

CLIMATE SMART GOVERNANCE

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Department of Science and Technology



SECTOR - 5

CLIMATE CHANGE AND URBAN DEVELOPMENT

**TRAINING MODULE
(2017-2020)**



CLIMATE CHANGE AND URBAN DEVELOPMENT

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1. CLIMATE CHANGE AND URBAN DEVELOPMENT

Urban populations are growing very rapidly throughout the world and by the turn of the century almost half of the world's population will live in urban areas (WMO, 1996). The temperature is usually higher in a city. In some cases, it leads to excessive heat stress, especially in the tropics. The pollution in the urban air blocks solar radiation and can be a health hazard itself.

Cities can be viewed as hubs of rigorous resource demand, environmental degradation and greenhouse gas emissions. Cities form a major part of the solution in promoting low carbon development, through use of renewable energy, energy efficiency, green buildings and mitigating emissions from urban transport. Cities are also going to be the centre of increasing losses due to the impacts of climate change because of concentrated populations and large-scale economic investments (The Energy & Resource Institute [TERI], n.d).

Today, urban areas constitutes more than 50% of the world's population. This is linked with "Development" and considered to be a good change. There is an increasing pressure on nations to outshine other by having larger and larger proportion of its population living in cities, this is so because it is regarded as a sign of economic and as well as overall development.



To provide better quality of life, cities are known, which is attributed to better access to facilities, more employment opportunities, better income, better education and overall increase in choices in one's life. Living in a city is also considered as a status symbol in many of the developing countries. While cities have always been fascinating & attractive because of extensive opportunities they have their own problems face criticism. Cities have been long criticized for numeral problems like deteriorating health condition because of stress, loss of culture, hectic & stressful life, resource depletion & particularly climate change (PlanningTank, n.d.).

1.1 Urban Growth leads to climate change

The local climatic conditions influences urbanization process. At the same time, urban development has introduced changes in land surface characteristics which, in turn, have changed the local climate into what can be defined as "urban climate".

- **Energy Consumption**

Because of presence of industries, per capita demand, type of facilities available & a large number of consumers, the urban areas are known to have high energy consumption. Per capita carbon emissions are highest in urban areas.

- **Electricity**

Electricity in a city is generally obtained from outside the city where it is generated by means of hydro/thermal/nuclear/solar power plants. This shows the dependency of cities on outside area for electricity

requirements. This electricity generation results in air, water and land, pollution. Hydro power plants are known to disturb the aquatic life. This results in ecological imbalance.

Electricity consumption is high in urban areas due to more dependency on technology & electronic goods. More and more electronic equipment are used in houses, industries, offices & commercial areas. For eg. Street lights consume a large proportion of electricity in United States, this is due to large number of street lights and high road density which is a feature of urban areas. Increase in road density also results in heat gain and rise in temperature due to their colour and material. Roads take up as much as 20% -25% of the total land mass in cities. Eg. Approx. 22% of land mass of Delhi is occupied by roads. In developing nations where electricity is generated using coal based thermal power plant 1kg of carbon dioxide is released along other gases to generate one unit of electricity because of burning of coal.

Since electricity consumption is high in urban areas, emissions also become high although outside the city boundary where power plant is located.

- **Fuel**

Use of fuel for industries, transportation & other used results in pollution. Large number of trips in urban areas to access facilities, to reach workplace, for shopping & leisure activities results in pollution. Travel distance and journey time in urban areas are relatively much higher than in rural areas and thus per capita fuel consumption is also high. High private vehicle ownership and traffic jams add to wastage of fuel.

Although there have been focus on more use of public transport & increased usage of electric vehicles so as to reduce the air pollution, but it is ignored that the electricity which is used to run these vehicles is causing air pollution at some other place. There has been shift in focus to be less dependent on fossil fuels for electricity generation and use of more renewable energy but still directly or indirectly non-renewable sources of energy are being used for electricity generation.

- **Deforestation**

Cutting of trees on large-scale for getting land is also an area of concern. Large number of trees are cut to make land available for a project. Due to this people face number of respiratory problems and cities act as smoking chimneys.

In urban areas soft spaces are occupied and covered with hard non porous materials which affects percolation of water into ground and increases surface runoff. This water is at times contaminated and enters in water body and thus pollutes it. Also waste water coming from houses, industries in cities is not treated properly and contains toxic substances and pollutes water bodies (PlanningTank, n.d.).

- **The urban heat island (UHI)**

A well-known phenomenon in urban areas is the formation of urban heat islands (UHIs). Urban Heat Island" (UHI) defined as the tendency for a city or town to remain warmer than its surroundings, by as much as 10 deg. F or more. This effect is caused mostly by the lack of vegetation and soil moisture, which would normally use the absorbed sunlight to evaporate water as part of photosynthesis (a process called

"evapotranspiration"). This is also the reason why forests are cooler than deserts.

