SAMUCHIT ENVIRO TECH, INECC, LAYA

Sustainably SMART Pune 2030

DECEMBER 2018

Sustainably SMART Pune 2030 Study Report is authored by:

Priyadarshini Karve, Samuchit Enviro Tech

Pournima Agarkar, Laya

Abstract

By 2030, more than half of the population of India will be living in cities. This is a huge opportunity for India to grow in a systematic and planned manner for a sustainable future in a climate challenged world. However, current urban development paradigm in India mostly ignores equity, climate change and ecological concerns. Laya and Samuchit Enviro Tech, members of Indian Network on Ethics and Climate Change (INECC), have developed an alternative vision of urban development, called 'Sustainably SMART', as an outcome of Sustainably SMART Pune 2030 Study project. This vision is also aligned with the sustainable development goals (SDG) framework.

Pune city is a prominent urban centre in Maharashtra state, which is one of the most rapidly urbanising states in India. It is also one of the cities at the forefront of implementation of SMART Cities Mission, and several projects are already under way in Pune through Pune SMART City Development Corporation Limited.

There are several inherent flaws in the SMART City mission approach which is likely to lead to densely populated, consumerism focused, highly disaster-prone islands of prosperity. The alternative of Sustainably SMART city focuses on liveability for all, environmental viability and climate resilience in an urban settlement. On this basis, we define a triangle of sustainability limits considering the three important aspects crucial for making any city Sustainably SMART.

INECC Sustainability Index can quantify the sustainability limits and help present the current as well as projected and desired future limits in the form of a radar chart. It is based on six parameters, two each corresponding to the three sustainability limits. For Pune city, the following parameters were used: Socioeconomic inequity (Access to Civic Services, Gender Gap in Education), Environmental Impacts (Environmental Degradation, Ambient Air Quality), Climate Change Impacts (Carbon Footprint, Climate Vulnerability). Each parameter is quantified between 0 (best) and 10 (worst) for the radar chart.

The analysis for Pune is not very definitive due to numerous data gaps, however it is sufficient to show the general trends. The city scores fairly well on the socioeconomic inequity indicators, but there is scope for improvement on the indicators for environmental and climate change impacts. However, deeper analysis of the socioeconomic survey data shows that there is disparity in access to civic services as well as access to education across various income groups. Thus, there is room for improvement even on the indicators for socio-economic inequity.

The Sustainably SMART approach is in line with SDG 11: Sustainable Cities and Communities. We propose the target for 2030 in terms of all sustainability indicators being minimised to 1 (close to the best-case scenario which is 0), except climate vulnerability, which must be minimised to 0. Actions required to operationalise the roadmap which are also in line with the targets under SDG 11 have been identified, and these include involvement of city administration as well as citizens. The role of citizens is crucial in articulating the vision of a sustainably SMART Pune, pushing the administration in operationalising it, and working with the administration to sustain it.

It must also be noted that while we have focused our approach on urban sustainability challenges, the basic principles are applicable to a settlement of any size and population density, and can thus also provide useful insights into developing a sustainable approach to rural development.

We believe that the INECC Sustainably Index and the Sustainably SMART development approach can help:

- citizens to articulate and imbibe a vision of a sustainable, equitable and liveable city,
- citizen groups to play the role of a watch dog over the local administration,
- city administrations to plan a development trajectory in line with SDG 11 in collaboration with citizens,
- state and central governments to align the urban (and rural) development policies in India with SDG 11.

Contents

Introduction

World Bank reports that 90 percent of urban growth is taking place in Asia and Africa, and Indian cities are growing at a phenomenal rate (*Urban Poverty in Asia 2014*). The United Nations Sustainable Development Goals (SDGs) for the first time included a specific goal focused on urbanisation: To make cities and human settlements inclusive, safe, resilient and sustainable *(Sustainable Urban Strategy 2016*). Urbanization has the potential to lift people out of poverty and increase prosperity, but rising inequality and exclusion threaten to derail progress. Urbanisation also means increased population density in a location, which has the potential of optimisation of resource use, but often leads to multiple adverse environmental impacts. We in India and other developing countries have the advantage to learn from the mistakes of cities in the developed world. In India the urban population has gone up gradually from about 11 percent in 1907 to 17 percent in 1951 and then to 28 percent in 2001 *(Jayaswal,Saha 2014*). By 2030, more than half of the population of India will be living in cities. This is a huge opportunity for India to grow in a systematic and planned manner for a sustainable future in a climate challenged world.

Laya, Visakhapatnam and Samuchit Enviro Tech, Pune are part of a national network, Indian Network on Ethics and Climate Change (INECC). The network has been critically examining the most-talked-about urban development policy of the Government of India - the SMART Cities Mission, in the context of SDGs and above-mentioned projections around urbanisation. We feel that there is much to be concerned about the current urban development paradigm in India as it seems to mostly ignore equity, climate change and ecological concerns. These considerations are being paid lip service to in the official descriptions of urban development policies, but are not reflected in the outlined actions. We however wish to go beyond mere critical analysis, and engage with various stakeholders by presenting an alternate vision around a representative city - an alternative that we are calling 'Sustainably SMART'. Our model is based on the belief that for a sustainable future, a city needs to account for its intake, output, and efficiency of resource use and decide on the limits to its growth. Pune being at the forefront among the SMART cities, in 2015 we proposed to develop a roadmap for sustainability for a city like Pune, by taking 2030 (end of the SDG period) as the target. In the process, the study has also come up with a methodology for Sustainably SMART planning for urban development. This approach may on one hand be used by citizen groups in articulating a citizens' vision for their own city, and on the other hand help monitor the local policies driving the urban development agenda. The approach also provides a pathway to help align SMART city mission and other urban development policies and programmes with the SDG framework.

This document summarises the outcomes of the sustainably SMART Pune 2030 study conducted during 2015-18 by Samuchit Enviro Tech in association with INECC and Laya, with funding support form Misereor, Germany.

Pune City

Pune, located at 18°32' north 72°51' east, is the second largest city in the state of Maharashtra which is the ninth most populous state in India. It is situated near the western margin of the Deccan Plateau. It lies on the leeward side of the Sahyadri ranges and Western Ghats, 560 m above sea level, at the confluence of the Mula and Mutha Rivers. Two more rivers, Pavana and Indrayani, traverse the North-western outskirts of the urban area. The Sinhagad-Katraj-Dive Ghats range forms the southern boundary of the urban area. The city of Pune lies in the eastern belt of the state at a distance of 178 km from Mumbai. In general, the weather is clear and sub-tropical, Pune experiences three different seasons i.e. winter, summer and monsoon. During summer, maximum temperature in the city can go up to 44 deg C and in winter, temperature can go as low as 5 to 6 deg C. Average rainfall is about 62.5 cm. The city has good natural environment with Chaturshrungi hill, Bhamburda hill, Law College hill, Hanuman hill, Vetal hill, SNDT hill, on the southern side, hills in Wadgaon, Dhayari, Hingane, Parvati, Bibwewadi, Dhankawadi, Katraj and Ram tekadi to the South of Pune-Solapur road.

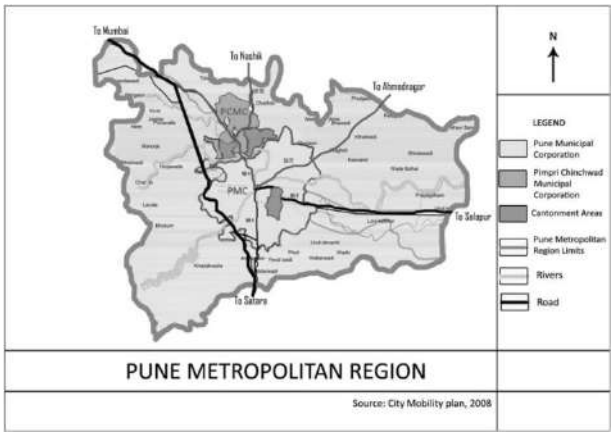


Figure 1 Pune Metropolitan Region map

In 2015, a development authority was formed for Pune Metropolitan Region (PMR) which comprises of two Corporations (Pune and Pimpri Chinchwad), two municipal councils (Talegaon and Alandi), three Cantonments (Pune, Khadki, Dehu Road), and 129 villages (Figure 1). The Pune Metropolitan Region Development Authority (PMRDA) has a jurisdictional area of 6,616.79 sq km and a population of 1.01 crore.

Pune SMART City Project

Pune was ranked second in the top 20 cities considered for the first phase of SMART cities mission in 2015.

Internationally, the underlying philosophy of SMARTness is to use IT tools to improve governance and management systems so as to provide various services to the citizens with greater efficiency and promptness. Just focusing on SMARTness may or may not lead to a 'liveable' city, capable of surviving the various environmental and socio-economic challenges.

In the SMART city mission document, the interpretation of SMARTness was left to the applicant cities. Our analysis of the SMART city projects sanctioned (*Ministry of Urban Development 2015*) shows that most applicants have focused on creation of infrastructure with some peripheral SMART components.

