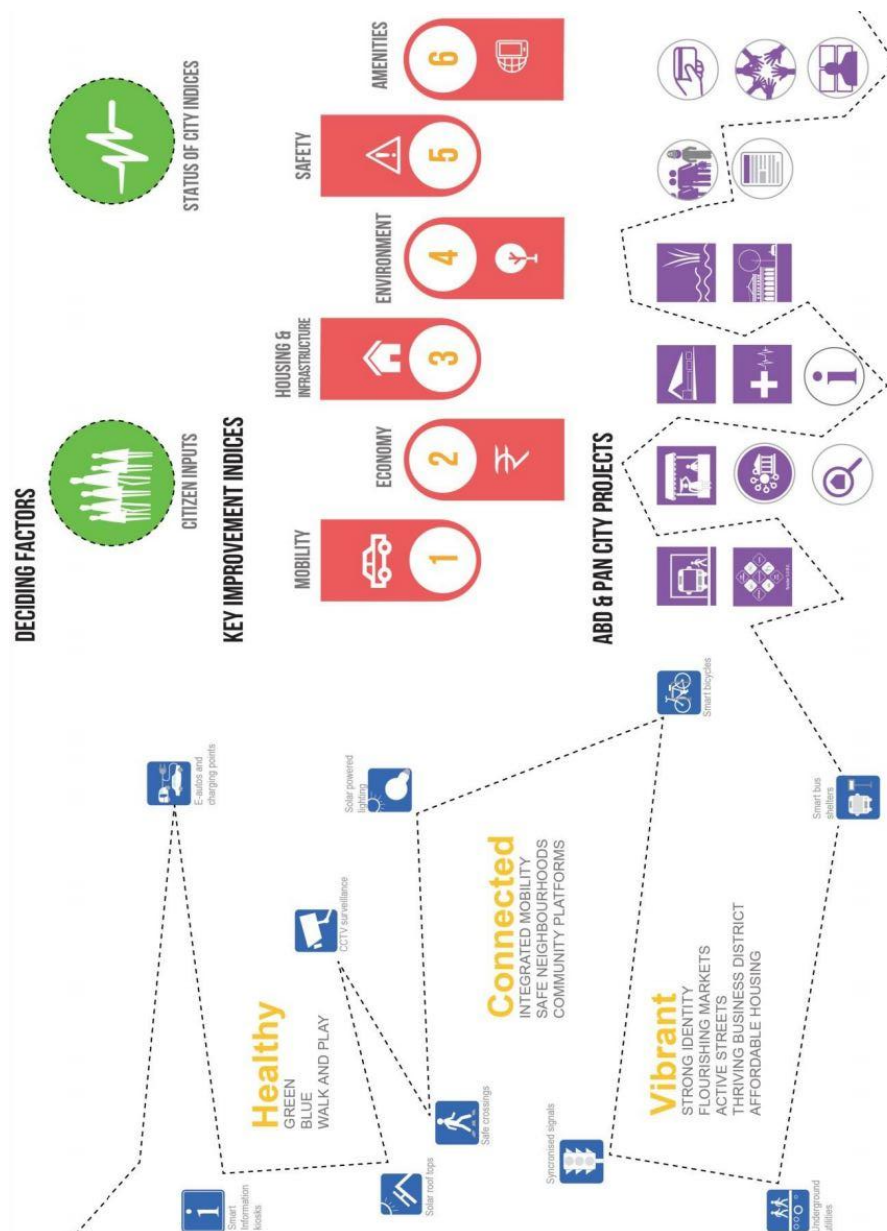


Figure 30 Bengaluru Smart City Vision (UUD, 2019)

The city’s vision is **‘Livable Bengaluru’** with the 10 areas of interventions or projects, out of which the most prominent ones directly or indirectly related to climate and mentioned as it is are:

**Project 2:** Integrated mobility towards creating vibrant destinations at three major transit points

**Project 4:** Innovation of downstream cleanup of drainage system for Ulsoor lake and Sankey Tank

**Project 5:** Protection and redevelopment of centrally located parkland Cubbon Park

Other attempts are to create a **Central Command Centre** which will serve as a single platform connecting all stakeholders’ departments in order to **promote citizen centric E-governance services** (UUD, 2019).

**2.6.2 Greater Bengaluru Authority (GBA)**

The major political parties of Karnataka: Indian National Congress (INC), Bharatiya Janata Party (BJP) and Janata Dal Secular (JD-S) have underscored the need for a dedicated law for the governing of Bengaluru instead of the city directly coming under the **Karnataka Municipal Corporations Act, 1976 (KMCA, 1976)**. The city population is currently 12.5 million and the BBMP Restructuring Committee in June 2018 has published a draft of ‘The Greater Bengaluru Governance Bill’ for a three-tier governance structure (figure 24) called **Greater Bengaluru Authority (GBA)** and if this is passed, all the existing city departments will be directly under the administrative control of the GBA (Bharadwaj, 2018). The **three-tier governance** will have **GBA at city level, multiple corporations (5 in total) and empowered ward committees (400 in total)**. The expert committee has suggested five corporations – North, South, East, West and Central as shown in figure 25; each of which will have Mayors elected by the Council of Corporators (Pinto, 2018).

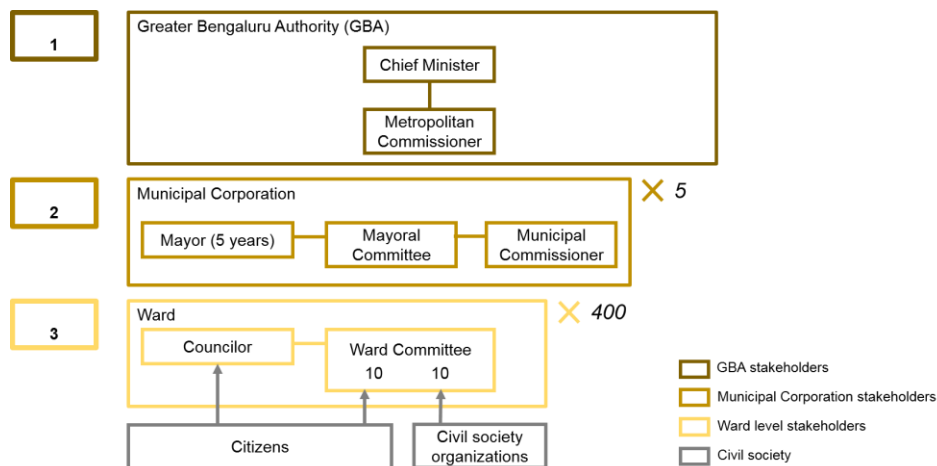


Figure 31 Proposed 3-tier governance with key actors  
Developed by Author, based on (ici, 2015)

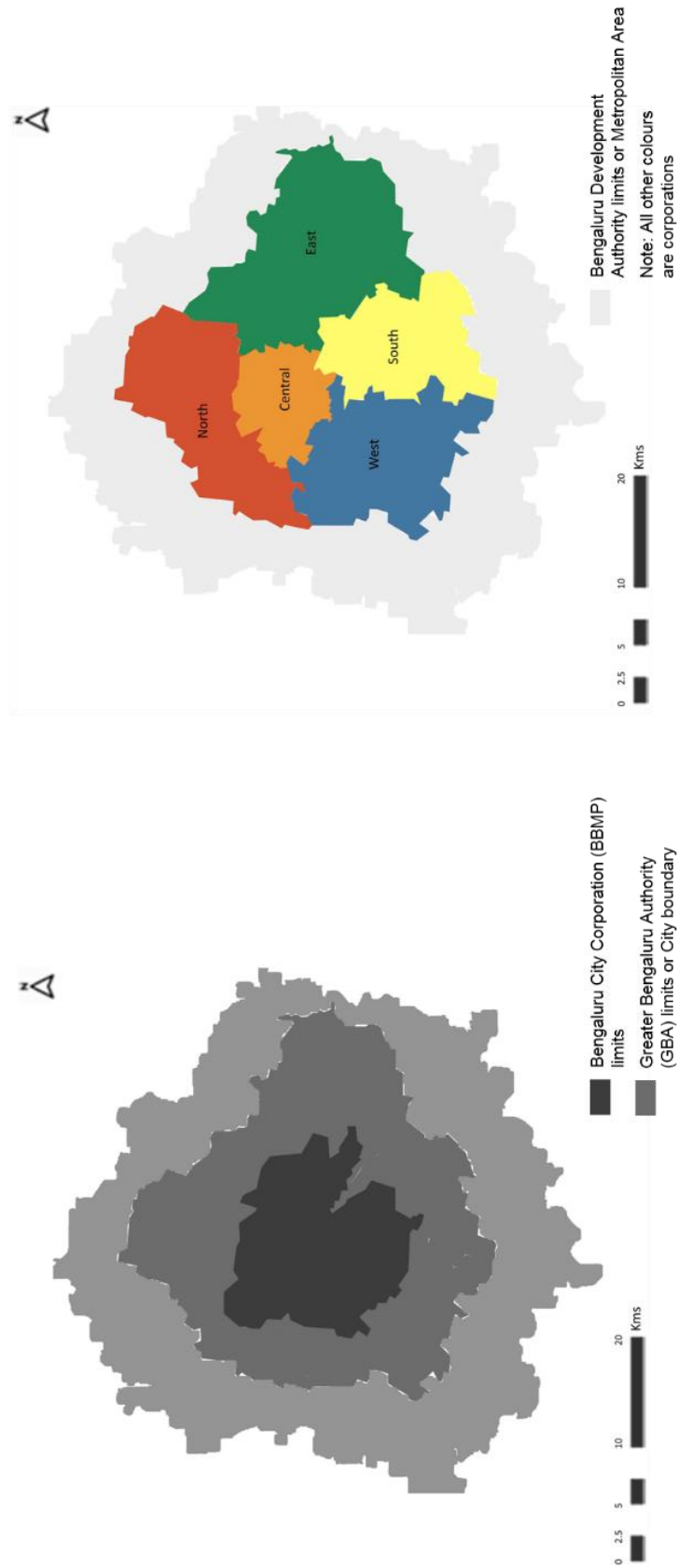


Figure 32 Existing corporation limits and proposed GBA limits with 5 corporations  
Developed by Author, based on (CES, 2019), (AkshathaM, 2015)

## 2.7 Objective A\_Summary

**National Government** often focuses on challenges such as economic development and poverty reduction, thus leading to very little emphasis on issues such as climate action. The Government of India has often argued in the International Climate Change negotiations by stating that developed countries of the North have a responsibility to aid developing countries. This assistance involves both technological and financial contributions (Beermann, 2016, p. 3). **State governments** play an important role in urban reform processes; however, the state governments often use urban areas as a “showcase” for policies and regulations (Beermann, 2016, p. 4). Bengaluru **city government** is directly depended on the state government for resources and policies. Complex and overlapping responsibilities between sectoral departments as shown in table 4 leads to confusion and chaos. The figure gives an idea of the original or the actual function, overlapping function and coordination function of various stakeholders at city level. Even though a draft bill proposes for a 3-tier governance structure, it is unclear when the bill will be passed by the state government. **Local governments** often struggle to find the necessary resources to act on issues due to the financial constraints associated with India’s federalist structure (Beermann, 2016, p. 4).

Table 4 Functional analysis of government agencies

Agency	BBMP	BDA	BMRDA	BWSSB	BESCOM	BMRL	BMTC
Jurisdiction	Municipal limits	Urban dvpt. area	Metro area	Metro area	Metro area	Metro area	Metro area
Water and sewerage	Coordination function		Coordination function	Original function			
Electricity	Coordination function				Original function		
Transport: Road	Coordination function	Coordination function	Coordination function				Original function
Transport: Rail	Coordination function		Coordination function			Original function	
Road infrastructure	Original function	Overlapping function	Overlapping function				
Development control	Coordination function	Original function	Overlapping function				
Slum clearance and rehabilitation	Overlapping function						
Urban finance	Coordination function	Original function	Overlapping function				
Tax collection	Original function						
Waste Management	Original function						

Dvpt. = Development

■ Original function

■ Overlapping function

■ Coordination function

All three functions together

Source: Developed by Author, based on (Wankhade, 2014)

## 3.0 Objective B

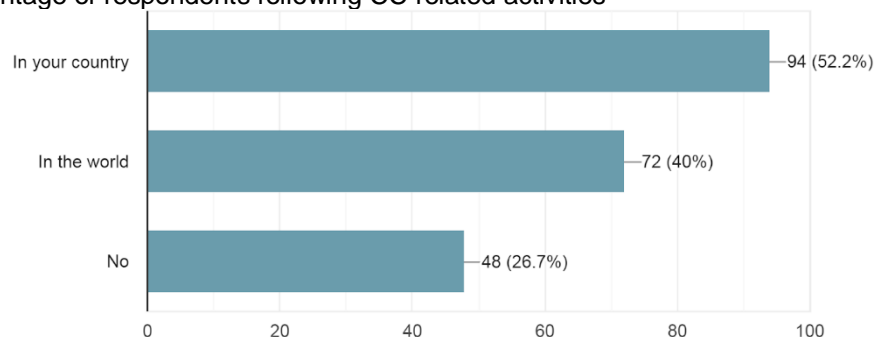
## Explore society's knowledge, opinions and behavior

Similar to the survey conducted by (Bojovic, 2014, pp. 13-18); online interviews were conducted with citizens of Bengaluru (180 residents) by a questionnaire created using Google Forms and shared via online platforms WhatsApp, Facebook, LinkedIn and Instagram. Responses were recorded from 21<sup>st</sup> Dec 2018 to 1st Jan 2019 and 1<sup>st</sup> March to 10<sup>th</sup> March 2019 on the **awareness, perceptions or opinions; and behavior** pertaining to climate change (CC) and following are the results. The aim was to receive as many responses as possible from the residents during the period of field survey (questions mentioned in annex A8).

### 3.1 Awareness

When asked as to how many people follow CC related activities in India and across the world; nearly 52% of the respondents answered they follow CC activities regularly in the country as compared to only 40% who are aware of activities across the globe. Surprisingly, nearly 1 out of every 4 respondents does not follow any CC activities; which calls for the need of increasing awareness among the civil society.

Figure 33 Percentage of respondents following CC related activities

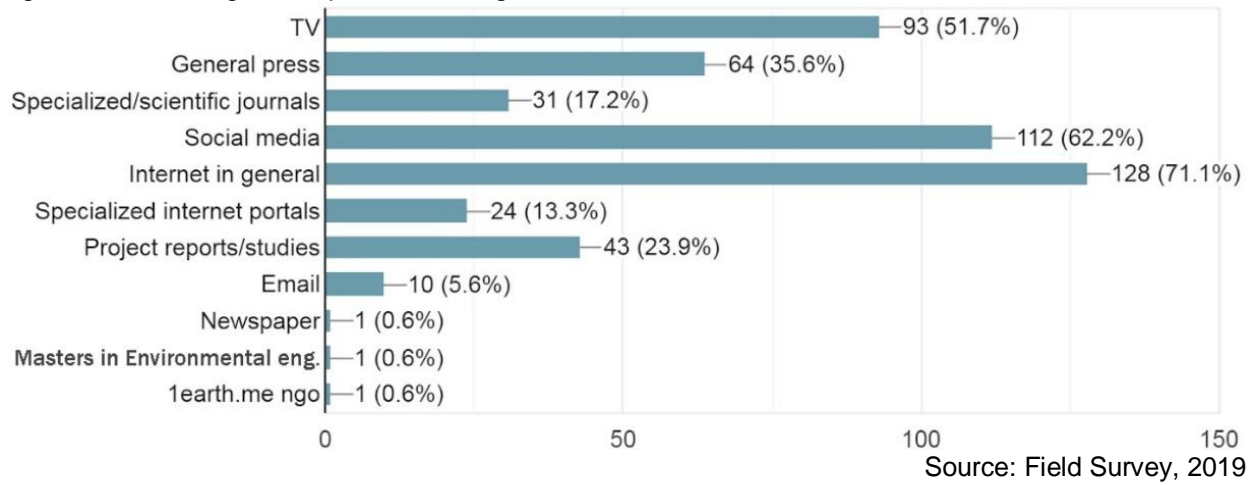


Source: Field Survey, 2019

Nearly 73% who follow CC information find relevant information from mixed sources; the highest being from internet in general (accessed by around 71%), followed by social media (~62%) and television (~52%). Implications are internet, social media and television play a crucial role in accessing information and the proposals suggested requires considering this aspect. Just one person claimed to follow CC information through newspaper leading to assumptions that environmental topics are either not emphasized upon by newspaper companies or these topics are simply ignored by the readers; or the shift to digitalization could have led to a decrease in newspaper readers.

