International Journal on Emerging Technologies **8**(1): 371-374(2017)

ISSN No. (Print) : 0975-8364
ISSN No. (Online) : 2249-3255

Impact of Urbanization on Environment with reference to Climate Change

Shreya Giri* and Professor Alok Ranjan*
** Department of Architecture and Planning,*
Malaviya National Institute of Technology, Jaipur, India

(Corresponding author: Shreya Giri)
(Received 28 December, 2016 accepted 18 January, 2017)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: Rapid urbanization in the past few years has resulted in many environmental issues in large cities. It has caused number of negative consequences in different parts of the world, one of these consequences is a phenomenon known as climate change. In this paper, Climate change is understood as an immediate threat. Climate change, also called global warming, refers to the rise in average surface temperatures on Earth is one of these environmental issues. On-going changes in climate across global, regional, local and micro scales are primarily caused by human actions and the effects of this phenomenon are extremely harmful to both people and places. The paper studies the causes and effects of climate change from both human and natural environment perspective. The paper focuses on the urban areas and its linkages with climate change and also the solutions/mitigation measures that could reduce its impacts. In this regard, adaptation is studied as a response to climate change and urban planning act as an agent of adaptation.

Keywords: Urbanization, Urban area, Climate change, Mitigation, Adaptation, Urban Planning

I. INTRODUCTION

Urbanization is taking place at unprecedented rates. By 2030, it is predicted that over 60% of the world's population will live in cities. As migration has accelerated, the abilities of urban centers to accommodate these populations has been put under increasing pressure. The majority of the world's population now lives and works within urban area and the trend is increasing .This tends to contribute hugely to increase in greenhouse gas emissions and consequently, climate change. In quantitative terms, the impact of urban systems on climate change is illustrated by the fact that 75% of all greenhouse gas emissions are generated in the world's urban areas.

Within urban systems, spatial functions include building structures to house people and the provision of space for social and economic interactions. Transport functions include the movement of people, goods and materials to, from and around cities. Supply functions include the provision of food, sanitation and clean water, as well as electricity, light and heat. These functions and others ensure that urban systems contribute hugely to the demand for fossil fuels, which, in turn, contribute to climate change. Thus, there is a direct causal relationship between the function of urban systems and climate change.

All urban area will face some vulnerability to climate change effects. These effects may disrupt or even destroy a wide variety of urban functions. The urban features may exacerbate these impacts and the vulnerability of urban spaces. Such features include:

Asphalt, tarmac, concrete and other hard surfacing absorb heat from the sun, causing an 'urban heat island' effect, increased urban temperatures; Hard surfacing also reduces the absorption of rain water, which can overwhelm storm water systems and increase flood risks; Population densities in urban areas can reduce or put pressure on green spaces that could reduce heat, water runoff and air pollution; Population densities can also put pressure on water supplies, leading to an increased potential for shortages.

II. CAUSES OF CLIMATE CHANGE

The primary cause of climate change is the burning of fossil fuels, such as oil and coal, which emits greenhouse gases into the atmosphere, primarily carbon dioxide.

It is also caused by factors such as biotic processes, variations in solar radiation received by Earth, plate tectonics, and volcanic eruptions.

Other factors that can shape climate are called climate forcings or "forcing mechanisms" processes such as variations in solar radiation, variations in the Earth's orbit, variations in the albedo or reflectivity of the continents and oceans, mountain-building and continental drift and changes in greenhouse gas concentrations.

Fig. 1. Increased burning of fossil fuels contributes to climate change.

Anthropogenic factors such as the increase in CO2 levels due to emissions from fossil fuel combustion, followed by aerosols (particulate matter in the atmosphere) and the CO2 released by cement manufacture. Other factors, including land use, ozone depletion, animal agriculture and deforestation, also contribute to climate change.

III. EFFECTS OF CLIMATE CHANGE

Even small increases in Earth's temperature caused by climate change can have severe effects. The earth's average temperature has gone up 1.4° F over the past century and is expected to rise as much as 11.5° F over the next. Rising sea levels due to the melting of the polar ice caps (again, caused by climate change) contribute to greater storm damage; warming ocean temperatures are associated with stronger and more frequent storms; additional rainfall, leads to flooding and other damage; an increase in the incidence and severity of wildfires threatens habitats, homes, and lives; and heat waves contribute to human deaths and other consequences.