Out of the total 98 cities under the SMART city mission to date, 10 cities are from Maharashtra including Pune. The other cities are Navi Mumbai, Nashik, Thane, Greater Mumbai, Amravati, Solapur, Nagpur, Kalyan, Dombivali and Aurangabad. The Pune SMART city project has focused on Aundh-Baner-Balewadi suburbs for area development and the sectors of water supply and transport for city-wide intervention. The total cost of the project proposed is Rs 2,932 crore. Table 1 summarises the priorities as outlined in the project document *(Smart City Proposal Presentation 2015).*

Table 1 Interventions Proposed in Pune SMART City Plan

<table>
<tr><th>Pan city initiative</th><th>Area based development</th></tr>
<tr><td>Smart Pune Public Transport System to improve availability, reliability and passenger comfort.</td><td rowspan="3">Aundh-Baner-Balewadi - to create a model neighborhood of liveability and sustainability matching global standards in the selected local area by fully deploying all 24 smart city features in a “future ready” manner.

Mixed land use, riverfront development in the stretch of 3.5 km, 24X7 water supply, waste management and transport management system.</td></tr>
<tr><td>Smart Pune Traffic Management System to reduce congestion</td></tr>
<tr><td>Smart Water solutions to ensure equitable 150 lpcd water to 100% citizens on 24x7 basis along with best-in-class customer experience.</td></tr>
</table>

According to *Pune SMART City Development Corporation Limited (PSCDCL)* (*Annual Report 2016-17 and 17-18)* several initiatives are already under way, as on end-2018, the major ones being listed in Table 2.

Table 2 SMART Pune Initiatives as on end-2018

Pan city initiative	Area based development
• Place making and Open spaces (Pilot, various PMC sites) • Installation of Information-Communication-Training enabled smart elements for the use of citizens • Street redesign with universal accessibility • Street lighting project • Pune Bicycle Sharing Plan • Bus Intelligent Transport Management System (ITMS) • skill development and healthcare for low income groups • Road works – several stretches	• Street Retrofit works • Creation of placemaking and open spaces like the Energize Park with open air gym, library, solar power etc.

The SMART City corporate office is located in ICC trade tower on Senapati Bapat Road, and the command control office and Digital Literacy centre are located on Sinhgad road. In the literacy centre, a demonstration of all the smart elements has been arranged. It consists of environmental sensor, flood sensor, public address system, Emergency call box, WIFI hotspots and Variable Message Display screens for displaying of information. Anyone interested in knowing ongoing initiatives can visit either office.

Problem with SMART City Approach

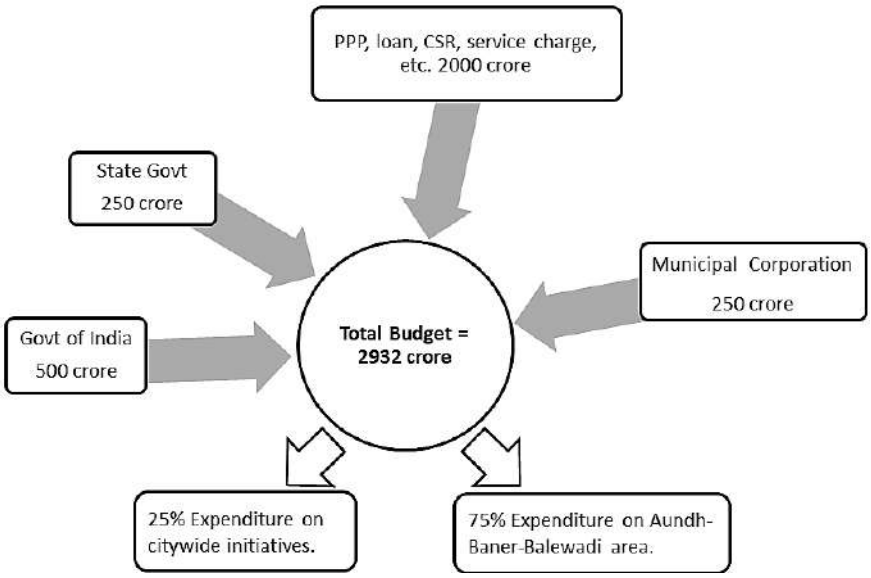


Figure 2 Pune SMART City Proposal - Financials

Pune SMART city proposal (Fig.2) has a total cost estimate of Rs 2,932 crores. But only around 25% of this is for the two city wide initiatives. The major chunk (about 75% of the expenditure) is for development of the Aundh–Baner–Balewadi area as a SMART City (Rs 2,196 crore). This area that has been selected for area development already has a very large presence of high-profile businesses and upper middle class and rich residents. A lot of SMART and modern infrastructure is in any case coming up in this area through private investments. It is questionable therefore if SMART City Mission will achieve anything much over and above what was anyway likely to happen with 'business as usual' in the absence of the SMART city project.

Of the Rs 2,932 crore, only Rs 500 crore is the contribution from the Central Government, while the state government and the PMC are to give Rs 250 crore each. The major chunk of the budget, nearly Rs 2,000 crore, is expected to come from user charges, like increased charges for civic services, increased local body taxes, as well as from Corporate Social Responsibility (CSR) funding, Public-Private-Partnership, etc.

The mission demands creation of a Special Purpose Vehicle (SPV), a corporate body, to run the smart city project in any city. The SPV has complete control over planning, implementation, and operation of the Plan. The SPV is headed by a CEO appointed by the governing body of the SPV, which comprises of bureaucrats and elected representatives from the urban local body. The rationale behind the SPV approach is to fast track implementation. However, this creates a power center without any direct accountability to the citizens who are the biggest financial

contributors to the project. Secondly, following the SPV approach is a tacit admission that the existing bureaucratic processes at the municipal level are time consuming and inefficient, but rather than trying to address this governance problem, a parallel structure is being created to bypass the existing system.

The Mission's overarching objective is SMARTness. While the mission document avoids a clear definition of SMARTness, the illustrative examples give a clear indication of the focus on SMART technologies. As a result, in the SMART city proposals, most cities have typically prioritised interventions on the basis of possibility of inserting SMART technologies, rather than on the basis of what is needed to improve the quality of life of the citizens. Thus, in Pune city, the focus of the water supply intervention is on using SMART metering and SMART detection of leakages etc., to improve efficiency of municipal water supply. However, this in itself cannot ensure long term continuity of uninterrupted and adequate water supply equitably across the city, when on one hand the city's population is growing at an exponential rate and on the other hand availability of water from the natural reservoirs is becoming more and more uncertain due to erratic rainfall - a climate change impact. The holistic and long-term solutions such as promoting rainwater harvesting, revival of traditional wells and ponds, on site treatment and recycling of waste water to reduce daily need of fresh water, educating citizens and encouraging innovation to improve efficiency of water usage, etc., are not being addressed as there is no direct and readily available SMART technology component in such interventions.

Problems with SMART City Mission: In a nutshell

Most of the expenses come out of citizens' pockets, but they have little say in decision making.

SMART technologies as a goal in itself shifts focus from interventions most needed for liveability and sustainability.

No cognizance taken of the city's existing long-term development plans, regional development imperatives, other relevant policies at central and/or state level, etc.

Ignores linkages of the city with surrounding area and local ecosystem.

Lacks alignment with the targets of SDG 11.

The SMART city mission framework totally ignores linkages of a city with its surrounding area and even with its past and present development approaches. The practical need to align the proposed activities with existing and ongoing development plans, as well as other related schemes and policies (e.g., programmes and policies related to waste management, health, education, environment, climate change, energy, etc.) does not reflect in the SMART City mission, and therefore in none of the SMART city proposals.

An overarching problem with the SMART City approach is that it is not aligned with the SDG framework to which Government of India has committed itself. Specifically, SDG 11 focuses on

creating cities that are Inclusive, Safe, Sustainable and Resilient. SMART City Mission pours in a lot of investment in creating infrastructure in selected 100 cities, which are already islands of prosperity. This is not inclusive. As the prosperity of these cities goes up, the risk of crime and terrorist attacks also goes up, putting safety and security at risk. As the focus of the SMART City approach is on maximising economic activity and contribution of cities to the GDP, the interventions are more likely to promote increasing consumerism. The resultant increasing use of energy and material resources take the city away from the basic principles of sustainability. The potential disaster risks arising from massive land use changes, steep rise in population density due to migration, and climate change impacts are nowhere being addressed in the SMART City approach. Thus, the resilience of these cities is being weakened.

As a part of the project we interacted with citizens of not just Pune, but also a number of other SMART cities such as Visakhapatnam, New Delhi, Guwahati, Madurai, Salem, and Varanasi. In all the locations, the citizen groups as well as urban planning experts were typically critical rather than supportive of the SMART City approach. It is also noteworthy that the progress on this high-profile mission has been astonishingly slow across the country. According to an assessment by the Finance ministry carried out in March 2018, the SMART Cities Mission had utilised only 1.83% of the total outlay till date (Anuradha S *2018*). The progress has continued to remain slow, and SMART City Mission seems to be the most underperforming mission of all the urban development policy initiatives of the Government of India.

