RESILIENT CHENNAI

PIONEERED BY THE ROCKEFELLER FOUNDATION

PRELIMINARY RESILIENCE ASSESSMENT

PRELIMINARY RESILIENCE ASSESSMENT

CHENNAI

LETTER FROM THE COMMISSONER

Dear Reader,

It is my pleasure to showcase to you Chennai's Preliminary Resilience Assessment (PRA) on behalf of the city of Chennai. This document brings together inputs from Citizens, Government officials, Civil society, Academia and Business leaders, to provide a comprehensive view of the city's challenges as seen through a resilience lens.

We believe, this will be an important starting point for any future local, national, or international body that works with Chennai on its resilience issues.

On behalf of our city, I thank the Chief Resilience Officer and his team for putting together an important document that will help Chennai become more resilient.

Dr. D. Karthikeyan
Commissioner, Greater Chennai Corporation

LETTER FROM THE CHIEF RESILIENCE OFFICER

Dear reader,

I have lived in Chennai (Madras) all my life... 60 full years! I have watched from the sidelines as the city has tried to tackle its many challenges. Now, as the Chief Resilience Officer (CRO), I have spent the last 6 months meeting different stakeholder groups involved with helping the city manage and overcome its shocks and stresses.

Government departments, civil society, academia and our people, of course. I have come to the firm conclusion that in order to bring about positive change and build a more resilient Chennai, we, as a people, must become more resilient ourselves; to actively engage with civic issues and not just find fault and complain; to learn the linkage between individual behaviour and collective failure or success and believe that our voices do matter; to have a sense of ownership and responsibility towards the city and earn the right to be called the citizens of a resilient Chennai.

I sense an urgency to engage with our city's complex challenges and to implement real changes on the ground -- revive our rivers and water basins, manage our solid and liquid waste, ease our transportation issues and raise the quality of life of our urban poor who are woven into the tapestry of our city. There is a need to learn to coordinate and operate with each other and institutionalise our learnings, and, as we expand into our peri-urban areas and grow into our water basins, to do so in a planned, green and healthy manner, protecting our water bodies and the livelihoods of our farmers and rural folk; to work together so that we may we build a more sustainable, resilient Chennai.

Krishna Mohan Ramachandran
CRO, Resilient Chennai

TABLE OF CONTENTS

EXECUTIVE SUMMARY

INTRODUCTION

Chennai joined the 100RC network in 2014 with a desire to improve multi-stakeholder coordination, and long-term planning, especially in disaster response and protection of low-lying coastal areas. In order to support the city, 100RC has provided funding for the office of the Chief Resilience Officer (CRO), access to ~100 expert organisations, support in developing a resilience strategy, and learning opportunities from other cities in the network. This Preliminary Resilience Assessment (PRA) completes Phase 1 of the strategy, with a focus on understanding the city's context and challenges, while identifying key resilience strengths and weaknesses. The PRA provides an overview of the learnings from Phase 1 and highlights priority areas (known as 'discovery areas') that the city will focus on for further development in Phase 2. Now, the CRO and his team will initiate Phase 2, in which a final resilience strategy document will be developed.

To arrive at the PRA, the CRO and his team engaged a broad range of stakeholders including civil society, corporate, academia, and government leaders. The figure below provides an overview of the stakeholder engagement in this phase.

We engaged major local & state government departments, the city's best universities, its foremost think tanks, its most active civil society groups, and largest corporates.

CITIZEN SURVEY

Engaged over 1800 citizens from across the city including over 500 from vulnerable communities to understand the city's major shock & stresses

EXPERT SURVEY

Engaged over 25 city leaders (i.e. corporate, government, civil society, and academia) to understand city's strengths and weaknesses

WORKING GROUP

Engaged over 40 technical experts in the area of water, disaster management, civic engagement, informal settlements and unplanned growth with an underlying theme of resilience finance discussed across all working groups

EXPERT INTERVIEWS

Engaged 4 city champions from different stakeholder groups to validate our findings and hypotheses

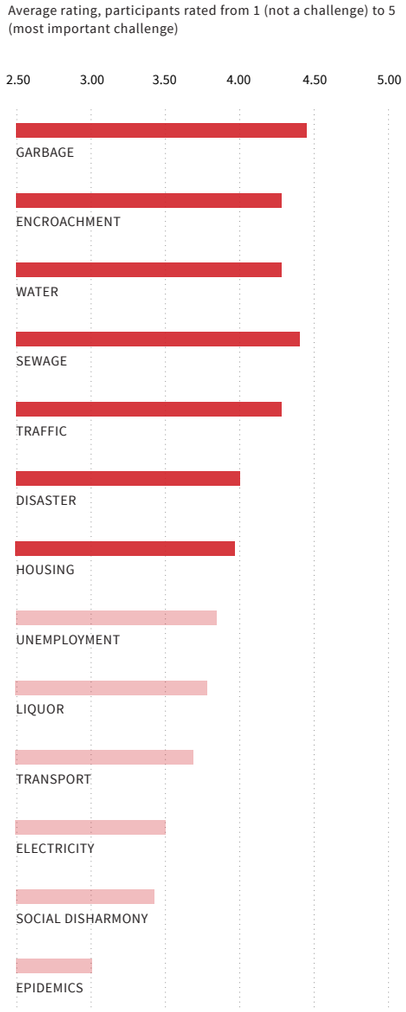
CITY CONTEXT

Chennai's position as an important urban center is well recognized – as a major port city and capital of the Madras Presidency during the British colonization, and as a modern economic engine (India's 4th largest metropolitan economy) for south India currently. Fort St. George, the seat of Tamil Nadu's state legislative bodies, was the anchor of the British Empire's presence in the region. This, combined with a strong railway network converging on the city, made Chennai the 'Gateway to South India'.

Today, the city has a diverse economy, with both manufacturing, and services contributing to economic prosperity. Business, finance & professional services, manufacturing, and trade & tourism contribute 18-25% each to the city's economy with IT services, and automobile manufacturing being the city's most visible hi-tech sectors.

However, distribution of Chennai's economic prosperity has been unequal. The disparity is visible in the spatial distribution of households in the city. As construction has focused on middle/high income housing, for the beneficiaries of the economic boom, as well as on commercial establishments, low- income households have moved to informal settlements, and many have moved to peripheral parts of the city. These settlements tend are hard to reach, especially with limited government capacity, and / or are jurisdictional grey zones because of which access to key public goods and services is limited.

Results from the Citizen Perception Survey, N = ~1800



The city has also seen severe environmental damage due to improper land use, especially with encroachment on ecological buffer zones, that has limited the ecosystem's ability to respond to adverse climate events. This was starkly visible during the catastrophic 2015 floods. While these social and environmental costs exist, Chennai performs better than other Indian cities in reducing poverty and delivering certain key public services such as healthcare, education, law & order, and safety.

Despite the good intentions of the local government and leadership, and increased urgency to protect the city's ecosystem, overlapping mandates of various government bodies, high levels of attrition in leadership, political uncertainty, and dependency on the state government for funds and policy direction, have limited the city's ability to plan for the long term, coordinate across government bodies, and raise accountability. The CRO can be an important participant in the city's ecosystem and can help plug this gap by becoming the city's focal point for long-term resilience planning and implementation.

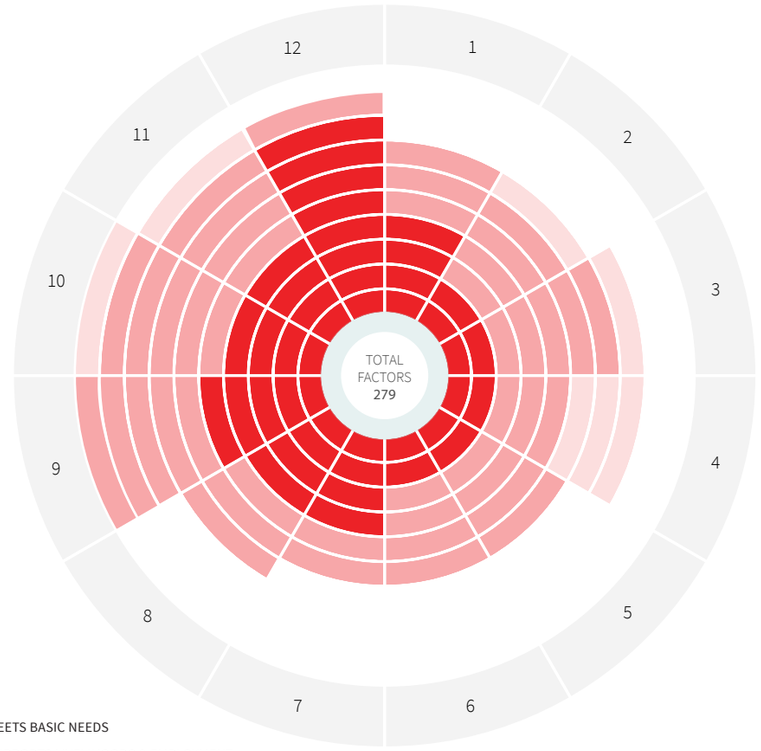
KEY CHALLENGES

Based on inputs from the citizen survey, expert survey, and the agenda-setting workshop (ASW), the CRO and his team have identified six stresses and one shock as priority areas for the city.

KEY STRENGTHS AND WEAKNESSES

The CRO and his team engaged city leaders from academia, civil society, government, and the private sector to understand the resilience strengths that the city can leverage, and the weaknesses it needs to address to respond to the shocks and stresses highlighted above. The City Resilience Framework (CRF), framed our engagement with stakeholders. From this process, we identified drivers 1, 7, 8, 9, 10, 11, and 12 as weaknesses and 3, and 4 as strengths. As with shocks and stresses, we found clear interlinkages between these drivers. For example, 'empowering a broad range of stakeholders' was linked to 'promoting cohesive and engaged communities' as citizens highlighted the need for more transparent decision making, and a greater say in policy making.

Perception of resilience strengths and weaknesses of stakeholders in Chennai



1. MEETS BASIC NEEDS
2. SUPPORTS LIVELIHOODS & EMPLOYMENT
3. ENSURES PUBLIC HEALTH SERVICES
4. PROMOTES COHESIVE & ENGAGED COMMUNITIES
5. ENSURES SOCIAL STABILITY, SECURITY & JUSTICE
6. FOSTERS ECONOMIC PROSPERITY
7. MAINTAINS & ENHANCES PROTECTIVE NATURAL & MANMADE ASSETS
8. ENSURES CONTINUITY OF CRITICAL SERVICES
9. PROVIDES RELIABLE COMMUNICATION & MOBILITY
10. PROMOTES LEADERSHIP & EFFECTIVE MANAGEMENT
11. EMPOWERS A BROAD RANGE OF STAKEHOLDERS
12. FOSTERS LONG-TERM & INTEGRATED PLANNING

Need to do better
Doing well, but can improve
Area of strength

KEY ACTION AREAS

Delving deeper into the CRF drivers, the CRO and his team looked at current and past initiatives within each, to understand which areas required greater support. Post 2015 floods, many actions have been focused on 'continuity of critical services' especially in flood management. Similarly, significant actions have been taken in 'long term and integrated planning' through city master plans and disaster management plans. However, gaps exist in 'empowering a wide range of stakeholders' as well as in 'effectively managing' the city.

DISCOVERY AREAS

Based on the findings of this phase, six discovery areas were identified, as broad areas of engagement for Phase II:

1. **WATER SYSTEM: building a better understanding of the water system in Chennai:** The water system in Chennai currently suffers from limited, and fragmented information. This limits a common understanding, across all actors, of the city's water system, its priority challenges, and its interactions with other systems (e.g. with the solid waste system). Building a better understanding of the system and its interactions will be crucial to ensure the viability of the city's water ecosystem.

2. **METRO GOVERNANCE: institutionalising multi-stakeholder coordination and improving monitoring and enforcement capabilities of government, and civil society:** Different government bodies as well as civil society are storehouses of different kinds of expertise, capabilities, and knowledge. Coordination, across the board, and harmonisation of the levels of expertise continue to remain a challenge, including in disaster management settings. In addition, local government and para-statal bodies lack the capacity to monitor delivery of key public services, or enforce regulations. As Chennai is expanding and consuming more resources, it needs to manage and control the use of key resources (e.g., land, transportation infrastructure etc.), and ensure safe disposal of both solid and liquid waste, including through the enhancement of capacities of government & civil society, to ensure equitable and sustainable growth.

3. **CIVIC ENGAGEMENT: deepening citizen's involvement in protecting man-made and natural assets, especially the city's green cover:** Many of Chennai's stresses relate to a failure of collective action. Stresses such as overexploitation of water resources, encroachment, traffic congestion etc., can be partly explained by citizens not responding or valuing the city and its assets.

4. **VULNERABLE AND LOW-INCOME GROUPS: ensuring high quality service delivery to low-income groups especially those in informal settlements:** No new slums have been notified in the last 30 years while slum population has almost doubled. Weak access to services due to lack of legal resident status, loss of livelihoods & public goods due to relocation, discrimination based on various cleavages including caste, etc. are all significant challenges. Addressing these challenges can ensure that the benefits of the city's growth are distributed equitably.

5. **HEALTHY AND PLANNED URBANISATION: enabling policy makers to plan for and mitigate risks of population growth and geographic expansion:** Chennai is expanding, in terms of both people and territory. While recent announcements have formalised this expansion and the city is set to grow to over 7 times its current size, bodies responsible for managing this expansion have to leverage scarce resources, and capacity to ensure sustainable access to key public services. Planners and policy makers have to ensure that the growth is managed well and the politico-legal framework (including land use regulations) within which this growth occurs is robust enough for the city to sustain vibrant social and economic lives for its people.

6. **FINANCE URBAN RESILIENCE: Capital scarcity is a common problem across the country – especially for significant projects, which need large capital outlays.** It is estimate that Chennai requires ~USD 50 billion to setup critical public infrastructure as roads, water supply, solid waste, storm water drains etc., as its population and geography expands. Chennai's dependency on state and central grants makes it difficult for the city to raise resoues for special projects, a lot of which may be required to enhance resilience.

NEXT STEPS

In the next phase, the CRO and his team will prepare a resilience strategy for the city through continued consultations with city leaders and key stakeholders. In parallel, the CRO will facilitate the implementation of 'easy to implement' and 'high impact' pilots that relate to these discovery areas.

1

INTRO-DUCUTION

CHENNAI'S PARTICIPATION IN 100RC

In 2014, Chennai was part of the second cohort of cities selected into the 100 Resilient Cities (100RC) program. It was selected over 300 other applicant cities by a panel of judges that included African Development Bank President, Donald Kaberuka, CEO of the Asia Society, Josette Sheeran, and former President of Costa Rica, Jose Maria Figueres.