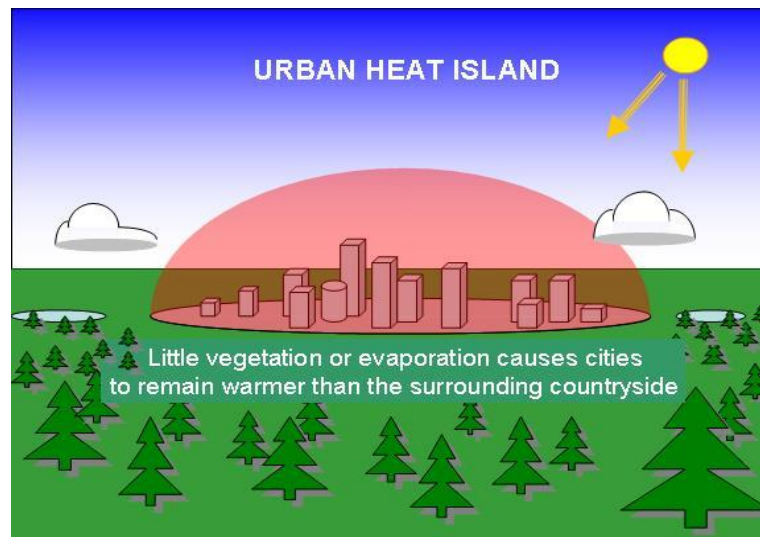


Figure 5.1: Urban Heat Island

Source: http://www.weatherquestions.com/What_is_the_urban_heat_island.htm

These are formed due to heat absorption by concrete, asphalt & other construction material which increases the temperature of these materials and surrounding area. These UHIs results in increased energy demand to keep areas cool. This also effects the micro climate & alters the local wind pattern.

Instead, the sunlight is absorbed by manmade structures -- roads, parking lots, and buildings. With little or no water to evaporate, the sunlight's energy goes into raising the temperature of those surfaces and the air in contact with them. As the day progresses, a dome of warm air forms over the city as convection transports heat from the surface to higher in the atmosphere.

The urban heat island over a city takes on a three-dimensional dome-like shape and is affected by the synoptic/large-scale winds.

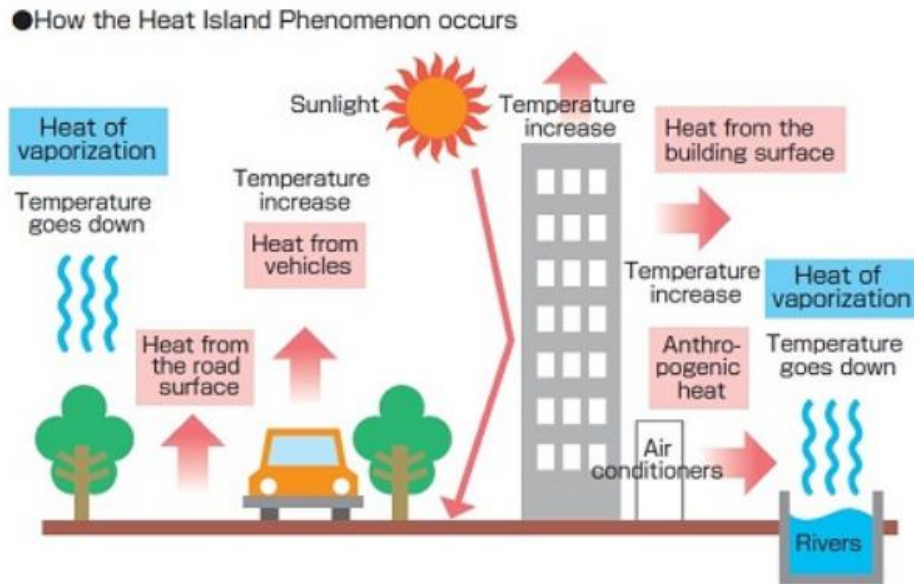


Figure 5.2: How Heat Island Phenomena occurs

Source: <http://www.comfortfutures.com/urban-heat-island-effect/>

The magnitude or intensity of urban heat island (UHI) depends on several factors, such as the size and morphology of the city. The primary factors are the increased absorption of heat caused by changes in land cover, the trapping of heat by buildings due to their mass and canyon-like geometry, and the reduction in vegetation.

Heating and other increased energy uses no doubt contribute to increased outdoor city temperatures especially during winter at high latitudes. At lower latitudes, air conditioning increases outdoor temperatures while providing a pleasant indoor climate. The change in water balance in the urban area contributes to the formation of the UHI as a result of reduced evaporational cooling from vegetation and forced drainage of rain-water.

- **Urban Water Balance**

Water, in its various forms, deeply affects the life of a city. Great quantities are piped around for industrial and domestic use. Rain-water must be drained away in a controlled manner in order to avoid flooding, erosion, and landslides. Snow and ice have to be cleared and the potential impact of hail and thunderstorms should be minimized. Urban areas may cause considerable intensification of rain, hail, and thunderstorms, especially «downwind» from the major sources of rain triggering nuclei. Icing on structures, such as masts and power lines, may pose a safety threat to people and property. The peak runoff is reached more rapidly and is higher than if the city were not there.

- **Urban Winds**

When the large-scale winds are light or calm, the UHI can generate its own wind system. What is sometimes called the "city wind" develops in a fashion that is similar to that of the sea breeze; in coastal areas, the two wind systems may combine into intense and complex circulations. The surface in an urban area is normally rougher than in the surrounding countryside causing the urban boundary layer to be both deeper and more turbulent. When large-scale winds are strong, both a decrease in wind speed and changes in wind direction are experienced as air crosses the city.