It is therefore imperative that the SMART City Mission approach be modified to address its inherent weaknesses and also to align the policy with SDG 11. Based on our study, we are proposing an alternative approach entitled ‘Sustainably SMART City’.

Sustainably SMART City

The concept of sustainability focuses on achieving social good through economic prosperity without destruction of ecology. However, the current urban development agenda is disproportionately focused on economic prosperity, often at the expense of environment and social good. The SDG 11 gives a better vision for cities than the narrow focus on maximising GDP from cities, which has always been the main driver for urban development policies in India. We believe that SMART technologies can be used as a tool for striking a balance between social good, economic prosperity, and healthy ecology, thereby creating a sustainable and liveable city as envisioned in SDG 11. However, this requires a judicious choice of technological interventions, and a long term holistic vision for the city.

When a city aims to be sustainable; interventions planned at the level of the city should adhere to the following principles:

- The intervention should lead to reduction rather than increase in the use of non-renewable and non-local resources, through optimal and prioritised use of renewable and local resources. (Example: Mandating roof top solar or solar-wind-hybrid electricity generation systems for all residential buildings, and prioritising use of the locally

produced RE based electricity over grid power in delivering electric services on the premises.)

- The intervention should lead to increased efficiency and quality of service delivery to the citizens in a uniform and equitable manner. (Example: Creating cluster level rainwater harvesting and safe storage systems and coupling them with municipal water supply to ensure that all parts of the city and all types of communities have access to adequate amount of clean water to meet daily needs in a fair and equitable manner throughout the year.)
- The intervention should create cyclic paths of resource utilisation so that the wastes generated in one process become inputs for other processes, ultimately leading to very little waste leaving the boundary of the city, and enhancing clean and hygienic living conditions within the city. (Example: Achieve 100% at source segregation and near 100% recycling of plastics into various products for local use. Plastic wastes that are rejected by recyclers should be used for mixing in tar for construction, repair and maintenance of roads across the city.)
- Some specific interventions are needed for proofing the city against climate change related disaster risks. (Example: Excessive and unseasonal rainfall leading to local waterlogging and flooding is a potential climate change risk. Building a network of optimally designed storm water drains across the city and maintaining the system to be functional all year round is a necessary measure against this risk.)

Operationalising the above principles at the municipal level, and encouraging citizen participation in the new processes being set up also has a tremendous potential for green social entrepreneurship at the city level. This can be seen from the illustrative examples given above. A few of these (e.g., installation of roof top solar PV systems or building rainwater harvesting systems, etc.) cannot be operationalised effectively without the presence of relevant technical advisors and service providers in the city. Thus, the economic agenda, which has traditionally been the focus of urban development policies, can also be met in the process, through localised livelihood generation based on innovative and green business approaches. SMART technologies too have a vital role to play in the process in the form of control systems (e.g., a mechanism that would prioritise use of roof top generated electricity over grid power at the building level) as well as data collection and management systems (e.g., metered water supply to a community to be regulated on the basis of how much harvested rainwater is available at the community level on a daily basis).

Our vision of a sustainably SMART city is thus based on low carbon, environmentally sound interventions that usher in socially equitable development. The approach encourages use of SMART technologies, but only as a means rather than as a goal in itself.

We envisage that by 2030 Pune city should be:

- **Liveable for all** citizens equitably (provide equal opportunities for progress and equal access to civic services to enable a comfortable quality of life for all citizens irrespective of their social and/or economic status).
- **Environmentally viable** (the local environmental impacts to be within the environmental capacity of the local ecosystem to renew or rejuvenate in order to continue satisfying future demands.)
- **Climate resilient** (the city to have a carbon footprint in line with the global goal of keeping the average global temperature rise well below 2 deg C by the end of the century and to also be well adapted to the irreversible impacts of climate change that are already affecting the city)

In order to achieve this, the city collectively (the municipal corporation, the citizens, the SMART city SPV, etc.) should decide on its sustainability limits as shown in Fig.3.

Figure 3 Triangle of Sustainability Limits

The triangle of sustainability limits considers the three important aspects crucial for making any city Sustainably SMART. It acknowledges the reality that there cannot be zero environmental impacts, zero carbon footprint and/or zero climate vulnerability and absolutely no socio-economic inequity. However, the city must continually strive to minimise these, so as to reduce the area of the triangle, to the highest extent possible.

In our three-year study, we attempted to collect data for Pune city under each of the three aspects through primary and secondary sources. We conducted surveys and interactions with citizens, and group discussions with experts and members of civil society groups working on urban issues. Inputs were taken from governmental and non-governmental local bodies working on the ground level for understanding the actual situation. We also used study reports from academic institutions as well as official documents such as the annual Environment Status Report, the development plans of Pune municipality, etc. However, as our approach of looking at urban development priorities differs from the standard and established norms, we were hindered by lack of data, and therefore our analysis may be considered illustrative rather than comprehensive.

In the process, we came up with a methodology that can be used by municipal corporations, urban planners, as well as NGOs and citizen groups, for developing a vision for the city and assessing the alignment (or misalignment) of the development pathway of a city with the Sustainably SMART approach.

In the forthcoming sections we describe our approach along with the outcomes of our analysis in Pune city.

INECC Sustainability Index

While formulating the limits for sustainability, it was evident that there is a need to measure sustainability, as whatever can be measured can be effectively managed. This led to the development of an index that we have titled as *INECC Sustainability Index*.

The index consists of six parameters based on the three limiting boundaries. For example, for Pune city, we chose the parameters as described in table 3.

Table 3 Parameters contributing to INECC Sustainability Index

Boundary	**Critical Parameter**	**Threshold based on**	**Source of Threshold Data**
Socioeconomic Inequity	Access to Civic Services Indicator	Service Level Benchmarks	Literature
	Gender Gap in Education Indicator	Percentage of men and women with education up to 10th standard or higher should be equal.	Sample Surveys
Environmental Impacts	Environmental Degradation Indicator	Standard values for environmental factors	Literature
	Ambient Air Quality Indicator	Indian ambient air quality standards	Literature
Climate Change Impacts	Carbon Footprint Indicator	Desired per capita Carbon Footprint to keep climate change within manageable limits in this century.	Literature
	Climate Vulnerability Indicator	Negative or zero, as per IPCC methodology	Sample Surveys

Once appropriate parameters and their corresponding threshold values are determined, the actual values for the parameters are either obtained from existing data or derived on the basis of available information or from surveys, etc. Based on a comparison of the actual value with an ideal or threshold value, each parameter is awarded a value on the scale of 0 to 10. In this case, 0 depicts the best case (same or better performance as the threshold) whereas 10 depicts the

worst case (poor performance compared to the threshold). The quantified parameters are then used to plot a radar chart, also called as a spider diagram as shown in Fig.4. One can plot the current status as well as future projections and targets pictorially for ease of understanding.

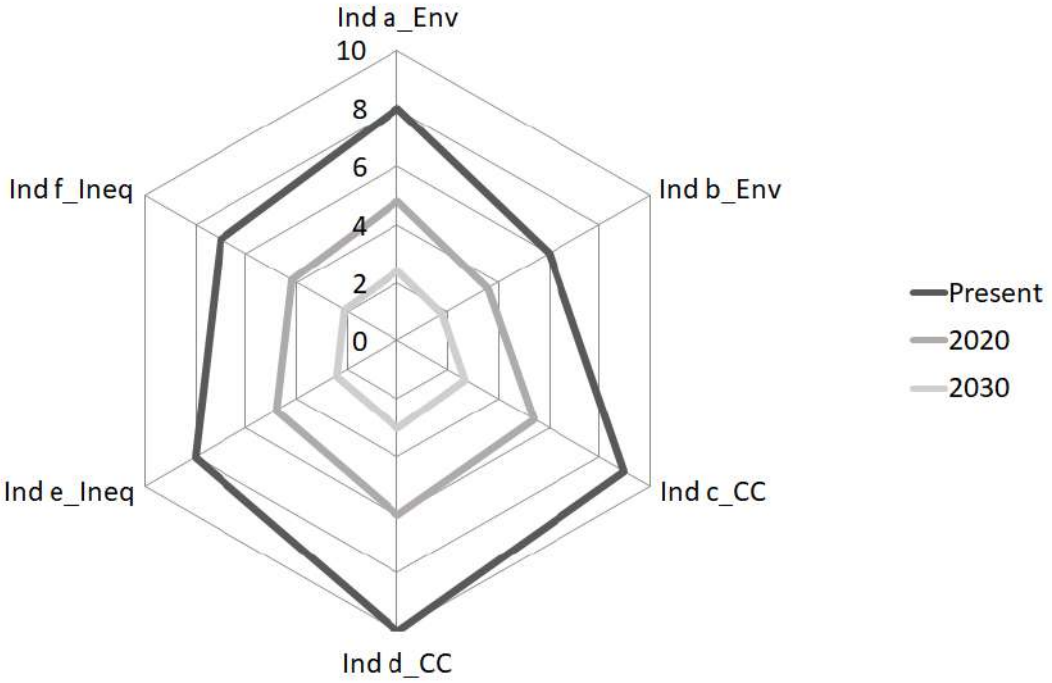


Figure 4 Schematic Representation of INECC Sustainability Index - Radar Chart

We propose that the municipal administration as well as watchdog groups of citizens and/or researchers, should focus on generating/collecting data to quantify the current values of these parameters. This can serve several purposes:

1. Watchdog groups or researchers may create a checklist of criteria to assess any proposed development activity in the city for alignment with the principles of sustainability. This may be used for advocacy at the citizen as well as administration level.
2. If citizens and municipal administration join hands and adopt the principles of sustainability as laid out above, they can develop consensus on where the city wants to be in 5-10-20 years' time. Addition of these curves to the radar chart makes the diagram (Fig.4) a pictorial depiction of where the city is headed or wants to head in the short-term and long-term future. Once the starting point and the destination are identified, the actions needed to chart a course towards the destination can also be identified in a more strategic and systematic manner.

