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Climate change and status of urban environment in the developing countries

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Abstract

As the world climate is changing due to rapid urbanization, the urban environment especially in developing countries facing various problem. This paper explores the problems of urban environment in developing countries due to climate change. The urban areas of developing countries are more vulnerable than the developed countries. Climate change have a great impact on human health, approximately 800,000 annual deaths from ambient urban air pollution, 1.9 million from physical inactivity, and 1.5 million per year from indoor air pollution. The rapid growth of population and climate change is increasing water scarcity and hampers the irrigation process, drinking & domestic use of water. The earth temperature that contribute to sea level rise and consequently, the salinity intrusion decline the crop production, increase the food scarcity. About 25 million people are environmental refugee amounting to 58% of the world's total refugee population. Displacement rate is very high (50 million) in agriculturally dislocated areas, in developing countries. The world famous cities are near to coast and experience natural disaster every year. These are at risk of flooding due to heavy rainfall, sea level rise and storm surge. China experienced annual losses from natural disasters averaging 3.9 percent of GDP. Small Island states are more vulnerable and Alexandria, Egypt; Banjul, Gambia, Tianjin, China, Jakarta, Indonesia, Bangkok, and Thailand will be affected. Adaptive measurement is required to minimizing the loss of climate change. There is a need of a more active input from the public & private sector to ensure that development and environmental policies contribute to a preventive approach to local and global urban environment sustainably.

Keywords: Climate, environment, developing countries, vulnerable

1. Introduction

Climate change will have a disproportional negative impact on all countries around the globe. Developing countries are much more vulnerable than the developed world because of high population growth, high population density, poverty, rapid urbanization etc. Climate change will embitter problems of developing countries related to rapid population growth, food security, existing poverty, agriculture and environment [1]. The world is facing inevitable effects of climate change at the same time that the population is increasingly concentrated in urban areas. About 50% of the world's population lives in urban areas with this percentage continuing to rise to the end of the century [2]. The developing countries will responsible 95% of the world's urban population growth. By 2050, the urban population of the developing world will be 5.3 billion; Asia alone will host 63% of the world's urban population, or 3.3 billion people [3]. Those populations of less developed countries, often in cities with inadequate infrastructures. In fact, smaller cities and towns in these countries which tend to have weaker infrastructures than large cities which are growing the fastest. Many cities are located along coastal areas and in locations vulnerable to severe damage from storms or a rise in sea level. The urban poor tend to live in neighborhoods most at risk. Developing counties have not enough capacity to cope with the problems causes by climate change [2].

Spreading disease, more extreme weather, declining agricultural yield, natural disaster, water shortages, Damage to primary industries and fisheries, food security are the impact of climate change on urban areas African, Asian and Latin American developing countries [1]. Floods, infectious diseases and enhanced air pollution are the hazards most likely to be caused by climate change or greatly exacerbated by its wider consequences. The scientific understanding of severe flood events is developing rapidly with better computer models and warning systems that are now available for hurricanes, tropical cyclones, dam failures, storm surges, rainstorms and tsunamis. But static structures such as permanent flood barriers and dykes are not sufficient to deal with all types of flood in urban areas; dynamic structures can also be used, such as moveable flood barriers, e.g. steel walls in Prague, the Thames Barrier and floating houses in The Netherlands [4]. Climate change also have a significant impact on the economies of the developing countries specially the urban areas of those countries.

To minimize the impact of climate change, adaptation developing countries is urgently needed. Reliable estimates of adaptation costs are still unavailable, but they are likely to run into the billions of dollar per year. Climate change is also likely to affect the attainment of several of the Millennium Development Goals (MDGs). Through its impacts on agriculture, climate change is likely to have a significant impact on reducing severe poverty and hunger [5].

The main objective of the study is as follows

1. Observation of the impact of climate change on urban environment of developing countries.

Methodology of the study

For this study secondary data and information were collected through various papers, journals and books such as Ludwig, *et al.* 2007, UNDP, 1995, Emanuel, 2005, IPCC 2007, Stelling, 2006, Burton, 1999 etc.