As part of the application, city officials signalled a desired to develop coordinated disaster response plans, and protect low-lying coastal areas in the face of high flood risk. Furthermore, the presence of other 'resilience-linked' programs such as Smart Cities, and C40 created space for collaboration over a broad vision of the city's future, which proved to be an important in its successful application for the 100RC program.

THE 100RC OFFERING

100RC defines resilience as 'the capacity of individuals, communities, businesses, and systems, within a city to survive, adapt, and thrive no matter what kinds of challenges they experience.' These challenges could be either shocks (e.g., floods, cyclones etc.) or stresses (e.g., solid and liquid waste build up, road accidents, lack of safe drinking water etc.). Shocks are acute and sudden while stresses affect cities on a day-to-day basis.

Fundamental to 100RC's philosophy on resilience is preparing cities for disasters but also, working with different socio-economic groups and a wide range of stakeholders to prepare for economic, social, and physical stresses and shocks.

100RC, therefore, offers four types of support:

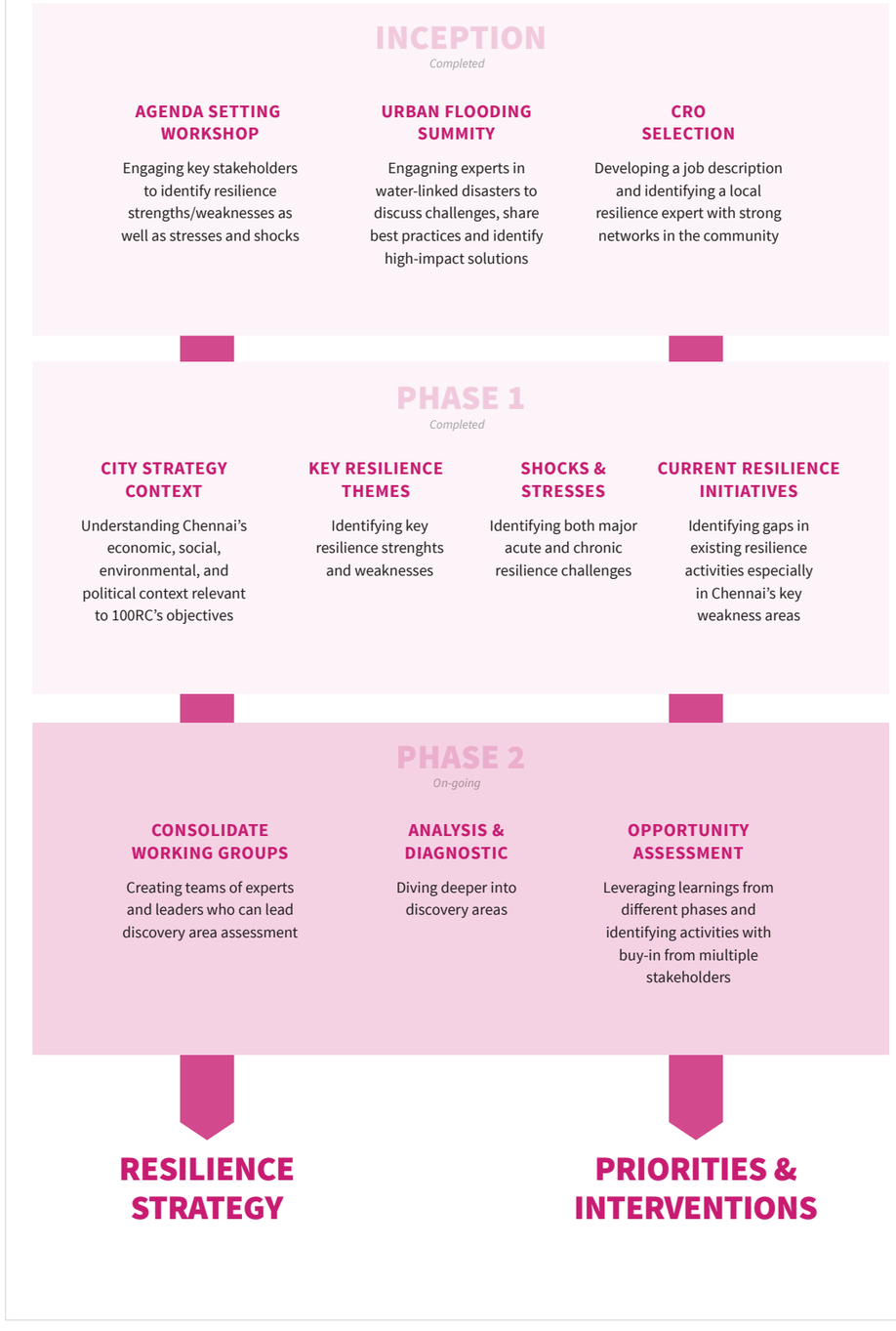
1. **Funding to hire a Chief Resilience Officer ('CRO')**
2. **Support to develop a City Resilience Strategy**
3. **Access to a platform of technical partners and their services to deploy solutions**
4. **Membership to a global network of cities with opportunities to share best practices**

THE 100RC CITY RESILIENCE STRATEGY PROCESS

100RC supports the development of a resilience strategy in the city, which serves as a roadmap to build resilience in a city. It highlights the city's priorities, and specific interventions within those priorities which combine both immediate and long term actions. The CRO, embedded within a city government, acts as a central coordinator in both the design and implementation of the strategy.

Figure 1: 100RC strategy process overview

Figure 2: Overview of Chennai's 100RC journey so far



The objectives of the strategy phase include:

1. Establish and elevate the CRO as the resilience leader in the city, and build capacity, and resilience knowledge city-wide
2. Mobilise, connect and catalyse action across diverse stakeholders and sectors
3. Advance and inform the city's understanding of its resilience strengths and weaknesses
4. Identify specific implementable initiatives to help the city better prepare for, adapt to and rebound from shocks and stresses
5. Deliver a public document that inspires city officials, constituents and partners to act

RESILIENT CHENNAI: THE JOURNEY SO FAR

In Chennai, the city has completed the inception phase, which included organising an agenda-setting workshop, hosting a flooding summit, and selecting the CRO. In Phase 1, we learned more about Chennai, its resilience strengths and weaknesses, its resilience efforts, and identifying focus areas ('discovery areas') for the city to work on. In Phase 2, we will delve deeper into the discovery areas identified at the end of Phase 1, and identify opportunities for action, and intervention.

STAKEHOLDER ENGAGEMENT

In Phase 1, we engaged with a wide variety of stakeholders to learn about Chennai, its resilience challenges & strengths, and focus areas for Phase 2. Based on the outcomes of inception phase, and our discussions with various stakeholders, we have focused on the areas of water, disaster management, civic engagement, informal settlements, and unplanned growth. Our stakeholder engagement plan is captured in the graphic below:

Figure 3: Stakeholder Engagement in Phase 1

CITIZEN SURVEY

Engaged over 1800 citizens from across the city including over 500 from vulnerable communities to understand the city's major shock & stresses

EXPERT SURVEY

Engaged over 25 city leaders (i.e. corporate, government, civil society, and academia) to understand city's strengths and weaknesses

WORKING GROUP

Engaged over 40 technical experts in the area of water, disaster management, civic engagement, informal settlements and unplanned growth with an underlying theme of resilience finance discussed across all working groups

EXPERT INTERVIEWS

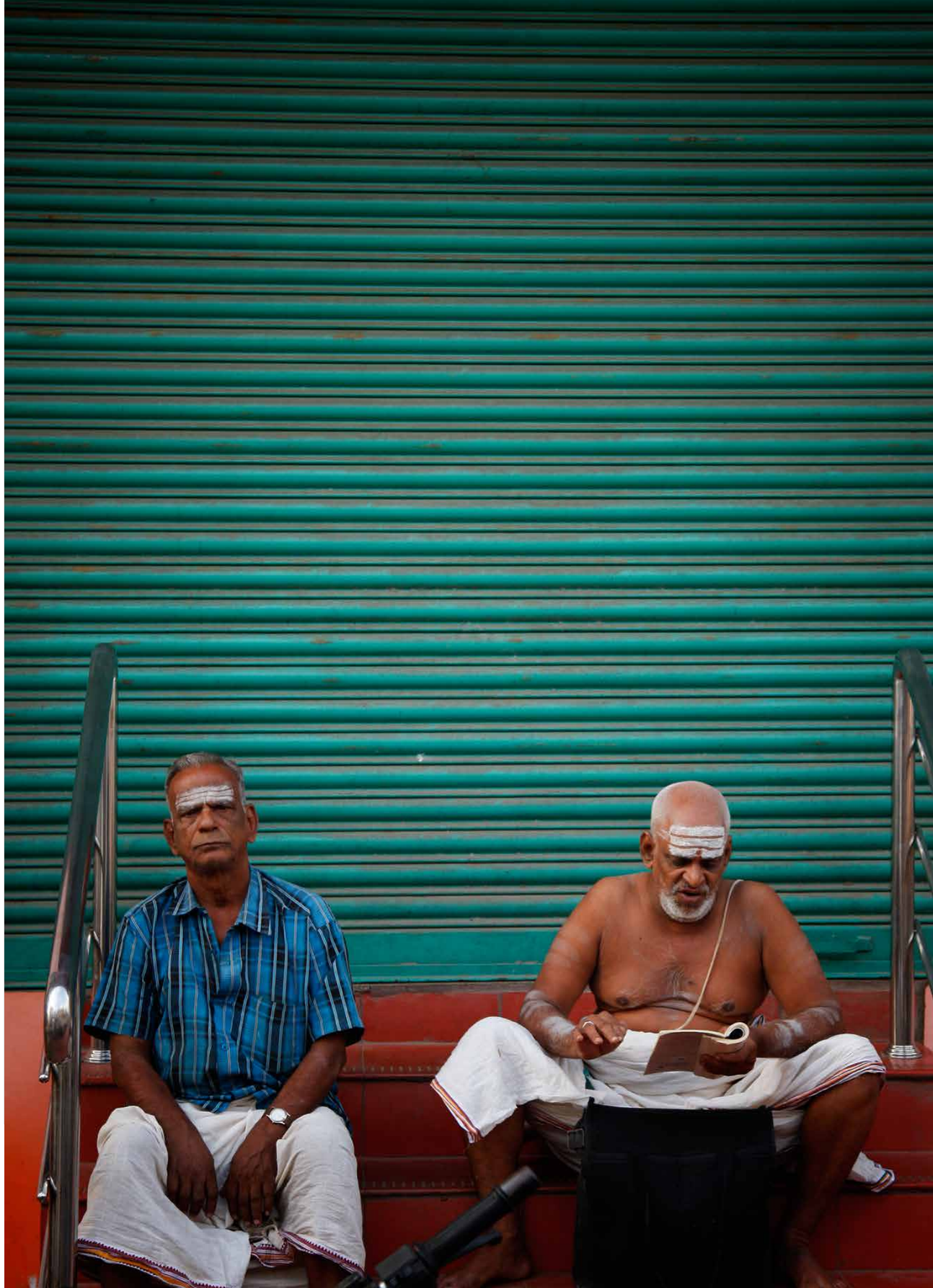
Engaged 4 city champions from different stakeholder groups to validate our findings and hypotheses

② UNDER-STANDING THE CITY

2.1 KEY ACTIVITIES ARE AIMED AT GETTING A HOLISTIC VIEW OF THE CITY

Table 1: Overview of Phase 1 activities

ACTIVITY	OBJECTIVE	APPROACH / METHODOLOGY
Understanding city strategy context	Understanding Chennai's economic, social, ecological, and political context relevant to 100RC's objectives	• Expert interviews • Desk research
Identifying key resilience themes	Identifying key resilience strengths and weaknesses	• Perception Assessment Tool • Working groups • Expert survey
Prioritising shocks and stresses	Identifying both major acute and chronic resilience challenges	• Expert interviews • Citizen's perception survey • Working groups
Synthesising current resilience initiatives	Identifying gaps in existing resilience activities/programs/policies especially in Chennai's key weakness areas	• Cities Actions Inventory • City leadership inputs on own actions • Desk research



2.2 THE CITY'S STRATEGY CONTEXT: A LARGE & COMPLEX CITY

Table 2: Key Facts (Chennai Metropolitan Area, unless otherwise mentioned)

POPULATION (2011)	8,653,521[1]
AREA	1189 KM SQ.[2]
DENSITY (2011)	7,283 PEOPLE/KMSQ
PER CAPITA INCOME (2014)	USD 6,469 (PPP) OR INR 1,11,266[3]
LITERACY RATE (2011)	90%
RELIGIOUS COMPOSITION (2011)	HINDUS (81%), MUSLIMS (9%), CHRISTIANS (8%), JAIN (1%), OTHERS (1%)
AUTOMOBILE OWNERSHIP (2011)	CAR (13%), MOTORBIKES (47%), BICYCLES (37%)
POVERTY RATE (2010)	8.7%[4]

CITY OF HISTORIC & MODERN SIGNIFICANCE

Modern day Chennai took shape under British rule, however, the city and its surrounding areas have been of historic importance in economics, politics, and culture. Parts of modern day Chennai (e.g. old Pallavaram) have been notified as megalithic sites, establishing a strong link with pre-historic times. The city and its surrounding areas were central to some of the most important empires (e.g. Chola, Pallava, Vijayanagara etc.) in India's history. Under the Chola empire (~300 BC – 1279 AD), the foundation of the city's rich Tamil literary and architectural heritage was established. This influence of this heritage has gone far and wide, including areas parts of South East Asia. Legendary South Indian poet Thiruvalluvar, who wrote about wide ranging issues such as ethics, economics, and even love, also hailed from Chennai.

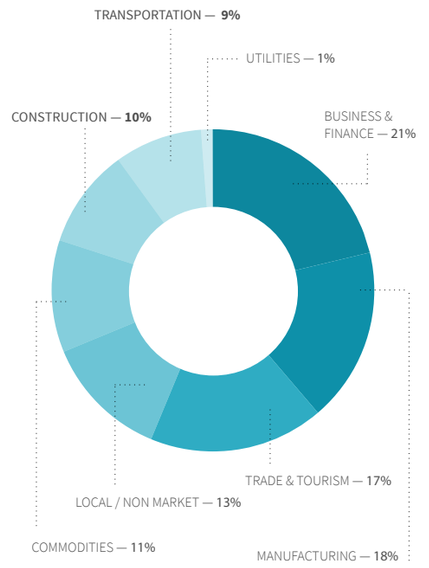
Later influenced by Portuguese and Dutch Settlers, the British East India Company laid the foundations of the port of Madras, making it an important centre for trade between India and Europe. The British East India Company used Fort St. George, built at the site, as an anchor to fuel expansion into adjoining areas to form the Madras Presidency, with Madras as its capital.