The following section describes how we attempted to define and quantify the INECC Sustainability Index for Pune.

Sustainability Indicators for Pune

Socioeconomic Inequity

The socioeconomic inequity in the urban context has many dimensions to it. It may manifest in terms of caste, class or gender -based divides in societal and economic interactions, or in terms of discrimination in opportunities for improving quality of life available to different social groups, or in terms of disparity across income levels in access to basic services, etc. While social divides and disparity in available opportunities do exist in India, the scale of the problem as well as scope of the solution are far wider than the boundaries of any particular city and sphere of influence of any specific city administration. From the limited perspective of a city, we decided to focus primarily on those aspects that fall within the scope of a municipal administration, namely the basic civic services.

The basic services that a municipal corporation is expected to provide all citizens are:

- Water supply
- Public transport services
- Waste management services
- Sanitation services
- Basic health services

For the parameter based on access to services, we assigned scores to each of the service parameters with respect to their service level benchmarks and the value of the single indicator was calculated as average of the scores for all the basic services being considered.

Universal access to education can be the single most empowering and equalising intervention to address the larger problems of inequity in the society. In India there still exists a gender disparity in access to education, which translates into gender bias in access to opportunities for a better life. On the other hand, experiences across the world show that access to education for girls and women plays a key role in moving the entire family up the socio-economic ladder.

Since municipalities are at least partially responsible for creating educational infrastructure at the city level, we decided to base our second socioeconomic inequity parameter on gender gap in access to basic (up to tenth standard) education. For this, the difference in the percentage of men and women educated up to 10^{th} standard or more was used as the measure. Needless to say, ideally 100% men and women should at least complete 10 years of schooling, and the gender gap should be zero, in any community.

Table 4 describes the scoring schemes used for the two socio-economic inequity parameters.

Table 4 Scoring Schemes for Socioeconomic inequity parameters

Access to Service Percentage population having access to the service up to service level benchmark (or higher)	**Awarded Score**		**Gender Gap in Education Percentage of men educated up to 10th standard or more - Percentage of women educated up to 10th standard or more**	**Awarded Score**
Zero	10		Negative or Zero	0
nonzero, up to 10	9		Nonzero, up to 10	1
up to 20	8		up to 20	2
up to 30	7		up to 30	3
up to 40	6		up to 40	4
up to 50	5		up to 50	5
up to 60	4		up to 60	6
up to 70	3		up to 70	7
up to 80	2		up to 80	8
up to 90	1		up to 90	9
up to 100	0		up to 100	10

For Pune, our assessment is based on sample surveys carried out in Ghole Road Ward (Fig. 5).

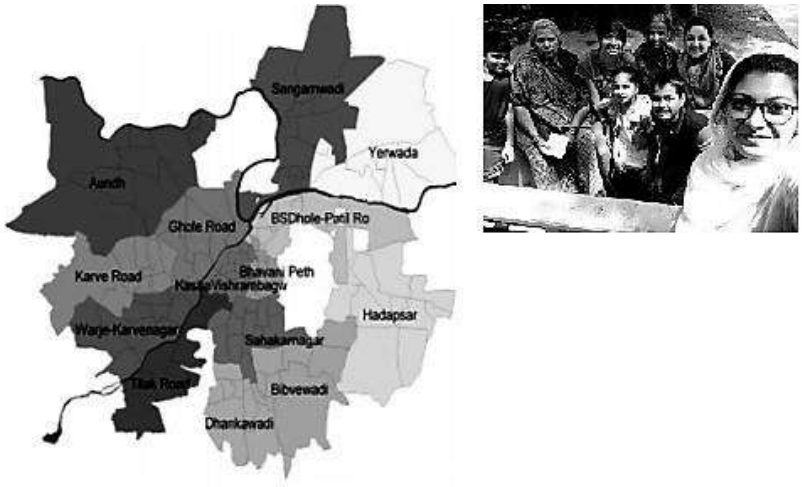


Figure 5 Indicative Map of Pune Municipal Wards. Inset: interns conducting surveys with a respondent family

Based on the wardwise census data *(Wardwise City Census 2011)*, Ghole Road ward mirrors the distribution of various income groups across Pune city. This ward also includes some older and some newly developed areas. It also spreads over some hillslopes and river bank areas. Thus, it is a good representation of the city.

The sample size for the surveys was 439 households,

based on 1% population from each income group - High (HIG), Medium (MIG), Low (LIG) and Slum. The surveys were carried out by a group of seven interns, over a period of about a month. The data was collected on paper, and then fed into SurveyMonkey for ease of analysis. The calculation for the two parameters is shown in Table 5 and Table 6 respectively.

Table 5 Calculation of Access to Services

Service Factor	**Parameter**	**Threshold**	**Percentage population with access**	**Score**
Water supply*	Per capita per day water supplied	135 lit	100	0
Public transport	Percentage population using	50	18	8
Waste management	Percentage Household coverage for waste collection	100	53	6
Sanitation	Percentage households with toilets within premises	100	85	1
Health services**	Percentage population with affordable and easy access	100	100	0
Average score for Access to Services				**3**

** At present in Pune there is no metering of water supply. Therefore, the assessment of the water supply service is not based on comparison with the threshold, but on the respondents' level of satisfaction with the water supply that they are getting.*

*** Although we did not specifically collect survey data on access to health services, based on secondary data, there are an adequate number of government as well as private health services in the ward under consideration.*

Table 6 Calculation for Gender Gap in Education parameter

Access to education up to 10th standard (or more)	**Ideal**	**Percentage of individuals having access - based on surveys**	**Score**
Male	100	42	
Female	100	39.5	
Gender Gap	**0**	**3.5**	**1**

Detailed aspects of the socioeconomic survey data analysis were presented by the then Research Associate, Anu Kuncheria, in a series of blog posts on 'SustainABLE Life' blog (*Anu Kuncheria 2016).*

Box 1: Assessing Deprivation

The socioeconomic inequity in the city can be further understood through Deprivation Index across income groups. For example: To find the measure of deprivation for access to waste management, the following steps are followed.

Step 1: Conduct sample surveys in an income group to find average number of households getting the service of doorstep collection of household waste.
Step 2: Mark the extent of access based on the following scheme:

Up to 20% households in an income group getting the service of doorstep collection of waste: 0
Up to 40% people in an income group getting the service…: 1
Up to 60% people … getting the service…: 2
Up to 80% people… getting the service…: 3
80% or more people in an income group getting the service of doorstep collection of waste: 4

The more service parameters have a deprivation index between 0-2, the more deprived is that particular income group, and higher is the extent of socioeconomic inequity in that city. This additional assessment provides another insight into socioeconomic inequity at the city level, and can provide a guideline to the municipal corporation for setting its priorities in improving access to basic services. In the context of Pune city, with the limited data that our surveys provided us, we calculated the Access Scores and Deprivation as shown in Table B1.

Table B1: Deprivation in civic services across income groups in Pune

Parameter	***Access Score***			
	Slum	*LIG*	*MIG*	*HIG*
*Water Access**	*4*	*4*	*4*	*4*
Sanitation Services	*1*	*3*	*4*	*4*
Waste Management	*1*	*1*	*4*	*4*
Public Transport	*0*	*0*	*1*	*1*
*Health Services***	*4*	*4*	*4*	*4*
Deprivation Score	***3***	***2***	***1***	***1***

** Not based on actual comparison with benchmark, but based on respondents' satisfaction with service.*
*** Not based on survey data, but based on secondary data.*

The data clearly shows that lower the income level higher is the deprivation from access to civic services. This deeper analysis of the socioeconomic data indicates that there is still scope for improvement on the front of socioeconomic equity in access to basic services.

The deprivation is also reflected in the education parameter. The overall percentage of population with education up to 10th standard or more is much lower than the ideal 100%. Further analysis of the data shows that there is a marked variation across income groups and typically, the number of educated men and women is much lower among slum dwellers and LIG.