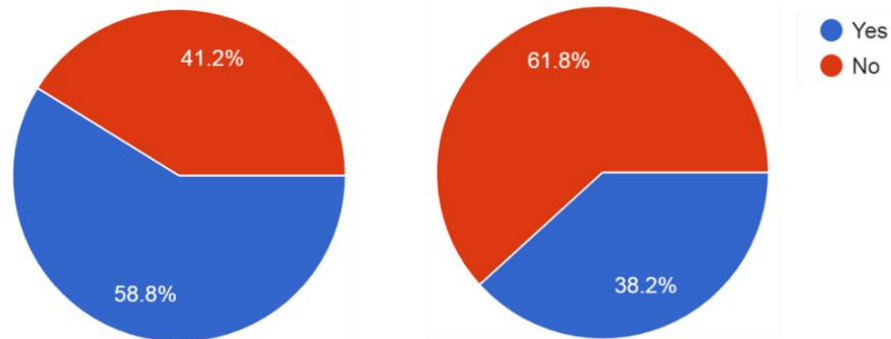


Figure 34 Percentage of respondents using different sources to find CC information



Nearly 59% of respondents are aware of the NAPCC as compared to just ~38% who are aware of the SAPCC for Karnataka as shown in figure 28. Despite the availability of various means and sources to convey information, a large percentage are unaware of the current official activities at different levels. Other **awareness** answers are part of annex A8 which includes how well informed are they about different issues related to CC, the three different action plans for Karnataka and the deadline given to city of Bengaluru to submit its own climate action plan.

Figure 35 Percentage of respondents who are aware or not aware of the NAPCC and SAPCC respectively

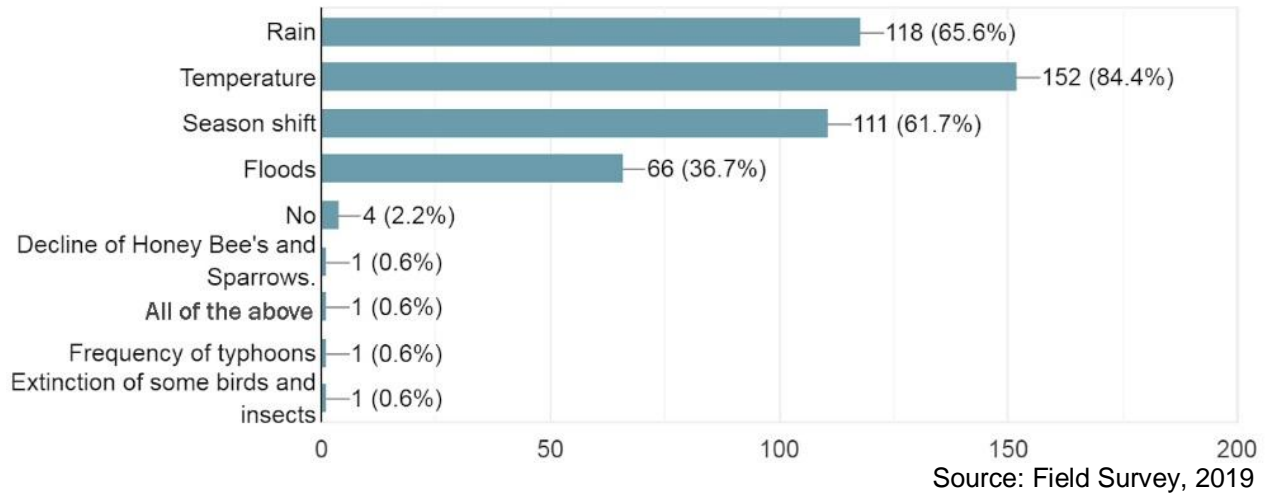


### 3.2 Perceptions or Opinions

For the question on whether or not some changes in the climate (over last 10 years) has been observed in the region; nearly 98% of interviewees claimed to have noticed changes in the climate parameters. More than 84% of the respondents say the temperatures have changed and more than 60% have observed changes in rainfall pattern and shift in seasons. Interesting answers include the **declination of birds and insects** such as **sparrows and honeybees**; whose number and health are threatened by climate change (Marshman, Blay-Palmer, &

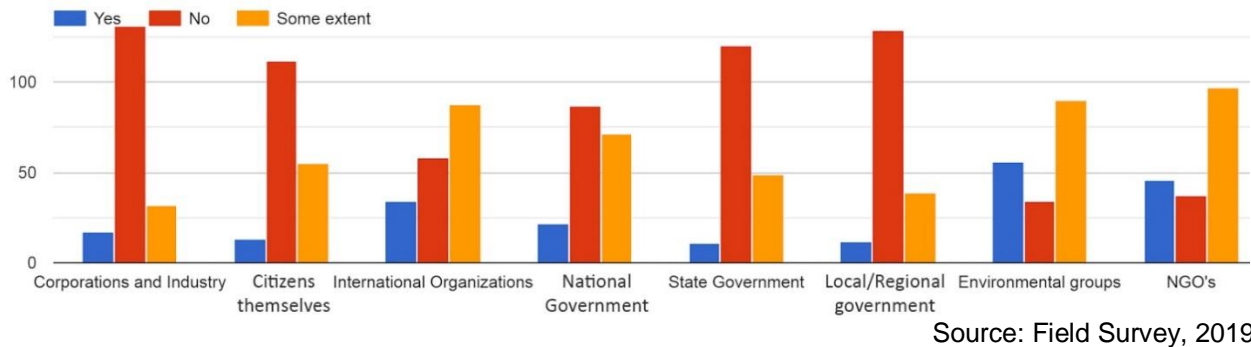
Landman, 2018), (Roberts, 2019) . Not just these, but a number of flora and other fauna species are expected to be affected drastically due to the global concern.

Figure 36 Percentage of respondents who have observed changes in climate parameters over last 10 years



When asked about what they think about the contribution of various stakeholders in dealing with CC; more than 55% respondents claim that not enough is being done by local/regional authorities, state government, corporates/industries and citizens themselves.

Figure 37 Number of respondents who think enough is being done for CC by the following



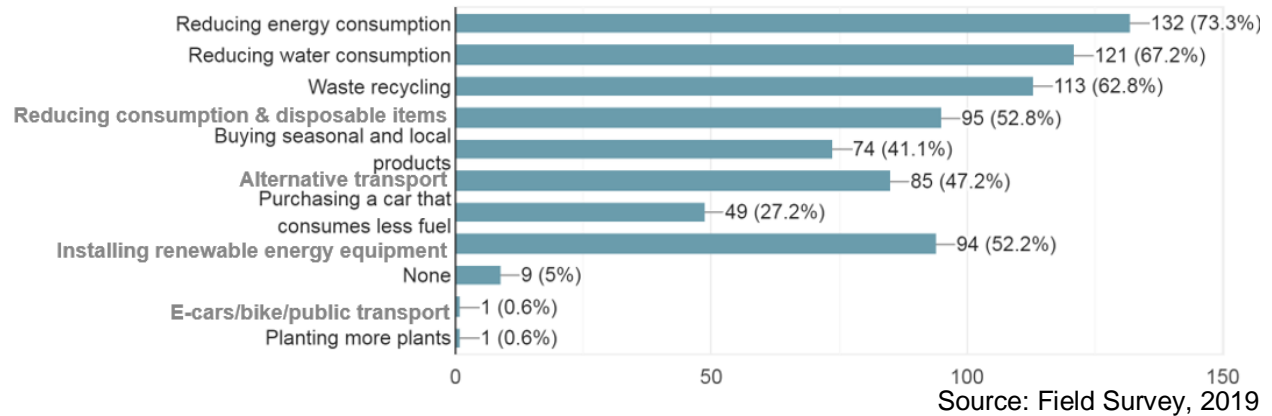
Environmental groups receive the highest upvotes followed by non-governmental organizations; whereas the state government and local/regional government receives the lowest number of 'yes' for positive contribution. This leads to an opportunity for the state and local government to step up and take noticeable actions.

Other perceptions or opinions (annex A8) reveals clearly that out of the few persons who are aware of the NAPCC and SAPCC, only a small percentage are satisfied by its quality.

### 3.3 Behavior

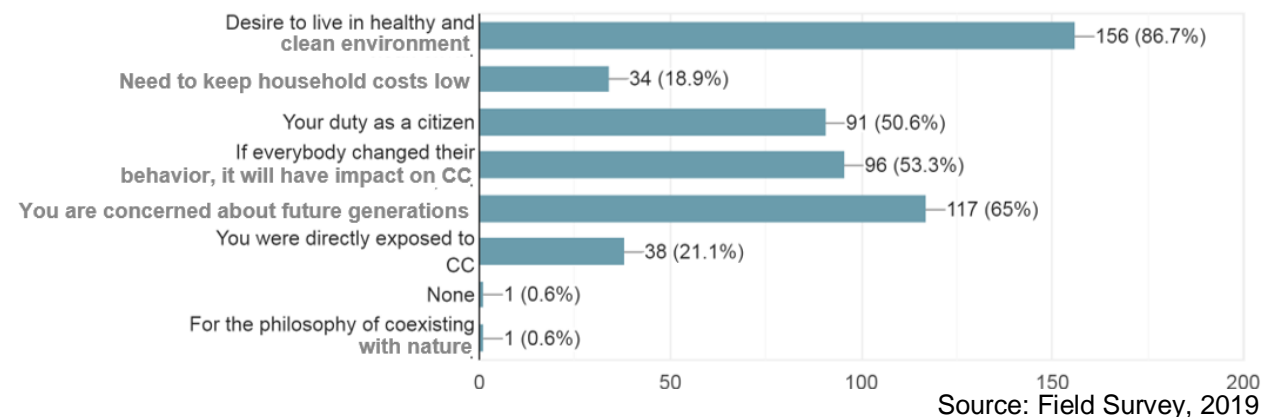
**Behavioral** patterns observed are that majority consider CC while consuming energy (~73%), water (~67%) and recycling waste (~63%). Of all, 9 respondents do not consider environment and CC while making decisions on any of the mentioned aspects (figure 31). A major concern is that less than 50% consider using alternative transport such as public transportation, e-vehicles. This could be for multiple reasons and one such reason being the decreased supply of public transportation, especially buses; with the city in 2017 having just 6,207 public buses as against the required 12,000-14,000 buses (Philip, 2017).

Figure 38 Percentage of respondents considering environment and CC when making decisions



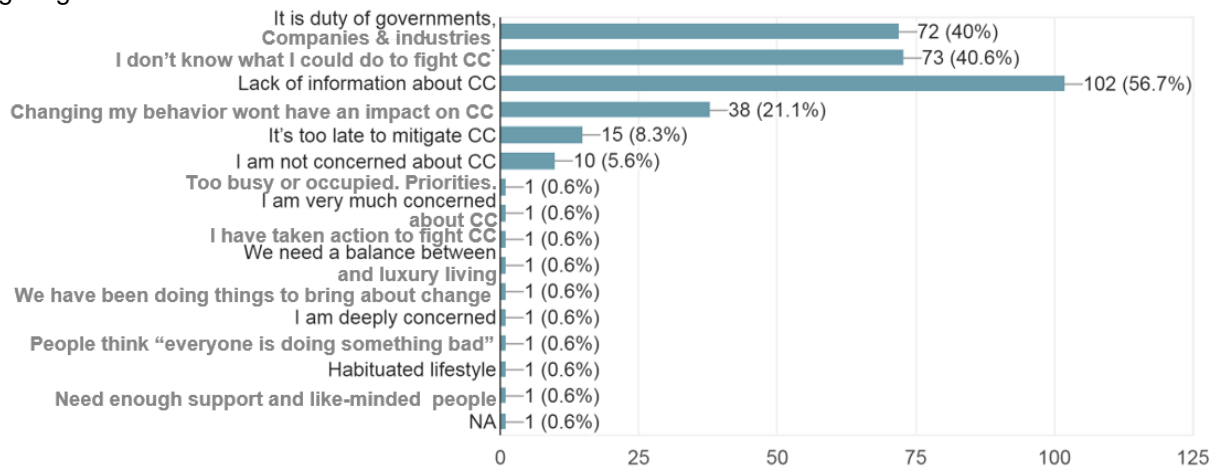
The main reasons to take actions aimed at fighting CC is the desire to live in healthy or clean environment (~86%) and being concerned about future generations (~65%). This is followed by the belief of ~53% who think “if everybody changed their behavior, it will have impact on CC” which is a highly unlikely situation. Around 20% were directly exposed to CC and; nearly the same percentage desire to keep their household costs low.

Figure 39 Percentage of respondents based on their reasons to take actions aimed at fighting CC



The next question on what the reasons are from taking CC aimed actions; nearly 56% respondents claim due to the lack of information about CC, do not take necessary steps for a positive change. Around 70% claim they do not what could be done to fight CC and nearly the same percentage believe it is the duty of governments, companies and industries. Surprising attitude of 38 respondents who think changing their behavior won't have an impact on CC and 10 respondents who do not care about the global issue.

Figure 40 Percentage of respondents based on the reasons stopping them from taking actions aimed at fighting CC



Source: Field Survey, 2019

Other behavior related questions aimed at figuring out which of the national level or state level plans are being contributed towards either directly or indirectly on a daily basis by the residents and what are their comments or suggestions towards the various plans currently in place (annex A8).

### 3.4 Objective B\_Summary

The general behavior, opinions or attitude of the society towards climate change is severely affected due to limited knowledge and experience on the topic. To bring about a positive change in the mindset, there is a need to extensively use platforms such as online platforms, social media and television to spread relevant information. All the respondents believe that they have observed certain changes in the climatic parameters over the last decade and despite the current efforts, there is an urge and need to do lot more in order to achieve considerable results.

# 4.0 Objective C

## Investigating Planning and Implementation Gaps

To understand the planning and implementation gaps in the governance system and strategies; in-person and online interviews were conducted with representatives from **6 Non-Governmental Institutions** (international, national and sub-national levels) and **7 Governmental Institutions** (state and city levels) between 1<sup>st</sup> Jan to 14<sup>th</sup> March 2019.

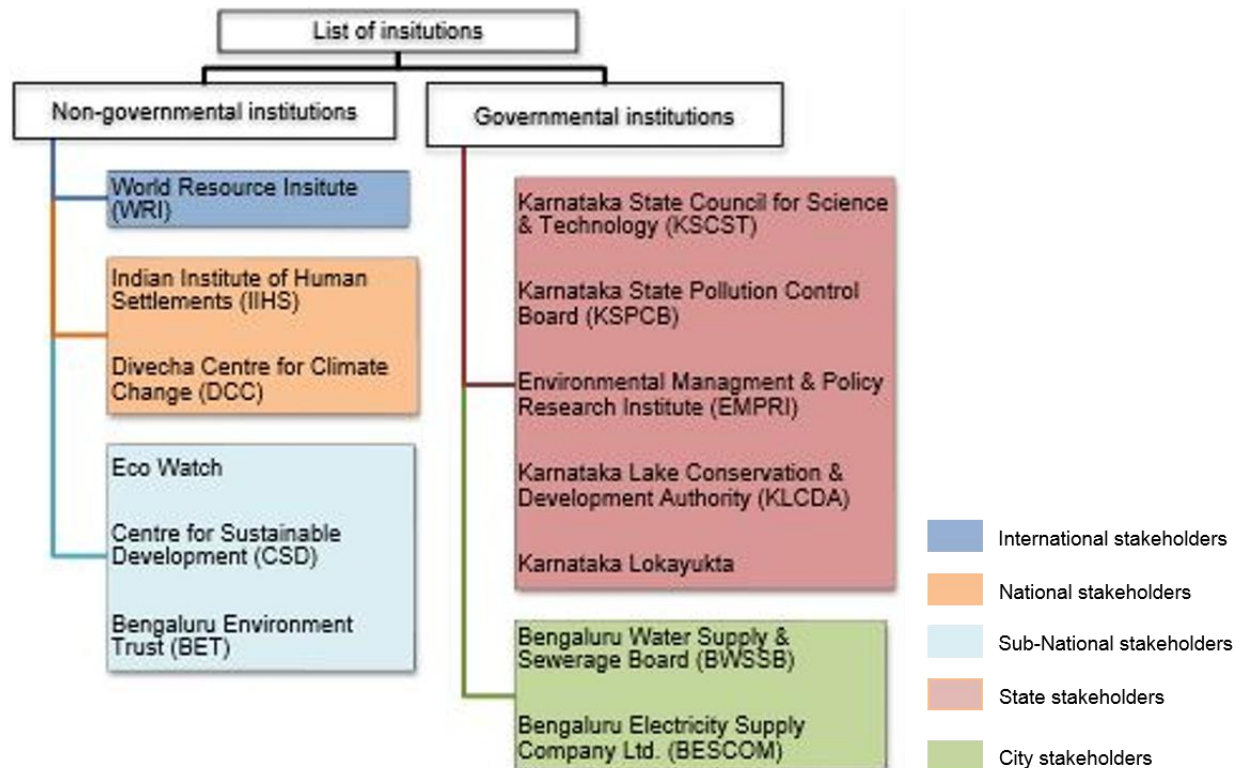


Figure 41 List of institutions interviewed or reviewed for investigating planning and implementation gaps  
Developed by (Author, 2019) based on interviews and media coverage

### 4.1 Non-Governmental Institutions

#### 4.1.1 International

(Kelkar, 2019), Director of Climate Policy at **World Resource Institute (WRI)** supporting the move by IPCC, stresses on the need to **decarbonize carbon content** in the air and not just focus on reducing emissions. Furthermore, she expresses the need for a “**Comprehensive Urban Resilience Strategy**” like the one done for the city of Surat in 2017. Surat is the first city in India have such a strategy (100RC, 2017). (Ginoya, 2019), Senior Project Associate for Climate Resilience at WRI hints that climate resilience approaches at city level are always in line with the city programs proposed by governmental institutions. All projects are worked in with

the **collaboration and support of governmental agencies**; and cannot be done independently. (Goswami, 2019), Manager of WRI Sustainable cities works on development of data analytics, tools or platforms, and highlights on **the need and active lookout for supporting innovative ideas developed by entrepreneurs and startups**.