Emergence of railways in the 19th century connected the city to other regional hubs, expanding its trade and making the city the Gateway of South India. Post-Independence, the port, currently the second largest container port in India and the largest port on the Bay of Bengal has been one of the key drivers of growth. Road-links to Bengaluru (west), Kolkata (north), Nellore, Srirangam, Tanjore (south), and Old Mahabalipuram provided regional connectivity.

Overtime, Chennai has become an important centre of culture, being the birthplace of Carnatic music, one of India's two major streams of classical music (the other being Hindustani music), and 'Bharatanatyam', one of the country's major dance forms. Today, the emergence of Kollywood, the Tamil movie industry, with Chennai as its hub, epitomises the role played by the city in arts, entertainment, and culture.

1. Chennai district metropolitan/urban population (2011 census)CMDA website
2. CMDA website
3. Purchasing power parity USD PPP to INR is 17.2 and sourced from Brookings Institute's Metro Monitor (2015)
4. Staff reporter, "Chennai's urban poverty rate is one of the lowest in country", The Hindu, Aug 2010

Figure 5: Chennai's output by Industry in 2014 (percentage)



Today, Chennai is India's fourth largest metropolitan economy with a diverse economic base and is at the heart of the country's most urbanised state – Tamil Nadu. Over the last decade, Chennai has been India's fastest growing major city, with a growth rate of ~6% per annum, and has become its fourth largest metropolitan economy with an annual GDP of USD PPP 58 billion[5] (INR 997 billion). The state of Tamil Nadu is a favoured destination for foreign investment due to its business-friendly policies. This has helped Chennai build a diverse economic base with IT, BFSI (banking, financial services, and insurance), and manufacturing (including automobile, computer, technology, and hardware industries) as important drivers of its economic growth. It also has a booming retail trade in textiles, jewelry, consumer durables and services trade in hospitality, education, and healthcare. Both automobile exports and electronics hardware are key export oriented industries, with Chennai being the largest exporting hub in the country. This gives Chennai the distinction of being the 'Detroit of Asia'. In services, Chennai employs ~300,000 in its booming IT sector, and hosts the world's largest IT Park. Further, the city is said to host banking back office support for over 10% of the world's population.

CITY OF ECONOMIC DISPARITIES

Despite the strong growth, Chennai continues to have a significant low-income class with wide wealth inequality. For example, about 40% of households in the city live in one-room or shared dwellings while over 87% do not own cars.

The city's lower income population is moving either into the city's periphery or into informal settlements. In the past few decades, Chennai has witnessed a rapid increase in high and middle- income housing[6] in the core of the city, driven by strong demand by a section of a population, which has seen its income rise rapidly. However, this has exacerbated the major demand-supply mismatch in low-income / affordable housing. Unavailability of low-income housing in the city has compelled low-income populations to move out to the peripheries of the city. This movement has occurred either through government resettlement programs or through organic migration outward, leading to strained social ties, and livelihood opportunities.

In addition, migrant and low-income populations have built informal settlements. For example, in the north of Chennai, the increasing presence of major manufacturing (e.g. thermal power plants, refineries etc.) units as well as ports has made the region a hub for low-skilled jobs. However, demand of land for manufacturing units, coupled with high demand for low-income housing has pushed housing prices upwards. This has led to a significant increase in informal settlements in the area. Driven by the above factors, among others, the city has witnessed a ~50% rise in slum populations[7] over the past decade.

Limited government capacity to serve hard-to-reach pockets, and the jurisdictional grey zone in peri-urban areas and informal settlements, has made it difficult to guarantee quality public services. As Chennai expands rapidly and due to lack of appropriate planning, the government is unable to build requisite capacities to deliver public services to hard-to-reach areas. In informal settlements, lack of land security, and consequent lack of recognition from

5. 2014 Global Metro Monitor, Brookings Institute, GDP PPP USD million, 2014; local/non-market includes administrative, waste management, remediation, education, healthcare, social assistance, arts and entertainment
6. Idicheria & Neelkantan et al, Transforming Chennai, Okapi & Mercy Corps, Nov 2016
7. Christien Mathew Philip, Slums in Chennai increase 50% in a single decade, Times of India, Jan 2016

the authorities, further reduces availability of key public services like housing, electricity, water, and sanitation. Poor access to basic services (e.g., less than half the population owns a flush latrine at home[8]), coupled with limited disaster management, results in serious public health concerns, especially during disasters, for residents of these informal settlements.

The poor often rely on informal markets for basic services, and can enter a poverty trap, where much of their income is consumed in accessing unaffordable services. For example, the average household in Chennai spends ~3% of their income on water, while those accessing water through private providers (e.g., private tankers, plastic can suppliers etc.), spend up to ~6% of their monthly income[9] on it.

Despite these spatial changes, the city fares well when compared to other metropolitan cities on health, education, law and order, and poverty reduction. Chennai is often called the 'medical capital of India' with 2.1 beds per 1000 people compared to Delhi (1.4), Mumbai (0.8), and Kolkata (0.8)[10]. In education, Chennai is the hub of Tamil Nadu's higher education, which has the highest concentration of elite universities and the highest tertiary enrolment rates in the country[11 & 12]. In 2016, Chennai was ranked as the safest city in India by Mercer's Quality of Life Rankings and was recognised for its internal stability, relatively low levels of crime, and local law enforcement. Poverty in Chennai stands at 8.7%, much lower than the national average of 27%, as well as the rates in other major cities like Delhi (~11%)[13] and Mumbai (~20%)[14].

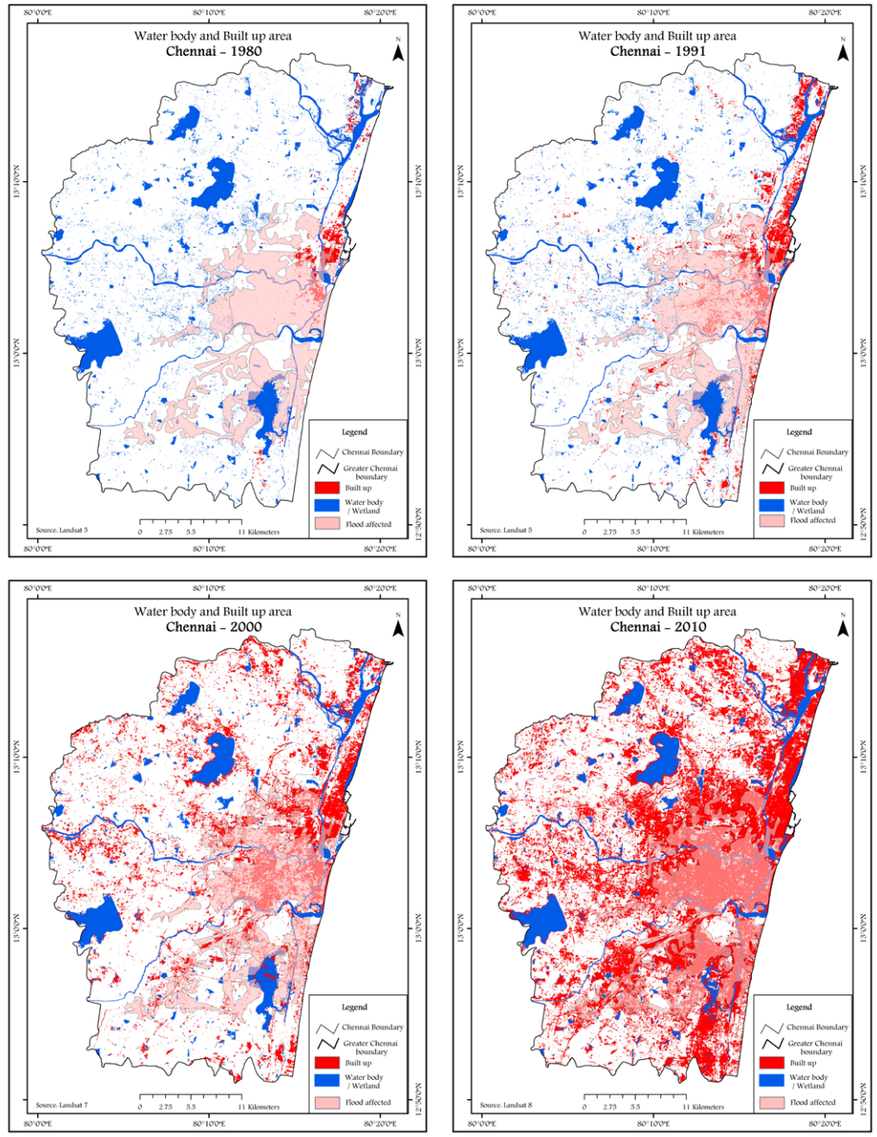
CITY OF MAN MADE & NATURAL VULNERABILITIES

Chennai's natural ecosystem has had its capacities severely reduced over the past three decades due to poor waste management, siltation, and encroachments. The Chennai region comprises of watersheds of three major rivers, and includes five wetlands, and six forests. While industrial effluents pollute Kosasthalaiyar river, two thirds of the city's total untreated domestic, commercial sewage is dumped into the Cooum and Adyar rivers, affecting their aquatic health. Tests conducted in the Adyar creek showed BoD[15] levels to be ~5 times higher than the safe limit for aquatic life to survive[16]. This pollution also makes the city especially susceptible to waterborne diseases. Siltation of lakes has reduced their storage capacities and impacted their biodiversity and related economies.

For example, Pulicat, the second largest coastal lagoon in India, now has a reduced depth of 0.8 m, compared to 3.8 m. A report by the PWD suggests that Chennai hosts over 20,000 illegal structures, and 50% of 19 major lakes in the city have been encroached on, severely limiting their catchment area[17]. Illegal structures have also affected the Pallikarnai marsh which is directly influencing the city's ability to manage flooding.
The city's green cover has witnessed a similar decline – in addition to the reduction due to unplanned constr--uction, and encroachment, the city's green cover reduced by over 10,000 acres between 2010-15 to make way for parks, lake bunds, education institutions etc.[18]

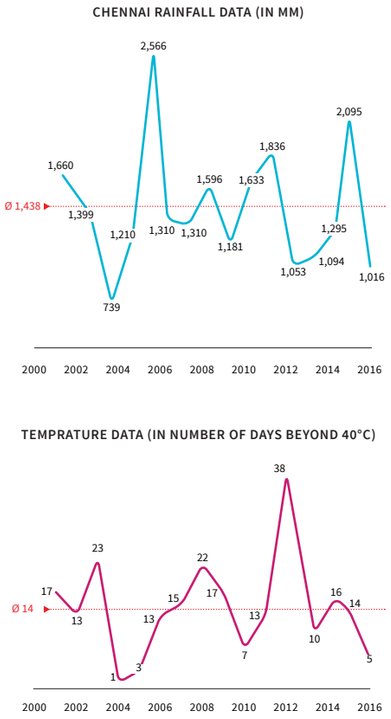
Increased temperatures, torrential downpours, and droughts in Chennai have become frequent, driven in part by changing climate. In the past decade, Chennai has witnessed unpredictable cycles of droughts and floods as well as rising temperatures.

Figure 6: Chennai water body and built up area map for 1980, 1990, 2000, and 2010



8. Ibid 4
9. L Venkatachalam, Informal water markets and willingness to pay for water: a case study of the urban poor in Chennai City, India, IJWRD, Apr 2014
10. Country's med capital to get 3,000 more beds, Times of India, July 2011
11. P. Raghavan, Tamil Nadu, Delhi, and Maharashtra have the best higher education institutions in the country, Times of India, April 2016
12. Tamil Nadu ranks third in enrollment in higher education, Times of India, Nov 2014
13. A niruddha Ghosal, Delhi per capita 3 times more than rest of the India, Indian Express, May 2017
14. Linah Baligai, 1 in 5 Mumbaikars below poverty line, Times of India, September 2011
15. Biochemical Oxygen Demand
16. Divya Gandhi, It was sewage that killed the fish, The Hindu, Feb 2015
17. Namma Chennai, Chennai's encroachments.
18. Forest cover in Tamil Nadu growing but Chennai losing its tree cover, Deccan Chronicle, Jan 2016

Figure 7: Chennai rainfall data (in mm) and temperature data (in number of days beyond 40℃)



Rainfall has varied between 60% above to 60% below the norm, with one of highest rainfall rates observed in 2015. Climate scientists are also expecting the monsoon spread (number of monsoon days) to shrink by 80% in the coming decade. This, together with the stunted capacity of the region's ecological infrastructure to hold and allow percolation, and drain excess water led to catastrophic floods in 2015, leading to a loss of 267 lives and an estimated economic cost ranging between USD 2.2 - 3 billion[19,20] (INR 142 – 194 billion).

Further, the absence of piped connections for water, and growing demand from the city's core has led to severe water shortages in peri-urban areas[21], residents of which are increasingly relying on private tankers and groundwater wells. The groundwater exploitation levels have reached 185% in Chennai, where 100% is considered overexploited.

The city is losing 10-20 cm of its groundwater table to exploitation each year. Further, the over-exploitation of groundwater, especially in the coastal areas of Chennai, leads to the risk of seawater intrusion into the ground water table.

In the wake of the Chennai floods in 2015 and Cyclone Vardah in 2016, there is a sense of urgency to protect the city's ecosystem. Wide ranges of initiatives have begun taking shape to protect the city's water bodies, and green cover. For example, the Chennai Corporation, Chennai River Restoration Trust (CRRT), Public Works Department (PWD), and civil society actors (e.g., Care Earth, Environmentalist Foundation of India, Art of Living Foundation, Chennai Trekker's Club etc.) are undertaking eco-rejuvenation projects of the city's rivers, lakes, and ponds. Proximate causes such as solid and liquid waste as well as encroachments of buffer zones have become core civic issues[22].

