



# Towards a Sustainable Smart City: The Case of Aizawl

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Photo: ORF

## ABSTRACT

India's hill cities are unique poles of development. While they have managed to record some degree of economic growth, increasing urban population and unfavourable topography have also made such growth haphazard and unsustainable. In turn, this has threatened the quality of the built environment

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and of urban life in these cities. This report studies the case of the hill city of Aizawl, the administrative capital of Mizoram, which is part of the government's '100 Smart cities mission'. The report analyses the problems concomitant to the unplanned urbanisation of Aizawl, as well as the initiatives taken by the Mizoram state government to make the city a vibrant, competitive and liveable city. It offers recommendations for the effective implementation of the Aizawl smart city mission.

## **INTRODUCTION**

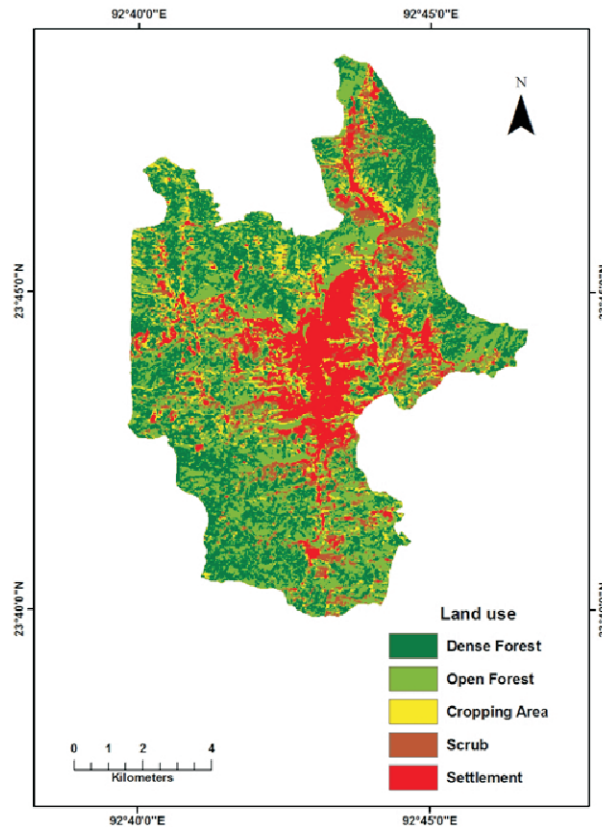
Cities in India are focal points of regional growth and development. The rapid pace of urbanisation is no longer considered 'parasitic', but rather 'generative', contributing to the growth of the national economy. The increasing wave of globalisation, particularly after the economic reforms in the country, has enhanced the pivotal role of cities in the process of development. It cannot be overemphasised that national and regional development rests largely on the competitiveness, vibrancy, efficiency and liveability of cities. At the same time, questions of sustainability, inclusiveness and equity have been raised as a reaction to globalisation-led urbanisation.<sup>1</sup>

The remarkable growth of cities in recent years has put tremendous pressure on their infrastructure and socio-economic resources. As a response, the concept of the so-called 'smart city' has evolved over the recent years—the aim is to transform the cityscape with more investment in traditional infrastructure, and by wide-ranging applications of Information and Communication Technologies (ICT) to "fuel sustainable economic growth and a high quality of life, with wise management of natural resources, through participatory governance".<sup>2</sup> The use of ICT will enhance urban productivity and lead to more efficient urban governance.<sup>3</sup>

## **AIZAWL CITY: AN OVERVIEW**

Aizawl, the administrative capital of Mizoram, is a hill city with moderate climate throughout the year. It is connected to the rest of the country by National Highway No. 44 from Guwahati via Silchar. The nearest airport is Lengpui – a two-hour drive from the city. The city has a highly dense core with multiple land-uses interspersed with uninhabitable steep slopes (Figure 1). From the core, there has been linear urbanisation in several directions along transport routes, which have severely restricted accessibility. The city is known for its vibrant culture.