Climate change has the potential to increase flooding risks in cities in three ways: from the sea (higher sea levels and storm surges); from rainfall – for instance by heavier rainfall or rainfall that is more prolonged than in the past; and from changes that increase river flows – for instance through increased glacial melt.

In addition to flood hazards, more extreme rainfall events associated with climate change will also generate increased hazard from landslides in many urban centres.

Climate change is also likely to bring an increased burden of diarrhoeal disease and altered spatial distribution of some infectious disease vectors – for instance as warmer average temperatures permit an expansion of the area in which many "tropical" diseases can occur. In India, cities have become major reservoirs of vector-borne diseases such as malaria and dengue fever, hence the morbidity risks will increase. In most cities, the urban poor live in the most hazardous urban environments– for instance on floodplains or other areas at high risk of flooding or unstable slopes. These are also usually the sites most at risk from climate change.

IV. URBAN AREAS AND ITS LINKAGES WITHCLIMATE CHANGE

Urban areas have many linkages with climate change. Urban centres are drivers of global warming because they concentrate industries, transportation, households and many of the emitters of greenhouse gases (GHG). Urban areas concentrate populations, economic activities and built environments, thus increasing their risk from floods, heat waves, and other climate and weather hazards that climate change is expected to aggravate.

Climate change has become one of the most challenging global environmental issues facing humanity. In this context, urban centres of different sizes ,especially cities – play acrucial role in the climate change arena.

With modern urban lifestyles, cities are consuming ever more power, which is still largely generated by fossil fuel combustion; the main uses are heating or air conditioning homes and buildings and powering vehicles, with industry in cities now taking a relatively small proportion. In fact, cities discharge an amount of heat comparable to that received from solar radiation. Inevitably, cities contribute to greenhouse gas emissions from fossil fuel combustion and also from waste disposal management practices. As rapidly growing cities are clearing forests and vegetated areas, they are reducing the surface absorption of greenhouse gases and thereby further increasing their concentration in the atmosphere. The main problem in many cities is the lack of provision for adequate roads, piped water supplies and other infrastructures and services.

Most of the cities faces the risk of flooding when rainfall occurs. Buildings, roads, infrastructure and other paved areas prevent rainfall from infiltrating into the soil and produce more runoff.

Heavy and prolonged rainfall produces very large volumes of surface water in any city, which can easily overwhelm drainage systems. In well-governed cities, this is rarely a problem because good provision for storm and surface drainage is easily built into the urban fabric, with complementary measures to protect against flooding – for instance the use of parks and other areas of open space to accommodate floodwaters safely. In most cities, there is also scope for land-use management and incremental adjustments to increase flood-water management capacity. But in poorly-governed cities, this does not happen. Most residential areas have no drainage system installed and rely on natural drainage channels and it is common for buildings or infrastructure to be constructed that actually obstruct these drainage channels. In cities or neighbourhoods with inadequate solid-waste management or drain maintenance, garbage and plant growth can quickly clog drains, leading to localized flooding with even light rainfall.

V. MITIGATION MEASURES

Mitigation seeks to slow and reverse the processes of climate change by lowering global GHG emissions, which have increased dramatically during last decades. Mitigation technologies and practices for various sectors are as follows:

Energy supply. Improved supply and distribution efficiency like Fuel switching from coal to gas, nuclear power, renewable heat and power (hydropower, solar wind, geothermal and bio-energy); early applications of CO_2 capture and storage(eg; storage of removed CO_2 from natural gas).

Transport. More fuel efficient vehicles (hybrid vehicles, cleaner diesel vehicles, bio-fuels); modal shifts from road transport to rail and public transport; measures to enhance the use of cycling , walking , land-use and transport planning.

Industry. More efficient end-use electrical equipment; heat and power recovery; material recycling and substitution; control of non-CO_2 emissions.

Waste. Landfill methane recovery; waste incineration with energy recovery; composting of organic waste; controlled wastewater treatment; recycling and waste minimization.

Buildings. Efficient lighting; more efficient electrical appliances and heating and cooling devices; improved cook stoves; improved insulation; passive and active solar design for heating and cooling; alternative refrigeration fluids; recovery and recycling of fluorinated gases; Less carbon intensive building materials eg; wood, construction and demolition technologies.