- **Solar Radiation**

Due to pollution and, in some cases, increased cloudiness, the amount of shortwave solar radiation which reaches the surface in an urban area is normally less than that in the surrounding countryside.

Photochemical reactions contribute to the formation of secondary pollutants and haze.

- **Pollution**

Urbanization is associated with pollution of both water and air in many different ways. In addition to the direct effects that the various pollutants have on health, they also have an impact on climate. Aerosols, especially, affect the incoming solar radiation and may also play an important role in triggering precipitation, thus having an impact on the precipitation pattern. The evolution of urban air pollution in and around large cities results in a new mixture of contaminants which do not only pose serious health hazards and deteriorate in the quality of life, but can also destabilize the urban atmospheric chemistry, thus creating different end products that have a long life-span and can spread well beyond the boundaries of the normal sphere of influence.

With increased population, change in lifestyle & wider choices people tend to buy more, use more and waste more. This results in problem of Solid Waste Management (SWM) which if not done properly results in land, air and water pollution. Once the waste gets mixed up in dumping site/ landfill site it starts generating toxic fumes & other harmful gases in the atmosphere. Thus there is a need of segregation & proper disposal which again increases energy consumption.

When looked at the collective damage caused by activities in cities it is attributed to large problems like greenhouse effect, ozone layer depletion, rising sea level, loss of diversity of flora and fauna (World Meteorological Organization [WMO], 1996).

1.2 Climate Change impacts on Urban Development

Changes in the climatic variables are likely to impact future patterns of spatial growth and development in cities and act as a stressor in addition to existing pressures. Short term and long-term changes in climatic variables such as temperature and precipitation may pose hazards to urban systems. The populations most vulnerable to climate change are those living in slums and informal settlements that often lack access to basic services and infrastructure. Apart from the risk to coastal populations from sea level rise, cyclones, storm surges and other associated impacts, a high proportion of urban settlements in the low and middle-income countries are on sites that are at risk from flooding or landslides. The key primary and secondary order impacts on cities due to short-term and long-term changes in climatic variables have been summarized (TERI, n.d).

Changes in climatic variables	Primary and secondary impacts
Temperature extremes Rise in average temperatures of a region may lead to warm spells and heat waves	<ul style="list-style-type: none"> • Heat-related mortality - at high risk being the aged, those with pre-existing ailments such as cardiovascular and respiratory diseases and those with poor housing structures. • Increase in demand for water and impacts on air and water quality, and increased demand for cooling etc.
Heavy precipitation events (which may or may not be associated with cyclones and storm surges)	<ul style="list-style-type: none"> • Deterioration of the quality of surface and groundwater • Mortality, injury, water-borne and food-borne diseases • Flooding and water-logging • Disruption of mobility • Displacement of settlements • Damages to industry and infrastructure (including drainage, sewerage etc.)
Sea Level Rise¹	<ul style="list-style-type: none"> • Land inundation • Salt-water intrusion into groundwater aquifers • Impacts on coastal agriculture and livelihoods etc. • Displacement of coastal settlements • Damage to industry and infrastructure
Climate change may increase the frequency and intensity of extreme events such as floods and cyclones	<ul style="list-style-type: none"> • Mortality and morbidity • Damage to infrastructure, including communication channels, power supply etc. • Spread of water- and food borne diseases etc.

Figure5.3: Climate change & its impacts on Urban Development

i Sea level rise

One of the alarming prospects of climate change will be its impact on the rise in sea level. Mainland India, endowed with a long coastline of 5,700 km will not escape the wrath of the seas. The total length of the Indian coastline is about 7,500 km when all the island territories of Andaman and Nicobar, and Lakshadweep are taken into account.

Low Elevation Coastal Zones (LECZ) are regions, which fall under 10 meters of coastal elevation. Approximately 81,000 square km of land fall under LECZ in India, housing a population of over 60 million. 50% of this population is in urban regions comprising approximately 31 million people.

Also, it is projected that the sea-level rise along the Indian coast will be between 30 and 80 cm over the next century. In the absence of any preventive measures, the people living in coastal areas are potentially going to be affected. Three major cities Mumbai, Kolkata and Chennai are on the coast and are on an average elevation of 2-10 meters in the LECZ. They are likely to suffer from flooding of lands particularly during high tide, salinization of water sources, destruction of ecosystems and natural resources that supply them. Cities in deltaic locations like Kolkata are more likely to be affected by coastal floods as they are at lower elevation, experience more or less natural subsidence and, in some cases, receive more water from the rivers feeding melting glaciers.

ii Health/Diseases

Climate change is expected to increase environment-related diseases. Warmer and/or wetter period of breeding due to global warming will provide ideal conditions for expansion of mosquito-borne

diseases as puddles, in which malaria carrying mosquitoes breed, are created either by excessive rainfall or by droughts in rivers.

Lack of sanitation and potable water will increase contaminated water and food-borne diseases like cholera, typhoid, diarrhoea, hepatitis, and gastroenteritis. Warmer cities will also induce an increase in respiratory diseases due to pollution whose effects are reinforced by higher temperatures.