Local Environmental impacts

Urbanization invariably involves building a variety of infrastructure, leading to changes in the land use and therefore damage to the local ecosystem. Urban spaces typically have high population density, are energy intensive, and generate a high amount of waste. All of these have a direct impact on our environmental resources such as air, water, soil and vegetation. According to the concept of ecological footprint, which is the measure of human demand on nature's productive resources and ability to assimilate wastes, we are running into an ecological deficit, as the capacity of nature to renew and absorb (biocapacity) is being compromised to a great extent. As per the *National Footprint Accounts* the world's average ecological footprint is 2.84 global hectare (gha) per person while the average biocapacity is 1.73 gha per person. In other words, our consumption and waste generation rate greatly exceed the nature's capacity to renew and absorb.

In the Indian context, our ecological footprint has always been greater than our biocapacity, primarily due to the high population density. In the last few decades, as economic prosperity has created a net upward movement along the economic ladder, there has also been an overall increase in consumption. This has led to widening the gap between the ecological footprint and biocapacity.

It is therefore important to understand and quantify the local environmental impacts in order to strategize for further development of a city with minimal impacts to the best extent possible. In our analysis, we looked at the following environmental aspects of Pune city.

- Change in green cover/vegetation
- Change in the quality of river water

We had to rely on secondary data to find information on each of these environmental aspects at the city level. Published research papers, studies by experts, data from environmental status report, city development plans were reviewed for understanding the changes in the environmental aspects. The percentage change in each environmental aspect is rated against the ideal values such that 0 is good and 10 is bad. The average of the two ratings is taken as the measure of environmental degradation.

We also looked at Ambient Air quality as a separate indicator, as it is a major concern in the context of liveability of all major cities in the developing world. Also, this is one parameter where quantitative data is available on past trends as well as up-to-date daily information in the public domain. For the sake of our sustainability assessment, we have considered the gap between the annual average at city level for PM2.5 and the National standard.

The scoring schemes for the two parameters are shown in Table 7.

Table 7 Scoring Schemes for Local Environmental Impacts Parameters

Environmental Degradation Percentage change (Threshold - Actual)X100/Threshold	**Awarded Score**		**Ambient Air Quality (Annual average ambient PM2.5 level - Indian standard on PM2.5 level for ambient air)x100/Indian standard on PM2.5 level for ambient air**	**Awarded Score**
Negative or zero	0		Negative or zero	0
Nonzero, up to 10	1		Nonzero, up to 10	1
up to 20	2		up to 20	2
up to 30	3		up to 30	3
up to 40	4		up to 40	4
up to 50	5		up to 50	5
up to 60	6		up to 60	6
up to 70	7		up to 70	7
up to 80	8		up to 80	8
up to 90	9		up to 90	9
up to 100 or more	10		up to 100 or more	10

The values and analysis for the two parameters for Pune city are shown in Table 8 and 9.

Table 8 Calculation of Environmental Degradation Parameter for Pune

Environmental Aspect	**Parameter**	**Threshold**	**Actual Value**	**Percentage change**	**Score**
Change in green cover	Trees per person	7	1	85	9
Change in the river water quality	Dissolved Oxygen (DO) in mg/lit	6	2	66	7
Average score for Environmental Degradation Indicator					**8**

Table 9 Calculation of Ambient Air Quality Indicator for Pune

Ambient Air Quality Indicator	Threshold	Value	Percentage change	Score
Annual average PM2.5 level in µg/m^3*	40	76	90	**9**

**Based on the online data from December 2017 to November 2018 for Pune and using the National Ambient Air Quality Standards (NAAQS) value for PM2.5 as threshold (National Air Quality Index 2017).*

This is just an indicative evaluation and not an exhaustive one. For instance, while biodiversity is an important environmental parameter, we could not consider it in this analysis due to lack of relevant data. Similarly, changes in land use is another important parameter that has not been considered due to the complexity of evaluation. However, even this cursory level analysis is sufficient to highlight the extent to which we have degraded our urban environment.

In depth analysis of air quality, its contributing factors, and its health and economic impacts for various cities including Pune are being published from time to time. Rather than duplicating the work, we are using a relatively simplistic indicator of ambient air quality with the limited objective of drawing attention to this severe problem facing all urban settlements in India. The city administrators need to factor the continually growing body of knowledge on air quality emerging from expert studies into its decision-making processes, and we hope that the sustainability indicator will help citizen groups as well as municipal authorities in assessing and mapping progress on this factor in a simple way.

Climate change impacts

Climate change is the biggest global threat in this century and cities have a dual role to play in combating it. On one hand, cities are contributing more to greenhouse gas emissions compared to rural areas, and on the other hand, cities are also more vulnerable to short term as well as long term impacts of climate change, due to the high population density and heavy investment in businesses and infrastructure. Therefore, in order to make cities climate resilient, appropriate mitigation as well as adaptation strategies need to be identified and implemented. From that perspective, we have chosen a city's per capita carbon footprint and city level climate vulnerability as the two crucial parameters in the context of climate change.

Per capita carbon footprint is total greenhouse gas emissions per person per year expressed in terms of tons of carbon dioxide equivalent (tCO_2eq). Typically, this calculation is done at country level by considering the total energy consumption in a country, the proportion of fossil energy in the same, estimating the corresponding net greenhouse gas emissions, and dividing this number by the total population. However, applying the same approach to a city, actually leads to underestimation of the carbon emissions associated with a city. At a city level, while there is a direct energy consumption in terms of electricity and fuels, there are also a lot of indirect contributors to the carbon emissions of a city such as the energy spent outside the city limits on transporting food and a variety of other goods to the city, the energy spent on building

the infrastructure, houses, buildings, etc., in the city, etc. However, there is no simple way of quantifying the indirect emissions, and therefore the standard practice is to consider only the direct emissions. In that sense, the city level carbon footprint as reported in literature, is an underestimate of the actual carbon footprint of the city.

In spite of this limitation, we have chosen to take the per capita carbon footprint as a parameter in our analysis, mainly because well researched data is available from literature, and is likely to continue to be available in the future as increasingly more attention focuses on climate change and cities. At this point, the climate science indicates that the global per capita carbon footprint should not be more than 2 tCO_2eq to ensure that the climate change within this century remains at a manageable level. However, climate science is still advancing and this number may get revised in later analysis. We propose to use the reported desired value at the time of the assessment as the threshold point. The value assigned for carbon footprint indicator is based on the scoring scheme described in Table 10.

Another parameter that we have considered is Vulnerability to Climate Change. It is a relatively new concept, and we have not found much cognisance of it being taken in India. IPCC's third assessment report defined climate vulnerability as "a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity"*(McCarthy et.al 2001)*. We have used the approach recommended by IPCC for assessing the vulnerability to climate change.

According to this framework, vulnerability is defined as Potential Impact minus Adaptive Capacity. Potential Impact is a product of how sensitive an area is to a particular climate change impact and what is the likely level of exposure to be experienced. Adaptive Capacity, as the phrase suggests, is a measure of how well the local community is equipped to deal with the Potential Impact. The Potential Impact is based primarily on the trend of climate change and its reflection in the local weather patterns on one hand, and the geographical and ecological nature of the location on the other hand. There is nothing much that the local community can do to change Potential Impacts, but building Adaptive Capacity is entirely up to the local community and local administration. A systematic assessment of Potential Impacts for the variety of ways in which climate change may manifest itself in a locality is crucial to building Adaptive Capacity and reducing overall climate change Vulnerability. This process can benefit immensely from inputs from climate modelling research, however this type of data is not likely to be easily accessible or even comprehensible to lay people. However, the IPCC methodology provides a qualitative way of assessing this parameter.

Unfortunately, the municipal corporations are apparently not taking cognisance of climate vulnerability, and the disaster management plans (where they do exist) do not in general address potential climate change disasters. We believe that this is a glaring omission in disaster management methodologies, and needs to be rectified urgently in view of the fact that India is one of the group of countries that are most vulnerable to climate change impacts.

As the assessment of Potential Impact, Adaptive Capacity and therefore Vulnerability is based on subjective assessments, the specific value obtained in the calculation is irrelevant. Based on the definition, it is obvious that negative value of Vulnerability is desirable. We have therefore used a binary scoring system (0 or 10) to fit this parameter in our overall scheme, as outlined in Table 10.