#### 4.2.1 National

(Basu R. , 2019), Senior Research Associate at the **Indian Institute for Human Settlements (IIHS)** stresses on the importance of roles and responsibilities of **nodal officers** in addition to educational institutions promoting **Massive Open Online Courses (MOOC) courses**. This way institutions can be not just dynamic educators but also knowledge hubs for bringing about habitual changes.

(Srinivasan, 2019), distinguished scientist at the **Divecha Centre for Climate Change (DCCC)** located in the prestigious Indian Institute of Science (IISc); promotes the idea of **local solutions** rather than central solutions which needs to be achieved in collaboration with **grass-root movements** by young population. Adding on, to avoid the State of Karnataka to be split into two different states (similar to the recently split Andhra Pradesh state); economic and social development needs to be more focused on the depleted Norther and Central parts of the state, away from the capital city.

#### 4.2.3 Sub-National

(Heblikar, 2019), a noted filmmaker, environmentalist and founder of **Eco-Watch** suggests four measures to improve the current situation: first, **to develop smaller cities (tier 2 and tier 3)** in order to attract migrating population and reduce burden on tier 1 city like Bengaluru. The type of classification is done by Government of India where tier 1 refers to bigger cities and tier 3 refers to smaller ones. Second solution **is the need to involve more environmentalists and ecologists** in the governance system. Third measure is to **focus on economical shift towards agricultural** and related sectors; and the last is **spreading awareness through art and literature** (such as music, folklore, poetry etc) on the importance of environmental conservation. (Kumar, 2019), a Research Associate at the same institution adds on by stating the importance and the need for **national government to show enhanced interest and cooperation** in order **to support sub-national governments** including city level and ward committees to contribute positively.

(Srinivas, 2019), Executive Director at **Centre for Sustainable Development (CSD)** who has **contributed to the final state action plan** stresses on the importance of having a **climate**



**change cell in each of the sector** of local government. The scientist adds on that the role of non-governmental organizations is that of facilitators reporting climate change initiatives, however governmental authorities are the final implementors.

## 4.2 Governmental Institutional

### 4.2.1 State

(Remadevi, 2019) Head of Climate Change Unit at **EMPRI** says, they have been attempts to make climate action plans for Bengaluru City in different sectors such as expanding metro rail transportation to be a sustainable means of public transport. There have been **no comprehensive attempts** cutting through all sectors of the city; however numerous attempts have been made to update and revise the state action plan. The new plan is expected to address the topics of **budgetary allocation** along with **mechanism for monitoring and evaluation**.

Latest news and surveys have ranked the State of Karnataka as **one of the most corrupted states in the country** and the most in accessing public services which has severely hindered people's beliefs (PTI, 2017). (Asha, 2019), a Gazetted Assistant at **Karnataka Lokayukta** (an anti-corruption ombudsman institution) highlights the three major roles of the institution: **checking for mal-administration practices, irregularities and corruption** in governmental organizations. The biggest drawback is that as per the Lokayukta Act, they are only recommenders to the state government and not decision makers on the punishment. Constant change in ruling parties every few years and new rules passed by them are causing the institution to lose its strength and original powers.

### 4.2.2 City

(Sunil, 2019), Project Associate at a Water Harvesting Theme Park by **BWSSB** says as per the gazette notification issued in 2016, all new structures built on 30X40 sq. feet and above and all old buildings built on 40X60 sq. feet and above must install **Rain Water Harvesting (RWH)** system. However not all owners are abiding by this rule. As per a newspaper article by (Gururaj, 2018); BWSSB has revealed that out of 1,54,328 buildings which were to install RWH system, still around 59,000 structures are yet to have it. **Space problem** to install the system and **resident's ignorance towards the law** (despite the fines and penalties) are major concerns.

(Lohith, 2019), junior engineer at **BWSSB**, explains that as an autonomous body they receive no funding from the government and faces hurdles due to the **complexity of rules or regulations and limited staff knowledge** when it comes to coordinating with other

departments. Problems associated with **improper demarcation of wards jurisdiction boundaries** adds on to the mess. As per the article by (Bagchi, 2018) , Bengaluru urgently needs measures to save water as it is predicted to be the **second-most likely city in the world to run out of water**.

(Swamy, 2019) **BESCOM**, talks about the problems associated with the theft of electricity despite the presence of vigilance squads to combat them. Apart from this, to reduce maintenance efforts during heavy downpours of rain, overhead electricity lines are being changed to underground systems. The organization in collaboration with the central Ministry for New and Renewable Energy have constantly promoted the use of LED bulbs of less wattage (7-9 Watts) and providing subsidies for Solar Roof Top Photovoltaic (SRTPV). Despite the efforts, not a large population is encouraged enough to contribute especially due to **space problem** to install the system.

### 4.3 Objective C\_Summary

Apart from the above mentioned information, through the results of common questions shared with the non-governmental and governmental institutions (refer annex A11 for the list of organizations); and online references, the top challenges or gaps in planning and implementation are as shown in the figure 53. Questions and results of the interviews are mentioned in annex A8, A9 and A10.

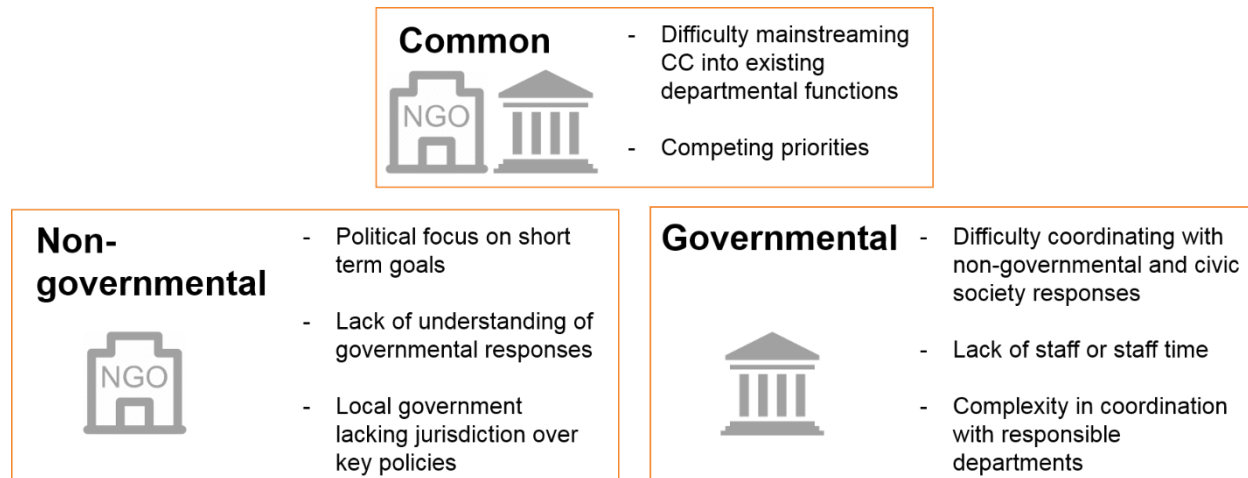


Figure 42 Top challenges or gaps in planning and implementation  
Developed by (Author, 2019) based on interviews

None of the non-governmental or governmental institutions interviewed face any challenges when it comes to funds for planning, implementation or hiring sufficient staff. The available staff time in non-governmental institutions is sufficient and they do not face awareness related

difficulties. Though governmental staff are well informed and aware of the consequences, lack of staff or staff time (despite having the funds for it) in many of the institutions is affecting their performance levels.

### 4.4 SWOT

At city level, the main **strength** is that the city of Bengaluru is proposed to be a smart city and also the GBA is to be established in the near future. Under the smart city vision, a number of climate interventions are planned to be implemented. Similarly, GBA is expected to have actions which would require a unit responsible for facilitating, monitoring and coordination purposes. **Weakness** is the poor ranking city’s governance in comparison to other major cities and the fact that the mayor and deputy mayor are filled through quota system. This type of system is a way in which citizens from scheduled castes/tribes or backward classes are selected. Reservations such as these have led to disastrous outcomes leading to the merit to be replaced by mediocrity. It is continued practice despite many attempts including petitions being circulated in recent times to abolish all reservations (change.org, 2015), (Agrawal, 2016).

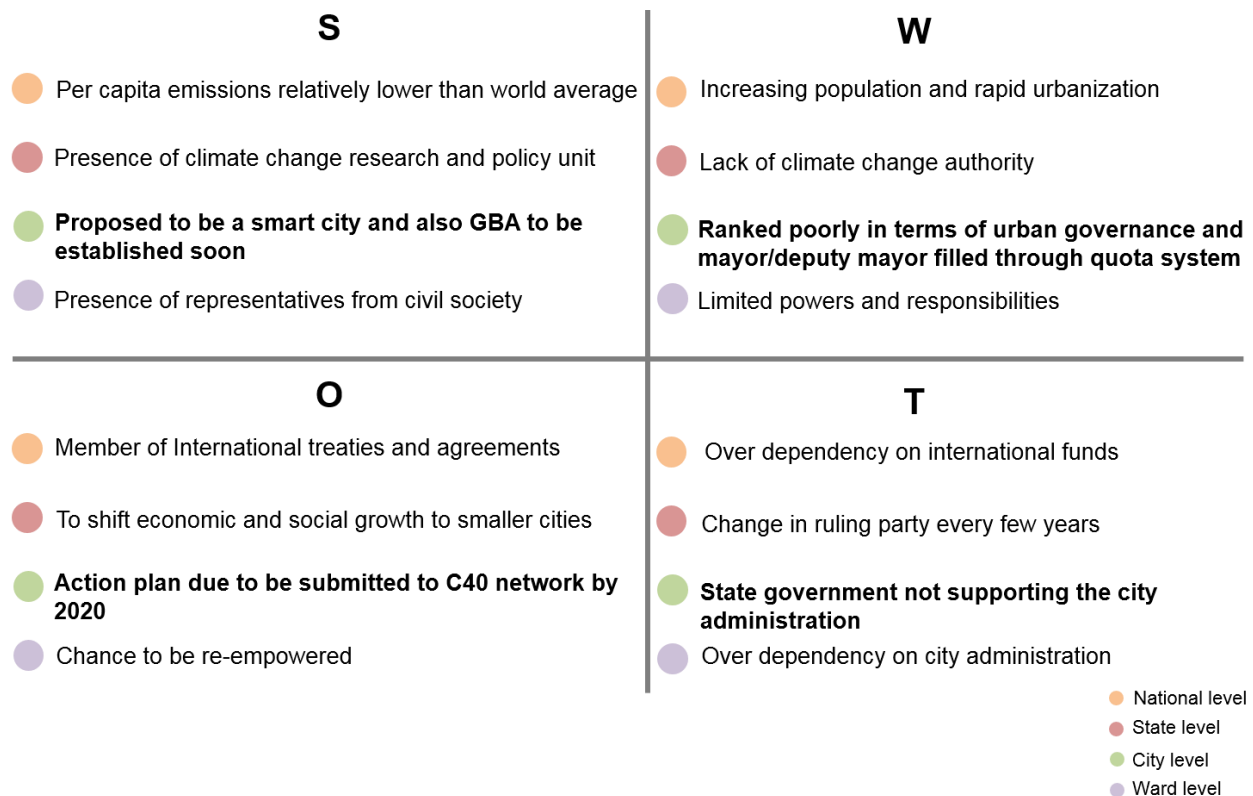


Figure 43 SWOT  
 Developed by (Author, 2019) based on objectives A,B & C

The biggest **opportunity** is in developing a consolidated climate action plan due to be submitted to the global network C40 by 2020. A city level action plan has the potential to

address specific issues in order to cut down on overall GHG emissions through co-benefits such as energy savings, reduced air pollution and improved public health (Ruth, Ghosh, Mirzaee, & Lee, 2017). This would require policies supporting innovation, economic benefits and social life improvement.

However, the **threat** lies in the truth that state government may or may not support city administrations. This could be addressed by having a coordinator appointed by the state responsible for overlooking the preparation and functioning aspects of climate actions. The biggest problem is administrative complexities associated with the current centralized top-down approach. This has led to **non-efficient local government practices, limited apprehension of urban civil society and restricted responses by non-governmental organizations** to deal with Urban Climate of Bengaluru.

# 5.0 Objective D

## Propose Innovative Climate Governance Strategies

### 5.1 Hypothesis

Based on the outcomes of previous chapter and limited availability of information, the hypothesis developed is that the GBA will be established from 1<sup>st</sup> Jan 2020, the state government currently has no plans to establish neither a city level action plan nor an authority for Bengaluru and; that the current governance approaches do not have innovative solutions to the big problem of climate change. These assumptions are necessary to come up with the proposal and suggested innovative strategies.

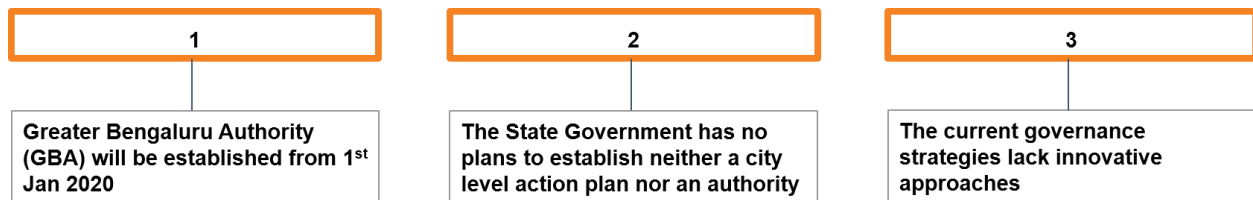


Figure 44 Hypothesis  
Developed by (Author, 2019) based on Objectives A,B & C

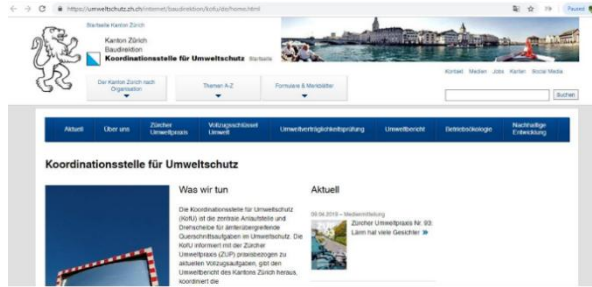
### 5.2 The Vision, Mission Statement and Proposal

The project vision is '*Integral and Serene Bengaluru*' based on mission statement '*Inclusive Governance for Efficient Climate Action*' focusing on innovative strategies through the proposal of a city level climate action unit called "**Bengaluru Urban Climate Unit (BUCU)**". Integral and inclusiveness represents the bottom-up involvement of various stakeholders, to more effectively deal with urban climate and overcome the challenges.

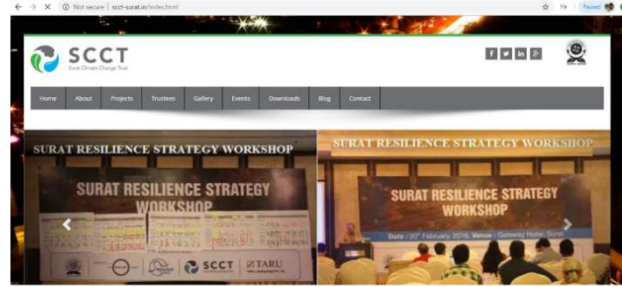
### 5.3 Benchmark and Innovative Strategies

One such international example as a benchmark for BUCU is the '*Koordinationsstelle für Umweltschutz*', a special unit for environment protection in the city of Zurich (Switzerland). This unit supervises the city's climate policy by acting as a service agency with cross-departmental tasks (COZ, 2019). An example from India is the '*Surat Climate Change Trust*', first of its kind city level public trust in the Surat Municipal Corporation office engaging in climate change action and policies (SCCT, 2019). The references considered from the international and national benchmarks are organization background and governance.

The proposed BUCU is planned to work on similar lines acting as a coordination centre connecting stakeholders from various levels both horizontally and vertically. BUCU strategies, structure (both coordination and organization), roles, responsibilities, timeline and feasibility (legal and economic) have been discussed in detail.



Coordination office for Environmental Protection



Surat Climate Change Trust

Figure 45 Screenshot of benchmark websites (COZ, 2019), (SCCT, 2019)

The suggested innovative strategies are in accordance with polycentric or networked governance, advanced communications and urban experimentations; and they are **Cross-Departmental Coordination and Climate Action**, **e-Platform for Knowledge Sharing and Micro-Level Climate Interventions** respectively. These strategies would help in the creation of a climate friendly city.