Poor people may suffer more as they have lesser possibilities to adapt. As stated by UNFPA, “poor areas that lack health and other services, combined with crowded living conditions, poor water supply and inadequate sanitation, are ideal for spreading respiratory and intestinal conditions, and for breeding mosquitoes and other vectors of tropical diseases such as malaria, dengue, typhoid and yellow fevers. Changes in temperature and precipitation can spread disease in previously unaffected areas and encourage it in areas already affected.”

iii Heat waves

Global warming will be felt more in cities because of the “urban heat island effect” that makes cities warmer than their surrounding from 2 to 6oC because of the modification of the land surface and waste heat produced by high-energy use. Heat waves that can kill hundreds of people may become more frequent and intense.

iv Infrastructures

Storms, floods, cyclones, coastal flooding that are expected to be more frequent put infrastructure at great risk. This includes transportation (roads, railways, bridges, ports and airports) and

communication networks, water supply, sewage, gas pipelines, drainage, flood and coastal defence systems, power and telecommunication infrastructures, industrial units, plants. As far as buildings are concerned, informal and traditional housing are the most vulnerable to storms and floods (Centre for Education and Documentation, 2010).

v Sewerage and Storm water drainage

An adverse impact on water supply is most likely to have negative effects on sewerage and drainage systems in the city. In case precipitation is very high, it can decrease the capacity of the system making it susceptible to flooding and sewer overflow during rainfall extremes. It is important to note that the existing urban drainage system maybe designed to operate under specific weather conditions for a specific area. The age of the system can vary and, in some parts these may not be adequate to deal with future conditions of intense flooding.

vi Solid Waste Management

Climate change has the potential to impact waste management services and sites (Bebb and Kersey, 2003), by: Damaging some on-site waste management facilities such as some gas and leachate collection systems, weighbridges etc, Disruption of transport facilities impacting the collection of waste from source points and delivery of waste to the management site.

vii Water Supply and Sanitation

Changes in precipitation patterns and water cycle will increase the already existing problems of water supply and quality in urban areas, especially in big cities. The IPCC Report underlines those cities in drier regions like Delhi will be hit hard. Changes in precipitation patterns may lead to reductions in river flows, falling groundwater tables and, in coastal areas, saline intrusion in rivers and groundwater-all leading to a net decline in the water resources available for supply to urban areas.

Water quality problems may also increase where there is less flow to dilute contaminants introduced from natural and human sources. The increase in water temperature can alter the rate of operation of bio-geo-chemical processes (degrading and cleaning) and lower the dissolved oxygen concentration of water. This may lead to increased load on water treatment plants for bringing the water to a recommended standard before it can be released for human consumption and use in the cities.

Water-supply abstraction and treatment plants, which are generally situated near water sources, may be affected due to disasters such as floods. In severe riverine floods with high flow velocities, pipelines, electrical switchgear and pump motors may get damaged.

Climate related disasters such as floods, cyclones, storm surges etc can also increase the vulnerability of sanitation infrastructure to structural damage. The main impact of climate change would be, on on-site sanitation systems such as pit latrines, is likely to be through flood damage. Flooding may also cause septic tanks and sewers to overflow. Since sanitation infrastructures (or the lack of them) are the main determinant of the contamination of urban floodwater with faecal material, damage to these presents a substantial threat of enteric and other water-borne diseases (TERI, n.d)).

2. URBAN DEVELOPMENT: National and international

India has the 2nd largest urban system in the world, with 310 million people in over 5161 cities as of 2005. Although presently the 5100 urban centres hold less than 30% of the total Indian population, this figure is expected to rise to 40% by 2030 in an estimated 70,000 urban settlements, as urban population is likely to grow by 575 millions over the next 50 years. By 2025, 70 Indian cities are expected to have more than 1 million inhabitants.

By designing and building urban areas in harmony with climate and the environment, it is possible to mitigate many of the negative impacts related to urbanization. As most of the energy is used in urban areas, energy efficient urban planning and design can contribute to the decrease of greenhouse gas emissions and, thus, lessen the threat of global climate change. By arranging for appropriate warning systems and related preparedness schemes, the impacts of severe storms and flooding can be minimized (TERI, n.d).

3. SUSTAINABLE & RESILIENCE HUMAN SETTLEMENTS

An urban system is dynamic, facing conditions of balance or normalcy and conditions of stress (owing to climatic, socio-economic, demographic factors etc.). While sustainability is related to the “ability of a system to maintain its optimum structure and function over time”, Resilience is more than maintaining the optimal conditions- it is also the “ability to accommodate new changes and conditions of stress, and shifting to new states while maintaining the set of critical functions being provided earlier”. In these ways resilience overlaps with sustainability (TERI, n,d).