Results and discussions

Climate change and urban health

Climate change is emerging threat to global public health. It is also highly inequitable, as the greatest risks are to the poorest populations of the urban areas of less developed country, who have contributed least to greenhouse gas (GHG) emissions. Common vulnerability factors include coastal location, exposure to the urban heat-island effect, high levels of outdoor and indoor air pollution, high population density, and poor sanitation. These vulnerable influence some of the largest current global health burdens, including approximately 800,000 annual deaths from ambient urban air pollution, 1.2 million from road-traffic accidents, 1.9 million from physical inactivity, and 1.5 million per year from indoor air pollution [6]. About 90% of the world's climate related disasters occur in cities of Asia. Climate change will expose Latin American populations to new or intensified health threats, particularly from infectious diseases. Dengue fever and malaria are likely to spread as mosquitoes and other vectors move into areas that were previously too cold or dry [7]. In 2001, the Intergovernmental Panel on Climate Change report on impacts, vulnerability and adaptation to climate change found that the incidence of experience of heat stress, injury and death from natural disasters (such as floods and windstorms), vector-borne diseases (such as malaria, dengue, schistosome miasis and tick-borne diseases) and water-borne and food-borne diseases water-borne diseases, such as cholera and diarrhea, will increase in urban areas of Latin American and Africa.

Climate change and urban water supply

Urban areas of developing countries are facing increasing water scarcity due to rapid changes in the hydro-environment at different scales, like those of climate and land-cove. In Africa, one third of the urban population is already affected by a lack of access to safe drinking water. Climate change is expected to exacerbate Africa's persistent water-stress. Water scarcity presents a very serious hazard for peoples' existence in Africa. As rainfall declines, the quality of water deteriorates because sewage and industrial effluents become more concentrated, thereby exacerbating water-borne diseases and reducing the quality and quantity of fresh water available for domestic use in urban areas of Africa. By 2050, between 350 million and 600 million people are projected to experience increased water stress due to climate change [8]. Climate change is projected to decrease freshwater availability in central, south, east and Southeast Asia,

particularly in large river basins [7]. Loss of food and water security may lead to increased conflict. In Kenya, there have been territorial disputes over receding water bodies, and increases in cattle raiding and violence as people who have historically managed through periods of drought and food shortages find themselves dealing with unprecedented famine [9]. The New Economics Foundation considers water stress to be a major impact of climate change with some of Asia's major rivers such as the Tigris, Euphrates, Indus and Brahmaputra projected to fall by as much as a quarter. In the short term, the Himalayan glaciers have already retreated by 67% since 1990, and further summer glacial melt could increase summer river flow and floods over the next few decades. The trend of glacial retreat and reduced rainfall combined with the growing concentration of Asia's population in urban areas and higher per capita water demands, could prove catastrophic if freshwater reserves are exhausted [7]. In urban areas of many small island states, rainwater is the main source of drinking and irrigation supplies. As rainfall patterns have changed due to climate change, droughts have been experienced in Papua New Guinea, the Federated States of Micronesia and Fiji. Tuvalu, Kiribati and the Cook islands have also experienced water shortages. Underground reserves of fresh water are also vulnerable. Irrigation and drinking water in many atoll states is supplied by a thin layer of fresh groundwater which sits atop the saltwater. These reserves are threatened by reduced precipitation rates and rising sea levels [9].