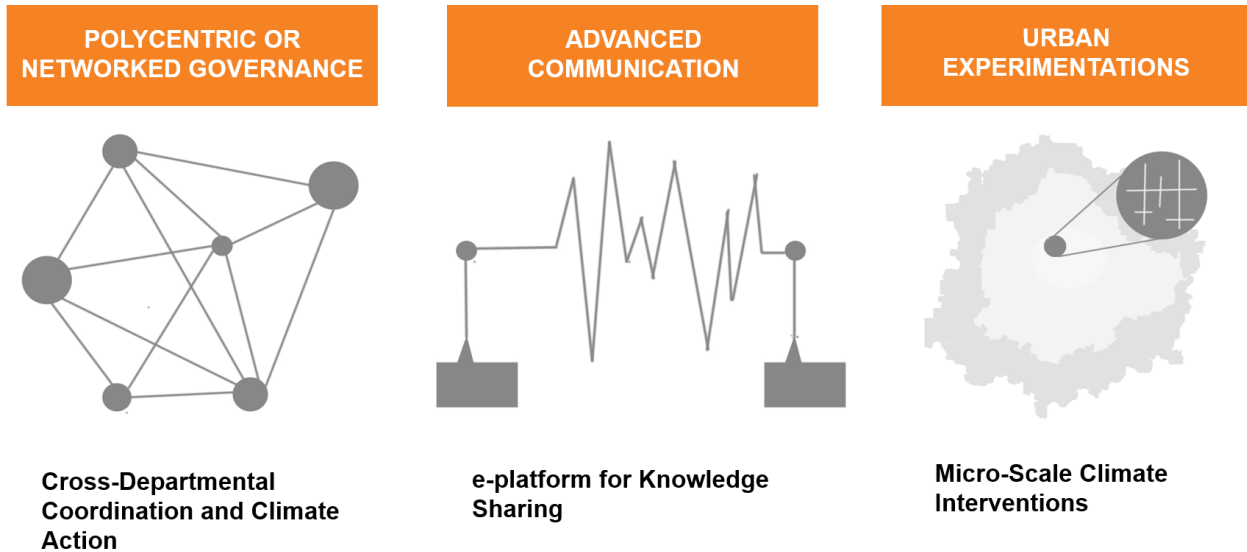


Figure 46 Suggested Innovative Strategies Developed by (Author, 2019)

### 5.3.1 Strategy 1\_Cross-Departmental Coordination and Climate Action

The **special administrative unit BUCU** would be responsible for cross- sectoral based climate change coordination and actions as suggested by (Kern & Alber, 2009, pp. 3-4). The BUCU would be housed under the GBA, assuming it will be functional from 1<sup>st</sup> January 2020 and have an official website of its own. It is expected that for first 5 years, the GBA would be under the Chief Minister’s rule after which mayors will be elected from the municipal committees. More information regarding its coordination and organization structure is mentioned in section 7.4.



### 5.3.2 Strategy 2\_e-Platform for Knowledge Sharing

A webpage within the official website of BUCU is planned to be a theoretical approach of knowledge sharing via **Massive Open Online Courses (MOOC)**, participation for which is open to public and free of charge. The courses are offered both in **English and Kannada** (official language for the state) and are under the title “**Climate Science for All**”. It deals with the topics of **climate impacts, risks & challenges, local adaptation measures and solution strategies**. Being a common platform for interdisciplinary participation, it combines traditional knowledge transfer forms such as videos and reading materials with communication forums bringing together different actors (UNCC, 2019), (WWF, 2019). To keep up the motivation and participation levels, students are offered credits and honorary certificates upon successful completion which could be compensated for regular environmental related subjects at schools or universities. Whereas, the rest of the participants upon successful completion are offered monetary benefits through discount coupons to be redeemed while purchasing eco-friendly products.

### 5.3.3 Strategy 3\_Micro-Level Climate Interventions

Strategy 3 of micro-level climate interventions (MLCI) on the contrary to strategy 2 is a practical based approach by all individual wards through shared responsibilities to come up with neighborhood action. To ensure collective action, the ward committees (group of 3-4 wards) need to work cohesively. A successful international example is that of **Quartiersmanagement Berlin or Neighborhood management** where 3-4 neighborhoods are grouped together as quarters work on resolving social issues (QMBerlin, 2019). Four members (2 citizens and 2 civil society representatives) from every WC would be dedicated to closely work as a management unit with the administrations, ward residents and non-governmental institutions on an integrated approach **defining local level climate-related problems, proposing ideas and supporting the implementation process**.

## 5.4 Bengaluru Urban Climate Unit\_Structure

### 5.4.1 Coordination

**BUCU** as a **coordination unit** will be the central point of contact for stakeholders at different levels – international, national, state, city and wards regarding climate action in the city. At international level, it would be in contact with representatives from **UN, 100 Resilient Cities (100RC) and C40 Megacities Network**. At National level, with the **MOEF, Ministry of Science and Technology** followed by **EMPRI** at state level; and **5 Municipal Corporations (MCs), SPV**

for smart city mission; development, services and transport sector stakeholders at city level along with the WC at local level.

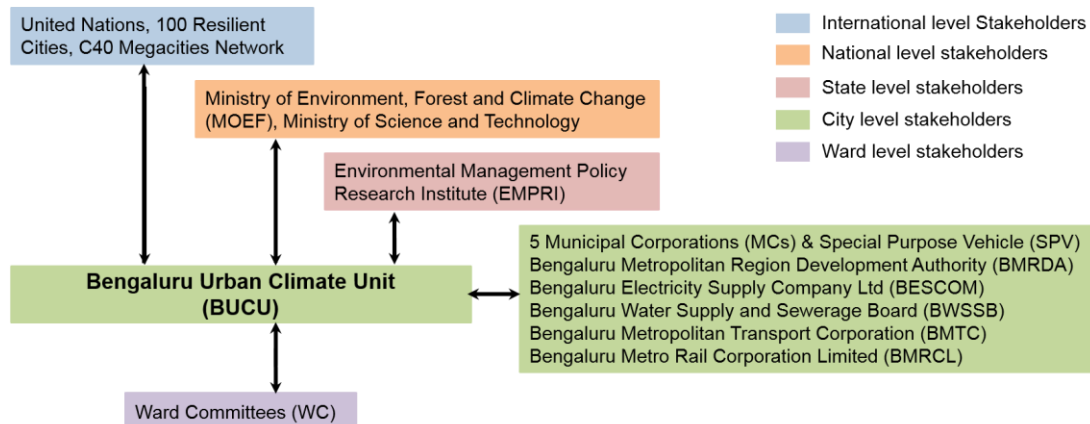


Figure 47 Coordination Structure of BUCU  
Developed by (Author, 2019)

#### 5.4.2 Organization and Roles

In the 3-tier governance, BUCU is planned to be at the second level under the GBA, same as that of the 5 MCs. It will consist of a total 9 full-time employees, divided into 3 categories of technical, administrative and consultation teams as shown in figure 59. To make it a multi-stakeholder and inter-disciplinary authority, employees are appointed, hired or selected from various disciplines and professional backgrounds. Bengaluru in 2014 joined the network of '**100 Resilient Cities (100RC)**' pioneered by the **Rockefeller Foundation**. As per 100RC's suggestion, the **Chief Resilience Officer (CRO)** appointed by the State Government will lead the city's resilient efforts (Dubey, 2014). Whereas, the **Administrative Officer (AO)** is to be appointed by the 5 municipal corporations and responsible for cross-departmental coordination. Both CRO and AO, like the remaining employees are appointed for 5 year duration.

The positions of **Technical Expert and Projects Coordinator (2#)** are reserved for private firm consultants working in the field of urban planning and town development related backgrounds. Whereas, the position of **Consultation Head** is to be reserved for representative (preferably an environmentalist or similar) from NGOs working in the field of environmental and climate action. Under whom would be appointed **Researcher (2#)**, the post of which is also reserved, for master's graduate from environmental, political or social sciences background. Further, the **IT Expert or Web Developer** is hired as a private employee.

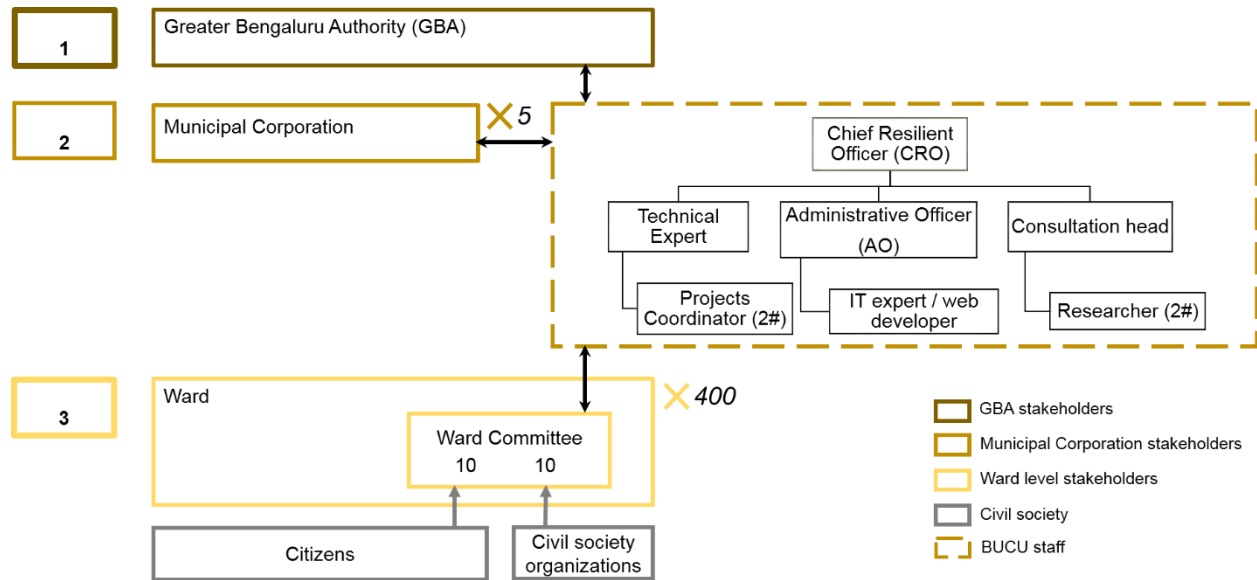


Figure 48 Organization Structure of BUCU  
Developed by (Author, 2019)

## 5.5 Bengaluru Urban Climate Unit\_Responsibilities

### 5.5.1 Integrated Action Plan Preparation

BUCU under strategy 1 will develop a **comprehensive urban resilience plan** with a holistic vision. Bengaluru city is due to submit its **own climate action plan** to the global C40 network by 2020, defining the various organizations and stakeholders working together in addition to providing guidelines for action. The action plan however would not be an independent plan but rather be integrated with the urban development plan to be called a **Bengaluru Comprehensive Urban Resilience Plan (BCURP)** with a holistic approach. The suggested special administrative unit can function only with the proposal of strategic plans with sectoral based targets, policies and measures with project-based approaches, to avoid departmental segregation (Kern & Alber, 2009, pp. 3-4). International example is the city of Berlin (Germany) which adopted a legal framework – das '**Berliner Energiewendegesetz (EWG Bln)**' to achieve carbon neutrality by 2050 and simultaneously support the country's energy and climate protection policy (Berlin.de, 2019). Indian example is the '**Ahmedabad Heat Action Plan 2018**', a guide to extreme heat planning in the city by the municipal corporation (AMC, 2018). BCURP preparation is to be led by the technical team providing a framework for implementation, coordination and evaluation.

### 5.5.2 Facilitating Strategies 2 & 3

Under the assistance of both technical and consultation team, the MOOC courses (strategy 2) will be developed by the IT expert or web developer. The IT expert is also responsible for technical maintenance of the official website which similar to the MOOC courses would be available in both English and Kannada (official language of the state). The website would include information about the NAPCC, SAPCC, BUCU, its organization and coordination structure, projects, events and contact details for public viewing. Similar MOOC courses are offered for free by international organizations such as **World Wide Fund for Nature (WWF) and UNCC**. However, the uniqueness offered through “**Climate Science for All**” is its availability in local language, monetary and honorary benefits; and the synergies it creates with city strategies 1 and 3. Synergy created through MOOC courses is that it covers the topics of city and local level interventions highlighting real-life climate actions being planned and executed under strategy 1 and 3. To ensure strategy 3 success, the four dedicated members from each of the WCs form a **micro-level team** and are solely responsible for environmental and climate interventions in their respective wards. The consultation team will lead this strategy of micro-level climate interventions working closing with the roughly 100 to 120 micro-level teams across the city.

## 5.6 Timeline

The project timeline is divided into four categories of **preparation phase, climate action plan, strategies 2 and 3 timelines**. Preparation phase is from 27<sup>th</sup> Sep 2019 to 2<sup>nd</sup> Mar 2020 highlighting the formation of BUCU. Timeline for climate action plan, strategies 2 and 3 extends from 3<sup>rd</sup> Mar to 31<sup>st</sup> Dec 2024 which is the first term of BUCU.

### 5.6.1 Preparation Phase

After the end of term of the current Mayor of Bengaluru on 27<sup>th</sup> Sep 2019, for a brief period ruling in the city would be under the Chief Secretary and Commissioner similar to the commissioner’s rule that was in place from Mar-April 2010.

During this phase, the GBA is expected to be established and fully functional, following which the CRO and AO are appointed. Six positions: Technical Expert, 2 Projects Coordinators, Consultation Head and 2 Researchers are required to be selected for a period of five years. Based on the qualification requirements mentioned in section 7.4.2, these positions are open to be applied for by the residents (above 18 years of age) of Bengaluru. CRO and AO as state and city appointed representatives respectively, under the supervision of coordinators from MOEF

(national level) and 100RC (international level) are responsible for leading the selection process from 2<sup>nd</sup> Feb 2020 to 27<sup>th</sup> Feb 2020. Involvement of coordinators is to maintain transparency and to ensure provision of fair chance for applicants to be selected.

Apart from this, CRO and AO are also responsible for hiring the IT expert and overall functioning of the unit’s progress over the years.



Figure 49 Preparation phase timeline  
Developed by (Author, 2019)

### 5.6.2 Climate Action Plan

The AO would call for city action proposal ideas on 4<sup>th</sup> Mar 2020 and applications are open for the public to share their requirements. The coordinators will not just lead the selection process to decide on ideas to be considered for the final plan but also monitor the progress of the plan through continuous evaluation. Implementation of the plan would start from 16<sup>th</sup> Dec 2020 through systematic coordination with responsible stakeholders.

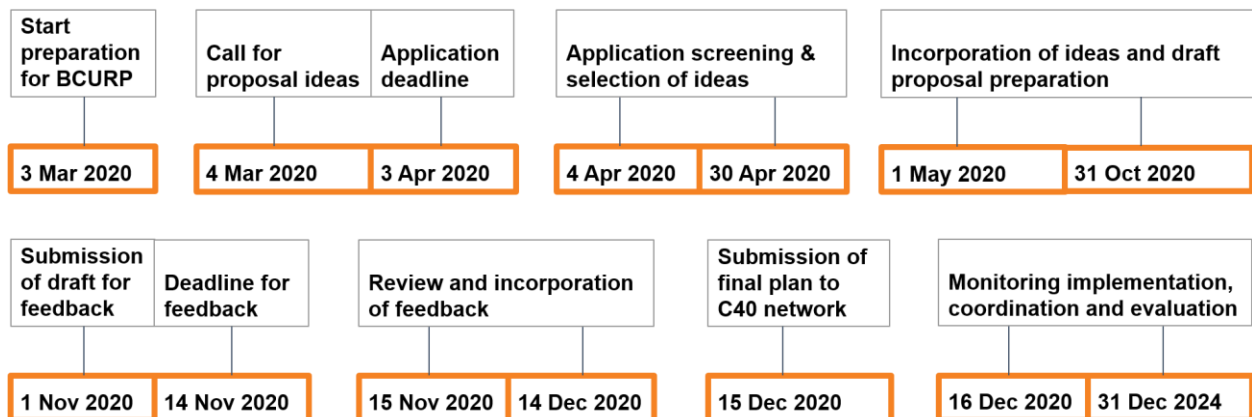


Figure 50 Climate Action Plan timeline  
Developed by (Author, 2019)

### 5.6.3 Strategy 2 Timeline

Annual MOOC courses (lasting 2 months from July to August) would be conducted for a five years period from 2020 to 2024 by partnering with educational institutions across the city. The web courses are planned to be interactive, user- friendly giving regular updates through creative videos and graphics; including the status of BCURP implementation and MLCI progress under the **scientific knowledge support of IPCC and Ministry of Science and Technology** (national level).

Online discussion forum allows the participants to easily communicate with the organizers who continuously review to improve the course requirements and standards. The once archived modules are designed to be available for future viewing both online (in the personal login accounts of the participants) and also for downloading for those who wish to access it offline. The completion certificates would be recognized by the Department of Education (Government of Karnataka) to ensure its credibility standards.

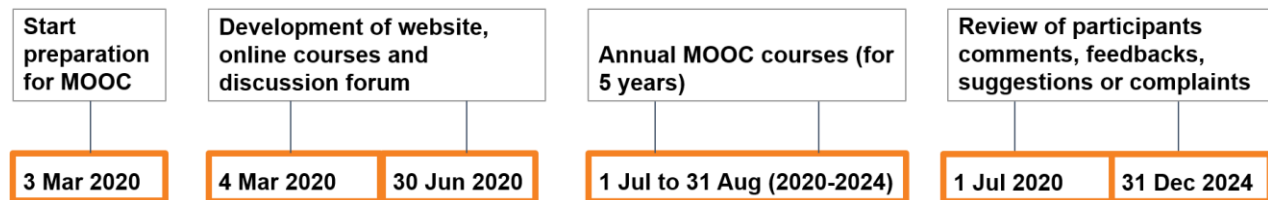


Figure 51 Strategy 2 timeline  
Developed by (Author, 2019)

### 5.6.3 Strategy 3 Timeline

Strategy 3 focusses more on offline and on-ground practical approaches and is used as a tool to integrate with communities who are interested in collective actions and also for those who do not have access to the internet or other means to access the online courses. Awareness to participate is through rallies and campaigns led by the consultation team in collaboration with the selected micro-level teams. BUCU as a consultation service provider helps in connecting the micro-level teams with potential funds and resource providers to realize their respective projects.