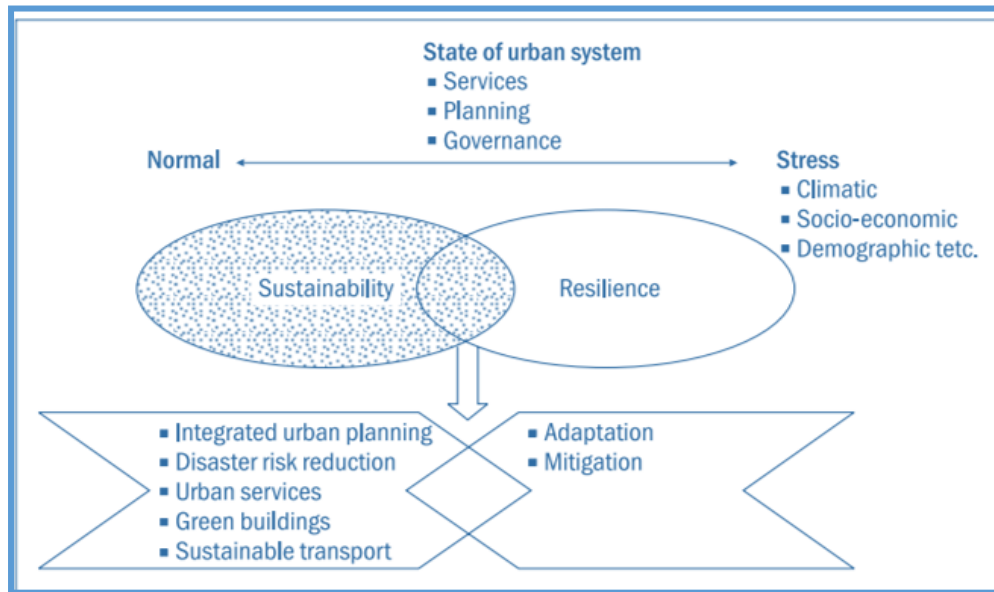
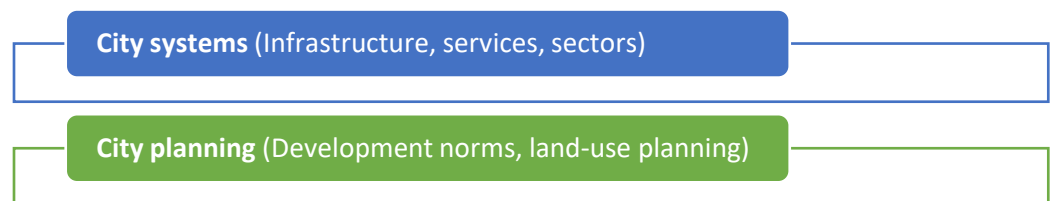


Figure 5.4: Climate Resilient and Sustainable Urban Development (TERI, n,d)

Resilient cities in the light of climate change should be able to develop plans for future development and growth bearing in mind the climate impacts that the urban systems are likely to face. There is a strong need therefore, to incorporate climate resilience considerations into:-



Climate resilient cities have the capability to reduce and manage the negative impacts of climate change because they have planned and factored these changes in their development goals and planning by:

- ✓ Utilizing climate information (past and future) to identify climate stressors typical to their cities/region

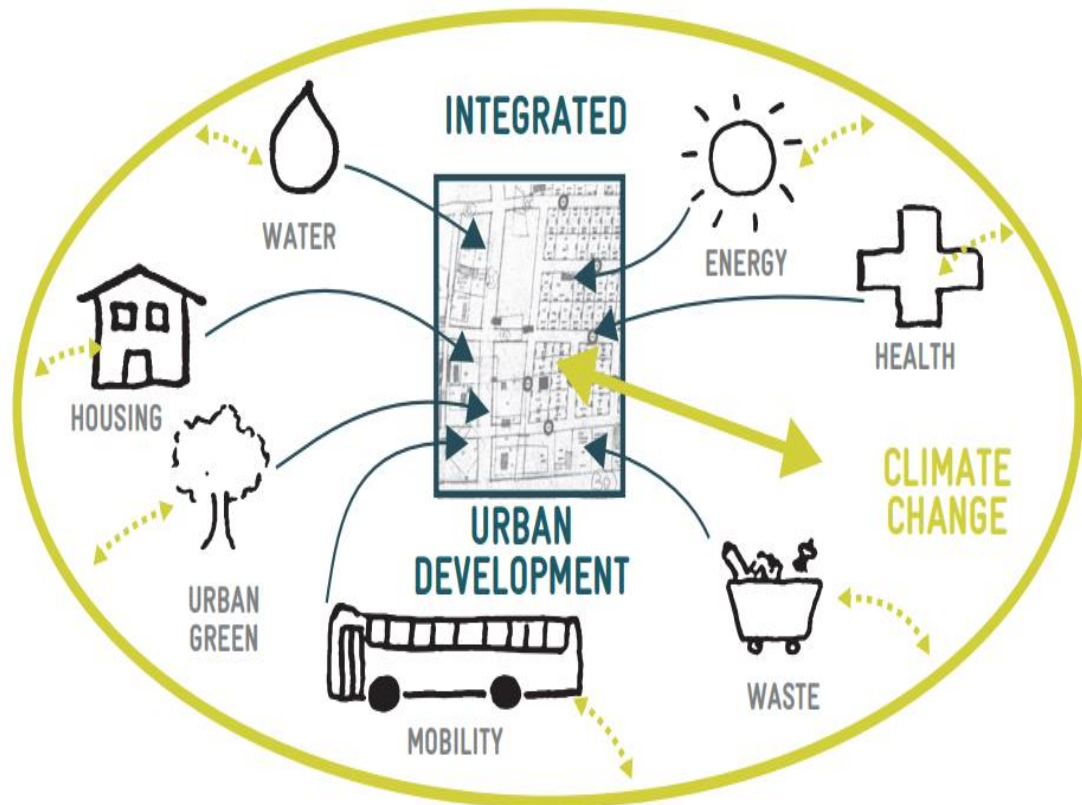
- ✓ Preparing and implementing strategies to reduce vulnerability of population and city systems.
- ✓ Adapting to change, preparing and responding to disasters, mitigating GHG emissions (Sharma, 2015).