CITY OF MANY ACTORS

Multiplicity of state, local, and para-statal bodies makes coordination, accountability, and systems thinking a challenge. While urban planning and development is a state subject in India, city municipalities are charged with the operations and maintenance of basic local civic services (e.g., Chennai Corporation provides services like education, health, green spaces, solid waste management etc.). Parastatal bodies, led by state appointed officials, are not directly accountable to the citizens of Chennai (vis-à-vis the state as the whole) even though some, like the Chennai Metropolitan Development Authority (CMDA), are responsible for visioning the direction of growth and laying out the regulatory frameworks for development. Often, multiple state, local, and para-statal agencies are responsible for the same issues, and have overlapping jurisdictions (e.g. the city's water bodies). This multiplicity, coupled with siloed thinking (as highlighted in subsequent sections), makes coordination, and accountability highly complex and challenging, resulting in sub-optimal planning and execution of policies.

19. The Business Line, Chennai Floods Largest Natural catastrophe in India in 2015: Swiss Re, March 2016
20. Carolyn Cohn, Indian economy suffers $3 billion loss from Chennai floods: Aon Benfield, Live Mint, Dec 2015
21. Development Planning Unit, 'So Close to the city, so far from the pipes', DFID, 2012
22. Citizen perception survey, Resilient Chennai, September 2017

Furthermore, high levels of attrition in city leadership inhibit long-term policymaking. Transfer of key government personnel is a regular occurrence at key leadership positions in Chennai. For example, the Chennai Corporation and Metrowater, a para-statal body responsible for water and sewage connections, have both witnessed major changes in leadership in the last 3 years. The Corporation has witnessed three different Commissioners in the last 2 years. A senior official told a leading national newspaper - "every time a new commissioner takes charge, he tries to introduce his ideas to the corporation. It becomes difficult for us as (they) change plans and we have to start from scratch." This has inhibited the city from following through on promising initiatives championed by leadership. In addition, this likely leads to the creation of sub-optimal, and often short-term, incentives throughout the chain, again leading to unwanted and / or inefficient outcomes.

As the state capital of Tamil Nadu, state politics have a significant impact on Chennai. Political uncertainty at the state level would also cause uncertainty in the city's governance. The city's politics is deeply bipartisan with two major parties - the AIADMK and the DMK dominating the political landscape for the last 50 years. Tamil Nadu has become known for its longstanding welfare programs, often branded with the prefix 'Amma' in reference to the late J Jayalalitha, who had been Chief Minister for 10 of the last 17 years. During elections, the state also sees pre-election 'freebies' (e.g., Television sets, rice cookers, cash etc.) given to voters, creating a narrative of a 'dormant electorate' in the state. The stalwarts of the two parties are no longer in active politics as Ms J Jayalalitha (AIADMK) passed away in late 2016 and Mr M Karunanidhi (DMK) has passed on the reins to the younger generation. Therefore, the state, and the city are looking at the emergence of a new set of leaders.

Chennai Corporation is largely depended on state and central grants, with low own revenue generation compared to most other major cities in India. Chennai Municipal Corporation's annual budget for 2016-2017 is INR 48,780 million (USD 753 million). Property taxes form the major revenue stream at INR 6,500 million (USD 100 million) and salaries form the major expense at INR 10,220 million (USD 158 million).

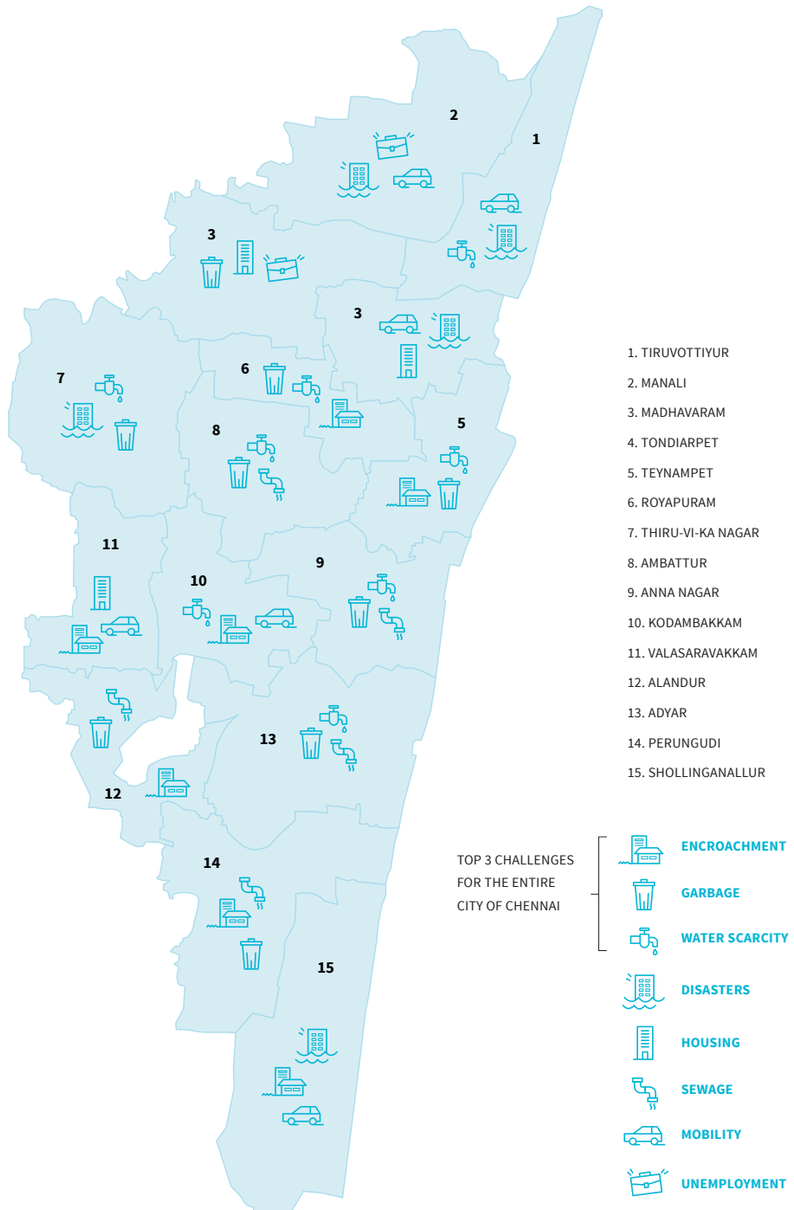
The revenue generated by the city covers only a small proportion of its total expenditure, as Chennai's share of own revenue in total expenditure was at just 27% in 2016, compared to 77% in Hyderabad, 68% in Delhi, 68% in Mumbai, and 47% in Bengaluru[23]. This reliance on state and central funding leads to significant dependence on, and significant influence of state, v and national bodies on local policies.

Civil society actors are attempting to bridge the gap in government capacity to deliver key services. Chennai has a vibrant civil society, ranging from funders (e.g., DFIs like the World Bank, Asian Development Bank, and Japan International Cooperation Agency) to technical experts (e.g., Citizen Action Group, World Resource Institute (WRI), Okapi etc.) to implementers (e.g., Environmentalist Foundation of India, Art of Living Foundation, Bhoomika Trust, Chennai volunteers, etc.). For instance, in water conversation, organizations such as the Care Earth Trust actively support government officials with technical expertise on Chennai's water bodies, while DFIs like the World Bank have funded large-scale river rejuvenation projects, and volunteer organizations (e.g., Chennai Trekker's club) have initiated river clean up initiatives through their large volunteer base. However, there is limited coordination between the government and civil society, and across civil society groups. Hence, these activities exist in siloes and rarely do they fit within a framework of coordinated response.

23. Annual Survey of India's City-Systems 2016, Janaagraha

2.3 PRIORITIZING SHOCKS AND STRESSES

Map of Chennai indicating top three challenges in each zone
Data for this map was aggregated from 2000 responses to a citizens perception survey



We prioritised Chennai's shocks and stresses based on inputs provided by citizens as well as government, civil society leaders, academics/technical, and corporate leaders. We deployed a mixed method approach of working sessions, citizen surveys, and one on one interviews. We provide below the aggregate results of the citizen perception survey and the agenda-setting workshop.

Priority shocks and stresses, discussed below, were triangulated through the agenda-setting workshop, and other stakeholder interactions. Furthermore, these priority areas show low variance across different zones in the city, and hence, are ubiquitous challenges. Below we highlight key implications for each challenge.

SPOTLIGHT

SELF-HELP GROUP (SHG) LED WASTE MANAGEMENT IN PAMMAL

In 1993, a group of women decided to initiate a door-to-door solid waste collection system in Ward no. 1 of Pammal, a sub-100,000 population town in Kanchipuram district. When residents showed their discomfort at paying for such a service, the group of women decided to recycle much of the waste to cover costs. Starting with a vermicomposting plant with an initial donation, the SHG expanded operations to all 21 wards in Pammal by 2006 thanks to CSR contributions from PepsiCo. In 2006, operations were formalised with the SHG turning into an NGO – Exnora Green Pammal (EGP). The NGO began selling its branded compost to farmers, which together with user's fees of INR 10-25 (USD 0.15 – 0.4) per household went a long way in covering its operating costs. Today, EGP is present in four states, serving half a million households. More recently, the local government has taken up the user fees, which combined with the on sales of waste helps EGP cover its total operating costs.

GARBAGE

Citizens rated garbage a 'very high' impact challenge while experts rated it as medium frequency/medium severity challenge. Some implications of poor solid waste disposal include:

- Contamination of city's water systems through drains or via direct dumping. The waste clogs Chennai's water systems, limiting their natural flow, and making de-silting harder
- Formal landfills and ad-hoc dumping yards often pose a major environmental/health risk to those living in the surroundings
- Garbage dumped in the open is an eyesore for residents and visitors alike

"It's very difficult to motivate residents to segregate at source. They ask, "even if we segregate at sources, what happens next? We often don't know."

TREASURER OF AN RWA

ENCROACHMENTS

Citizens of Chennai rated encroachments as a 'high impact' challenge while experts rated it as a high frequency and high severity stress. Some implications of encroachments include:

- Encroachments by private and public actors, especially in its ecological zones, have had a debilitating effect on the city's ecosystem – shrinking catchment areas of city's rivers, lakes, and ponds, due to encroachments, widely recognized as a major cause for the city's 2015 floods
- Encroachments also exacerbate other issues such as traffic, and create planning, and service delivery challenges

"Encroachment is political issue and we can rarely undo much of it on our own"

SENIOR BUREAUCRAT IN A PARA-STATAL BODY

WATER SCARCITY

Citizens of Chennai rated water scarcity as a 'high impact' challenge while experts rated it as a 'medium severity' but 'high frequency' challenge. Some implications of this include:

- In low rainfall years, Chennai's citizens receive approximately half the per capita water supply compared to central government norms
- Fundamental implications on wide ranging issues from public health to household budgets (for private purchase) to sanitation
- To bridge the gap both government and citizens have had to make significant capital investments (e.g., rainwater harvesting systems at home, desalination plants by government)

"It is indeed ironic that despite a vast system of lakes and rivers combined with very high annual rainfall, we are unable to provide populations with stable water supply"

SENIOR BUREAUCRAT IN A PARA-STATAL BODY

SEWAGE

Citizens rated sewage or liquid waste as a 'very high' impact challenge while experts rated it as medium frequency/medium severity challenge. A major implication of this includes:

- Limited sewage collection network, coupled with limited capacity of wastewater treatment plants, implies that in the off-season, Chennai's water bodies are carriers of untreated sewage
- Severe ecological imbalances. E.g. the Puzhuthi-vakkam Lake, has lost much of its aquatic and bird life, and has shrunk by 70% due to silting, thus influencing its ability to absorb and drain rain water.

"Because we don't periodically desilt the storm water drains even in low monsoon years, we have our ground floor homes flooded. Our zone is a low-lying area, we have to desilt constantly."

FORMER PROFESSOR WITH EXPERTISE IN WATER MANAGEMENT

TRAFFIC

Citizens of Chennai rated traffic as a 'high impact' challenge. Further, participants of the ASW rated 'traffic congestion' as a high frequency and high severity stress. Some implications of this include:

- Chennai's narrow main roads, increasing concentration of cars and high two-wheeler concentration has significantly slowed down traffic, reducing commercial efficiency. Limited capacity of existing public transportation networks, lack of integration, and para-transit/last-mile transit further exacerbates this problem.
- The city also has the highest frequency of deaths by road accidents compared to other major cities despite its relatively low population.

"People just do not feel responsible for their actions and the implications of that to those around them. Ownership of the city, its assets, and empathy towards other citizens is lacking."

FILM PRODUCER WITH EXPERIENCE IN PUBLIC INFORMATION CAMPAIGNS

DISASTERS

Citizens of Chennai rated disasters as a 'high impact' challenge while experts rated 'hurricanes, floods, cyclones, and heat waves' as a high frequency and high severity shocks. Some implications include:

- Each year, Chennai is faces a significant flood risk; major incidents in 2002, 2005, and 2015 led to significant loss of life, property, and economic productivity. During the 2015 floods, losses accrued to households, as well as large and small businesses alike. For example, limited insurance coverage meant that households had to write off losses/damages. Chennai's importance as an automobile hub meant that manufacturing halted, as well as both local and global delivery of automobiles. For MSMEs, limited resilience planning, both at the time of setup and in day-to-day operations also amounted to major losses, including a total stop on some industries (e.g. calendar manufacturers)

"The organic mobilisation of people during the floods was awe- inspiring. However, lack of coordination during the floods and poor preparedness and mitigation before them forced us to come together."

DIRECTOR AT A MAJOR THINK TANK

SPOTLIGHT

TAMIL NADU GOVERNMENT PREPARES FOR CYCLONE VARDAH

After the floods in 2015, the government was under considerable pressure to prepare for future disasters. Within a year, Cyclone Vardah hit Chennai. However, some lessons, like the importance of data and a coordinated response, were internalised from 2015. Two months prior, government bodies identified areas with different vulnerabilities to allocate resources when the cyclone hits. Volunteers were identified and trained by International NGOs, who became both first responders and the government's 'eyes and ears' on the ground. Providers of key public services such as hospitals and ESCOs were asked to prepare and protect critical infrastructure for the onset of the disaster. While the rainfall during the cyclone was much lower compared to 2015, damage to both life and property were limited by these efforts.

SPOTLIGHT

XS REAL PROPERTIES LAUNCHES PRADHAN MANTRI AWAS YOJANA COMPLIANT AFFORDABLE HOUSING

Tapping into the Central Government's desire to ensure 'housing for all' XS Real Properties has launched an affordable housing project in Guduvancherry (Kanchipuram district) of 1 and 2 bedroom apartments. These units cost between INR 4 to 10 lakhs (~USD 6200 – 15500) at an EMI of INR 2800 to 6800 (USD 43 to 105) after government subsidies. These homes are located just off the main GST road, and are located close to major amenities such as hospitals, and schools.