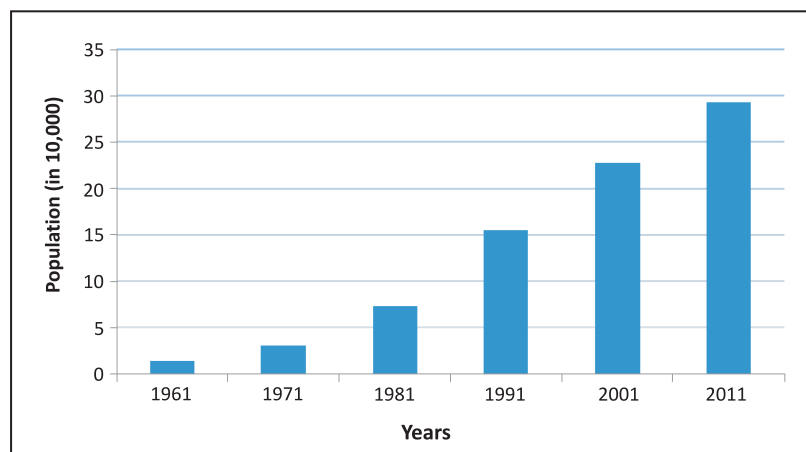
**Figure 1: Land Use/Land Cover Map of Aizawl City**



*Map prepared by Vanlaltanpuia, Research Scholar, Mizoram University, based on LISS - III satellite images.*

From its establishment as a colonial military outpost in 1890 to accommodate soldiers, Aizawl has grown rapidly in the last 128 years to reach a population of more than 2.93 lakh, according to the 2011 Census (Figure 2). Socio-political turmoil in the state due to 20 years of insurgency (from 1966 to 1986) led to large-scale migration into the city. Other reasons for the rapid growth of Aizawl are availability of employment opportunities, and better amenities and infrastructural services than elsewhere in the state. At present,

**Figure 2: Growth of Aizawl Population, 1961-2011**



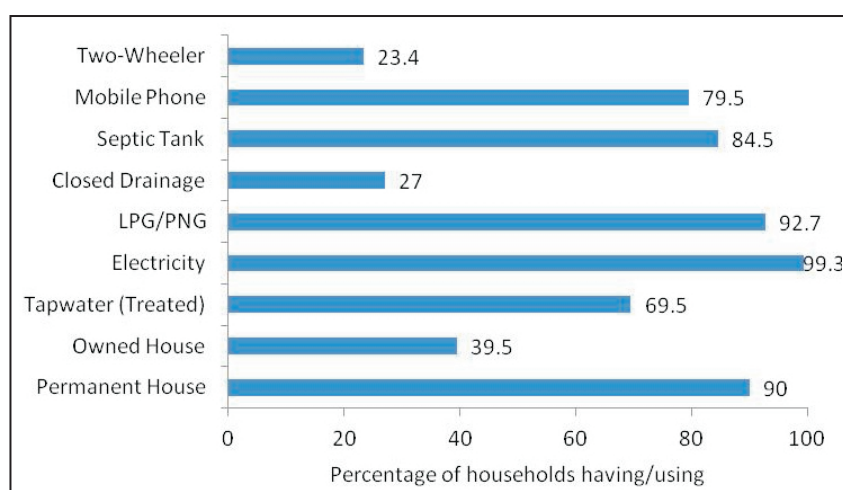
*Source: Census of India, 2011.*

the city is home to 27 percent of the total population of Mizoram, though it occupies only 0.6 percent of the state's total geographical area. The second biggest town in the state, Lunglei, which had a population comparable to Aizawl's in pre-independence times, now has only a fifth.

The rapid growth of Aizawl's population has put tremendous pressure on the land, economy and physical infrastructure of the city. In the absence of a proper urban policy, the city has simply sprawled, and its inadequate infrastructure and services have barely managed to cope. The space economy of the state has been highly distorted in favour of Aizawl, with infrastructure, services and avenues for employment largely concentrated in this single city. Consequently, it attracts people and resources from other district capitals, smaller towns and villages. The lack of spatial planning has resulted in construction of buildings on steep slopes, a poor transport system, narrow roads, inadequate provision of drinking water, poor management of solid waste, lack of open spaces, insufficient pavements and parking lots, and other municipal deficiencies.