Steps (Sharma, 2015):-



Cities need an integrated approach that considers mitigation, adaptation and urban development. The improvement of city services is related to the ability of cities to adapt to climate change and reduce their greenhouse gas emissions. Cities with excellent services are generally resilient cities:

- Advanced drainage systems can alleviate flooding during intense storms
- Healthcare services are equipped to respond to emergency situations
- Warning systems and transportation infrastructure allow citizens to evacuate in response to risk.



Cities that focus on provision of basic urban services to the poor tend to do so in an integrated manner that follows a simple hierarchy. Adaptation to, and mitigation of, climate change should follow a similar integrated city-wide approach:

- (i) fully providing basic health and environmental services (and primary education);
- (ii) encouraging and enhancing the resilience of community organizations;
- (iii) improving building quality, particularly residential;
- (iv) avoiding development in hazardous or sensitive areas;

- (v) protecting buffering capacities of local ecosystems and minimizing degradation (for example, groundwater, mangroves, and wetlands);
- (vi) ensuring food security (for example, evaluating relevance of local agriculture provision);
- (vii) ensuring the security and resilience of water supply (and quality) and energy provision;
- (viii) strengthening city-wide security nets, resilience planning, and effective public information;
- (ix) providing and regularly updating publicly available land-use or development plans;
- (x) effectively integrating migrants and other marginalized groups;
- (xi) increasing energy efficiency of buildings and transportation;
- (xii) identifying and, where possible, ameliorating local climate impacts such as ‘urban heat islands’;
- (xiii) participating in regional and national programs to increase resilience;
- (xiv) enhancing local economies;
- (xv) switching to low consumption lifestyles; and
- (xvi) participating in global policy dialogues (for example, city-influence on national and international policies, such as agriculture and energy subsidies and UNFCCC negotiations) (World Bank Group, n.d).

4. CASE STUDIES

Study 1: Thailand: Comprehensive Urban Environmental Management

The city of Bangkok, Thailand has used a 'Local Agenda 21' urban management approach since 1998. The Bangkok Agenda 21 prioritizes environmental considerations and outlines sustainable economic, environmental and social development. It highlights the role of political leadership, public participation, priority setting and environmental cost benefit analysis to enable integrated urban planning with the participation of local government and private sector representatives. It comprehensively emphasizes good governance and ecotourism through its different components. The Metropolitan Master Catalogue serves as a planning tool to guide "physical development" in the city; and The Bangkok Municipal Administration (BMA) encourages public participation and has developed a Green Areas Master Plan to increase public green spaces and encourage residents to plant trees.

Study 2: Singapore: Land Use and Transportation Policy

Timely city-level strategies are often pushed by state and national level commitments. Singapore's national government supported efforts to sustain energy efficiency, develop local knowledge and consolidate municipal-level expertise for energy management. The high-level commitment through its National Climate Change Strategy to employ strict and strategic urban planning guidelines has been a step towards making Singapore's capital city climate resilient. Strategic and integrated

urban planning policies have enabled the “efficient use of space” and “clustering people in smaller land areas, often through high-rise, high-density settlements” (Yuen and Kong, 2009). It is an example of effective resilience and low carbon development pursued through urban planning, effective leadership and strengthened municipal initiatives.

Study 3: Denmark: Energy Re-use

Cities across the EU are also instrumental in promoting integrated urban planning to promote resilience. Since 1990, Copenhagen has reduced its CO2 emissions by 20%. It also uses a wind farm with wind turbines reaching high into the sky and has one of the world’s largest districts heating system, covering 97% of city households. The city uses an innovative system to send surplus heat produced from generating electricity high into the air and has a waste management system that reuses 90% of all building waste and incinerates 75% of all household waste. These examples of mitigation and urban heat waste management at the city level highlight the importance of municipal-led intervention strategies.

Study: Public-Private Partnership (PPP) for solid waste management in Nagpur

The Centre for Development Communication (CDC) in Nagpur and the Municipal Corporation worked on a PPP mode for complete coverage of the city by door-to-door garbage collection. The objective of the initiative was to improve solid waste management in the city through a low-cost method, while also providing livelihood support to ragpickers. The revenue savings for the NMC (Nagpur Municipal Corporation) through

this initiative has been about Rs 20 million. Owing to the better handling and disposal of the waste, the city drains are not clogged during floods and related health concerns have been addressed in a major way (TERI, 2009).

5. GOVERNMENT POLICIES

The Ministry of Urban Development and the Ministry of Urban Employment and Poverty Alleviation constitute the nodal authorities at the national level responsible for formulating policies and guidelines, designing programmes, coordinating and monitoring activities of various central, state and urban local bodies concerning all issues of urban development in the country. India's cities are increasingly feeling the impact of climate change and recognizing the need for adaptation as well as resilience in these urban spaces. A number of policies and programs, schemes and development projects are already under implementation for various urban sectors and services. These include:

i. Smart Cities Mission, 2015

Smart Cities Mission of the Government is a bold, new initiative. It is meant to set examples that can be replicated both within and outside the Smart City, catalysing the creation of similar Smart Cities in various regions and parts of the country.