VI. ADAPTATION AS A CLIMATE CHANGE RESPONSE

Adaptation to climate change is direct action to minimize and manage the expected negative consequences of climate change. Promoting adaptation as a climate change management strategy represents a shift away from mitigation as the primary response tool. Mitigation strategies tend to focus on reducing greenhouse gas emissions in order to reduce the extent and severity of climate change and its potential effects. Mitigation is an important strategy for limiting future climate change impacts, whilst adaptation is necessary to manage those set in motion by historical GHG emissions.

Adaptation will be necessary to address impacts resulting from the warming which is already unavoidable due to past emissions and following are the adaptation strategies for various sectors:

Water: Expanded rainwater harvesting; water storage and conservation techniques; water re-use; desalination; water-use and irrigation efficiency.

Infrastructure and settlement (including coastal zones): Relocation; seawalls and storm surge barriers; dune reinforcement; land acquisition and creation of marshlands/wetlands as buffer against sea-level rise and flooding; protection of existing natural barriers.

Human health: Health action plans; Emergency medical services; improved climate-sensitive disease surveillance and control; safe water and improved sanitation

Tourism: Diversification of tourism attractions and revenues; shifting ski slopes to higher altitudes and glaciers

Transport: Realignment /relocation design standards and planning for roads, rail and other infrastructure to cope with warming and drainage

Energy: Strengthening of overhead transmission and distribution infrastructure; underground cabling for utilities; energy efficiency; use of renewable resources; reduced dependence on single sources of energy.

VII. URBAN PLANNING AS AN AGENT OF ADAPTATION

Developing adaptation strategies in urban systems is an extremely complex and challenging process and urban planning regimes are well suited to meeting challenges generated by the adaptation process. Planning is internationally utilised, multi-disciplinary, collaborative and forward-thinking. Urban planning regimes are societal tools charged with creating order among activities in urban spaces and reducing conflicts between them. Moreover, the tools employed by planning regimes, such as plan-making, development management, urban design, etc tend to be universal.

Planning regimes also tend to function primarily at local level.

VIII. ROLE OF GOVERNMENT IN URBAN PLANNING

Government play a key role in enhancing adaptation and watch over land-use management systems that are at the core of such sources of urban vulnerability as the location of populations in risk-prone areas.

Government's role in terms of urban development should be-

To assure that all urban dwellers have access to infrastructure and services;

to guide where settlements develop and where they do not; to regulate industries, transportation and other hazardous activities that can produce disasters;

to design land use regulations and zoning to influence land availability;

to encourage and foster better quality housing, and safer sites.

Governments can also include climate change considerations into urban planning by making sure that buildings and infrastructure take account of climate-change risks;

by planning and public sector investment decisions that take account of climate change;

by ensuring access to appropriate and widely understood information on climate change and its local impacts;

by coordinating and supporting strategies and programs to avoid and to prepare for disasters; and

by addressing the factors that generate both vulnerability and poverty .

IX. CONCLUSIONS

Climate change presents a significant challenge for urban systems worldwide. Its effects will likely intensify over the coming decades. Impacts such as increased rainfall intensity, storm surges, flooding and urban heat island effects are likely to affect many urban systems. It is important to prioritize climate change in relation to economic growth, poverty reduction, political stability, and other societal issues. Cities are both the largest source of carbon emissions and at the same time are particularly vulnerable to the impacts of climate change.

Therefore, cities of the future will have to be redesigned first to reduce carbon emissions as much as possible and second to adapt to climate change in order to protect their populations from its worst effects.

Adaptation will be required in order to cope with these effects and urban planning has the potential to become a key actor in developing and implementing adaptive responses in urban systems. The fact that a number of planning jurisdictions are already engaged in this process demonstrates the important and evolving role that urban planning has in building climate resilience through adaptation. It is important that central and local government, developers, the public and other professions recognise the need for urban adaptation.

In conclusion, preparing for and attempting to manage climate change effects is becoming a key urban planning challenge for the 21st century. As the world's population becomes more urbanised, planning efforts in respect of managing climate change effects will require a particular urban focus. In this regard, adaptation is likely to feature prominently and the development of adaptive responses will become a central urban planning concern. This will have profound impacts on the planning profession, as well as on infrastructure and development standards and technologies.

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