The topography and associated limited available land has encouraged intensive utilisation of useable lands. All residential areas have mixed land-use, including commercial and small-scale industrial uses. Recently, the municipal corporation took the initiative to shift production and manufacturing units out of inner city areas. There are proposals to make these 'restricted residential areas'. Less economically competitive land-uses like green spaces, parks and playgrounds are but a fraction of the built-up space. There is little space left for construction or widening of roads. Even if this is made possible with a huge amount of outlay, it may come at the cost of immense environmental and physical degradation, and lead to frequent landslides.

**Figure 3: Household Amenities, Aizawl City, 2011**



Source: Census of India 2011.

Increasing migration and scarcity of affordable land have severely affected ownership of housing. Only 39.5 percent of all households are living in houses which they own (Figure 3). The increasing demand for housing has led to the proliferation of housing units on steep slopes, which are considered unsuitable for living. At the same time, vertical extension of buildings has become popular. A pattern of housing called ‘vertical differentiation’ has developed in which the rich and the poor occupy the same building – the upper floors are occupied by the better-off while poor people live in the basement.<sup>4</sup> Even in the wealthiest residential areas, the basements of multi-storied buildings are in slum-like condition.

It is increasingly becoming difficult to provide basic services to every household. The state has done a commendable job of providing electricity and cooking gas connections to more than 90 percent of total households. However, the supply is irregular and inadequate; water is also becoming more scarce. Strengthening institutional and infrastructural capacities to cope with increasing demand is highly needed. It is also necessary, given the threat of global warming, to increase utilisation of renewable sources of energy.

Even so, overall, the city maintains a green, harmonious and peaceful environment. It has a literacy rate of 90 percent, and its large population of educated people could yet serve as an innovative and transformative resource if provided proper skills, technologies and infrastructure. The community (including the minorities) has strong linkages through participation in organisations such as the Young Mizo Association (YMA), the Mizo Hmeichhe Insuihkhawm Pawl (MHIP), Mizo Women Federation/Association, and various religious organisations.

## **URBAN GOVERNANCE AND PLANNING: THE ROAD TO A SMART CITY**

Until 2007, the only local bodies in Aizawl city were the ‘Village Councils’ of the 76 localities within the city area. The Village Councils worked under the Local Administration Department (LAD) with minimal functions and powers. Urban planning fell under the jurisdiction of the Town and Country Planning (T&CP) Wing of the LAD. The state government enacted the Mizoram Urban and Regional Development (MURD) Act, 1990 “to make provision for the regulation of planned growth and development of urban and rural areas and regions”. Accordingly, the MURD Rules were passed in 1998. However, they have been poorly implemented.

Realising the increasing needs of the city to tackle urban problems, the state government created an Urban Development and Poverty Alleviation (UD&PA)

department in 2006. The Aizawl Development Authority (ADA) was also constituted the same year under the provisions of ADA Act, 2005. With an earlier master plan for Aizawl prepared by the T&CP wing having lost its relevance, a new “Aizawl Master Plan: Vision 2030” was prepared. In 2015, however, the ADA was dissolved and subsumed under the Aizawl Municipal Council (AMC).

The formation of the AMC was rooted in the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) initiated by the Centre in 2005 to improve urban infrastructure, ensure the provision of basic services to the urban poor, and strengthen municipal finances. The creation of an urban local body was made a prerequisite to receiving JNNURM funds. Thus was enacted the Mizoram Municipalities Act 2007, which led to the formation of the AMC, Ward Committees, and the rechristening of Village Councils as Local Councils (LC) with redefined powers and functions.<sup>5</sup> The first election of the AMC took place in 2009. The civic status of Aizawl municipality was changed from ‘Municipal Council’ to ‘Municipal Corporation’ in 2015 when it was estimated that the population of the city had reached 300,000.