Table 10 Scoring Schemes for Climate Change Impact Parameters

<table>
<tr><th>Carbon Footprint Indicator (per capita C.F. of the city - Desired value of C.F.) x 100/Desired value of C.F.</th><th>Awarded Score</th><th></th><th colspan="2">Climate Vulnerability Indicator Vulnerability = Potential Impact – Adaptive Capacity</th><th>Awarded Score</th></tr>
<tr><td>Negative or zero</td><td>0</td><td></td><td colspan="2" rowspan="9">• Identify critical factors arising from climate change impacts (e.g., water logging due to excessive and unseasonal rainfall, heat waves during summer, drop in agricultural income in hinterlands leading to mass migration, etc.).
• Conduct sample surveys of citizens to gather experiential data on the factors.
• Assign quantitative values to Sensitivity, Exposure, Adaptive Capacity based on survey data, using a scale of 1 to 5, where 1 is LOWEST and 5 is HIGHEST.
• Calculate Potential Impact = Sensitivity x Exposure, and Vulnerability = Potential Impact – Adaptive Capacity.</td></tr>
<tr><td>Nonzero, up to 10</td><td>1</td><td></td></tr>
<tr><td>up to 20</td><td>2</td><td></td></tr>
<tr><td>up to 30</td><td>3</td><td></td></tr>
<tr><td>up to 40</td><td>4</td><td></td></tr>
<tr><td>up to 50</td><td>5</td><td></td></tr>
<tr><td>up to 60</td><td>6</td><td></td></tr>
<tr><td>up to 70</td><td>7</td><td></td></tr>
<tr><td>up to 80</td><td>8</td><td></td></tr>
<tr><td>up to 90</td><td>9</td><td></td><td>Negative or zero</td><td>0</td></tr>
<tr><td>up to 100 or more</td><td>10</td><td></td><td>Positive</td><td>10</td></tr>
</table>

For Pune city, the latest data available on the per capita carbon footprint is 1.64 tCO_2eq *(Development of Pune Solar City-Draft Report 2017)*. Considering this value, the carbon footprint indicator turns out to be negative. This gives an impression that the per capita carbon footprint at the city level is well below the desired value, and hence this aspect is given no consideration in the urban planning. However, as mentioned above, the value of 1.64 tCO_2eq per capita is an underestimate of the actual per capita carbon footprint. We do not have the data required to get a realistic estimate of the per capita carbon footprint at this point. We encourage researchers to take up this challenge.

Figure 6 Climate Vulnerability Assessment Survey in Progress

In the context of climate change vulnerability of Pune, we did the analysis (Fig. 6) for three wards - Aundh (which is part of the SMART city area), Kothrud (a suburb that developed post 1960), and Kasba Peth (the core around which the city has grown since its inception by Chhatrapati Shivaji Maharaj in the 16th century). We found that the vulnerability was positive for the Kothrud and Aundh wards, but negative for Kasba Peth. The older part of the city seems to be more climate proof than the modern and newly developing areas. This is something for urban planners to introspect on.

Although, the analysis has not been carried out across the entire city, there is more population living in newly developed or developing areas, than the core area of the city. Pune is divided into 15 ward areas, out of these, only two (Kasba Peth and Bhawani Peth) fall into the core area of the city. If we assume that these two areas to have negative climate change vulnerability and the remaining 13 ward areas that constitute almost 80% of the city, to have positive climate change vulnerability, we can say that the entire city is vulnerable to climate change impacts.

Thus, based on the analysis of the data, and following the calculation methodology described above, we found the values for the two climate change impact indicators as follows.

- **Carbon Footprint Indicator: 0**
- **Climate Vulnerability Indicator: 10**

INECC Sustainability Index for Pune City

All the values obtained for the selected parameters are collected in Table 11. Our target for 2030, is to get all the parameter values to be around 1, with the exception of climate vulnerability indicator, which should ideally be 0. The corresponding radar chart showing the current status as well as the targeted status for 2030 in Pune is shown in Fig 7.

It is obvious that while the socioeconomic inequity indicators for Pune are fairly good, there is scope for improvement on the environmental and climate change impacts. At the same time, the insight provided by the Deprivation Index (Box 1) as well as the overall low percentages of both men and women having access to basic education show that there is room to improve even on the front of socio-economic inequity. The analysis clearly indicates that any proposed infrastructure development or urban expansion activities must undergo environmental and climate change impact assessments. No development activity should be approved without putting in place the required safeguards to minimise the environmental and climate challenges identified for that activity. Care must also be taken at the same time that the proposed intervention either maintains or improves upon the socioeconomic inequity indicators.

Table 11 INECC Sustainability Index - Parameter Values

Socioeconomic Inequity		**Local Environmental Impacts**		**Climate Change Impacts**	
Access to Civic Services Indicator	Gender Gap in Education Indicator	Environmental Degradation Indicator	Ambient Air Quality Indicator	Carbon Footprint Indicator	Climate Vulnerability Indicator
3	1	8	9	0*	10

**Grade as per measured value, which is an underestimate of actual value. Actual grade may be higher.*

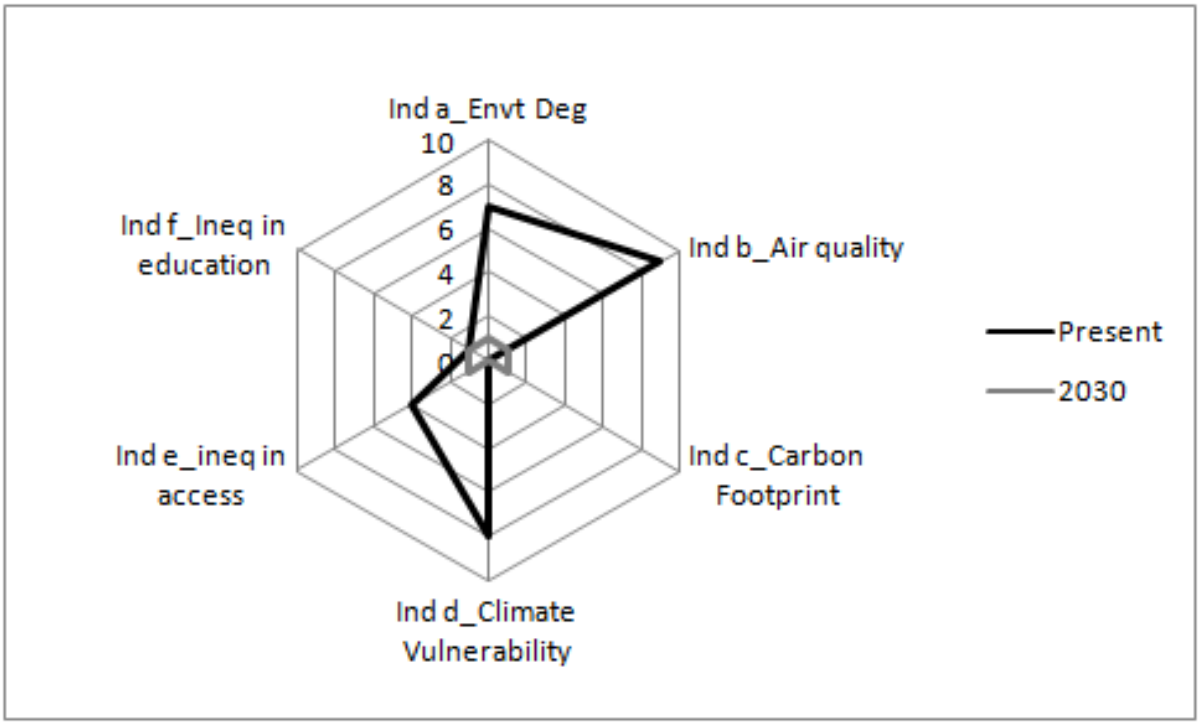


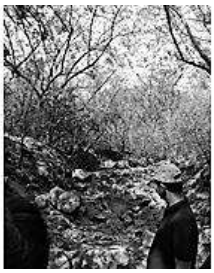
Figure 7 INECC Sustainability Index for Pune - Current and Target for 2030

The approach of assessing any proposed interventions on these six indicators to ensure that the intervention leads to at least maintaining and ideally shrinking the area enclosed by the radar chart can also help in identifying elements of a sustainably SMART development plan for Pune. Researchers may carry out detailed analysis of SMART Pune plan and ongoing activities as well as Pune Municipal Corporation's development plans, as well as the vision and plans of PMRDA on the basis of the sustainability SMART approach, using these indicators.

However, this specific analysis of Pune city is based on either very limited primary data or a lot of non-verified and/or non-updated secondary data. While we believe that the trend shown by the analysis is correct, the precise values of the indicators are significantly uncertain. As a result, at this point our target for 2030 is also rather arbitrary. However, we hope that as more relevant and accurate data becomes available, the analysis can be made in a more precise way.

BOX 2: Additional Studies Conducted

During the course of this project, in addition to the socio-economic sample survey in one ward and the climate change vulnerability assessment surveys in three sample wards, some additional studies were carried out, mainly with the help of interns. These allowed us to gain insights into sustainability challenges of the present-day Pune and also suggest a few solutions to move the city towards our vision of Sustainably SMART Pune.