Source:<http://blog-img1.gradestack.com/blogs/wp-content/uploads/2016/02/01160040/Smart-Cities-All-you-need-to-know.jpg>

The core infrastructure elements in a smart city would include:

- adequate water supply,
- assured electricity supply,
- sanitation, including solid waste management,
- efficient urban mobility and public transport,
- affordable housing, especially for the poor,
- robust IT connectivity and digitalization,
- good governance, especially e-Governance and citizen participation,
- sustainable environment,
- safety and security of citizens, particularly women, children and the elderly, and
- health and education.

As far as Smart Solutions are concerned, an illustrative list is given below. This is not, however, an exhaustive list, and cities are free to add more applications.



Figure 5.5: Solutions in a Smart City

Accordingly, the purpose of the Smart Cities Mission is 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. Area based development will transform existing areas (retrofit and redevelop), including slums, into better planned ones, thereby improving livability of the whole City. New areas (greenfield) will be developed around cities in order to accommodate the expanding population in urban areas. Application of Smart Solutions will enable cities to use technology, information and data to improve infrastructure and services. Comprehensive development in this way will improve quality of life, create employment and enhance incomes for all, especially the poor and the disadvantaged, leading to inclusive Cities (Ministry of Urban Development, 2015).

ii. Atal Mission Rejuvenation and Urban Transformation AMRUT, 2015

The components of the AMRUT consist of capacity building, reform implementation, water supply, sewerage and septage management, storm water drainage, urban transport and development of green spaces and parks. During the process of planning, the Urban Local Bodies (ULBs) will strive to include some smart features in the physical infrastructure components.

The Mission will focus on the following Thrust Areas:

- water supply,
- sewerage facilities and septage management,
- storm water drains to reduce flooding,
- pedestrian, non-motorized and public transport facilities, parking spaces, and
- enhancing amenity value of cities by creating and upgrading green spaces, parks and recreation centers, especially for children.



Source: <https://www.projectstoday.com/WeekAtGlance/AMRUT-to-rejuvenate-Indian-cities>

The purpose of Atal Mission for Rejuvenation and Urban Transformation (AMRUT) is to:-

- ✓ ensure that every household has access to a tap with assured supply of water and a sewerage connection;
- ✓ increase the amenity value of cities by developing greenery and well maintained open spaces (e.g. parks); and
- ✓ reduce pollution by switching to public transport or constructing facilities for non-motorized transport (e.g. walking and cycling).

All these outcomes are valued by citizens, particularly women, and indicators and standards have been prescribed by the Ministry of Urban Development (MoUD) in the form of Service Level Benchmarks (SLBs) (Ministry of Urban Development, 2015b).

iii. Deendayal Antyodaya Yojana - National Urban Livelihoods Mission NULM, 2013

National Urban Livelihoods Mission (NULM) was launched by the Ministry of Housing and Urban Poverty Alleviation (MHUPA), Government of India in 24th September, 2013 by replacing the existing Swarna Jayanti Shahari Rozgar Yojana (SJSRY). The NULM will focus on organizing urban poor in their strong grassroots level institutions, creating opportunities for skill development leading to market-based employment and helping them to set up self-employment venture by ensuring easy access to credit. The Mission is aimed at providing shelter equipped with essential services to the urban homeless in a phased manner. In addition, the Mission would also address livelihood concerns of the urban street vendors (Ministry of Housing & Urban Affairs [MOHUA], 2018a).



Source: <https://www.india.gov.in/spotlight/deen-dayal-antyodaya-yojana>

iv. Rajiv Awas Yojana (RAY), 2011

In pursuance of this vision of “Slum free India”, Rajiv Awas Yojana (RAY) was launched in June 2011 in two phases; the preparatory phase for a period of two years which ended in June 2013 and implementation phase. Central Government has approved the implementation phase for the period of 2013-2022. RAY envisages two-step implementation strategy i.e. preparation of Slum free City Plan of Action (SFCCPoA) and preparation of projects for selected slum (Ministry of Housing & Urban Poverty Alleviation [MOHUPA], (n.d.).

The specific activities as envisaged under the RAY include:

- Integrated development of notified and non-notified slums
- Provision and/or improvement of access and provision of basic services to the urban poor. These include water supply, sewerage, drainage, solid waste management, road access, street lighting, community toilets, market access, livelihoods centres etc.
- Liaisoning with other schemes for the urban poor, related to water and sanitation, health, education, livelihood support, infrastructure, connectivity etc.
- Development of low-cost and affordable houses along with basic infrastructure and services (for ownership, rental or both) (TERI, n.d).

v. National Mission on Sustainable Habitat, 2010

The National Mission on Sustainable Habitat (NMSH) envisages a framework to build urban resilience to climate change, by integrating adaptation and mitigation aspects into the urban planning process.

In design, the NMSH describes strategies to implement measures in the various sectors listed below:

- Energy Efficiency
- Urban Transport
- Water Supply and Sewerage
- Municipal Solid Waste Management
- Urban Storm Water Management
- Urban Planning (Shivaranjani, 2015)



Source: <http://greencleanguide.com/national-mission-on-sustainable-habitat/>

vi. Jawaharlal Nehru National Urban Renewal Mission (JNNURM), 2005

The JNNURM was launched in 2005 as the first flagship scheme of this Ministry. JNNURM implemented by MoHUPA has two components e.g. Basic Services for Urban poor (BSUP) and Integrated Housing and

Slum Development Programme (IHSDP) which aimed at integrated development of slums through projects for providing shelter, basic services and other related civic amenities with a view to providing utilities to the urban poor.