Climate change and urban food security

Food security is a fundamental determinant of human wellbeing and a prerequisite for sustainable development. Food production is a major source of employment and export earnings in developing countries. The adverse effects of climate change on agriculture will thus disproportionately burden poor Countries. The combination of rising average sea levels and more severe storm surges threatens crop gardens in several smaller Melanesian and Polynesian atolls with saltwater intrusion and destruction by windstorms. Export cash crops, such as copra, coffee and sugarcane are also highly vulnerable to damage by heat, and severe weather [7]. Rising ocean temperatures may affect marine ecosystems on which subsistence and commercial fisheries depend. By the mid-21st century, crop yields could increase up to 20% in east and Southeast Asia. In the same period, yields could decrease up to 30% in central and south Asia [7]. Much of the population urban areas of Latin America experiences inadequate food security, from malnutrition to the extreme of intermittent famine. Human Development Report 2005 records that approximately 10% of the population of Latin America and the Caribbean as malnourished. However, this figure is much higher in very poor Caribbean and Central American states such as Haiti (47%), Honduras (22%) and Guatemala (24%), which are likely to be seriously affected by climate change related extreme weather events [9]. Grain cropping production and forestry is forecast to decline. On the coast, the effect of sea level rise on natural barriers such as mangroves may threaten coastal farmland. Valuable estuarine fisheries may be lost, and tourism threatened by the bleaching of coral reefs. Many rural populations in Latin America are already very poor and have few resources with which to adapt their farm practices or endure more frequent bad seasons. At least 70 percent of the rural population lives in poverty in Bolivia, Guatemala, Honduras, Nicaragua, Paraguay and Peru. Extreme poverty afflicts more than a third of the rural

population in Bolivia, Colombia, El Salvador, Guatemala, Honduras, Nicaragua, Paraguay and Peru ^[9]. In Africa, over 70 percent of workers rely on small-scale farming that is dependent on direct rainfall. Food security can be threatened by even the slightest changes in weather patterns. The coordination of aid efforts and design of development policies will be seriously challenged by the impacts of climate change ^[9].

Climate change and urban Land loss

Previously attributed to unsustainable land development, coastal erosion is now increasingly exacerbated by storm and wave action. In Pacific States, affected coastal land not only constitutes a high proportion of total land area, it is also the location of most infrastructure, economic activity and agriculture ^[10]. There have been reported losses of sandbanks and shorelines in Tuvalu (the motu of Tepuka Savilivili), and in the Carteret Islands since the 1960s. Some islands in Fiji have retreated 30m in the past 70 years. In Kiribati, the motu of Tebua Tarawa, once a landmark for fisherman, is now under water ^[7].

Climate change and urban development

Climate change will reduce the economic growth and development of the developing country especially in Asia and Africa. Climate change could reduce GDP by 10% in India by 2100 compared to a situation without climate change. The combination of declining environment and the shock of extreme weather will affect the development of the urban area as well as the whole areas of developing countries. The extreme events will knock back years of development while the declining environment will slow down development between extreme events and decrease the resilience to cope with the impacts of extreme events ^[11]. Extreme weather event such as droughts and large scale floods had a significant impact on the Economic growth and development of developing countries. During these droughts or floods government incomes are often reduced due to a lower productivity while government spending needs to increase to supply food aid and repair damaged infrastructure. Future climate change is likely to increase the number of floods and droughts which will reduce government incomes and increase spending with a negative impact on budgets ^[11]. In Southern Africa a longer dry season and more uncertain rainfall has reduced agricultural production and has forced people to adapt through switching crops, diversifying livelihoods and planting trees ^[12].

Climate change and Refugees

As according to the International Federation of Red Cross and Red Crescent Societies in their World Disasters Report 2001, the year 2000 more people were forced to leave their homes because of environmental disasters than war. Approximately 25 million people could currently be classified as environmental refugees, amounting to 58% of the world's total refugee population. For instance, in China, the government estimates that some 30 million people are already being displaced by the impacts of climate change. Some authorities have set the figure higher, at 72 million. ^[9]. Significant numbers of people of urban areas of developing countries are already being displaced by climate change, and that the number will continue to grow in coming decades. According to Norman Myers of Oxford University, at a conservative estimate, climate change will increase the number of environmental refugees six-fold over the next fifty

years to 150 million ^[9].

Table 1: Displacement will result from a variety of factors, and will occur in urban areas of following developing countries by 2050 ^[9].

Region	People (million)
China	30
India	30
Bangladesh	15
Egypt	14
Other delta areas and coastal zones	10
Island states	1
Agriculturally dislocated areas	50
Total	150

In Bangladesh, around half of the country's population lives in areas less than five meters above sea-level. The Asian mega cities of Shanghai, Bangkok, Jakarta, Bombay and Manila are all built on low-lying coastal areas. The IPCC, 2007 forecasts that mean sea levels will rise by approximately 80cm between 1990 and 2080. The combined effects of storm surges and elevated peak tides will particularly threaten communities of people living in low-lying areas. It is estimated that by 2050 there will be 250 million people who will be forced to flee their homes due to drought, desertification and extreme weather events in Sub-Saharan Africa.