- *A study on stream mapping was undertaken by a group of interns. Pune city has two major rivers flowing through the city, however the water flow has decreased drastically due to upstream dams. At the same time, alarming volume of untreated sewage water is flowing into the rivers. The study explored the possibility of reviving a number of natural streams flowing into the river, to improve the health of the river. It was concluded that this can be a promising approach, however 100% treatment of sewage water has to be a high priority.*
- *Another internship project focused on designing an alternate riverfront strategy. We propose that the river is a natural heritage and hence the notion of riverfront development with purely commercial objectives should be opposed. On the other hand, we promote riverfront conservation and restoration as the right approach. A representative stretch from Nana Nani Park to Vartak garden was considered for this study, and an alternative to the riverfront development plan was postulated.*
- *We had also undertaken a study on devising the city biodiversity index for Pune, however due to lack of data and documentation, this study was limited to identifying data gaps. If these data gaps are filled, it will be possible to calculate Pune's city biodiversity index.*
- *Vehicular pollution has been one of the major contributors to poor air quality and hence a project aimed at understanding the role of Pollution Under Control (PUC) checks in air pollution abatement and control was undertaken. This study revealed that neither the PUC certification centres nor the traffic police are fully aware of the significance of this process. Furthermore, the PUC norms themselves are very lax compared to the national ambient air quality standards so that it is practically impossible for a vehicle to fail in a PUC check. Such lax standards also defeat the purpose of the entire process.*

Sustainably SMART Development and SDG 11

We believe that the Sustainably SMART approach is in line with SDG 11: Make cities and settlements inclusive, safe, sustainable, resilient *(Sustainable Development Goals 2016).* Table 12 gives the SDG 11 targets and the corresponding vision for a Sustainably SMART Pune in 2030.

Table 12 SDG aligned approach to Sustainably SMART Pune

S.N.	Target	Sustainably SMART Pune 2030 Vision
01	Adequate, safe, affordable housing for All	• All existing slums rehabilitated ideally in the same locations rather than relocating to inconvenient locations. • Demand and supply of housing for all economic groups aligned. • Safeguards in place to prevent formation of new slums.
02	Safe, affordable, accessible and sustainable transport systems for all	• Uninterrupted network of cycle tracks in operation across the city. • Rationalisation of transport systems as per updated mobility plan. • All the available modes of transport harmonised with each other. • Formalizing the para-transit modes of commute in order to manage the congestion in the city.
03	Participatory, integrated and sustainable planning and management	• Ward level Mohalla committees/Area sabhas to be active and thriving, with active participation and co-operation of local political and administrative authorities. • Consensus based decision making being practiced at various levels of decision making in the city. • Transparent and accountable administration.
04	Safeguard cultural and natural heritage	• Cultural and natural heritage sites in the city clearly identified in consultation with citizen groups. • Heritage locations clearly demarcated, and provided permanent protection from encroachment, acquisition, development etc., • Budget and personnel allotted to restore and conserve both cultural and natural heritage sites.
05	Disaster management with focus on protecting	• Ward level disaster management plans, including climate resilience component, prepared in consultation with Mohalla committees/Area Sabha groups.

	poor and vulnerable	• Scheduled activities like mock drills and training in safety measures like first aid to be undertaken periodically to disseminate knowledge to the general public. • Access to disaster management cell easily available through mobile apps as well as smart kiosks spread across the city.
06	Reduce per capita environmental impact (air quality, waste management)	• Low carbon and circular economy driven waste management process in place. • Ambient air quality on par with national standards achieved through shift to electric vehicles, dominance of non-motorised and public transport over private transport, etc. • River and water bodies ecosystem restored and maintained to its natural form through citizen involvement. • Forest cover on hill tops restored and maintained in its natural form through citizen involvement. • All infrastructure in the city based on principle of sufficiency and adhering to green building principles.
07	Safe, inclusive and accessible, green and public spaces	• Garden and play areas accessible free of cost or at nominal charge to all sections of society. • All public spaces accessible to persons with disabilities • Safety and security measures in place with special focus on women, children and senior citizens.

The proposed agenda in Table 12 has been derived applying the principles of minimising the six parameters that form the INECC Sustainability Index. This in turn is expected to lead to shrinking the area under the sustainability triangle.

Box 3: Outreach Activities

'My city My responsibility' is the title of weekly blog posts on SustainABLE Life blog, posted every Tuesday as part of awareness raising component of the project. The series is written by Pournima Agarkar, Research Associate (Pournima Agarkar 2016). In addition, the project team presented the study outcomes from time to time at various workshops, seminars, public meetings, etc., in Pune as well as in other emerging cities across India.

An offshoot of the study led to a Draft Citizens' Charter of a Sustainable City. This led to a short-term project aimed at refining the Charter and evolving a citizens' action agenda based on the targets under SDG 11, with funding from German Federal Ministry of Economic Cooperation and Development in coordination with Engagement Global as consultant.

We attempted to video document a few 'best practices' from in and around Pune. A few of the videos are available on YouTube (Samuchit Enviro Tech 2016). This is work in progress.

Another important point to note is that many of the measures outlined in Table 12 will be impossible to put in place and sustain in the long term without a sense of responsibility on the part of the citizens. For example, participatory governance cannot happen just by putting in place the framework, actual participation by citizens in the processes is the key to its success. Similarly, free, safe and equitable access to public spaces cannot be maintained without co-operation and responsible behaviour by citizens. Therefore, role of citizen groups in education and outreach is also critically important for a Sustainably SMART Pune.

It must also be noted that while we have focused our approach on urban sustainability challenges, the basic principles are applicable to a settlement of any size and population density. In other words, the framework can also lead to vision of a Sustainably SMART Village or a Sustainably SMART Town. The challenges and the specific parameters to focus on may vary, but the approach will be the same.

Our approach also shows that the current framework of urban or rural development, whether it is the development planning process at local body and regional level or mission mode processes like the SMART City Mission, needs to be and can be aligned with SDG 11. This is necessary not just to meet an international commitment by our government, but also to create sustainable and liveable settlements for India in a climate challenged world. Specifically, a lot of the urban infrastructure that will exist in India by 2100 is yet to be build. We are starting with a relatively clean slate. This is a tremendous opportunity to take our country on a low carbon sustainable path in a constructive way.

However, in a democratic system, the policies are guided by aspirations and demands of citizens. If the citizens have a myopic view of ideal cities based on what they see and experience in the developed world, the policies will follow along the same lines. The Sustainably SMART approach is designed more

Sustainably SMART & Carbon Neutral Pune!

From early 2018, the Samuchit-Laya team has joined Climate Collective Pune (CCP), launched by Pune International Centre (PIC) and Centre for Environment Education (CEE).

CCP has a two-pronged strategy to focus on climate literacy among citizens and carry out policy advocacy for low carbon interventions. The ultimate objective of the collective Carbon Neutral Pune 2030, which is very much in line with the Sustainably SMART Pune 2030 approach.

We are jointly promoting the idea of a Carbon Neutral Campus in educational institutions in and around Pune. Pune being a major educational hub in India, if the concept of a Carbon Neutral Campus catches the imagination of students and staff, the education sector in Pune may show the path towards carbon neutrality to the city.

Other outreach activities targeted at various stakeholder groups will be undertaken in the next few months.

for simplicity than academic rigour, so that citizen groups, local politicians and administrators can use it to apply the sustainability lens to their vision of their city's future. We hope that engagement with this framework will lead to articulation of a sustainably SMART roadmap for development of any city. This will help in awareness raising at the level of citizens, and will also push the citizens, politicians, and administrators to revise their aspirations and align with the principles of sustainability. In the short term, we hope that this will have a positive impact on the behaviour and practices of citizens as well as priorities of the local administrations. In the long run this approach may impact state and national level policies on urbanisation in general.

Thus, in summary, the INECC Sustainably Index and the Sustainably SMART development approach can help:

- citizens to articulate and imbibe a vision of a sustainable, equitable and liveable city,
- citizen groups to play the role of a watch dog over the local administration,
- city administrations to plan a development trajectory in line with SDG 11 in collaboration with citizens,
- state and central governments to align the urban (and rural) development policies in India with SDG 11.

Acknowledgement

We acknowledge timely inputs, guidance and expert advice of all the professionals (Architects, urban planners, engineers), researchers, academicians, bureaucrats, environmental reporters, and above all citizens and citizen groups. It is impossible to acknowledge every individual by name however, we would like to put on record our gratitude and appreciation of everyone's readiness to share information and knowledge, and to support the project in a variety of ways.

Following is the list of organizations in Pune that we interacted with and/or collaborated with during the course of the study. We put on record our thanks to all for their contributions.

1. Abasaheb Garware College of Arts & Science, Biodiversity department
2. Advanced Centre for Water Resources Development and Management (ACWADAM)
3. Agharkar Research Institute (ARI)
4. BAIF Development Research Foundation
5. Bharti Vidyapeeth College of Architecture
6. Bharti Vidyapeeth Institute of Environment Education and Research (BVIEER)
7. Centre for Environment Education (CEE)
8. Datameet
9. Ecological Society
10. International Council of Local Environmental Initiatives (ICLEI)
11. Indian Network on Ethics and Climate Change (INECC)
12. Indradhanushya Centre for Citizenship and Environment Education
13. INTACH
14. JeevitNadi Living River Foundation
15. Jividha
16. Kirloskar Vasundhara International Film Festival (KVIFF)
17. Mashal
18. Oikos for Ecological Services
19. Parisar
20. Parjanya Foundation
21. Pune International Centre (PIC)
22. Pune Municipal Corporation - Environment Cell
23. Pune Municipal Corporation - Heritage Cell
24. PVG College of Engineering
25. Sagarmitra
26. Shrishti Eco Research Institute (SERI)
27. Society for Promoting Participatory Ecosystem Management (SOPPECOM)
28. Sustainability Initiatives
29. SWaCH
30. The Daftar

We must also acknowledge all the interns who worked on various aspects of the study in the period of three years. We hope that the experience was as enriching for them, as their contributions were valuable to us.