In 2009, the Asian Development Bank selected Aizawl as one of the five capitals in Northeast India to be included in its North Eastern Region Capital Cities Development Investment Programme (NERCCDIP). The programme sought to make the newly established Aizawl Municipal Council (AMC) financially self-sufficient by 2017 through reforms in governance, and management of urban amenities and infrastructural services.<sup>6</sup> Infrastructural development, particularly water supply, sewerage and solid waste management, were carried out by the State Investment Programme Management and Implementation Unit (SIPMIU) under the UD&PA department.

The ‘100 Smart Cities Mission’ was launched by the central government in 2015. It deliberately avoided defining a ‘smart city’, but asked each chosen city to evolve their own parameters. However, it stated that the main purpose of the mission was “to drive economic growth and improve the quality of life of people by enabling local area development and harnessing technology, especially technology that leads to smart outcomes”.<sup>7</sup> The main sectors suggested for applying and formulating smart solutions were water supply, sanitation, mobility, housing, energy and environment.<sup>8</sup> The most crucial components of the Indian smart cities mission were its Area Based Development (ABD) and pan-city components. For ABD, cities were directed to choose any area for city improvement (retrofitting), city renewal (redevelopment) or city extension (greenfield development). They were also allowed to choose a mix of these. Pan-city development, also a strategic component of ABD, envisioned the application of selected smart solutions to existing city-wide infrastructure.

The proposal submitted by Aizawl city was accepted in the third round of competition for inclusion in the 'Smart Cities' initiative. The vision statement of Aizawl's Smart City Proposal (SCP) declared that the city will be an inclusive, sustainable and resilient one by leveraging its human capital through technology, and celebrating its culture and nature by focusing on resilient environment, economic sustainability, improved quality of life, improvement of basic services and strengthening of human resources. To implement these objectives, a special purpose vehicle (SPV) called 'Aizawl Smart City Ltd (ASCL)' has been constituted under the chairmanship of the Secretary to the Government of Mizoram, UD&PA.

Under the ABD component, the Aizawl SCP has opted for retrofitting-cum-greenfield development. The selected site for retrofitting is the core or 'economic spine' of the city which runs from Chaltlang to Dawrpui (including the Assam Rifles premises in the heart of the city). This core area may have been selected due to technical feasibility, need to promote tourism, and inner city redevelopment. The retrofitting proposals include opening and connecting ground floors of public and private lands in the built-up areas for 'multiple public congregation spaces' and enhancing accessibility; development of open spaces and walkways; and promotion of renewable sources of energy.

### ***Inclusive City***

Inclusive governance is one way to transform 'traditional cities' into 'smart cities'. This is done through the provision of infrastructure and services to various sections of the population. It also ensures participation of all stakeholders in the decision-making process. Mizoram has inclusive cultural institutions such as YMA and MHIP and they are unique. Although the names of these associations include the word 'Mizo', membership is open to all. Since their establishment, these institutions have proven themselves to be effective channels of communication between the government and the public.

Cities tend to get divided across population groups and spaces. In Aizawl, the infrastructure and facilities are not suitable for those who are physically handicapped. The topography of the city alone severely restricts their physical movement; it has not helped any that provisions for them in building regulations and construction manuals have been sorely neglected. The Aizawl SCP gives due importance to creating smart infrastructure to enhance their accessibility to the disabled, as well as other marginalised groups. The children of Aizawl have also been forgotten in the process of development—the city has only one community park and a few small playgrounds, and they are in poor condition.

A smart city should give priority to making adequate space for people's needs.<sup>9</sup> By putting more emphasis on area-based development, the Indian smart cities mission has largely failed to include the poorer sections at the urban peripheries. The state government recognised 73 slum pockets under the Rajiv Awas Yojana (RAY) scheme. Subsequently, the 2011 Census counted 26.8 percent of Aizawl's population as living in 'recognised slums'. These slum pockets are mostly found at the periphery of the city, on hill slopes and at valley bottoms. They occupy the least accessible, most vulnerable and unliveable spaces. It was surprising to see that the Aizawl SCP has made contradictory assertions by referring to the construction of 'slum housing' under the Pradhan Mantri Awas Yojana-Housing for All (PMAY-HFA) scheme (which has subsumed the RAY scheme) in the city profile section, while the 'Strengths-Weaknesses-Opportunities-Threats (SWOT) analysis section boasts that there are no defined 'slums' in the city.