This would mean partnering with local institutions such as schools, hotels, social enterprises and eco-entrepreneurs etc. Workshops and regular meetings are conducted not just to train these teams but also allow them to share their experiences with each other.



Figure 52 Strategy 3 timeline  
Developed by (Author, 2019)

## 5.7 Feasibility Study

### 5.7.1 Economic

Budget assumption is based on employment costs, their allowances and miscellaneous costs. Employment costs and their allowances are calculated based the GOK issued **order no.FD 06 SRP 2018** which is the 6<sup>th</sup> pay scale or revision of scales of pay and other related orders of public employees (GOK, 2018). Miscellaneous costs are calculated roughly for the entire term to be 3,274,500 Indian Rupees (INR), which includes expenses for stationery and plotting (590,000 INR), food and beverages (2,95,000 INR), office utilities (472,00 INR), technical maintenance (177,000 INR), workshops or events (1,475,000 INR) and website development or maintenance (265,500 INR). Calculation fact sheet is available in annex A12.

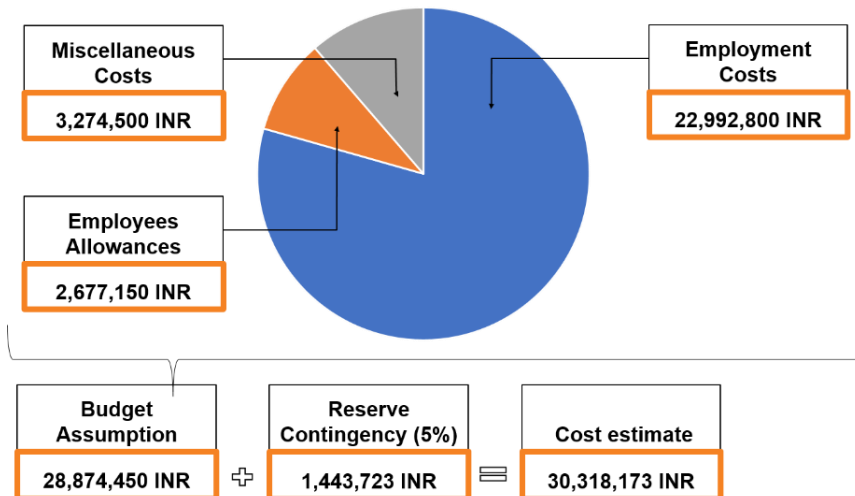


Figure 53 Budget Assumption and Cost Estimate  
Developed by (Author, 2019)

The office rent is not considered, as the unit will be located in a public office building space provided by the GBA and; also expenses of the micro-level teams are not calculated as they are



members of ward committees who would be compensated by the municipal corporations. Considering a reserve contingency of 5% of the budget assumption, the total cost is estimated to be 30,318,173 INR. Since, the technical team are hired as consultants from a private firm, the commercialization revenue or profit of the firm is considered to be 15% of the technical team expenses. This value along with the cost estimate is the **total project budget of 31,362,173 INR or 403,000 Euros** considering **77.82 INR = 1 Euro** as on 30<sup>th</sup> May 2019 (XE, 2019). UN CC:Learn though its UN partners is expected to cover the expenses for MOOC courses and website development or maintenance (roughly 10% of project budget). The CRO's position will be supported and guided both financially and logistically by 100RC network (Dubey, 2014). For which 100RC is required to cover 15% of the project budget; in addition, it would also support with resources required for drafting a resilience strategy by helping the unit connect to private, public, academic institutions and NGOs. Remaining funds are from NAPCC and SAPCC (30% each) and GBA funds (15%). Funding from NAPCC shall be received under the **National Mission for Strategic Knowledge on Climate Change**. Detailed cash flow available in annex A12.

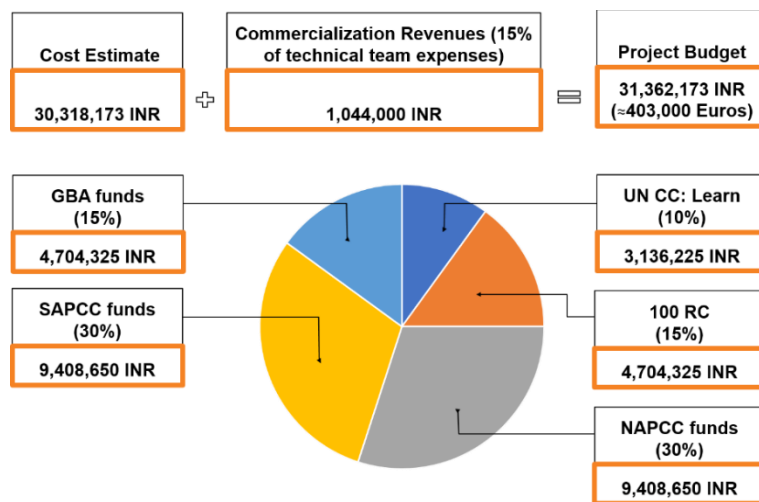


Figure 54 Project Budget and Mediums of funding  
Developed by (Author, 2019)

### 5.7.2 Legal

For the brief phase when there is no mayor's rule for the city, the Administrator and Commissioner's rule in the city is in accordance with the **Karnataka Municipal Corporations Act, 1976** until the GBA is established (KMCA, 2014). The BUCU as a public trust unit for lawful purpose would be established under the GBA as per the **Section 4 of Indian Trust Act, 1982** and registered under **Karnataka Registration Rules, 1965** with its office at the soon to be GBA head office in Hudson Circle, Bengaluru, Karnataka 560002 (LA, 2019), (KRR, 2019). The administrative officer with the permission of Civil court initiates the contract and registration

process . The CRO will be appointed as a person having special knowledge or experience in the GBA by the Government of Karnataka (GOK) as per the **74<sup>th</sup> Constitution Amendment Act, 1992 (74 CAA, 1992) article 243Q** (NPI, 2012). The same act also applies for the empowerment of local wards and ward committees.

Further, MOOC courses credibility can be ensured only through its recognition under the **Karnataka Education Act, 1983**. However, the act needs amendments as it does not cover sufficient rules and regulations about online courses (KJA, 2016). This would also require partnering with UN CC: Learn who would be the guiding force on module contents to develop the required learning resources.

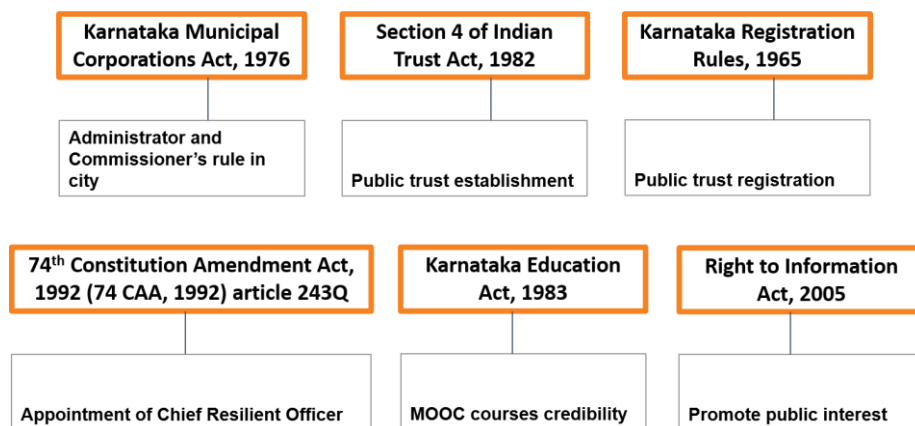


Figure 55 Overview of laws considered

Developed by (Author, 2019) based on (KMCA, 2014), (LA, 2019), (KRR, 2019), (NPI, 2012), (KJA, 2016)

The trust's functioning and operations would be made available to the public under the **Right to Information act, 2005**. This will promote public interest and make the administration more responsive. As per the trust objectives, the unit members are not implementors of actions, but rather facilitators including connecting stakeholders responsible for implementing with potential funding institutions and other resource providers.

## 5.8 Summary

The aim of effective climate governance is expected to **strengthen the existing weaknesses and create more opportunities to reduce the threats**. The weakness of ever increasing population and rapid urbanization could be addressed by increased awareness to positively affect people's behaviors and perceptions. The state taking lead on action coordination through representatives may help in overcoming the need for another authority which may or may not have positive effects. The city can improve its overall urban governance ranking through ward empowerment by promoting their active involvement and participation

The threat of overdependency on international funds is addressed by generating multiple level funding options. Furthermore, collective and integrated action along with cross-administration partnerships would help in improving the equity, effectiveness, participation and accountability levels; thus, ensuring increased trust in the ruling party to not just complete their term but also be re-elected.

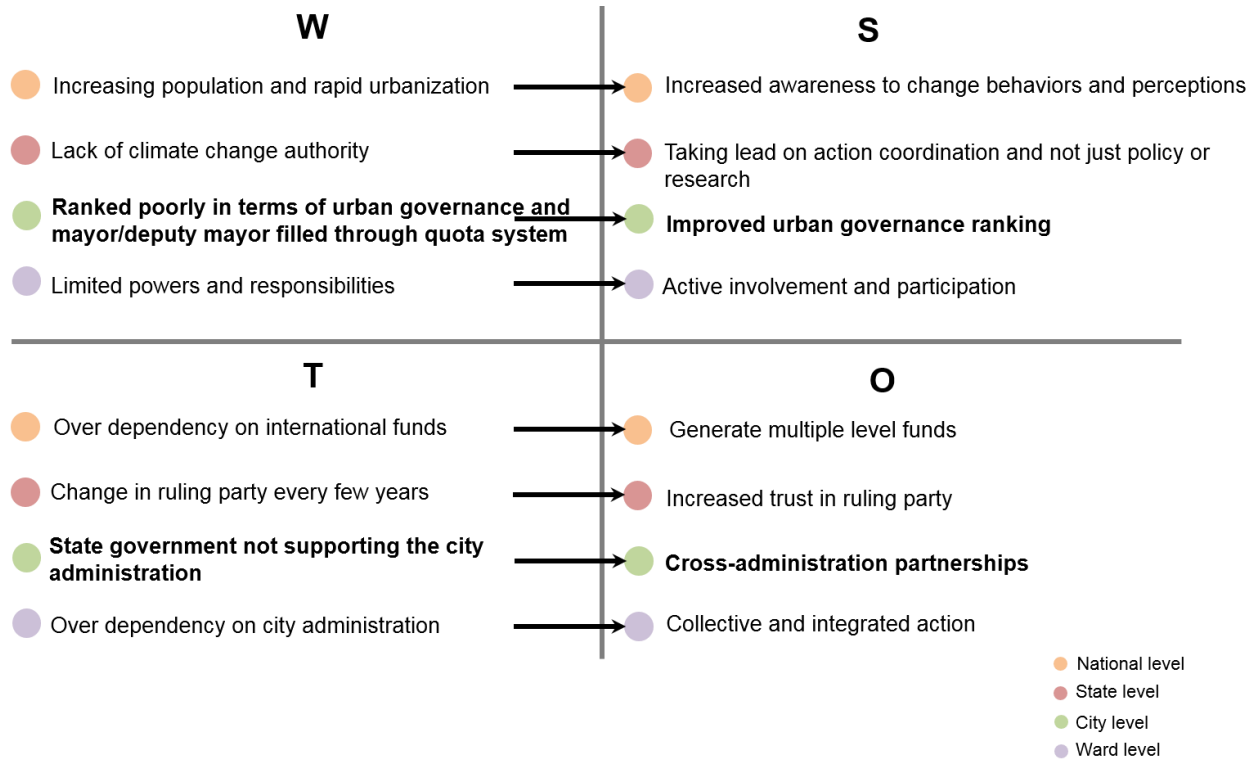


Figure 56 Summary  
 Developed by (Author, 2019)

However, proposals such as these are debatable and definitely have certain limitations or drawbacks and requires further research to better understand its feasibility and real-life applicability.

# 6.0 Limitations & Conclusion

Objective A on analyzing the current multi-level governance landscape only provides an overview of the key/ main stakeholders involved and the current approaches. Performance evaluation methodology, service delivery and financing methods for individual missions or actions are not covered. Restricted information regarding the current developments in the city: smart city mission and GBA due to the lack of systematic governance clarity; leads to assumptions and thus limiting the overall research. Objective B exploring the civil society's approach are responses recorded through online modes, not covering the section of population belonging to low income society. Further attempts would be required in understanding responses of poor and uneducated residents in the city. Objective C could involve more interviews with the developmental authorities. In addition, it would be ideal to discuss the research proposals of objective D with key stakeholders to receive their feedback and review for further development.

The recommendations made would contribute significantly to Bengaluru's approach to climate change and also contribute to the existing **state, national action plans and UN Sustainable Development Goal 13: Climate Action**. National missions under the NAPCC such as solar mission, enhanced energy efficiency, sustainable habitat, water mission, green India, sustainable agriculture, strategic knowledge on climate change and certain areas of actions under the SAPCC such as GHG emissions, agriculture, water resources, forestry, energy, urbanization and human health have been addressed. It gives the state government an opportunity to rethink climate goals and improve environmental performance. All these strategies mentioned would definitely require not just **dedicated and committed staff members**, but also **voluntary involvement** of various stakeholders who wish to bring about change and to ensure the feasible function of such a unit. The approach requires a high level of coordination, cooperation and confidence to be exhibited by departments and authorities at various levels ensuring both vertical and horizontal collaboration. Not just the governmental or non-governmental, but a combined effort including active and passive participation of the citizens who abide by the laws and regulations is necessary. **Local government** would be able to generate local funds and be re-empowered through increased commitment. **Socio-technical processes** enables in linking climate action experiments with the context of everyday life and these experiments are critical means of analyzing what it is to be living low carbon in different means; be it technically, socially, economically or politically, all of which are imperative for building an **"Integral and Serene Bengaluru"**.

## Abbreviations

74 CAA, 1992 - 74<sup>th</sup> Constitution Amendment Act of 1992

100RC – 100 Resilient Cities Network

BBMP - Bruhat Bengaluru Mahanagara Palike

BCCI K – Bangalore Climate Change Initiative - Karnataka

BDA - Bengaluru Development Authority

BESCOM - Bengaluru Electricity Supply Company Ltd.

BJP – Bharatiya Janata Party (political party)

BMRCL - Bengaluru Metro Rail Corporation Limited

BMRDA - Bengaluru Metropolitan Region Development Authority

BMTC - Bengaluru Metropolitan Transport Corporation

BUCU – Bengaluru Urban Climate Unit

BWSSB - Bengaluru Water Supply and Sewerage Board

C40 – 40 Megacities Network

CC – Climate Change

CEO – Chief Executive Officer

CIP - Climate Initiatives Platform

CRO - Chief Resilience Officer

CSD – Centre for Sustainable Development

EMPRI – Environmental Management and Policy Research Institute

EPI – Environmental Performance Index

GBA – Greater Bengaluru Authority

GHGs – Greenhouse Gases

IIHS – Indian Institute for Human Settlements

INC – Indian National Congress (political party)

INDC - Intended Nationally Determined Contribution

INR – Indian Rupees Currency

IPCC – Intergovernmental Panel on Climate Change

IT – Information Technology

JD(S) – Janata Dal Secular (political party)

LDC – Least Developed Countries  
MC – Municipal Corporation  
MLCE – Micro-Level Climate Experiments  
MoEF - Ministry of Environment, Forest and Climate Change  
MOOC – Massive Open Online Courses  
MST – Ministry of Science and Technology  
NAPCC - National Action Plan on Climate Change  
NGOs – Non-Governmental Organizations  
NIPCC – Non-Governmental Panel on Climate Change  
PMCCC – Prime Minister’s Council on Climate Change  
RWA – Resident’s Welfare Association  
RWH – Rain Water Harvesting  
SAPCC - State Action Plan on Climate Change  
SDA – State Designated Agencies  
SIDs – Small Island Developing States  
TV – Television  
TERI – The Energy Research Institute  
UHI – Urban Heat Island  
UN – United Nations  
UN CC - One UN Climate Change Learning Partnership  
UNEP - United Nations Environment Programme  
UNFCC – United Nations Framework Convention on Climate Change  
USI – Urban Sustainability Index  
WCs – Ward Committees  
WMO – World Meteorological Organization  
WRI – World Resource Institute