1. Aishwarya Shendage, BN College of Architecture
2. Ashlesha Karande, Environmental Science Department, Fergusson College
3. Avi Saini, Volunteer
4. Chandana Phadkule, Symbiosis School for Liberal Arts
5. Dexter Mosoh, Environmental Science Department, Fergusson College
6. Geetanjali Purkayastha, Tata Institute for Social Sciences, Guwahati
7. Hrushikesh Galagali, Environmental Science Department, Fergusson College
8. Jyoti Mishra, DY Patil School of Architecture
9. Kanchan Girde, DY Patil School of Architecture
10. Karuna Ghorpade, BN College of Architecture
11. Kasturi Sankpal, DY Patil School of Architecture
12. Mukta Deodhar, Bhoomi College, Bangalore
13. Sakshi Yenkar, Environmental Science Department, Fergusson College
14. Sanjita Maindargikar, DY Patil School of Architecture
15. Shivani Thigale, BN College of Architecture
16. Shreya Ramajgol, Environmental Science Department, Fergusson College
17. Swatee Solunke, DY Patil School of Architecture
18. Tejaswini Datar, BN College of Architecture
19. Tejaswini Landge, Volunteer
20. Vishaka Tawani, DY Patil School of Architecture

We are particularly grateful to Prof K. Kameshwar Rao, Environment Science Department, Geetam University, Visakhapatnam for useful inputs in the formulation of the methodology of the study.

The authors of the report would like to put on record their gratitude for the support of Nafisa D'Souza, Ajita Tiwari, Myron Mendes and Nagamani of Laya, as well as Anu Kuncheria, who worked as Research Associate for the first year of the project and continued to support voluntarily beyond the period of her assignment and Harshil Ruparel for his contribution to video documentation of best practices. We are also grateful to our colleagues at Samuchit Enviro Tech for their support and cooperation.

Samuchit, Laya and INECC also put on record their gratitude for the financial support from Misereor, Germany for this study.

References

Annual Report 2016-17 and 2017-18 Pune SMART City Development Corporation Limited (PSCDCL) Pune. Available from: https://punesmartcity.in/about-pscdcl/annual-reports/

Anu Kuncheria. [Internet] 2016 SUSTAINABLY SMART PUNE STUDY - Survey Analysis I. Pune Samuchit Blogspot; Available from: https://samuchitenvirotech.blogspot.com/2016/12/sustainably-smart-puen-study-survey.html

Anuradha S 2018 April Four Years and Counting Smart Cities Mission a damp squib. Express News Service [Internet] [cited on 5 Dec 2018] Available from: http://www.newindianexpress.com/business/2018/apr/01/four-years-and-counting-smart-cities-mission-a-damp-squib-1795310.html

Development of Pune SolarCity-Draft Report 2017. Pune Municipal Corporation (PMC) and International Council for Local Environmental Initiatives (ICLEI) South Asia. Pune (*Final report not yet published*)

Environment Status Report 2014-15 Pune Municipal Corporation. Pune Available from: https://pmc.gov.in/sites/default/files/reports_dpr/Draft_ESR%202014-15.pdf

McCarthy et.al [internet] .2001.IPCC TAR WG2 - Climate Change 2001 Impacts, Adaptation and Vulnerability, Cambridge University Press, Archived from: https://web.archive.org/web/20160514070847/http://www.grida.no/publications/other/ipcc_tar/?src=%2Fclimate%2Fipcc_tar%2Fwg2%2Findex.htm

National Air Quality Index [Internet] 2017 Pune City: Central Pollution Control Board Ministry of Environment, Forests and Climate Change. (cited data from December 17 to November 18) Available from: https://app.cpcbccr.com/AQI_India/

National Footprint Accounts 2016 Open Data Platform 2016 Global Footprint Network. Available from: https://www.footprintnetwork.org/our-work/ecological-footprint/

Neelmani Jaysawal, Sudeshna Saha. [Internet] 2014. Urbanization in India: An Impact Assessment (Article 3) Available from: http://article.sapub.org/10.5923.j.ijas.20140402.04.html

Pournima Agarkar. [Internet] 2017 My City My Responsibility –Walk the Talk. Pune: Samuchit Blogspot; Available from: https://samuchitenvirotech.blogspot.com/2017/12/my-city-my-responsibility-punes-voice.html

Samuchit Enviro Tech 2016 Jun 20 Sustainably SMART Pune 2030 Study Project - Talk by Priyadarshini Karve [Internet] .Youtube.com; [cited on 2018 Dec 7] Available from: https://www.youtube.com/watch?v=97U4mkKJk2o&list=PLO9IWBWSV1ag2NXxMOJ-hGBeukaGISGmd

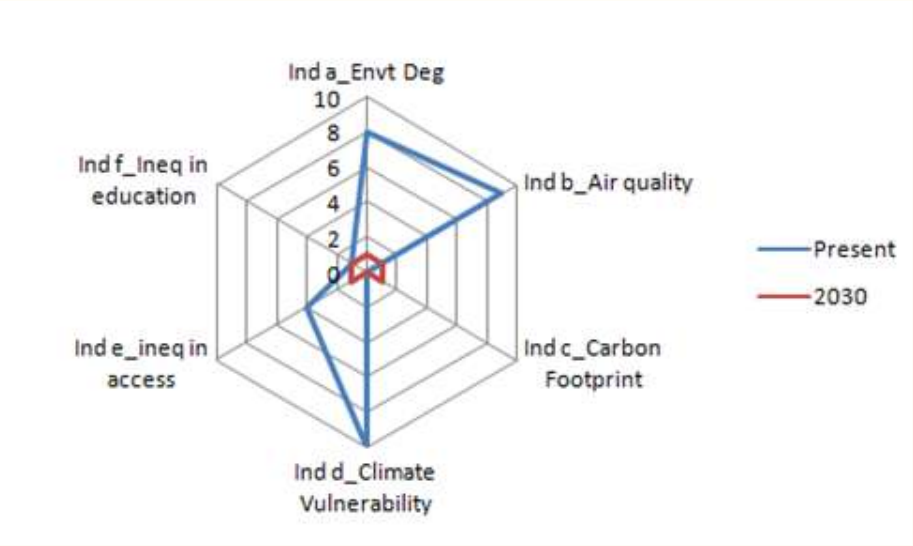
Smart City Proposal Presentation 2015 Pune Municipal Corporation Pune Available from: http://opendata.punecorporation.org/PMCReports/PSCDCL-Smart-City-Proposal-Presentation.pdf

Sustainable Development Goals [Internet]. 2016, United Nations Development Programme . Available from: http://www.undp.org/content/undp/en/home/sustainable-development-goals/goal-11-sustainable-cities-and-communities.html

Sustainable Urban Strategy - UNDP's Support to Sustainable Inclusive and Resilient Cities in the Developing World. [Internet] 2016 United Nations Development Program New York. Available from: http://www.undp.org/content/undp/en/home/librarypage/poverty-reduction/sustainable-urbanization-strategy.html

Urban Poverty in Asia [Internet] 2014 Asian Development Bank Mandaluyong City Philippines Available from: https://www.adb.org/sites/default/files/publication/59778/urban-poverty-asia.pdf

Ward wise City Census [Internet] 2011 Pune: Pune Municipal Corporation Open data Portal Available from: http://opendata.punecorporation.org/Citizen/CitizenCategory/Category?departmentId=3



This study has been supported by MISEREOR, a German Catholic Bishops' organization for Development Co-operation. For over 50 years, MISEREOR has been committed to fighting poverty in Asia, Africa and Latin America.

www.misereor.org

This report has been prepared by Samuchit enviro tech, Pune. Samuchit is a social enterprise with the mission of enabling individuals, households, institutions, and small businesses to embrace sustainability in their daily activities. While the majority of activities are focused in western India, Samuchit has been involved with a number of pan-India projects as well as projects in other countries in Asia and Africa, either as service/product provider for eco-friendly lifestyle products or as adviser for projects on environmentally sustainable household energy.

www.samuchit.com / samuchit@samuchit.com

In Association With

The Indian Network on Ethics and Climate Change (INECC).

INECC is a national network comprising of individuals and organizations from across 5 ecosystems and 12 states, who are concerned with the issue of climate change from a micro-macro perspective. It connects the issue of Climate change to larger sustainable development and social justice concerns. INECC's bye line is "Peoples Voices in Policy Choices'. In this context INECC perceives policy choices in favour of communities most challenged by the Climate Crisis.

www.inecc.net / inecc1996@gmail.com

Laya, an NGO based in Visakhapatnam.

Laya's journey for over 25 years aims at empowering the adivasi communities through a range of initiatives that demonstrates an alternate paradigm to development which is inclusive, equitable and sustainable. Laya functions as the secretariat of INECC.

www.laya.org.in / layarc@gmail.com