Moreover, a number of job-seeking migrants and poorer households are found living in the basements of multi-storied buildings within the inner city core area and adjacent localities. Most of them have settled there either due to their attachment to these places or proximity to their workplaces. These basement slums have not been recognised in the SCP, and no provision has been made to improve their quality of life.

### ***Sustainable City***

Sustainability is an important component of a smart city. The Aizawl SCP also stresses the importance of sustaining economic growth through human resource development and provision of infrastructural services and amenities. It emphasises utilisation of renewable sources of energy, recycling, and efficient management of waste.

### ***Sustainable Urban Economy***

Enhancing the economic growth rate of Aizawl city is essential for the development of the state. With Mizoram lying at the periphery of a 'globalising world', the economy of the state, devoid of industry, has been dominated by agriculture and services. The state government is the biggest employer. Other major employment generating sectors are trade and commerce, education, health, transport and construction. All these, except construction, have been dominated by local workers. Construction is dominated by migrant labourers from Bangladesh and various parts of India.



The urban economy is dominated by the informal sector. In Aizawl, the so-called ‘invisible economy’ is where the poor find their livelihood. The Aizawl SCP, however, only mentions demarcation of vending zones for street vendors. The formal economy of the city could be enhanced by increasing its absorptive capacity and employment opportunities for the educated and skilled professional residents as well as migrants.

Tourism, meanwhile, is expected to become an important source of revenue. The state is known for its beautiful landscape and unique tribal culture – its local food, folk dances, textile, ornaments, traditions and other markers of identity. Aizawl alone receives more than 500,000 domestic tourists every year. There are thousands of travellers every day from other parts of the state and neighbouring states. However, accommodating this floating population is a challenging task.

### ***Sustainable Resource Management***

Increasing population, economic growth and conspicuous consumerism have resulted in considerable depletion of natural resources, use of non-biodegradable materials such as plastic, and emission of pollutants. There has been a decline in the number and volume of public spring waters –an important water source for the poor and the middle class. Chite Lui, the river flowing in the eastern part of Aizawl becomes a channel of waste water during the rainy season and almost dries up in the dry season. The absence of measures to regulate rivers and streams in the state has led people to encroach upon them and utilise them for commercial purposes. Conservation measures have been taken up only lately by cleaning up plastic wastes and planting trees along the Chite Lui’s course.

Sustainable development demands harnessing of flow resources. It has been estimated that the annual average availability of solar energy in Aizawl city is 4.46 KW/M<sup>2</sup>/day. If harnessed properly, this could be a good alternative source of energy. However, 99.3 percent of Aizawl’s households have reported grid electricity as their main source of lighting. The state government has already initiated a solar programme by introducing its ‘Policy for Power through Non-Conventional Energy Sources’ in 2003 and the Mizoram Solar Power Policy in 2015. Some of the most important components of the Aizawl SCP under its pan-city component are the installation of solar powered street lights, traffic lights and digital hoardings, and the construction of public toilets with solar roof tops.

The provision of adequate water supply is a challenging task in Aizawl, particularly during the dry season of November to April. Only 70 percent of

Aizawl's residents depend on piped water supply from the government. The remaining 30 percent use other sources, including springs, and wells. The per-capita water supply is 70.1 litres per day, which is far below the minimum standard of 135 litres. Transmission loss of water due to the use of obsolete materials and equipment is estimated to be as high as 50 percent. Normally, water supply pipes provide water for only one or two hours twice a week and water is stored tanks, usually on the top of buildings. During the dry season, many people buy additional water from private water carriers.