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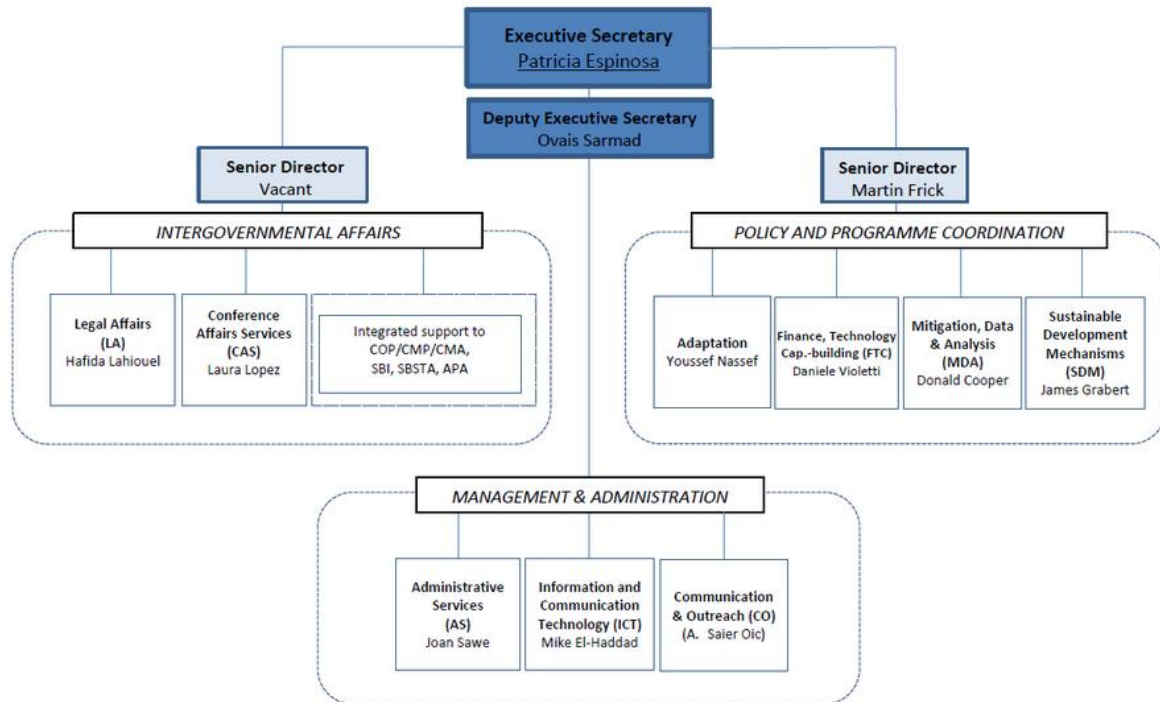
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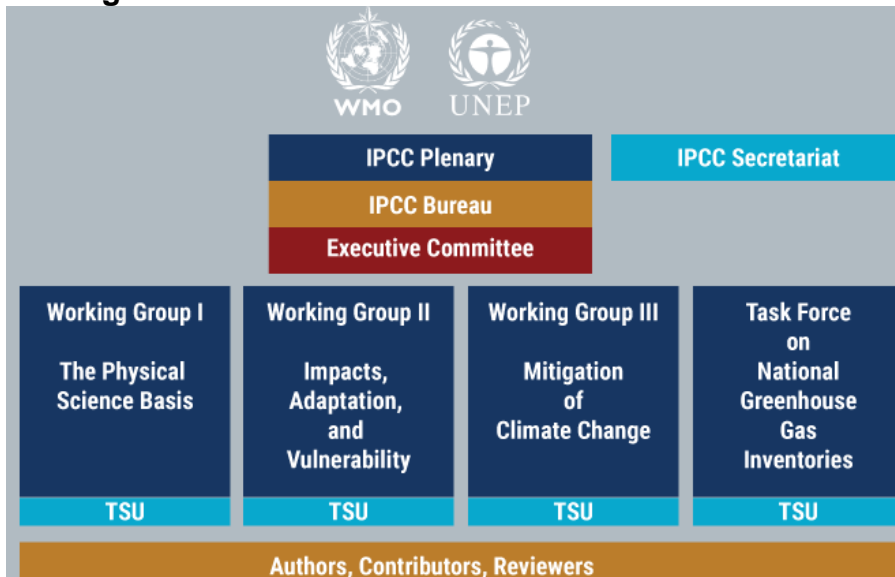
**Annexes**

**A1. Organization structure of UNFCCC**



(UNFCC, 2019), (UNFCCCsecretariat, 2019)

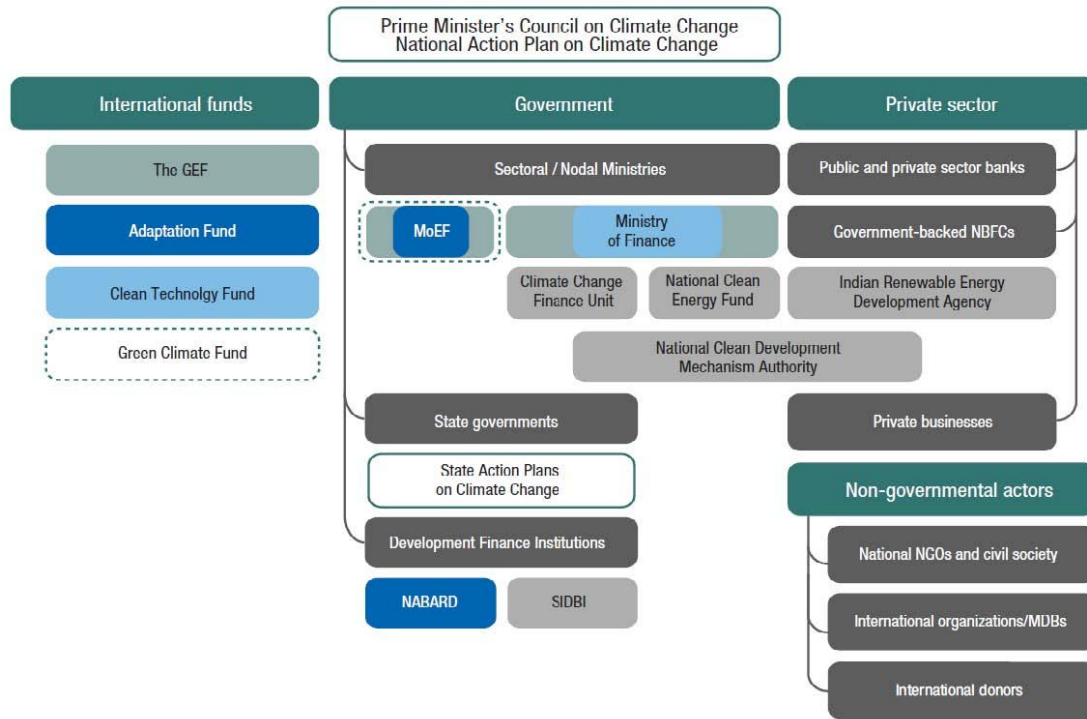
**A2. Organization structure of IPCC**



TSU – Technical Support Unit  
(IPCC, 2019)

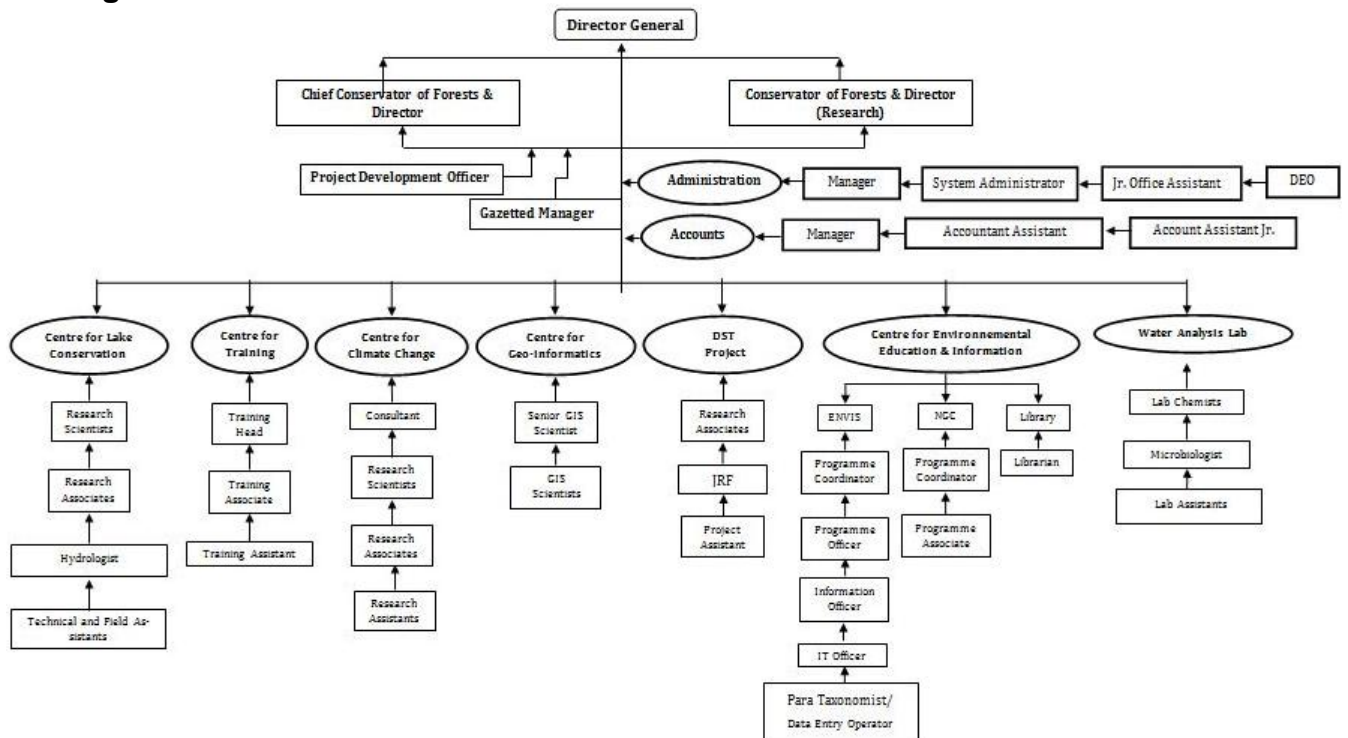


### A4. Climate Finance architecture in India



NBFC – Non-Banking Financial Companies  
(Jha, 2014), (Singh, 2017, p. 11)

### A5. Organization structure of EMPRI



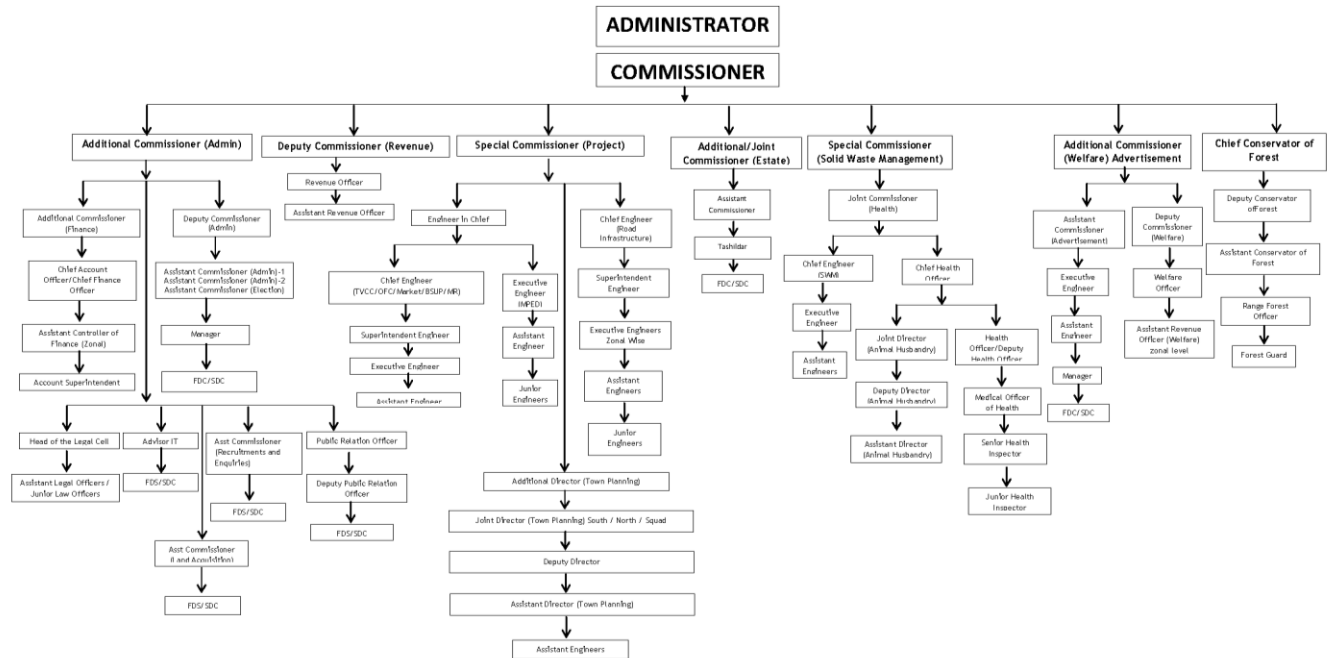
(EMPRI, Government of Karnataka, 2018)



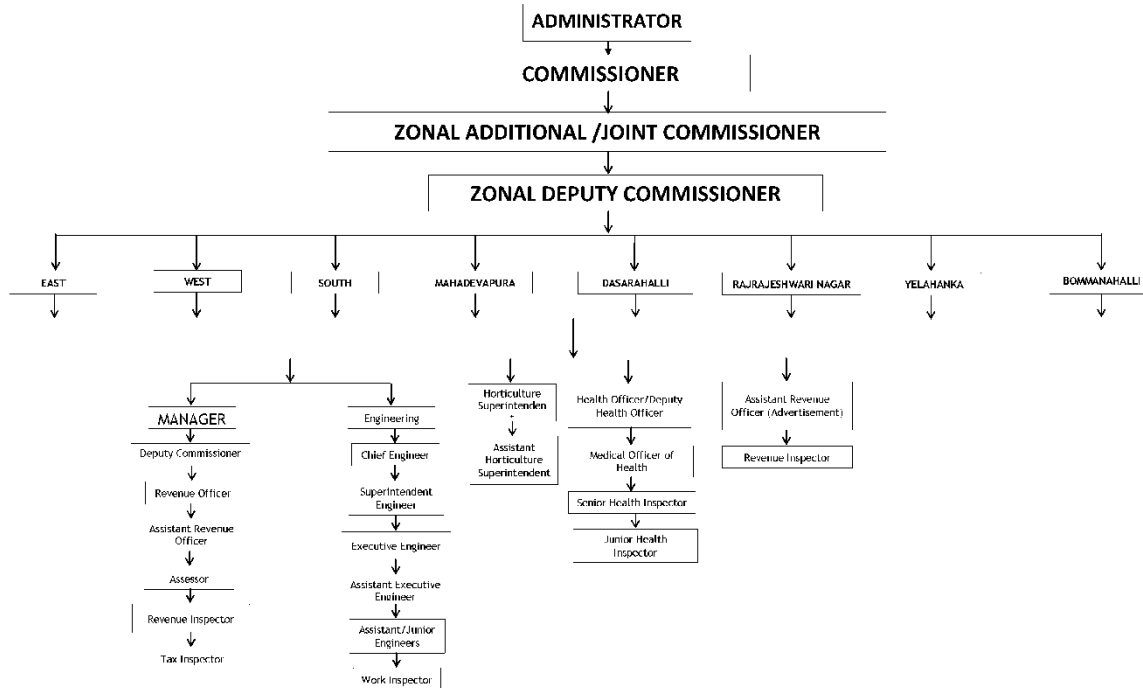
**A6. Organization structures at City level**  
**A6.1. Organization structure at BBMP**



**BRUHAT BANGALORE MAHANAGARA PALIKE ORGANIZATION CHART**



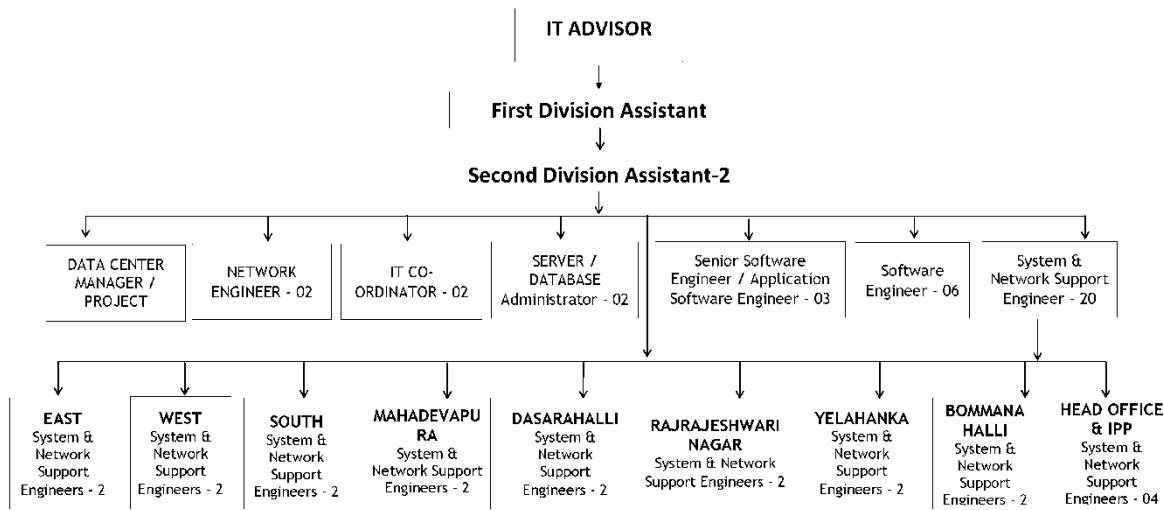
**BRUHAT BANGALORE MAHANAGARA PALIKE ZONAL ORGANIZATION CHART**



(BBMP, 2019)