Climate change and Natural disaster

Many of the world's largest and fastest growing cities are located on the coast, and therefore vulnerable to sea-level rise and also exposed to the more frequent severe windstorms and floods. In addition, construction patterns in many developing cities have resulted in a combination of degradation of natural protection (e.g., through deforestation and building on floodplains) ^[13]. 40 % of West-African people live in coastal cities; increased flooding risks due to sea level rise. In Asia several mega-cities are located along the coast and are likely to be affected by sea level rise; ten to hundreds of millions of residences are directly at risk of flooding. Coastal erosion is likely to rapidly increase with rising sea levels. In some Asian regions a 30 cm sea level rise could result in 45 meter of landward erosion. This erosion is likely to destroy many human made Structures built for flood protection. Changes in the frequency of El Niño and higher sea surface temperatures are likely to affect fisheries, especially along the Peruvian coast. Higher sea surface temperatures have a large impact on coral reefs; loss of coral reefs could have an impact on tourism in the Caribbean ^[14]. In 1982, Peru's GDP declined by 12 percent, half of which was attributable to the El-Niño – related floods of that year. Between 1989 and 1996, China experienced annual losses from natural Disasters averaging 3.9 percent of GDP. In 2000, flooding in Mozambique resulted in direct and indirect losses of some 6 percent of GDP. Damage and losses from Hurricane Mitch in 1999 equaled 80 percent of GDP in Honduras and 49 percent in Nicaragua ^[14]. By mid-century, more than 70 percent of the population in settlements that could be flooded due to a rise in sea level is likely to be located in West and East Africa, along the southern coast of the Mediterranean, and South and Southeast Asia. With a 40 centimeter rise in sea level, the midpoint of the IPCC projection ranges for the end of the century, the world population at risk from annual flooding is expected to increase from the current 10 million to 22-29 million by the 2020s, to 50-80 million by the 2050s, and to 88-241 million by the 2080s (Nichols, 2001). The biggest impacts, however, are expected in the small island states of

the Atlantic, Pacific and Indian Oceans. Cities such as Alexandria, Egypt; Banjul, The Gambia; Tianjin, China; Jakarta, Indonesia; and Bangkok, Thailand will be affected. A 50 centimeter sea level rise along Egypt's coastal zones would affect 2 million people, 214,000 jobs, and cause land and real estate losses worth US\$ 35 billion^[16]. Alexandria's Old City, 12 meters above sea level, is safe from the direct effects of a rise in sea level. However, the port area and newer suburbs are at risk since, with the aid of flood defenses, they were constructed on lowlands^[15]. The average number of people in Africa impacted by coastal flooding could increase from the one million of 1990 to a worst case scenario of 70 million by 2080. Through coastal erosion and a rise in sea level, Banjul, capital of The Gambia, could disappear by mid-century. East African coastal settlements are also at risk. In most small island states, coastal planes have provided the best locations for urban centers and population concentrations, physical assets, economic activities and services. On most Caribbean islands, for instance, more than half of the population lives within two kilometers of the coast. On atolls, the most important infrastructure and population clusters are less than 100 meters from the shoreline. The threats induced or enhanced by climate change will severely affect this group of nations and their cities that are becoming acutely aware of their vulnerability^[10].

Conclusion

The rapid pace of urbanization compounded with an ever increasing population burden has also significantly increased the overall vulnerability of urban areas of developing country to climate change. Developing countries are considered to be particularly vulnerable to climate change as many are in tropical and sub-tropical zones with economies and societies highly dependent upon the climate and heavily impacted by its variations. Many of the largest cities in Africa, Asia and Latin America are port cities, historically linked to a colonial past, and directly subjected to the impacts of a rising sea-level. The high cost of land in a central city and around ports has often encouraged major commercial developments on land reclaimed from sea and river estuaries that are especially vulnerable to a rise in sea level.

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