The Mission was initially for a seven year period i.e. up to March 2012 which was extended upto March 2014 for completion of the already approved projects. During March 2013, the Mission period was extended by one more year i.e. upto March 2015 to complete ongoing works. 65 Mission Cities identified based on urban population, cultural and tourist importance was covered under BSUP and the remaining cities were covered under IHSDP (887).

The two components of JNNURM were mandated to pursue 3 key pro-poor reforms, namely

- a) earmarking of 25% of municipal budget for the urban poor for provision of basic services including affordable housing to the urban poor;
- b) implementation of 7- Point Charter, namely provision of land tenure, affordable housing, water, sanitation, education, health and social security to the poor in a time-bound manner ensuring convergence with other programmes and
- c) reservation of 25% of developed land in all housing projects, public or private, critical for slum improvement (MoUHA, 2018b).

5. WAY FORWARD

Cities and urban areas have made progress over recent years, and adaptation strategies and action plans steadily emerging, supported by research outputs and guidance on the topic. Nevertheless, adaptation has yet to become a prominent agenda amongst city governors and

planners and new approaches are needed to understand and react effectively to urban adaptation challenges and opportunities. It is also clear that the development of a collaborative, sociotechnical agenda is vital. Associated research into different modes of collaboration and the utility of the outcomes they produce would be valuable, as would further enquiry on approaches to reposition and mainstream adaptation into urban development. With a view to encouraging transferable learning, comparative work on these themes engaging different cities would be constructive. There is a need to move beyond sustainable urban visions towards the grounded creation of new inter-disciplinary networks, adaptive capacities and collaborative practices, assembled to respond to the adaptation imperative at the urban scale (Carter, 2015).

6. FURTHER READINGS

- http://cdn.cseindia.org/attachments/0.55359500_1519109483_coping-climate-change-NAPCC.pdf
- <http://siteresources.worldbank.org/INTUWM/Resources/340232-1205330656272/4768406-1291309208465/PartII.pdf>

7. REFERENCES

Carter, (2015). Retrieved from <https://www.sciencedirect.com/science/article/pii/S03059006140003>

Centre for Education and Documentation. (2010). *Impact of Climate change on Urban Areas in India*. Retrieved from <http://base.d-ph-h.info/en/fiches/dph/fiche-dph-8632.html>

Ministry of Housing & Urban Affairs [MoHUA], (2018a). *About DAY-NULM*. Retrieved from <http://mohua.gov.in/cms/about-day-nulm.php>

Ministry of Housing & Urban Poverty Alleviation, (n.d.). *Rajiv Vikas Yojna (RAY) Scheme Guidelines 2013-2022*. <http://mohua.gov.in/upload/uploadfiles/files/RAYGuidelines.pdf>

Ministry of Urban Development, (2015a). *Smart City: Mission Statement & Guidelines*. Retrieved from [http://smartcities.gov.in/upload/uploadfiles/files/SmartCityGuidelines\(1\).pdf](http://smartcities.gov.in/upload/uploadfiles/files/SmartCityGuidelines(1).pdf)

Ministry of Urban Development, (2015b). *AMRUT: Mission Statement & Guidelines*. Retrieved from <https://smarnet.niua.org/sites/default/files/resources/AMRUT%20Guidelines%20.pdf>

MoHUA, (2018b). *Jawaharlal Nehru National Urban Renewal Mission*. Retrieved from <http://mohua.gov.in/cms/jawaharlal-nehru-national-urban-renewal-mission.php>

Planning Talk, (n.d.). *Urban Development and Climate Change Relationship*. Retrieved from <https://planningtank.com/urban-economics/urban-development-and-climate-change-relationship>

Sharma, (2015). *CHALLENGES AND OPPORTUNITIES FOR BUILDING RESILIENCE IN CITIES- ROLE OF POLITICAL LEADERSHIP*. Retrieved from http://www.teriin.org/projects/apn/pdf/orissa/day1/Challenges_and_opportunities.pdf

Shivaranjani, (2015). *National Mission for Sustainable Habitat*. Retrieved from http://www.ifmrlead.org/wp-content/uploads/2015/10/NAPCC/3_NMSH%20Brief_CDF_IFMRLEAD.pdf

TERI, (n.d.). *Climate Resilient and Sustainable Urban Development*. Retrieved from <http://www.indiaenvironmentportal.org.in/files/sustainable-urban-development-background-paper.pdf>

The Energy and Resource Institute [TERI], (2009). *An exploration of sustainability in the provision of basic urban services in Indian cities*. Retrieved from http://www.mumbaidp24seven.in/reference/Sus_Cities_Report_20090424151451.pdf

World Meteorological Organization [WMO], (1996). *Climate & Urban Development*. Retrieved from https://library.wmo.int/pmb_ged/wmo_844_en.pdf

World Bank Group, (n.d.). *Cities and Climate Change: An urgent agenda*. Retrieved from <https://siteresources.worldbank.org/INTUWM/Resources/340232-1205330656272/4768406-1291309208465/PartII.pdf>