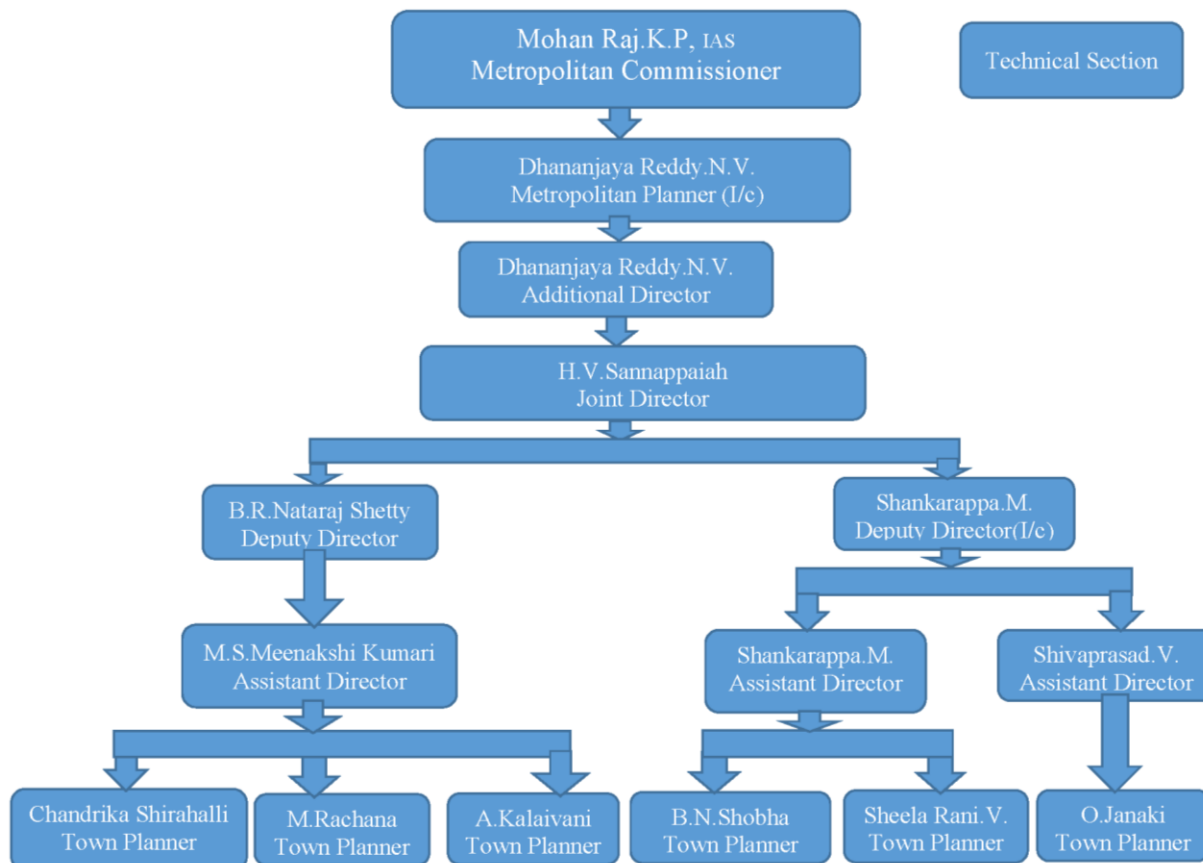
**BRUHAT BANGALORE MAHANAGARA PALIKE IT DEPARTMENT ORGANIZATION CHART**



(BBMP, 2019)

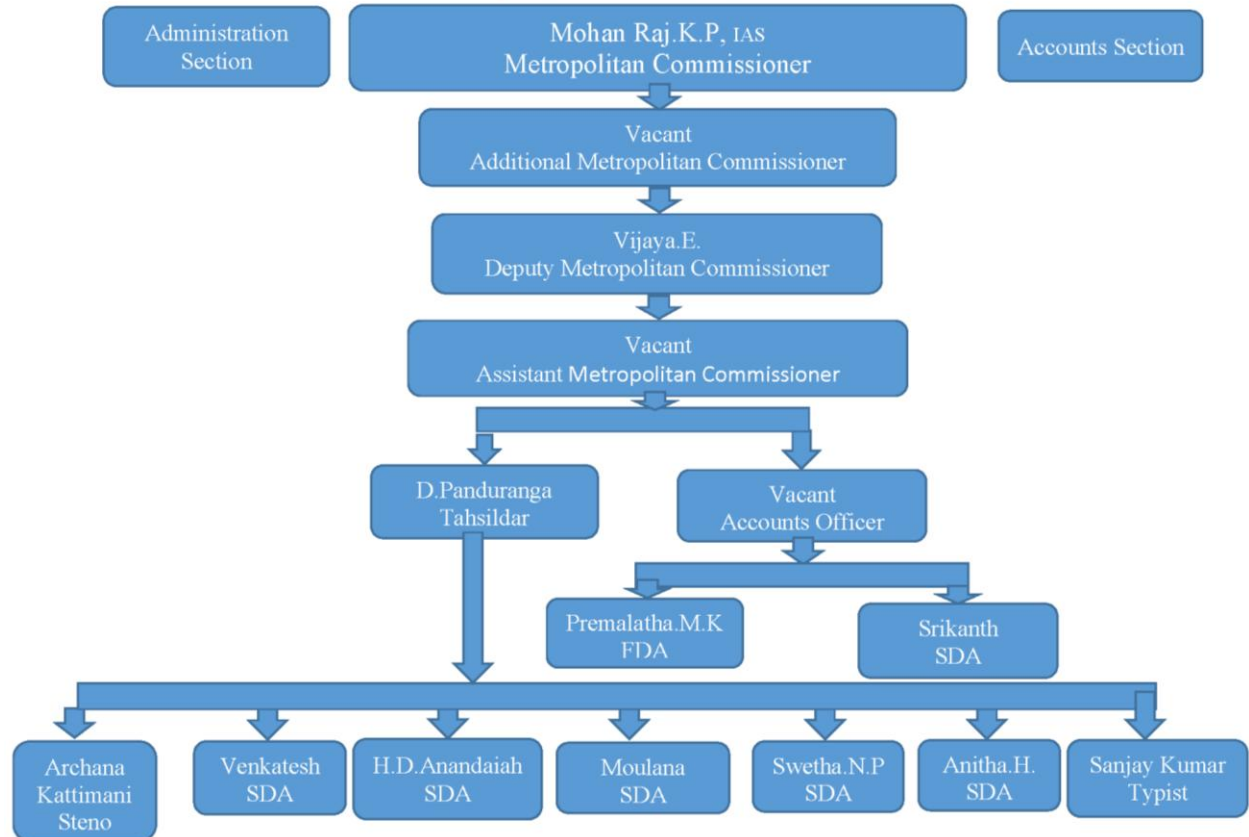
**A6.2. Organization structure at BMRDA**

**ORGANISATION CHART**



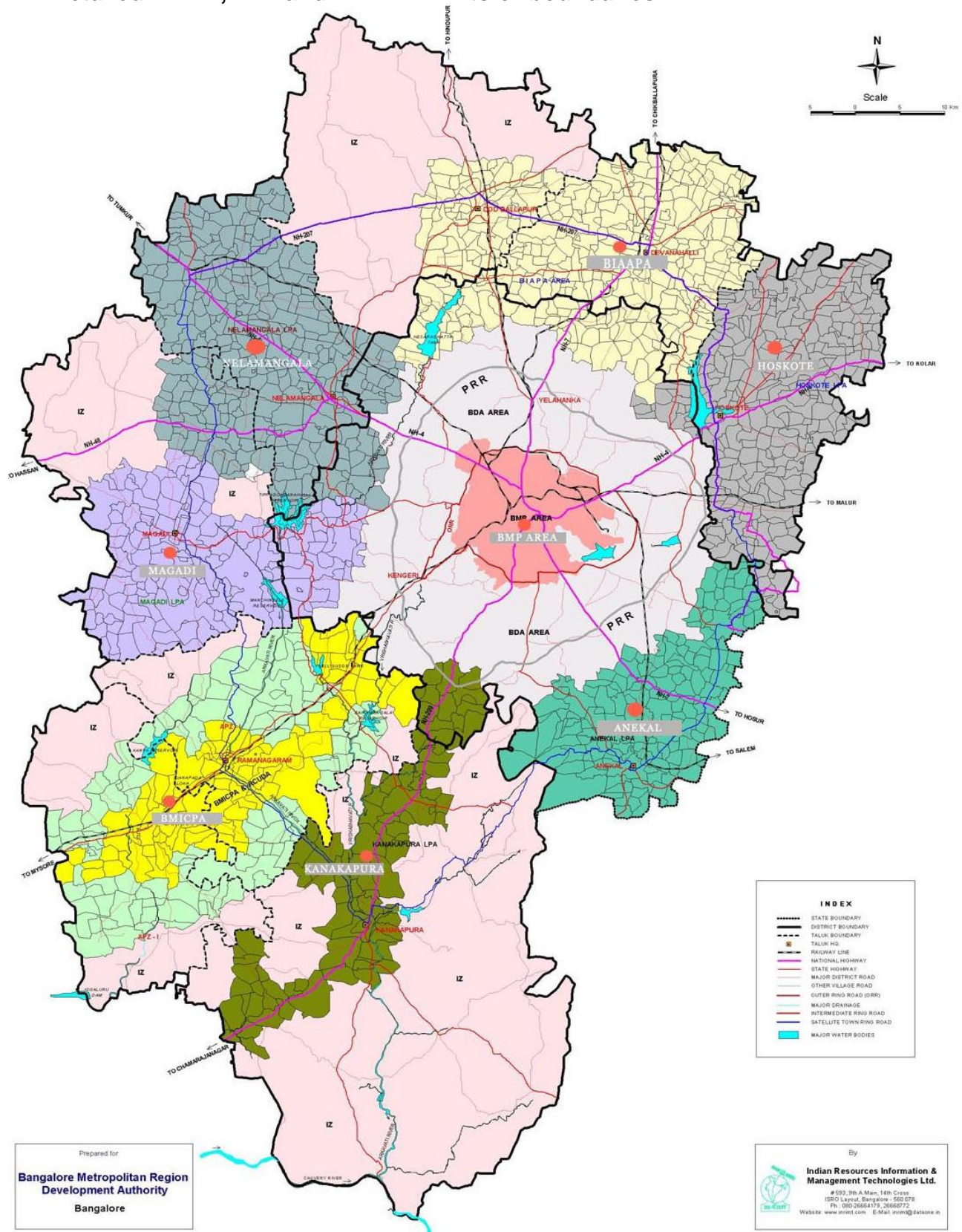
(BMRDA, 2017)

**ORGANISATION CHART**



(BMRDA, 2017)

### A7. Detailed BBMP,BDA and BMRDA limits or boundaries



(BMRDA, 2017)

## A8. Questionnaire for field survey with residents of Bengaluru city

### Part A\_Awareness:

Q1. Do you follow climate change related activities in the country and the world? **(Yes/No)**

- a. In your country
- b. In the world

Q2. Do you think you are well informed about different issues related to CC? **(Yes/No/Some extent)**

- a. The different causes of CC
- b. The different consequences of CC
- c. Ways in which we may fight CC
- d. Ways in which you may adapt to CC

Q3. Where do you find information about CC? **(which all)**

- a. TV
- b. General press
- c. Specialized/scientific journals
- d. Social media
- e. Internet in general
- f. Specialized internet portals
- g. Project reports/studies
- h. Email

Q4. Are you aware of the National Action Plan on Climate Change (NAPCC) for India? **(Yes/No)**

Q5. Are you aware of the State Action Plan on Climate Change (SAPCC) for Karnataka? **(Yes/No)**

Q6. Did you know that not just one but, three State Action Plan on Climate Change (SAPCC) for Karnataka were initiated in parallel? **(Yes/No)**

Q7. Are you aware that the city of Bengaluru has been given deadline till 2020 to submit its own climate action plan to the C40 global megacities network? **(Yes/No)**

### Part B\_Perceptions or Opinions:

Q1. Have you noticed some particular changes in the climate in the last 10 years in your region in **(which all)**:

- a. Rain
- b. Temperature
- c. Season shift
- d. Floods
- e. No

Q2. Do you think enough is being done for climate change by the following? **(Yes/No/Some extent)**

- a. Corporations and industry
- b. Citizens themselves
- c. International Organizations

- d. National Government
- e. State Government
- f. Local / Regional authorities
- g. Environmental groups
- h. NGOs

Q3. If yes for Part A – Q4, how do you feel about the quality of the NAPCC?

- 3 = Satisfied
- 2 = Moderate
- 1 = Not Satisfied

Q4. If yes for Part A – Q5, how do you feel about the quality of the official SAPCC by the Government of Karnataka (prepared by Environmental Management and Policy Research Institute in collaboration with The Energy and Research Institute)?

- 3 = Satisfied
- 2 = Moderate
- 1 = Not Satisfied

Q5. Any comments/suggestions from your side for the Climate Action Plans : National, State and City Level?

#### **Part C\_Behavior:**

Q1. Do you consider environment and in particular climate change when making decisions by **(which all)**:

- a. Reducing energy consumption
- b. Reducing water consumption
- c. Waste recycling
- d. Reducing consumption and disposable items
- e. Buying seasonal and local products
- f. Alternative transport
- g. Purchasing a car that consumes less fuel
- h. Installing renewable energy equipment
- i. None

Q2. There are many reasons why people take actions aimed at fighting climate change. **Which of the following** apply to you?

- a. Desire to live in healthy and clean environment
- b. Need to keep household costs low
- c. Your duty as a citizen
- d. If everybody changed their behavior, it will have impact on CC
- e. You are concerned about future generations
- f. You were directly exposed to CC
- g. None

Q3. There are many reasons that stop people from taking actions aimed at fighting climate change? **Which of the following** apply to you?

- a. It is duty of governments, companies and industries
- b. I don't know what I could do to fight CC



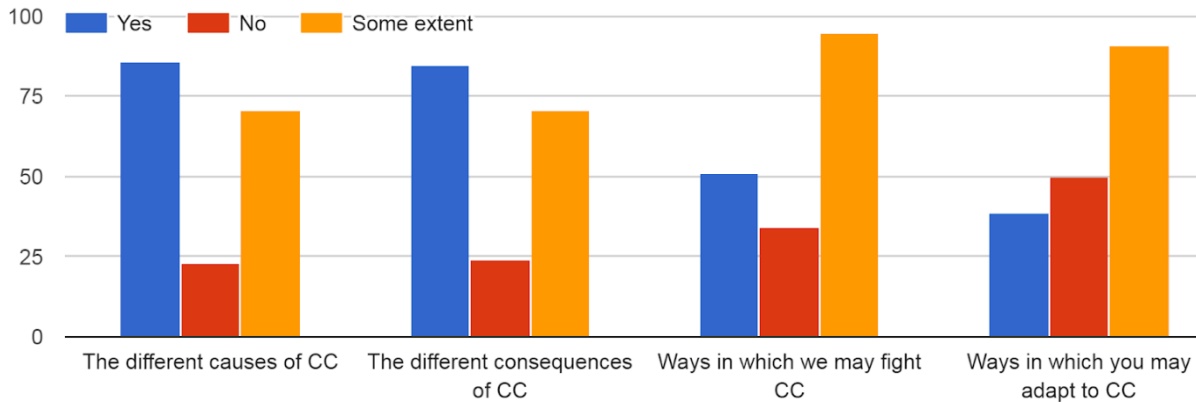
- c. Lack of information about CC
- d. Changing my behavior won't have impact on CC
- e. It's too late to mitigate CC
- f. I am not concerned about CC

Q4. Which of the following National Level or State level mission/sectors do you positively contribute to in your daily life either directly or indirectly? **(which all):**

- a. Enhanced energy efficiency
- b. Water resources
- c. Sustainable agriculture
- d. Strategic knowledge building
- e. Forestry/biodiversity/wildlife conservation

**Responses to awareness questions:**

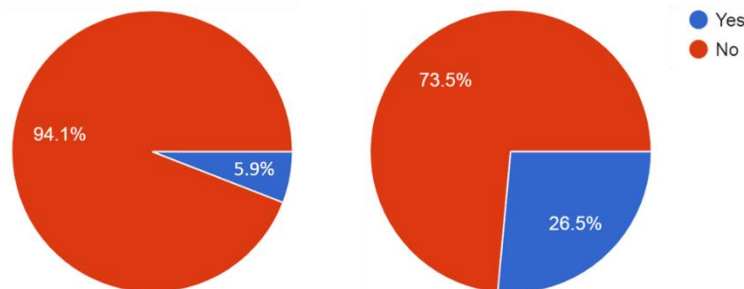
Q2. Do you think you are well informed about different issues related to CC?



(Field Survey, 2019)

Q6. Did you know that not just one but, three State Action Plan on Climate Change (SAPCC) for Karnataka were initiated in parallel?

Q7. Are you aware that the city of Bengaluru has been given deadline till 2020 to submit its own climate action plan to the C40 global megacities network?