LACK OF AFFORDABLE HOUSING/INFORMAL SETTLEMENTS IN CHENNAI

Citizens of Chennai rated lack of affordable housing as a 'high impact' challenge while experts rated it as a high frequency/high severity stress. Some implications of this include:

- Sharp increase in slum population, while those looking for formal accommodation have moved to the city's peripheries
- This displacement has resulted in second order issues which include impacted livelihoods, sub-par service delivery, and law & order challenges
- In certain areas, significant inequality visible with pockets of high income households segregated from the swathes of low income ones

"Lack of affordable housing in the core of city is creating ghettos where low-income and middle- class groups are either moving closer to the coast or outside the city. We need more mixed planning and more affordable housing"

SOCIAL ACTIVIST WORKING WITH LOW- INCOME GROUPS

INTERCONNECTIONS BETWEEN SHOCKS AND LINKAGES

Shocks and stresses are closely tied to one another. Below we provide a matrix of different priority shocks and stresses and their linkages to each other. Links could exist in terms of causes (i.e., a shock or stress responsible for a shock or a stress), consequences (i.e., a shock or a stress resulting from a shock or a stress), or amplifications (i.e., a shock or a stress multiplying the effect of another shock or stress).

These linkages can either be circular or linear. For example, while disposal of untreated sewage in water bodies can reduce the capacity of the city's drainage system thereby causing floods; these floods themselves can worsen the problem of sewage as untreated and polluted water comes onto the land and becomes a cause for epidemics.

Figure 8: Interconnections between shocks and stresses in Chennai

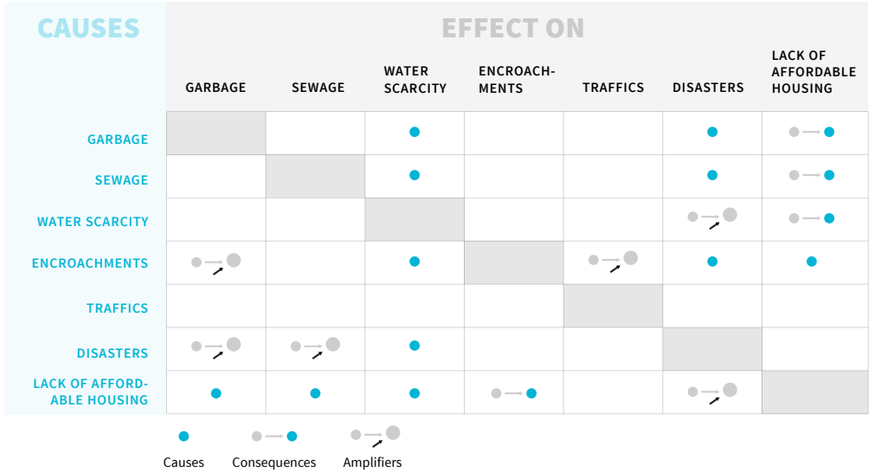
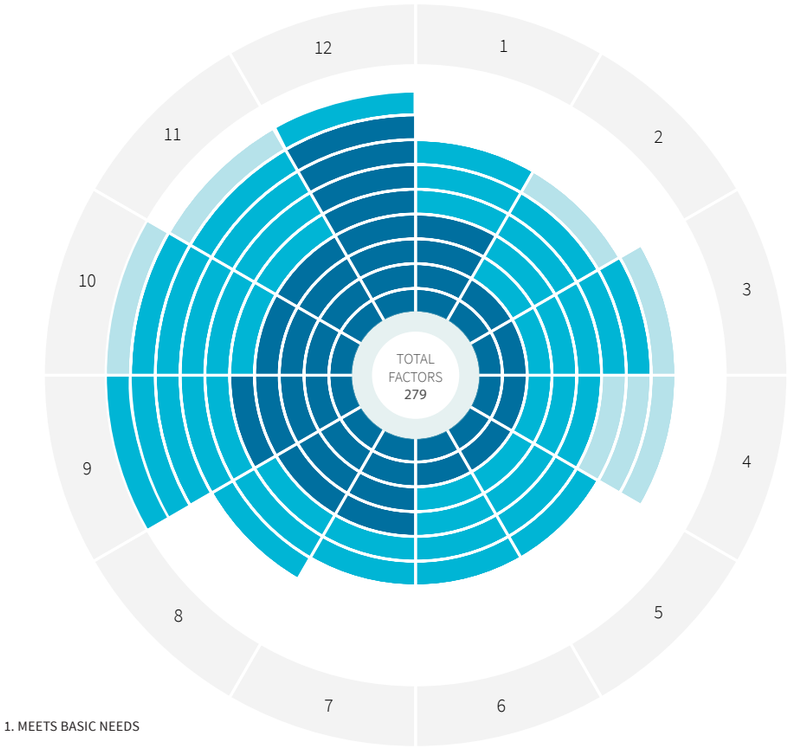


Figure 9: Stresses are often causes of shocks or other stresses

2.4 IDENTIFYING KEY RESILIENCE THEMES

We used the Preliminary Assessment (PA) Tool to understand broad resilience weaknesses and strengths for Chennai. City leadership, civil society members, technical experts, and corporate leadership provided inputs through a mixed method approach of working sessions, expert surveys, and interviews. Figure 18 lists broad resilience strengths and weaknesses of the city.

Figure 10: Preliminary Resilience Assessment



1. MEETS BASIC NEEDS
2. SUPPORTS LIVELIHOODS & EMPLOYMENT
3. ENSURES PUBLIC HEALTH SERVICES
4. PROMOTES COHESIVE & ENGAGED COMMUNITIES
5. ENSURES SOCIAL STABILITY, SECURITY & JUSTICE
6. FOSTERS ECONOMIC PROSPERITY
7. MAINTAINS & ENHANCES PROTECTIVE NATURAL & MANMADE ASSETS
8. ENSURES CONTINUITY OF CRITICAL SERVICES
9. PROVIDES RELIABLE COMMUNICATION & MOBILITY
10. PROMOTES LEADERSHIP & EFFECTIVE MANAGEMENT
11. EMPOWERS A BROAD RANGE OF STAKEHOLDERS
12. FOSTERS LONG-TERM & INTEGRATED PLANNING

Need to do better
Doing well, but can improve
Area of strength

KEY RESILIENCE WEAKNESSES

1. LEADERSHIP AND STRATEGY

The area of leadership and strategy, encompassing drivers 10 ('Promotes Leadership & Effective Management), 11 ('Empowers a Broad Range of Stakeholders'), and 12 ('Fosters Long Term & Integrated Planning') is the area is perceived to be the most significant weakness in the resilience context by stakeholders. These point at fundamental, structural challenges which impact governance capacity, and have significant influence on the other areas (infrastructure & environment encompassing drivers 7-9, economy & society encompassing drivers 4-6, and health & wellbeing encompassing driver 1-3) of the resilience wheel as well. However, this is also an area where positive impact can have significant leverage.

"We do not have the data on water supply after it enters the pipes. We do not know the leakages both during and at the point of consumption. It's difficult to make decisions in such an environment"

LEADERSHIP OF WATER BOARD

1A. 'Fostering long-term and integrated planning' is a key challenge in Chennai for which all major sub-drivers (i.e., building codes and standards, land use planning, strategies and plans, and access to data & monitoring) were highlighted as weaknesses. This challenge manifests itself across the city, and its implications are widely visible. For example, the city's inability to control construction of new residential and commercial complexes, and enforce building codes and standards, especially in ecological zones, has been blamed for the frequency and increasing impact of natural disasters such as the 2015 floods. Another example is the city's inability to manage its water systems, in part due to the absence of robust and comprehensive water data.

"We had a few consultations during the Vision 2020 document discussion with government but none of this comes up in the actual document."

LEADERSHIP OF WATER BOARD

1B. 'Empowers a broad range of stakeholders': is another key challenge, with 'knowledge transfer', 'communi-cation between government and public', and 'risk monitoring' highlighted as key weaknesses. For example, civil society leaders mentioned that not only is a structured relationship between civil society and the government absent but often it is unclear whether the government has data on actors in the space. Another instance is the resettlement of low-income groups to Ezhil Nagar and Perumbakkam, where lack of consultations meant that livelihood ties were severed, which led to over 15-20% increase in unemployment within the resettled community.[24]

1C. 'Promoting leadership and effective management' within which alignment across different stakeholders, and strong decision making & leadership are particularly highlighted as challenges by stakeholders. For example, many civil society groups mentioned a lack of continuity within bureaucracy as a major challenge. High levels of attrition / rotation within the government meant that successors would often bring their own approach and priorities, requiring civil society groups to build consensus from scratch. Further, stakeholders, both government and private, were frustrated by the lack of movement on many key ideas (e.g., a dashboard that could give a big picture view to a senior bureaucrat).

24. Forced to the Fringes: Disasters of 'Resettlement' in India. Report Two: Kannagi Nagar, Chennai. Housing and Land Rights Network (New Delhi: 2014)

2. INFRASTRUCTURE AND ENVIRONMENT

The dimension of infrastructure & environment encompassing drivers 7 ('Provides & Enhances Natural & Manmade Assets'), 8 ('Ensures Continuity of Critical Services'), and 9 ('Provides Reliable Communication & Mobility') has been identified as another broad area of weakness by stakeholders. These areas are important human development indicators and can potentially impact low-income citizens / residents of informal settlements disproportionately. The driver linked to natural and manmade assets, is also linked to the critical aspect of the maintenance of Chennai's water bodies and ecosystem, which impact a variety of shocks and stresses.

2A. 'Providing and enhancing natural and man-made assets' within which key weaknesses, as perceived by stakeholders, include, 'environment policy' and 'safeguard of critical infrastructure'. Through our interactions, including the ASW, the challenge of Chennai's aging infrastructure, its shrinking rivers, and its inability to manage its solid waste have been constant refrains. Stakeholders from across the board agree that limited stewardship of Chennai's critical infrastructure led to the adverse consequences faced during the Chennai floods. For example, the encroachment of the Pallikarnai marsh and over 3600 water bodies that is understood to have been a major cause for the 2015 floods.

2B. 'Ensures continuity of critical services' within which maintenance of assets, emergency plans for critical services, ecosystem management, and flood risk management are identified as key challenges. The city faced major floods in 2002, 2005, and 2015 and in each year, calls for a stronger and well- coordinated emergency response system have grown. Further, the city's natural assets including its water bodies, green cover and others, have been degrading due to both natural and man-made drivers, increasing the risk of disasters, and the risk of widespread damage to life and property upon the occurrence of disasters. Focus on this critical aspect has been growing, among both government and civil society actors, as evidenced in our working group discussions.

POSITIVE STEPS

ADYAR POONGA (CHENNAI RIVER RESTORATION TRUST)

Chennai River Restoration Trust (CRRT), established in in 2006, as a multi-stakeholder body with representatives from both state and local government to plan and implement eco-restoration projects of rivers, lakes, and creeks in Chennai.

As its first project, CRRT restored Adyar creek and its surrounding areas through the following activities: (a) excavating sludge and debris with some excavated soil retained for plantation, (b) retrofitting storm water drains entering the creek to sewer pipelines with support from Metro Water, (c) utilizing land in surrounding areas to support and enhance coastal vegetation, (d) protecting and encouraging animal diversity.

In Phase 1 of the restoration (called Adyar Poonga), water spread increased from 6% to about 60%, plant species grew to over 172 and animal species, more than doubled, from 65 to 159. Adyar Poonga is now a hub for recreation and environmental awareness.

It has also become an example of what can be achieved through focused, integrated efforts and co- operation across departments

2C. Providing reliable communications & mobility within which transport network and public transport are identified as major challenges by stakeholders. Stakeholders mentioned lack of integration between different forms of public transportation, and limited capacity of existing systems as key drivers increasing ownership of private transportation, and consequently traffic jams (identified as a major issue in the Citizen Perception Survey). Chennai's second master plan (2006-2026) is aims to build sustainable transportation networks, however, implementation has been slow and there is dissonance between plans and actions (e.g., funding geared towards two-wheel/four-wheeler friendly infrastructure like flyovers rather enhancing public transport capacity.)

3. MEETING BASIC NEEDS, WITHIN THE HEALTH & WELLBEING DIMENSION

Lack of affordable housing, and water scarcity have both been identified as major issues in the Citizen Perception Survey. The same is reflected in the stakeholder perception of which basic needs are not being met well within the city. As the city expands to the peripheries, providing access to clean drinking water to all, and quality housing to low-income groups are becoming major issues. Per capita supply in Chennai is 58 lpcd, which is less than half the norm under the Atal Mission for Rejuvenation and Urban Transformation25. Affordable housing is gaining ground in Chennai with improved financing for builders, however, the demand-supply mismatch is significant, leading to people being pushed out to either precarious informal settlements or distant (i.e., away from employment hubs and transportation networks) peripheries of the city.

SPOTLIGHT

INTEGRATION THROUGH CULTURE: URUR OLCOTT KUPPAM VIZHA

Urur-Olcott Kuppam Vizha attempts to use art and music to bring people belonging to different socio- economic groups together. The festival is held in Urur-Olcott Kuppam, a small fishing hamlet on the shores of Besant Nagar in Chennai. The location is unfamiliar to the middle-upper income groups and hence allows them to both experience the art and learn about the lifestyle of a different socio-economic class, leading to the development of empathy and correction of long held prejudices. The festival also attempts to delink 'classic' art from caste/class differences. The vizha exposes the social elite of the city to art usually considered 'not-for-them'.

The last 3 years of the vizha has witnessed Pariattam, Vilupattu, Kuchupudi, Bharathnatyam, Carnatic music, Koothupattarai, Tamil pop music, drama, mime and more. The festival is conducted by Urur Olcott Vizha volunteers consisting of people from all sections of the society. The volunteers also organise music events in public spaces like the Railway station, Bus stations, buses etc.

KEY RESILIENCE STRENGTHS

1. PROMOTING COHESIVE AND ENGAGED COMMUNITIES, WITHIN THE ECONOMY & SOCIETY DIMENSION

Key strengths, as perceived by stakeholders, include 'community participation' and 'local identity & culture'. Chennai being both a modern and historically important city has a unique blend of cosmopolitanism, and its historically singular dance, music, religious, and food cultures. Citizens have increasingly begun engaging on social, political, and civic issues. The recent protests to protect Jaalikattu (a regional festival), as well as the mass mobilisation during the 2015 floods are prime examples of community participation.