The amount of solid waste generated in Aizawl city is estimated at 160 MT per day. Of this, 38 percent is biodegradable or wet waste, while 39 percent is recyclable or dry waste. The remaining waste is inert ash and debris. The per-capita waste generation is 495 grams per day per person. Since 2009, solid waste management in Aizawl city has been carried out through the ADB-funded NERCCDIP project in public-private partnership mode, in which local councils are entrusted with collecting waste within their areas. Dry and wet waste buckets have been distributed to every household, and are collected by garbage trucks at collection points where residents bring their waste. The collected waste is disposed of at the Tuirial dumping site where it is burnt in the open. The AMC recently procured 54 especially designed dry and wet garbage trucks. A modernised solid waste resource management centre is also being constructed at the Tuirial dumping site.

Another serious issue in Aizawl is sewerage. With no existing sewerage, more than 84.5 percent of households use septic tanks. Pit latrines, connected to septic tanks, are used by 7.6 percent of households. Though septic tanks are usually two-chambered, they easily fill up because they were not constructed properly. Emptying of septic tanks has to be done manually by private agencies. In the absence of treatment facilities for the waste, collected septages are dumped on private lands along roads to be drained away by rain. The state government has purchased five cesspool cleaner vehicles under the ADB-funded NERCCDIP project, though people prefer to hire private agencies for the task.

Sullage or wastewater from kitchens and bathrooms is discharged into open drains. Only 27 percent of households have closed drainage systems while 10.3 percent have no drainage at all (Census 2011). This lack of proper drainage is considered one of the important causes of frequent landslides in the city. The Aizawl Master Plan has proposed setting up nine sewage treatment plants at different locations. One of them is being built under the ADB project near the Chite River at Bethlehem Vengthlang. It will treat household sullage and septage from public toilets, and is expected to benefit 67 percent of the

population living in core city areas, which is 30 percent of the entire city population.

### **Safe City**

Smart cities are safer cities, whether from natural hazards or issues of law and order. Aizawl is vulnerable to landslides, earthquakes, cyclones, and long-term hazards like environmental degradation and climate change. Almost every year, heavy and continuous rains trigger landslides that cause deaths, obstruct roads, and destroy buildings and other property. With the city being located in the highest earthquake risk zone, Seismic Zone V, thousands could be killed if a major earthquake occurs. To make the city more resilient, municipal building regulations have prohibited construction of buildings on steep slopes, as well as high-rise buildings. The maximum permissible height of a building has been fixed at 22 metres. The State's Disaster Management Authority has prepared the Mizoram State Disaster Management Plan 2011-12 as per the mandate of the Disaster Management Act, 2005. The plan has formulated strategies for the prevention of landslides, monitoring and mitigation of hazards, as well as preparation for, and coordinated response to disasters such as earthquakes.

Crimes and road accidents are growing public safety issues in Aizawl. A few CCTV cameras have been installed at various strategic locations to ensure safety of residents and tourists. The Aizawl SCP has laid out plans to install more surveillance cameras and better solar powered street lights. The streets and important buildings must have a sophisticated and integrated surveillance network.

### **Urban Mobility**

As a highly monocentric city with narrow roads, Aizawl is badly affected by the rapidly increasing volume of motorised vehicles. The absence of proper planning and the nature of the terrain are the main causes of traffic problems. Enhancing accessibility is one of the most challenging tasks of city planners, since transportation affects the environment, employment, health, education, and security. A traffic-congested city cannot be smart, liveable, economical and secure.

Aizawl city has a high density of motor vehicles: the Census of 2011 recorded 144 cars and 234 two wheelers per 1,000 households. Two-wheelers are increasingly popular because of the hill topography, narrow roads, and

sprawling nature of the city that limits travelling on foot and use of bicycles. The state government introduced two-wheeler taxis in 2016 to reduce traffic congestion and facilitate mobility.