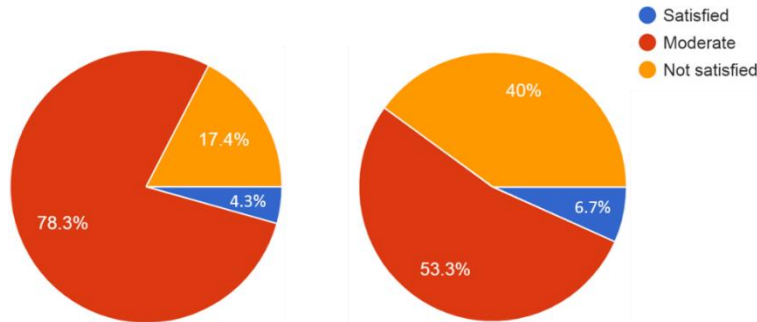


(Field Survey, 2019)

**Responses to perceptions or opinions questions:**

Q3. If yes for Part A – Q4, how do you feel about the quality of the NAPCC?

Q4. If yes for Part A – Q5, how do you feel about the quality of the official SAPCC by the Government of Karnataka (prepared by Environmental Management and Policy Research Institute in collaboration with The Energy and Research Institute)?



(Field Survey, 2019)

Q5. Any comments/suggestions from your side for the Climate Action Plans : National, State and City Level?

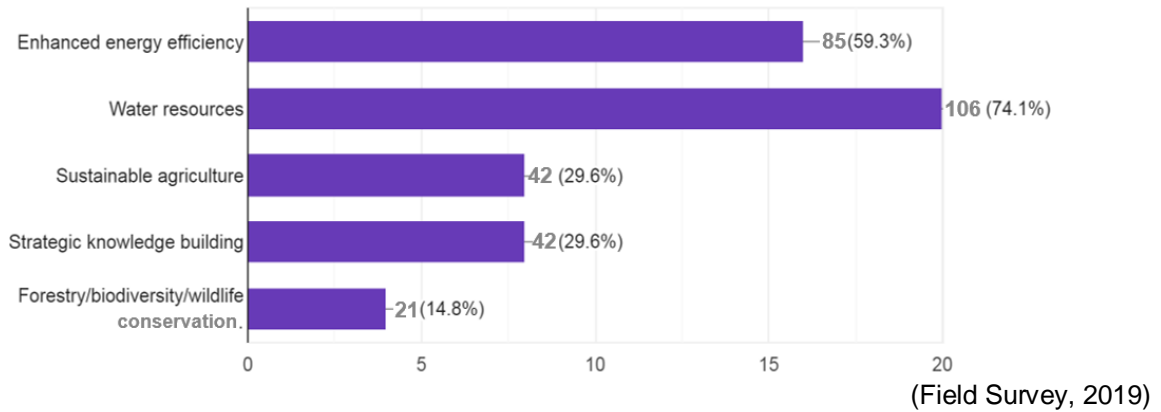
- Improve water use efficiency through pricing and other measures. Mandatory water recycling and lake revival projects to be implemented effective immediately
- I was not aware of information on climate action plan.
- To Reduce CO2 emissions by having a cap on the sales of Vehicles in a year .
- Research and action plans should be carried out without any hindrance
- I am not aware of any of the above climate action plans mentioned in this survey. However, based on my general understanding of climate change plans(Paris accords, Kyoto protocol), most of them fail as there are no strict metrics which are setup to gauge the success of the measures taken to combat climate change. As a result, a lot of resources are pumped into the action plans, without getting back real results which are of significance.
- Go green, and ban on plastic.
- We need to motivate and have regular awareness campaigns on climate change happening in Bengaluru at such a rapid pace due to urbanization and increasing reduction in green spaces & lakes.
- People should be educated on water and forest conservation
- Make it known to the public

(Field Survey, 2019)

**Responses to behavior questions:**

Q4. Which of the following National Level or State level mission/sectors do you positively contribute to in your daily life either directly or indirectly? **(which all):**





## A9. Questionnaire\_For Non-Governmental Institutions

### A9.1 General Questions for all institutions

Question 1: **Which of the following** are the challenges your organization faces when it comes to dealing with Climate Change? Please answer in brief for each of the points.

- Lack of funding for planning
- Lack of funding for implementation
- Lack of funding to hire sufficient staff
- Lack of staff or staff time
- Lack of awareness among staff
- Difficulty mainstreaming CC into existing departmental functions
- Competing priorities
- Political focus on short term goals
- Lack of understanding of Government responses
- Local government lacks jurisdiction over key policies areas

Question 2: **What are some practical things** that both locals and governments can do, to help address climate change and global warming problem more effectively?

### A9.2 Centre for Sustainable Development

Q1. Any attempts to make a revised or updated version of the action plan prepared by CSD?

Q2. If yes, will it focus on sectoral recommendations and also be promoted to be the official plan for Karnataka?

Q3. Any attempts to make a comprehensive climate action plan for the city of Bengaluru or other cities?

Q4. What are your suggestions when it comes to climate governance for the city?

## A10. QUESTIONNAIRE\_For Governmental Institutions

**A10.1 General Questions for all institutions**

Question 1: **Which of the following** are the challenges your organization faces when it comes to dealing with Climate Change? Please answer in brief for each of the points.

- a) Lack of funding for planning
- b) Lack of funding for implementation
- c) Lack of funding to hire sufficient staff
- d) Lack of staff or staff time
- e) Lack of awareness among staff
- f) Difficulty mainstreaming CC into existing departmental functions
- g) Competing priorities
- h) Difficulty in coordinating with Civil Society responses
- i) Difficulty in coordinating with Non-Governmental institutions
- j) Complexity in coordination with responsible departments

Question 2: **What are some practical things** that both locals and non- governmental institutions can do, to help address climate change and global warming problem more effectively?

**A10.2 Environmental Management Policy and Research Institute**

Q1. Is the EMPRI plan endorsed by the central government's National Steering Committee?

Q3. Any attempts to create an update or a comprehensive climate action plan for Karnataka?

Q4. If yes, will it have a chapter on vulnerability assessment and also be promoted to be the official plan for Karnataka?

Q5. Will the new plan address the topics of budgetary allocation, mechanism for monitoring and evaluation; and institutional mechanism to take the plan forward?

Q5. Any attempts to make a comprehensive climate action plan for the city of Bengaluru or other cities?

Q6. Why has GHG inventory chapter been included despite MOEF's request of not including it?

Q7. As per the plan, is there an 'energy conservation building code' being developed?

Q8. Any attempts to make a comprehensive climate action plan for the city of Bengaluru or other cities?

**A11. Results for Question 1 of Sections A9.1 and A10.1**

Non-governmental institutions	Lack of funding for planning	Lack of funding for implementation	Lack of funding to hire sufficient staff	Lack of staff or staff time	Lack of awareness among staff	Difficulty mainstreaming CC into existing departmental functions	Competing priorities	Political focus on short term goals	Lack of understanding of Government responses	Local government lacks jurisdiction over key policies areas
WRI	0	0	0	0	0	1	1	1	1	1
Eco watch	0	0	0	0	0	1	0	1	1	1
CSD	0	0	0	0	0	1	1	1	1	1
IIHS	0	0	0	0	0	1	1	1	1	1
BET	0	0	0	0	0	1	0	1	1	1
IISc	0	0	0	0	0	1	1	1	1	1
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>4</b>	<b>6</b>	<b>6</b>	<b>6</b>

Governmental institutions	Lack of funding for planning	Lack of funding for implementation	Lack of funding to hire sufficient staff	Lack of staff or staff time	Lack of awareness among staff	Difficulty mainstreaming CC into existing departmental functions	Competing priorities	Difficulty in coordinating with Civil Society responses	Difficulty in coordinating with Non-Governmental Institutions	Complexity in coordination with responsible departments
KSCST	0	0	0	0	0	0	0	1	1	0
BWSSB 1	0	0	0	1	0	1	1	1	1	1
BWSSB 2	0	0	0	1	0	1	1	1	1	1
KSPCB	0	0	0	0	0	0	0	1	1	0
BESCOM	0	0	0	0	0	1	1	1	1	1
EMPRI	0	0	0	1	0	0	0	1	1	0
KLCDA	0	0	0	0	0	0	0	1	1	0
Lokayukta	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>3</b>	<b>3</b>	<b>7</b>	<b>7</b>	<b>3</b>

0 = No and 1 =Yes

Developed by (Author, 2019) based on interviews results and research

**A12. List of interviewees and contributors from various institutions**

No.	Interviewee name	Stakeholder position	Organization	Type of Organization	Type of questions	Date and type of interview
1	Dr. S G S Swamy	Executive Secretary	Karnataka State Council for Science and Technology (KSCST)	State Government Authority	References	1 <sup>st</sup> January 2019 (Online)
2	V.Surya Prakash	Managing Associate-Integrated Urban Development	World Resource Institute (WRI), Bengaluru	International Non-Governmental Research	References	3 <sup>rd</sup> January 2019 (In-person)
3	Arivudai Nambi Appadurai	India Adaptation Strategy Head				
4	Ulka Kelkar	Director of Climate Policy			Planning & Implementation gaps; and suggested measures	
5	Namrata Ginoya	Senior Project Associate, Climate				

		Resilience				
6	Sahana Goswami	Manager, India Sustainable Cities				
7	Nelofer Zehra	Administrative Staff	Greenpeace India	International Non-Governmental organization	References	2 <sup>nd</sup> January 2019 (Online)
8	Sunil	Project Associate, Water Harvesting Theme Park	Bangalore Water Supply and Sewerage Board (BWSSB)	City Government Authority	Planning & Implementation gaps; and suggested measures	3 <sup>rd</sup> January 2019 (In-person)
9	Akshay Heblikar	Director and Trustee	Eco-Watch: Centre for Environment and Sustainable Development, Bengaluru	Sub National Non-Governmental Research	References	
10	Suresh Heblikar	Noted filmmaker, environmentalist and founder of Eco-Watch			Planning & Implementation gaps; and suggested measures	
11	Ullas Kumar	Research Associate				
12	Dr. Anshu Bharadwaj	Executive Director	Center for Study of Science, Technology and Policy (C-STEP)	Non-Governmental Thinktank	References	6 <sup>th</sup> March 2019 (Online)
13	Shrimoyee Bhattacharya	Senior Research Scientist				
14	Lohith	Junior Engineer	Bangalore Water Supply and Sewerage Board (BWSSB)	City Government Authority	Planning & Implementation gaps; and suggested measures	8 <sup>th</sup> March 2019 (In-person)
15	K.M. Nagaraj	Senior Environmental Officer, Bellary Zonal Office	Karnataka State Pollution Control Board (KSPCB)	State Government Authority	References	7 <sup>th</sup> March 2019 (Telephone)

16	Mahesh	Technical Officer, Head Office			Planning & Implementation gaps and references	8 <sup>th</sup> March 2019 (In-person)
17	Rajendra Kumar	Under Secretary to Government	Forest, Environment and Ecology Department	State Government Authority	References	
18	Swamy	Assistant Engineer, E-6 Division	Bangalore Electricity Supply Company Ltd. (BESCOM)	City Government Authority	Planning & Implementation gaps	
19	Dr. R. Srinivas	Executive Director	Centre for Sustainable Development (CSD)	Non-Profit Organization	Karnataka State Action Plans	
20	D.G. Rao	Senior Scientist	Defence Research and Development Organization (Ministry of Defense)	National Government Authority	Suggested measures	10 <sup>th</sup> March 2019 (In-person)
21	Nagendra Biradar	Executive Engineer and Senior Consultant	Karnataka Public Works Department	State Government Authority	References	
22	Shanthkumar	Chief Engineer	Karnataka Water Resources Department	State Government Authority	References	
23	Anuttama Dasgupta	Consultant – Urban Practitioners Programme	Indian Institute for Human Settlements (IIHS), Bengaluru	Non-Governmental education	References	
24	Ritwika Basu	Senior Research Associate -			Planning & Implementation gaps; and	12 <sup>th</sup> March 2019

		Practice			suggested measures	(In-person)
25	Ramesh.C	Project Development Officer	Environmental Management and Policy Research Institute (EMPRI)	State Government Authority	References	
26	Madhu	Librarian				
27	Praveen Kumar	Technical Expert				
28	Dr. O. K. Remadevi	Head, Climate Change Unit			Planning & Implementation gaps; and references	
29	Asha	Gazetted Assistant	Karnataka Lokayukta	Anti-corruption ombudsman organization	Anti-corruption measures	
30	Dr. A.N. Yellappa Reddy	Chairman	Bangalore Environment Trust (BET)	Non-governmental environmental protection organization	Planning & Implementation gaps; and suggested measures	13 <sup>th</sup> March 2019 (Conference)
31	Mohan	Chief Environmental Officer	Karnataka Lake Conservation and Development Authority (KLCDA)	State Government Authority		
32	G. Mamatha	Administrative staff	Divecha Centre for Climate Change, Indian Institute of Science (IISc)	Non-governmental research	References	2 <sup>nd</sup> January 2019 (online)
33	Prof. J. Srinivasan	Distinguished Scientist			Planning & Implementation gaps; and suggested measures	14 <sup>th</sup> March 2019 (In-person)

### A13. Economy Calculations

Project Name		Bengaluru Urban Climate Unit (BUCU)			
<b>Employment Cost</b>		<b>22 922 800</b>	<b>6 914 800</b>	<b>16 008 000</b>	-
	CRO (1 person) % occupation		100%		
	AO (1 person) % occupation		100%		
	Tactical (2 person) % occupation			100%	
	Operative (5 person) % occupation			100%	
<b>Travel and Accomodation Allowances</b>		<b>2 677 150</b>	<b>710 950</b>	<b>1 966 200</b>	-
	CRO (1 person) Nr. of months		59		
	AO (1 person) Nr. of months		59		
	Tactical (3 person) Nr. of months			58	
	Operative (5 person) Nr. of months			58	
<b>Office Cost</b>		-	-	-	-
	Office rent m <sup>2</sup>				
<b>Miscellaneous Cost</b>		<b>3 274 500</b>	<b>3 274 500.00</b>	-	-
	Stationary and Plotting INR per month		10 000.00		
	Food and beverages INR per month		5 000.00		
	Utilities INR per month		8 000.00		
	Technical Maintenance INR per month		3 000.00		
	Workshops and event INR per month		25 000.00		
	Website development & maintenance INR per month		4 500.00		
		-	-	-	-
<b>Total Project Budget Assumption</b>		<b>28 874 450</b>	<b>10 900 250</b>	<b>17 974 200</b>	
<b>Reserve Contingency</b>	<b>5.00%</b>	<b>1 443 723</b>	<b>545 013</b>	<b>898 710</b>	
<b>Total estimate</b>		<b>30 318 173</b>	<b>11 445 263</b>	<b>18 872 910</b>	
<b>Commercialisation Revenues (only technic</b>	<b>15%</b>			<b>1 044 000</b>	
<b>Project Budget</b>		<b>31 362 173</b>	<b>11 445 263</b>	<b>19 916 910</b>	-

### Fact Sheet (Author, 2019)

Project Costs	Start	End		Total	Year 01		Year 02		Year 03		Year 04		Year 05	
					2020	2021	2022	2023	2024					
CRO & AO	2/1/2020	1/1/2025	59	11 445 263	2 133 863	2 327 850	2 327 850	2 327 850	2 327 850	2 327 850	2 327 850	2 327 850	2 327 850	2 327 850
Remaining Staff	3/1/2020	1/1/2025	58	19 916 910	3 433 950	4 120 740	4 120 740	4 120 740	4 120 740	4 120 740	4 120 740	4 120 740	4 120 740	4 120 740
Subproject 03	1/0/1900	1/0/1900	0	-	-	-	-	-	-	-	-	-	-	-
Subproject 04	1/0/1900	1/0/1900	0	-	-	-	-	-	-	-	-	-	-	-
Subproject 05	1/0/1900	1/0/1900	0	-	-	-	-	-	-	-	-	-	-	-
				<b>31 362 173</b>	<b>5 567 813</b>	<b>6 448 590</b>	<b>6 448 590</b>	<b>6 448 590</b>	<b>6 448 590</b>	<b>6 448 590</b>	<b>6 448 590</b>	<b>6 448 590</b>	<b>6 448 590</b>	<b>6 448 590</b>
			Check (=0)	-										
<b>Project Commercialisation Revenues</b>														
CRO & AO	2/1/2020				-	-	-	-	-	-	-	-	-	-
Remaining Staff	3/1/2020				-	-	-	-	-	-	-	-	-	-
Subproject 03	1/0/1900				-	-	-	-	-	-	-	-	-	-
Subproject 04	1/0/1900				-	-	-	-	-	-	-	-	-	-
Subproject 05	1/0/1900				-	-	-	-	-	-	-	-	-	-
<b>Project Funding Requirments</b>														
Total per year					-	5 567 813	-	6 448 590	-	6 448 590	-	6 448 590	-	6 448 590
UN CC: Learn						627 245		627 245		627 245		627 245		627 245
100 RC						940 865		940 865		940 865		940 865		940 865
NAPCC funds						1 881 730		1 881 730		1 881 730		1 881 730		1 881 730
SAPCC funds						1 881 730		1 881 730		1 881 730		1 881 730		1 881 730
GBA funds						940 865		940 865		940 865		940 865		940 865
Total year per year						704 622	-	176 156	-	176 156	-	176 156	-	176 156
Total cumulative per year						704 622		528 467		352 311		176 156		-
			Interest	0.00%		-		-		-		-		-
Total financing per year						704 622		528 467		352 311		176 156		-
														<b>FEASIBLE</b>

### Cash flow (Author, 2019)