25. Press information bureau, press release, Government of India, Nov 2015

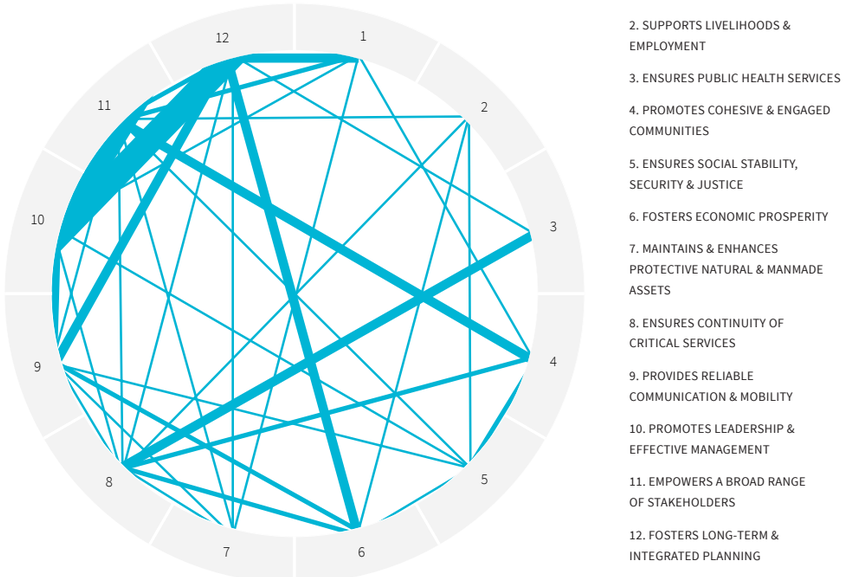
2. ENSURING PUBLIC HEALTH SERVICES, WITHIN THE HEALTH & WELLBEING DIMENSION

All the sub-drivers within 'Ensuring public health services' received a moderate rating from stakeholders, who did not see them as strengths but also not as weaknesses. Chennai is known for its relatively strong healthcare system with wide availability of both public and private facilities. While much of the private healthcare is unaffordable for low-income groups, it has become a hub for medical tourism. The state overall has relatively higher penetration of insurance, better infrastructure (e.g., beds per 1000 is among the highest in the country), and higher number of registered doctors.

INTERDEPEN-DENCIES BETWEEN DRIVERS OF RESILIENCE

The tool below aggregates linkages between sub-drivers of different drivers within the perceptions assessment tool to provide an overview of interdependencies between resilience drivers. The tool is useful in identifying drivers that can be addressed / leveraged simultaneously given their strong interdependencies as well as providing clarity on some discrepancies in strengths and weaknesses.

Figure 11: Perception dependencies



1. MEETS BASIC NEEDS
2. SUPPORTS LIVELIHOODS & EMPLOYMENT
3. ENSURES PUBLIC HEALTH SERVICES
4. PROMOTES COHESIVE & ENGAGED COMMUNITIES
5. ENSURES SOCIAL STABILITY, SECURITY & JUSTICE
6. FOSTERS ECONOMIC PROSPERITY
7. MAINTAINS & ENHANCES PROTECTIVE NATURAL & MANMADE ASSETS
8. ENSURES CONTINUITY OF CRITICAL SERVICES
9. PROVIDES RELIABLE COMMUNICATION & MOBILITY
10. PROMOTES LEADERSHIP & EFFECTIVE MANAGEMENT
11. EMPOWERS A BROAD RANGE OF STAKEHOLDERS
12. FOSTERS LONG-TERM & INTEGRATED PLANNING

AMONG THE VARIOUS INTER-DEPENDENCIES WE HIGHLIGHT THREE 'STRONG' LINKS OBSERVED IN OUR DATA COLLECTION PROCESS.

1. **Promoting leadership and effective management' and 'fostering long-term and integrated planning':** Ensuring alignment within government, as well as between government and civil society is critical to driving long-term planning. Programs where resident welfare associations, non-profits, and Chennai Corporation have come together have typically been successful and have sustained overtime.

2. **'Empowering a broad range of stakeholders' and 'promoting cohesive and engaged communities':** A key driver for citizen engagement is likely to be the space available for citizens to engage with the government without significant opportunity cost / direct cost. In the civic- engagement working-group discussion, civil society groups highlighted greater engagement from the government through consultations and town halls as well as transparency in decision making as being critical for citizens to feel influential, and consequently, engaged with the city's political, social, and civic issues. This would also drive a sense of empowerment, leading to greater participation in these issues, and decision making in the future.

3. **Ensuring public health services' and 'ensuring continuity of critical services':** In Chennai, solid and liquid waste are deeply linked with many aspects of city resilience, including public health. In areas where dumping of untreated liquid waste and unsegregated solid waste into water bodies continues unabated, there is a significant public health penalty for the city. The recent dengue related deaths in the city are just one example of the epidemic risk that poor maintenance of assets pose.

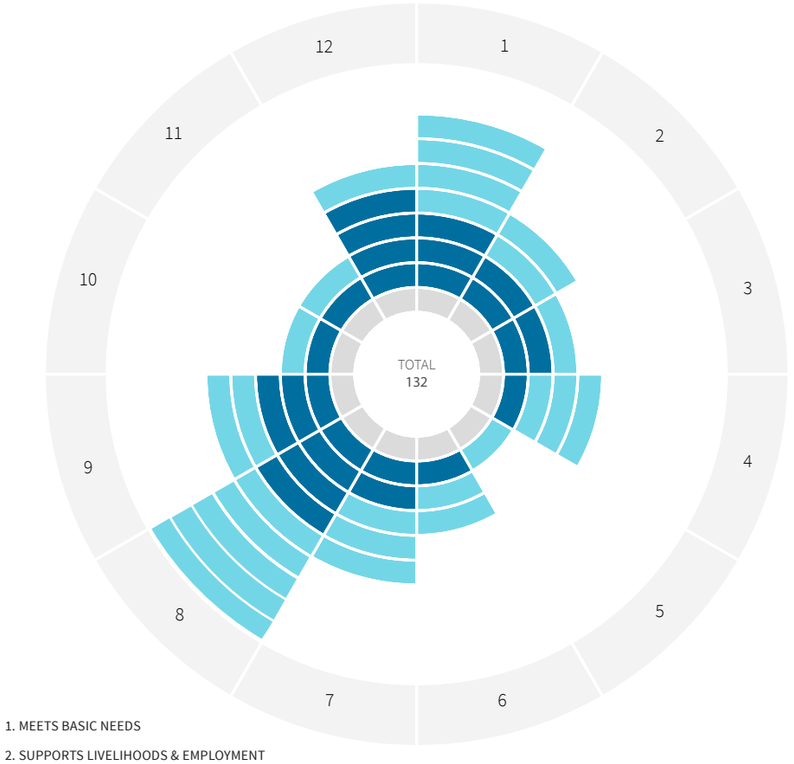
2.5 SYNTHESISING CURRENT RESILIENCE INITIATIVES

We worked with stakeholders from across government, and civil society to put together a list of resilience related activities in Chennai. The purpose of this activity was to identify actions and gaps in resilience efforts across different drivers of resilience.

Note: This is an evolving activity that we believe will continue beyond this phase. The current output is determined by the conversations that we have had, the sources that we have identified, and our evolving priorities in terms of focus areas. We hope to engage more stakeholders to dynamically identify and resolve gaps, and share with them, at regular intervals, this 'big picture' view of initiatives in the city.

We provide below the summary of different actions across the 12 drivers in the city resilience framework.

Figure 12: Overview of resilience actions



AREAS OF DEEP ENGAGEMENT

1. ENSURING CONTINUITY OF CRITICAL SERVICES

Ensuring continuity of critical services is an area of weakness for the city based on perceptions of stakeholders. Post 2015, however, flood management has become an urgent matter in the city with civil society, corporates, and the government working actively to clean up ponds on the one end, and conduct a mass rejuvenation of an entire river/basin on the other. Civil society has taken a leadership role in improving the city's green cover through plantation drives.

ACTION TITLE	DECRIPTION	OWNERSHIP	SCALE	SHOCK/STRESS
Integrated Cooum restoration	Conducted by CRRT and funded by the World Bank, the multi- stakeholder restoration includes removing silt and sewage, installing modular sewage treatment, and developing the flora and fauna in and around the river	Government	City	Encroachments, disasters, Sewage, and water scarcity
Ther Urban Farmer	The project works with large institutions to support segregation at source, composting and urban gardening	Civil societyt	City	Solid waste
Cognizant Green Brigade	A volunteer group of Cognizant employees that works with non-profits to restore ponds and plant trees	Corporate	Community	Encroachments, disasters, Sewage, and water scarcity

2. MEETING BASIC NEEDS

Meeting basic needs is an area of weakness for the city based on perceptions of stakeholders. The government has taken significant steps to improve the water, housing, and energy situation in Chennai. On water, restoration of water bodies is being combined with desalination plants to enhance the city's water supply. On housing, while the private sector is deeply involved in building high-income and middle-income housing, the Tamil Nadu Slum Clearance Board (TNSCB) has worked to resettle people living in informal settlements.

ACTION TITLE	DECRIPTION	OWNERSHIP	SCALE	SHOCK/STRESS
Nemmeli desalination plant	Constructed by a consortium of private sector firms, the plant provides water access to residents of South Chennai	Government	City	Water scarcity
Ford India	Ford India has worked over the past decade to make its operations more sustainable by reducing carbon emissions and water usage while improving the energy efficiency of its vehicles	Corporate	City	Water scarcity, electricity and pollution
Post-flood rehabilitation	Low-income groups were moved to affordable housing plots after the 2015 floods by the Tamil Nadu Slum Clearance Board (TNSCB)	Corporate	Comminity	Disasters; lack of affordable housing

AREAS OF MILD ENGAGEMENT

1. ENSURING SOCIAL STABILITY, SECURITY, AND JUSTICE

Ensuring social stability, security, and justice is a relative area of strength for the city. However, we identified certain areas of intervention undertaken by civil society groups and government bodies, which highlight some of the challenges within this resilience driver. We provide a small sample of these initiatives.

ACTION TITLE	DECRIPTION	OWNERSHIP	SCALE	SHOCK/STRESS
Right to the city: Chennai for All	Preventing mass evictions of slum dwellers across the banks of Cooum	Civil society	Community	Lack of affordable housing
Road safety policy	Strategies to curb presence of privately owned transportation on the roads and enhance public transport usage	Government (State)	City	Road accidents
Kelu Chennai Kelu	A crowdsourced report and public hearing to present concerns of the citizens related to flood preparedness to the local government	Civil Society	City	Disasters

2. PROMOTING LEADERSHIP AND EFFECTIVE MANAGEMENT

Promoting leadership and effective management is perceived to be an area of weakness for the city. We observed some effort in improving coordination during emergencies through disaster management plans, and by building alignment within the government through committees or bodies with a cross-section of government actors. Few actions include civil society working with the local government (as technical experts) to ensure broader policy buy-in. Initiatives are typically funded by the government or donors of civil society groups (i.e., as part of ongoing operating expenses of these groups). We provide below a small sample of these initiatives.

ACTION TITLE	DECRIPTION	OWNERSHIP	SCALE	SHOCK/STRESS
12th five-year plan for disaster management	Includes risk monitoring, training, coordination with hospitals, preparation of relief centres etc.	Government (State)	State	Disasters
Chennai River Restoration Trust	A para-statal body that includes representatives from local as well as state government working together to rejuvenate Chennai's rivers	Government	City	Water & Disasters
Bicycle sharing system	Institute for Transport Development Policy (ITDP) is working with the Corporation to create a cycle sharing system across the city which can act as para-transit to other forms of transportation	Civil Society and Government	City	Traffic

3. EMPOWERING A BROAD RANGE OF STAKEHOLDERS

Empowering a broad range of stakeholders is an area of weakness for the city. Based on our observations, initiatives focused on education were dominant, which is a positive development. Funding for education initiatives typically came from Corporation funds or Corporate CSR. Efforts to enhance the interface between government and the public were typically led by civil society groups through studies, public forums, surveys etc. Finally, some knowledge transfer activities were observed but there was little systematisation of this.

ACTION TITLE	DECRIPTION	OWNERSHIP	SCALE	SHOCK/STRESS
Shikshaantar	Tech Mahindra is working with the Chennai Corporation to provide high quality training in English to public school teachers	Corporate	City	Education
Traffic park	Chennai Corporation is building a traffic park near Napier's bridge that will be a hub for public education on all things related to traffic	Government	City	Traffic
From the deluge to displacement	A study conducted by the Housing Land Rights Network is a deep dive challenges faced by people in Ezhil Nagar and Perumbakkam after resettlement from coastal areas	Civil Society	Community	Disasters & lack of affordable housing

Both the interdependence and the long-term nature of these challenges suggest that stability and coordination across city and state leadership is essential. The CRO has the opportunity to convene stakeholders across levels, and types, and promote resilience thinking that sets Chennai on track to manage its challenges.

③

DISCOVERY

AREAS FOR PHASE 3

We have identified six broad discovery areas across Chennai's water systems, disaster management, civic engagement, informal settlements, and unplanned growth. Within each discovery area, we have key questions, which need to be answered in relation to these themes in Phase 2, as they relate to Chennai's resilience. Further, we have identified 1-2 pilot projects under each theme that we will undertake during the strategy phase to gain some early traction, and on-the-ground experience.