The most important route in Aizawl city runs in a north–south direction at the crest of the main ridge of the city. This route from Bawngkawn to Kulikawn (B–K route), also called the N-S Corridor, connects the most important sites of the city. Land value is the highest along this route. The Aizawl SCP proposal, however, failed to suggest ways for improvement of public transport on this corridor. Given the high population and vehicular congestion of this area, it is questionable if the proposals made under ABD components, such as development of multi-utility centres, rejuvenation of markets, and construction of housing for economically weaker section (EWS) will lead to improvements in liveability. The core city is already congested due to its centrality and narrow roads, and redevelopment of the area without widening of the existing roads may lead to even more congestion.

Parking is another issue in Aizawl, even as the state and municipal governments have initiated several measures to mitigate the problem. Non-parking areas have been delineated along important roads, and vehicles without a proper parking lot are not registered. However, effective implementation of parking rules is difficult due to the absence of regular checking and monitoring. The Aizawl SCP has tried to address the parking problem through construction of multi-level car parking lots.

Facilities for walking unhindered are an important feature of a smart city. Here, Aizawl also falls short: the city has only a few sidewalks/footpaths for pedestrians, which are found along the main roads. The spaces for potential footpaths along roads are usually used as parking lots. While a number of footpaths are recently being constructed in the inner city, steps along steep slopes need to be remodelled to make them suitable for the elderly and the disabled.

## CONCLUSION

The future of cities depends upon their increasing use of technology, and the capability and commitment of urban managers and users. The following measures are recommended to make Aizawl smart, inclusive, sustainable, resilient and liveable:

- **Participatory, Open and Inclusive Governance** – The ‘smart city’ concept has pushed for greater participation of smart citizens in

polycymaking - from planning to implementation. It also calls for better coordination and interconnection between citizens and decision-makers through social media and the Internet of Things (IoT). Devolution of more powers and functions to the 'unique' fourth tier of government, the Local Councils, would enhance popular participation.<sup>10</sup>

Smart governance is inclusive. The city should provide more spaces for children, the handicapped, pedestrians and women. Vulnerable groups could also be provided digital infrastructure to cater to their specific needs. The urban poor also deserve particular attention.

- **Smart Mobility** – Urban mobility can be enhanced by implementing an intelligent transport system (ITS) to reduce congestion. This can be done by collecting real-time traffic data from strategic locations to monitor and evaluate traffic movement. Likewise, parking lots must be equipped with digital devices to collect data on the duration of parking time. Other possible measures could include reduction of vehicular flow during the day by shifting wholesale and hardware shops and small-scale production units out of city core areas, declaration of off-days for specific markets, and opening markets at night.
- **Smart Resource Management** – Renewable energy – solar and water resources – could be efficiently harnessed through innovative rooftop rainwater-cum-solar harvesting systems. To improve the energy distribution system, remote-controlled smart meters could be installed to monitor allocation and leakages.


Solid waste management measures could include construction of solid waste gasification facilities, installing of GPS on garbage collection vehicles to know their exact movements, installing of underground smart bins equipped with sensors to measure the amount of garbage to increase the efficiency of collection.

The sewage treatment facility that is currently under construction will serve only 30 percent of Aizawl's population. It is necessary to construct more facilities to serve other parts of the city. Private agencies emptying septic tanks should be regulated.

- **Smart Living** – Provision of affordable housing to the urban poor is one of the first steps needed for smart living. Buildings should have solar-powered lighting systems and building automation systems (BAS) to enhance sustainability and liveability.

To improve the quality of education, online courses such as the Massive Open Online Courses (MOOCs) could be introduced. Healthcare could be improved by wider use of sensors, electronic devices and smartphone applications, integrated through 3G/4G connections with health workers and medical practitioners to enable remote diagnoses, treatment and monitoring.

- **Urban and Regional Planning** – The land use zones proposed by the city’s Master Plan should be properly implemented. Basic infrastructure such as roads, water supply, electricity, education and healthcare should be provided adequately in the peripherally located proposed land-use zones to attract private investment and skilled labourers.

The growing problems associated with increasing migration into the city need to be tackled with a regional planning and development approach.<sup>11</sup> The state government should be committed to strengthening administrative, educational and healthcare institutions in other district capitals and bigger towns. These should also be provided traditional and digital infrastructure to check migration to Aizawl. 

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