WATER SYSTEM

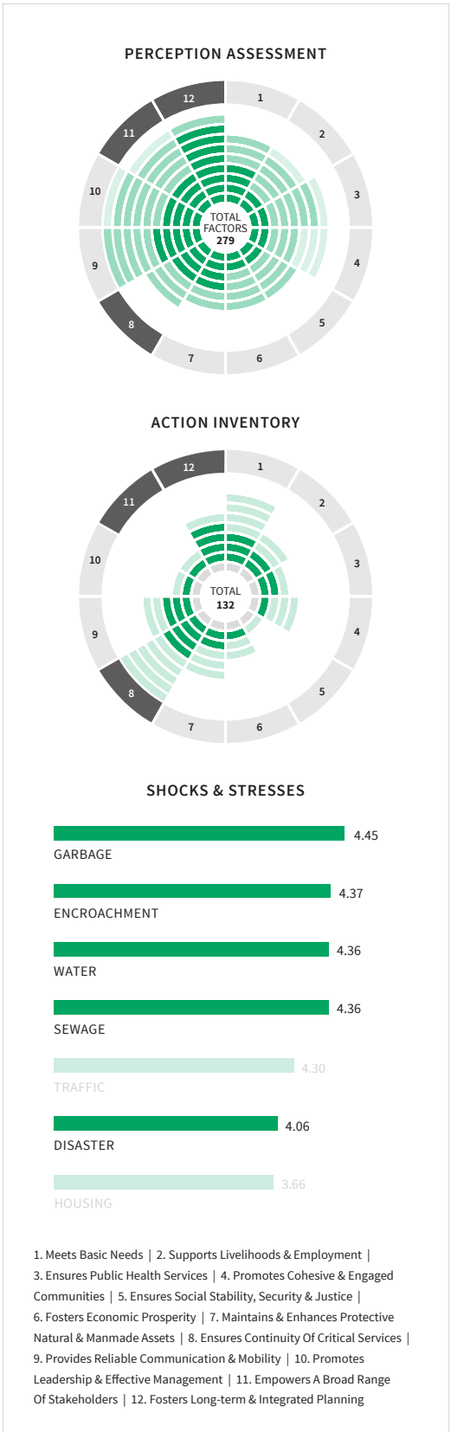
BUILDING A BETTER UNDERSTANDING OF THE WATER SYSTEM IN CHENNAI

OVERVIEW

The water system in Chennai currently suffers from limited, and fragmented information. Collecting, storing, analysing, synthesising, and presenting actionable data in relation to Chennai's water system (i.e., from source to consumption). This limits a common understanding, across all actors, of the city's water system, its priority challenges, and its interactions with other systems (e.g. with the solid waste system). Building a better understanding of the system and its interactions will be crucial to ensure the viability of the city's water ecosystem.

KEY CHALLENGES

Currently, **the institutional setup managing the water bodies of Chennai** is quite complex with control resting across a wide variety of state, local, and para-statal bodies. **Siloed thinking and unavailability of required infrastructure and underinvestment hamper information collection and analysis efforts across the value chain** (e.g. low metering). Further, **authorities are unable to curb overexploitation**, as there are limited avenues for enforcement.



KEY STRENGTHS TO LEVERAGE

There is a clear urgency among leaders to respond to water issues especially since the 2015 floods.

Key questions:

- How do we aggregate on-going efforts, initiatives, and expertise between government bodies, civil society, private sector, and other actors and institutionalise government's ability to coordinate and leverage them?
- What underlying systems need to be put in place (e.g., effective water pricing/payments system) to build an integrated water data strategy?
- How do we promote efficient and responsible water management practices among end-users?
- How can we drive action on stresses (e.g. solid waste, encroachments etc.) that influence the water system?
- How can we drive a better understanding of climate change as it relates to the city's water system?
- What technologies & processes can we identify that will assist in decentralising waste water infrastructure?
- How do we redesign our storm water drain systems to maximise ground water recharge ?
- As the city grows into its peri urban areas , how do we restore, protect and reintegrate the water bodies in our water catchment areas (Kancheepuram and Tiruvallur) in a sustainable manner?

SOME POTENTIAL PARTNERS

Environmentalist Foundation of India
Art of Living Foundation
Chennai Corporation
CRRT
Metrowater
NIUA urban observatory
Care Earth Environmentalist Foundation of India

POTENTIAL PILOTS

- **Keelkattalai lake restoration.** Providing knowledge and enabling partnerships for The Nature Conservancy (TNC) to get its Keelkattalai restoration pilot off the ground. TNC brings in a network of 600 scientists and regional/international funders as a 100RC platform partner.
- **Leverage water for transformative change.** Leveraging the experience of the Netherlands in water and flood management, 100RC, in partnership with the Dutch government, is looking at a holistic solution to Chennai's water challenges. As a first step, a global design challenge was announced at COP 23 in Bonn to develop innovation solutions for water challenges in 3 cities including Chennai. Details of this challenge will become available in early 2018. 'You can find more information at *www.waterasleverage.org.*

METRO GOVERNANCE

INSTITUTIONALISING MULTISTAKEHOLDER COORDINATION AND IMPROVING MONITORING AND ENFORCEMENT CAPABILITIES OF GOVERNMENT AND SOCIETY

OVERVIEW

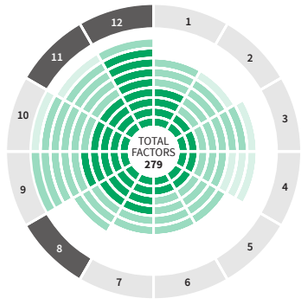
Different government bodies as well as civil society, and cities groups are storehouses of different kinds of expertise, capabilities, and knowledge. Coordination across the board and harmonising the levels of expertise continue to remain a challenge. In addition, local government and parastatal bodies lack the capacity to monitor delivery of key public services or enforce regulations. Chennai is expanding outwards and consuming more resources, and in order to ensure that the city's growth is sustainable and equitable to all, it needs to manage and control the use of key resources (e.g., land, private vehicles etc.) and safe disposal of both solid and liquid waste.

KEY CHALLENGES

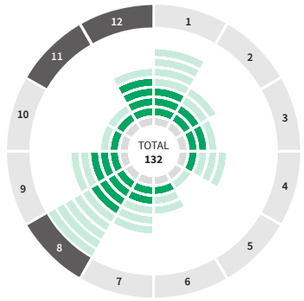
A lack of decision-making systems that are customised for the city and are broad based. For example, there is no nodal body for disaster management for the city of Chennai; the Disaster Mitigation Unit, a state government unit, leads disaster response. Further, **civil society plays a minimal role in decision making and planning within this unit**, and their support is requested and gained only in the time of crisis.

From an enforcement perspective, **the government has limited capacity** to manage the volume of violations that occur every day, and the level of **discretionary power at the enforcement level limits accountability** in the system. In relation to monitoring, government bodies are **yet to build formal feedback loops** that integrate learnings from third party initiatives or data collected in their own operations (e.g., citizen grievances). Local **individuals and civil society are not perceived to be empowered, are not integrated in government decision making, and are not part of**

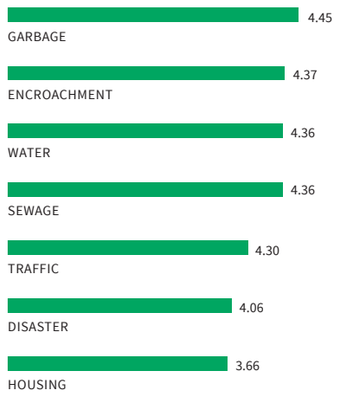
PERCEPTION ASSESSMENT



ACTION INVENTORY



SHOCKS & STRESSES



1. Meets Basic Needs | 2. Supports Livelihoods & Employment | 3. Ensures Public Health Services | 4. Promotes Cohesive & Engaged Communities | 5. Ensures Social Stability, Security & Justice | 6. Fosters Economic Prosperity | 7. Maintains & Enhances Protective Natural & Manmade Assets | 8. Ensures Continuity Of Critical Services | 9. Provides Reliable Communication & Mobility | 10. Promotes Leadership & Effective Management | 11. Empowers A Broad Range Of Stakeholders | 12. Fosters Long-term & Integrated Planning

formal feedback systems, leading to long winded accountability loops. Finally, some sectors (e.g., construction/real estate), are unique in that they are **deeply entrenched in local politics** leading to the disempowerment of enforcement officials.

KEY STRENGTHS TO LEVERAGE

The city can leverage its strong healthcare system and history of community participation.

KEY QUESTIONS

- How do we better identify and leverage areas of expertise, from both within and outside of the government setup?
- How do we improve and institutionalise coordination within government departments, and across different levels?
- How can we improve coordination between government and civil society, before, during, and after disasters?
- How can we improve monitoring and enforcement capacity in Chennai? What role can civil society, citizens, and academics play in improving these capacities?
- How do we de-politicise governance?
- How can we reduce the barriers and frictions in government to citizen interactions?

SOME POTENTIAL PARTNERS

Blue Cross of India
Chennai City Connect
Coast Guard
Tamil Nadu Disaster Mitigation Unit
Chennai Corporation
Bhumika Trust
World Resources Institute
Comptroller and Auditor General of India
Chennai Metropolitan Development Authority
Confederation Of Real Estate Developers' Associations Of India
Transportation Ministry (Tamil Nadu government)
Traffic Police

POTENTIAL PILOTS

1. **Disaster response training.** In partnership with the Coast Guard, Blue Cross of India, and Apollo Hospitals, we are looking to engage, develop and deploy a disaster response training module among citizens of the city, at the ward level.
2. **Disaster dashboard.** In partnership with World Resource Institute (WRI), we are looking to develop a disaster response dashboard that provides real-time information to local government leadership for efficient resource allocation.

CIVIC ENGAGEMENTS

DEEPENING CITIZEN'S INVOLVEMENT IN PROTECTING COMMON ASSETS, ESPECIALLY THE CITY'S BLUE AND GREEN COVER

OVERVIEW

Many of Chennai's stresses relate to a failure of collective action. Stresses such as overexploitation of its water resources, encroachment of ecological zones, traffic congestion etc., can be partly explained by citizens not responding or valuing the city and its assets.

KEY CHALLENGES

A lack of awareness among citizens, who often do not understand the linkage between individual behaviour and collective failure, is a major challenge. Further, limited enforcement of laws means that deterring asocial behaviour, and setting appropriate disincentives is a challenge. Finally, a low perception of influence among citizens, who believe that their voice does not matter is an issue.

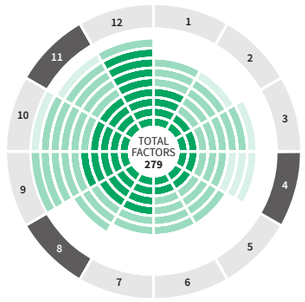
KEY STRENGTHS TO LEVERAGE

Chennai's unique culture and identity can be leveraged by anchoring greater political, social, and civic responsibility in pride for this culture, and using that to enhance awareness and engagement.

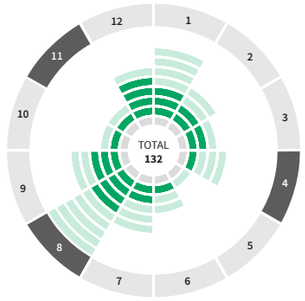
KEY QUESTIONS

- How can cultural pride be leveraged to transform behaviour towards common assets?
- How can institutional space be created for citizen groups to participate in governance?
- How can we cultivate champions and agents of change in schools and colleges to instil a greate sense of civic consciousness?
- How can the private sector be engaged in protecting common assets?
- While citizens desire a 'clean city', how can we inspire action that ensures cleaner public spaces?

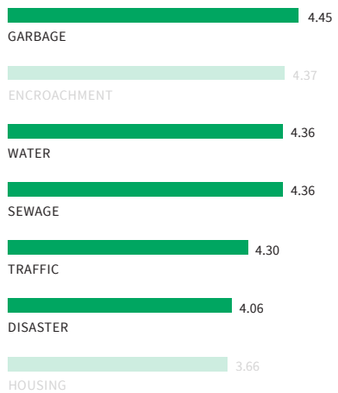
PERCEPTION ASSESSMENT



ACTION INVENTORY



SHOCKS & STRESSES



1. Meets Basic Needs | 2. Supports Livelihoods & Employment | 3. Ensures Public Health Services | 4. Promotes Cohesive & Engaged Communities | 5. Ensures Social Stability, Security & Justice | 6. Fosters Economic Prosperity | 7. Maintains & Enhances Protective Natural & Manmade Assets | 8. Ensures Continuity Of Critical Services | 9. Provides Reliable Communication & Mobility | 10. Promotes Leadership & Effective Management | 11. Empowers A Broad Range Of Stakeholders | 12. Fosters Long-term & Integrated Planning

SOME POTENTIAL PARTNERS

Swachh Bharat Mission (Urban)
Voice of People
Chennai Corporation
Vodafone
Kavithalayaa Productions
Nizhal
The Hindu
Chennai Trekker's Club

POTENTIAL PILOTS

1. **Urban horticulture:** In partnership with the students of University of British Columbia, CRO and his team is looking to leverage the significant roof space in Chennai to pilot terrace gardens that can help the city improve its green quotient.
2. **Urban Resilience training:** We are looking to train citizens to become more aware of the resilience issues affecting Chennai with the long-term aim of building a cadre of future civil servants who champion resilience.

VULNERABLE AND LOW INCOME GROUPS

ENSURING HIGH QUALITY SERVICE DELIVERY TO LOW-INCOME GROUPS ESPECIALLY THOSE IN INFORMAL SETTLEMENTS

OVERVIEW

No new slums have been notified in the last 30 years while slum population has almost doubled. Weak access to services due to lack of legal resident status, loss of livelihoods & public goods due to relocation, discrimination based on various cleavages including caste, etc. are all significant challenges. Addressing these challenges can ensure that the benefits of the city's growth are distributed equitably.

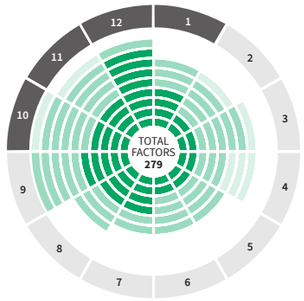
KEY CHALLENGES

The absence of **land security**, with <15% of informal settlers having land titles, leaves them susceptible to evictions. Further, **poor quality public services**, which are partly driven by the density and geography of settlements, and partly by lack of land security and low government capacity, is especially pronounced for these vulnerable groups. Chennai, despite its cosmopolitan fame, continues to observe undercurrents of caste **discrimination**, limiting the ability of vulnerable and low-income groups to educate themselves and rise out of their current socio-economic class. While informal settlements are not primary drivers of **encroachments**, the presence of small habitations in key ecological zones poses a flood risk to both the settlers and exacerbates the risk to the city, as a whole.

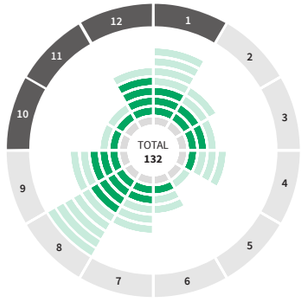
KEY STRENGTHS TO LEVERAGE

Leveraging both core competence as well as corporate social responsibility of city's **vibrant private sector** can help bolster service delivery in the city. Further, Chennai is a major hub for **tertiary education**, which can help drive social innovation in service delivery for the city's vulnerable groups.

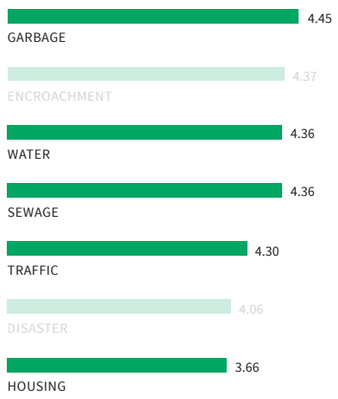
PERCEPTION ASSESSMENT



ACTION INVENTORY



SHOCKS & STRESSES



1. Meets Basic Needs | 2. Supports Livelihoods & Employment | 3. Ensures Public Health Services | 4. Promotes Cohesive & Engaged Communities | 5. Ensures Social Stability, Security & Justice | 6. Fosters Economic Prosperity | 7. Maintains & Enhances Protective Natural & Manmade Assets | 8. Ensures Continuity Of Critical Services | 9. Provides Reliable Communication & Mobility | 10. Promotes Leadership & Effective Management | 11. Empowers A Broad Range Of Stakeholders | 12. Fosters Long-term & Integrated Planning

KEY QUESTIONS

- What is the composition of the city's informal settlements, based on key developmental and service delivery parameters? On what key parameters do informal settlements vary?
- Under which scenarios, and for what kind of informal settlements, is 'in-situ' development preferred over resettlement?
- What are some pathways to transform informal to formal settlements that are centered on the needs of residents, and account for the priorities of government?
- What is the ideal form of resettlement factoring in various complexities of communities being resettled?
- How do we diversify the housing market to cater to varying demands in particular for low- income groups?
- How do you reduce vulnerabilities in disaster prone areas?

SOME POTENTIAL PARTNERS

Tamil Nadu Slum Clearance Board
Information and resource center for the deprived urban communities (IRDUC)
Citizen Action Group (CAG)
Vettiver Kotamaippu
Madras Institute of Development Studies (MIDS)

POTENTIAL PILOTS

Pilot projects to be developed during the strategy preparation phase.

HEALTHY AND PLANNED URBANIZATION

ENABLING POLICY MAKERS TO MANAGE URBAN GROWTH AND EXPANSION

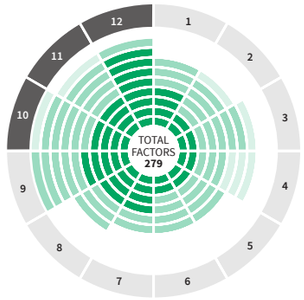
OVERVIEW

Chennai is expanding, in terms of both people and territory. While recent announcements have Formalised this expansion and the city is set to grow over 7 times its current size, bodies responsible for managing this expansion have to leverage scarce resources, and capacity to ensure sustainable access to key public services such as transportation, waste collection and disposal, water and sanitation, housing etc. Planners and policy makers have to ensure that the growth is managed well and the politico-legal framework (including land use regulations) within which this growth occurs is robust enough for the city to sustain vibrant social and economic lives for its people.

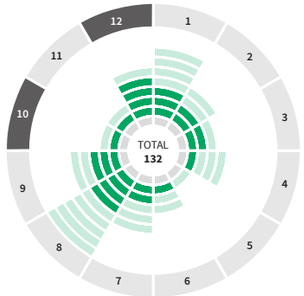
KEY CHALLENGES

Limited assimilation of best practices into the planning process. While external experts (e.g. ITDP in transportation) have made headway in influencing the planning process, there needs to be seamless integration between various actors in how the city plans for its expansion. **Lack of integration between service delivery and planning** leads to inappropriately designed plans, which have to undergo substantial changes when they encounter on-the-ground issues. **Limited institutional memory leads** to personality driven policies and focus, leading to sharp shifts whenever an important leadership post changes hands. **Siloed planning**, as has been highlighted before, leads to inefficiencies, and solutions which act as quick fixes but do not address the bigger picture.

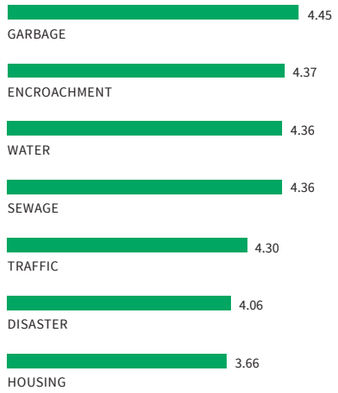
PERCEPTION ASSESSMENT



ACTION INVENTORY



SHOCKS & STRESSES



1. Meets Basic Needs | 2. Supports Livelihoods & Employment | 3. Ensures Public Health Services | 4. Promotes Cohesive & Engaged Communities | 5. Ensures Social Stability, Security & Justice | 6. Fosters Economic Prosperity | 7. Maintains & Enhances Protective Natural & Manmade Assets | 8. Ensures Continuity Of Critical Services | 9. Provides Reliable Communication & Mobility | 10. Promotes Leadership & Effective Management | 11. Empowers A Broad Range Of Stakeholders | 12. Fosters Long-term & Integrated Planning

26. India's Urban Awakening, McKinsey Global Institute, 2010

KEY STRENGTHS TO LEVERAGE

Strong ecosystem of technical experts within the city, both local and global, that can be leveraged to influence the planning process.

KEY QUESTIONS

- How can we plan for urban growth in an integrated manner that accounts for the capacities and priorities of both line departments, as well as different levels of government?
- What is Chennai's long-term vision for urban development as its demographics, geography and economy evolve?
- How do we ensure the transformation of Chennai's peri-urban areas is done in a more environmentally and socially responsible manner?
- How do we leverage global and local expertise to influence planning and policymaking landscape including updates to the master plans?
- How do you use data and emerging technologies to improve master planning and enforcement?
- What are the regulatory mechanisms to improve management of the built environment?
- What interventions are necessary to address encroachments and red tape?

SOME POTENTIAL PARTNERS

Chennai Metropolitan Development Authority
Urban Design Collective
The Institute for Transportation and Development Policy
Care Earth
Chennai Rivers Restoration Trust
World Resources Institute
IT Companies (e.g. HCL, Cognizant, Infosys, IBM etc.)

PILOT PROJECTS

1. Earth to Orbit (E2O) satellite mapping of Chennai's water bodies, and their boundaries, to further support data enabled planning and improve land use practices around these bodies.
2. Integrated planning dashboard that brings together all relevant information that can provide planners and policy makers with high quality and actionable data to make both short-term and long-term planning decisions.

FINANCE URBAN RESILIENCE

DEVELOPING AN ECOSYSTEM OF INNOVATIVE FINANCING FOR THE CITY'S RESILIENCE EFFORTS

OVERVIEW

Capital scarcity is a common problem across the country – especially for significant projects, which need large capital outlays. It is estimated that Chennai requires ~USD 50 billion to setup critical public infrastructure such as roads, water supply, solid waste systems, storm water drains etc.,[26] as its population and geography expands. Chennai's dependency on state and central grants makes it difficult for the city to raise resources for special projects, a lot of which may be required to enhance resilience.

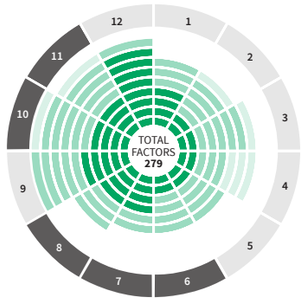
KEY CHALLENGES

Private capital has so far stayed away from resilience-linked investments, other than to protect their primary investments (e.g. factories, office spaces etc.), as they **do not see clear pathways to generate returns**. Furthermore, **lack of experience within government bodies** in engaging the private sector, and developing channels of innovative finance, means that **private financiers can find the municipal system difficult to navigate.** Finally, given the **limited ability of local government bodies (e.g. Chennai Corporation) to generate** its own revenue is likely to influence their creditworthiness with private financiers.

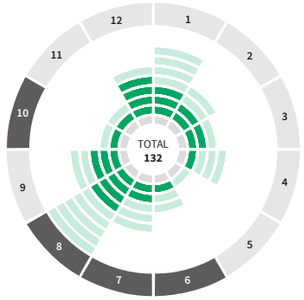
KEY STRENGTHS TO LEVERAGE

The presence of development finance institutions (e.g. JICA, World Bank, ADB, AIIB etc.), philanthropic organisations (e.g. Bill and Melinda Gates Foundation), as well as major urban rejuvenation programs (e.g. Smart Cities) can act as anchor to crowd in more private investment into key resilience linked activities.

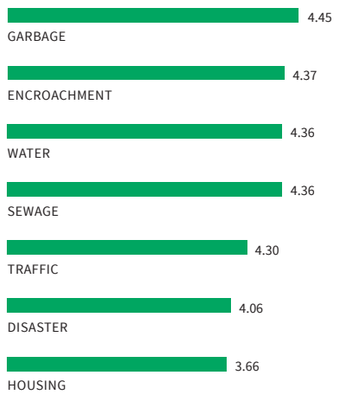
PERCEPTION ASSESSMENT



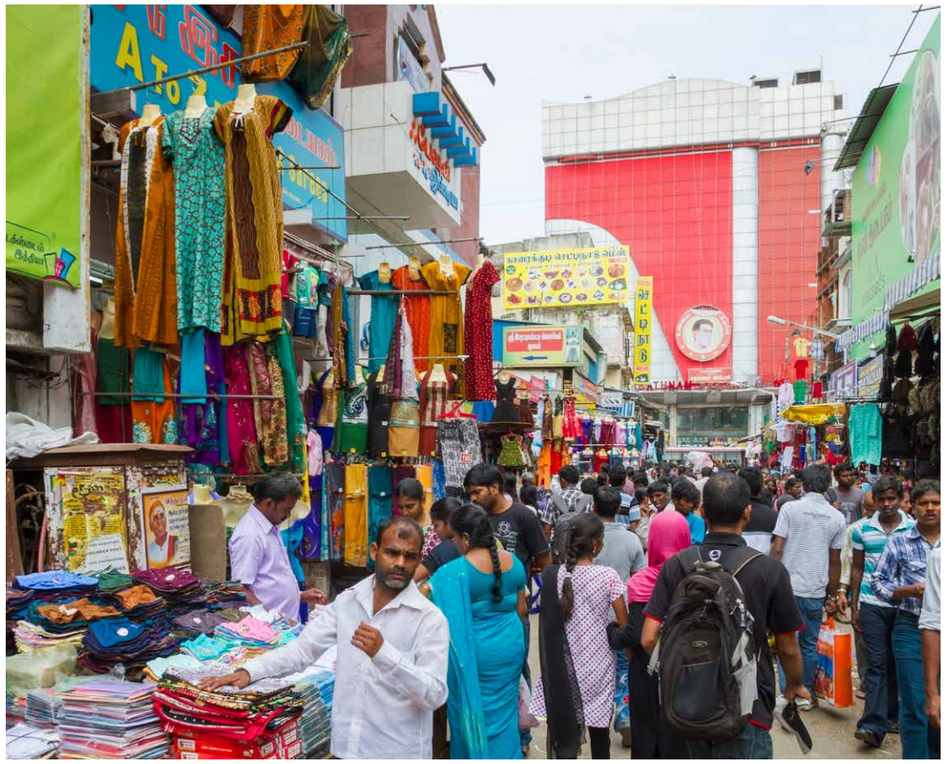
ACTION INVENTORY



SHOCKS & STRESSES



1. Meets Basic Needs | 2. Supports Livelihoods & Employment | 3. Ensures Public Health Services | 4. Promotes Cohesive & Engaged Communities | 5. Ensures Social Stability, Security & Justice | 6. Fosters Economic Prosperity | 7. Maintains & Enhances Protective Natural & Manmade Assets | 8. Ensures Continuity Of Critical Services | 9. Provides Reliable Communication & Mobility | 10. Promotes Leadership & Effective Management | 11. Empowers A Broad Range Of Stakeholders | 12. Fosters Long-term & Integrated Planning



KEY QUESTIONS

- How does the private investor community perceive the 'resilience' industry, and what is the risk perception? How can we drive nuance in their understanding (e.g. categorise different resilience linked activities by their risk profile)?
- How does the Chennai city and Tamil Nadu state government engage with the development banks, and private sector?
- What are some untapped traditional (e.g. municipal bonds) and innovative (e.g. development impact bonds) forms social financing instruments that are appropriate for Chennai?
- What role can DFIs, philanthropic capital, patient capital etc., play to crowd in commercial capital?
- How can insurance be effectively utilized to create innovative hybrid instruments and reduce risk perception?

SOME POTENTIAL PARTNERS

World Bank
SwissRe
Chennai Corporation
Japan International Cooperation Agency
United India Insurance
Tamil Nadu Urban Infrastructure Financial Services
Tamil Nadu Urban Finance and Development Corporation
Asian Development Bank
Asian Infrastructure Investment Bank

PROPOSED PILOTS

1. **Resilience finance roundtable:** bring together the investment community, resilience practitioners, and government officials in a roundtable format to chart a pathway forward for greater investability, and better investor interest of resilience-linked activities.

4

NEXT STEPS

The Resilient Chennai initiative offers a unique platform to build on the widespread stakeholder engagement, and analysis which has already been done to arrive at the discovery areas.

In Phase 2, we would look to delve deeper into the identified discovery areas to gain a holistic understanding of the issue, identify key areas for intervention, design templates for potential pilots, engage with government departments / civil society and other actors that are relevant for such pilots, identify partners & funders, and build implementation plans for such pilots.

We plan to build on our stakeholder engagement from Phase 1 to formalize multi-stakeholder working groups focused on each of the discovery areas. We plan to entrust these multi-stakeholder groups with the responsibility of leading the work for each of the discovery areas. We believe that such ownership by stakeholders would lead to greater buy-in among government and civil society, and lead to more actionable plans which can be synergized with existing or planned initiatives of such stakeholders. In addition, the strong relationships formed by working together in the working groups could help in breaking down siloes and fostering the integrated long-term planning that has been identified as a challenge for the city.

More details on the 100RC process, its theory of resilience, resilient Chennai's data collection approach, and its steering committee can be found on request by emailing CRO@resilientchennai.com

IMMEDIATE STEPS FOR PHASE 2

- Develop a detailed scope of work to structure the strategy design phase
- Initiate re-engagement with selected stakeholder to form working groups
- Initiate re-engagement with platform and local partners to answer some of questions raised above
- Follow-up on pilot programs

FULL PHASE 2 AGENDA

- Delve deeper into focus areas through working group meetings and activities
- Answer discovery area questions, and identify opportunities for the CRO and his team to engage
- Work with technical and local experts as well as city government to identify high impact solutions
- Identify partners to lead and support implementation, including from a funding perspective
- Design and release a detailed strategy document
- Our steering committee that comprises of eminent city leaders will provide formal leadership and decision making capacity to Resilient Chennai by validating and approving all interim (e.g. discovery area reports), and final documents (e.g. Resilient Chennai strategy)

Designed By

studiosubū

RESILIENT CHENNAI

PIONEERED BY THE ROCKEFELLER FOUNDATION