

## THE EFFECTS OF URBANIZATION ON NATURAL RESOURCES IN JAMAICA

### BACKGROUND OF STUDY AREA

Jamaica is the third largest island in the Caribbean, comprising of approximately 4,400 sq. miles or 10,991 square kilometers in area. Over two-thirds of the country's land resources consist of a central range of hills and mountains, with the Blue Mountain Range being the most significant, ranging over 6000 ft. in height (GOJ, 1994; Clarke, 2006). This means that urban development in areas such as the capital city of Kingston and other principal towns such as Montego Bay and Ocho Rios is limited to the relatively small amount of flat lands most of which has a coastal location (see figure 1).

**Figure 1 Showing a Map of Jamaica and the Various Cities along the Coast**



Source: [http://www.sangstersrealty.com/jamaica\\_map.htm](http://www.sangstersrealty.com/jamaica_map.htm)

Although a significant portion of the terrain is mountainous, in several places the coastal plain extends to form broad embayments. Among these, a dry embankment on the south side of the island known as the Liguanea Plain has been occupied by the city of Kingston. The built-up area of the city spreads over 50 sq. miles and comprises the parish of Kingston and the suburban section of St. Andrew. The city is located on the eastern side of the island which is sheltered from the north-east trade winds by the Blue Mountains, hence being ideal for the major seaport of the country- the Kingston Harbour (Clarke, 2006). In general, the main land- use categories can be identified as productive – for instance industrial uses; consumptive- as seen in the provision of housing, and conservational as with forestry (GOJ, 1994). In addition, the city is the focal point for various commercial, industrial and service-oriented activities making it a magnet for persons searching for 'bright light' opportunities that are associated with the urban area. As a result, Kingston like many other cities in other developing countries experience high rates of population density due to this influx of people usually from the rural areas.

## LITERATURE REVIEW

Urbanization is the process by which cities and towns develop and grow into larger areas. It includes the movement of people from rural to urban areas as well as movements among towns and cities (UNHABITAT et al, 2002). As posited by Brown et al (1987, p.5), *“Aside from the growth of world population itself, urbanization is the dominant demographic trend of the late 20<sup>th</sup> century. The number of people living in cities increased from 600 million in 1950 to over 2 billion in 1986. If this growth continues unabated, more than half of humanity will reside in urban areas shortly after the turn of the century”*. As will now be discussed, this process is a popular phenomenon that has not only dominated Jamaica, but other developing and more developed countries of the world.

Approximately 60% of urban population growth worldwide is caused by natural increase, with migration accounting for only 25% of growth in Africa and 34% in Latin America. In Asia however, migration remains the dominant factor, providing for 64% of city growth across the continent (Brennen-Galvin, 2001). In 1985, about 80 million people were added to a total world population of approximately 4.8 billion (World Commission on Environment and Development, 1987). According to the World Urbanization Prospects Report (W.U.P.) (2003), fifteen years later the world’s urban population alone was estimated to have reached 2.9 billion in 2000- that is, almost 4 times as large as what it was in 1950. As posited by Drakakis-Smith (2000), since 1980 the greater portion of the world’s urban population has been contributed by developing countries. During the second half of the 20<sup>th</sup> century, the world urban population seemed to have doubled every 25 years as it grew annually at a rate of over 2.7%. In comparison, the total population increased at an average annual rate of 1.76%, doubling every 39 years. The difference between those two rates of growth – the growth rate of the urban population minus the growth rate of the total population – is the actual rate of urbanization. Hence between 1950 and 2000, the world population urbanized rapidly, with the urban proportion increasing from 29% in 1950 to 47% in 2000.

Consequently the population of the world, of which the majority has always lived in rural areas, is presently on the verge of becoming more urban than rural for the first time. This is the case as previous projections had indicated that the 50% mark would have been crossed in 2007. Such diversity in the growth rates of urban and rural populations is certain to have important implications for the kind of life of the world’s population and the quality of the natural environment (W.U.P. Report, 2003). Clarke (2000) perceives that over the next two decades, 90% of population growth in developing countries would have taken place in urban areas. As stated in the World Commission on Environment and Development (1987, p.37): *“Each year the number of human beings increases, but the amount of natural resources with which to sustain this population, to improve the quality of human lives and to eliminate mass poverty remains finite.”* Apparently, if such resources cannot replenish themselves fast enough to be used and still be of good use to individuals, then obviously a worldwide crisis would have begun for humankind.

Even though cities are considered as the ‘engines’ of economic development, failure to manage the impacts of rapid urbanization provides a threat to the health of human beings, as well as environmental quality and urban productivity (Leitmann et al, 1992). In light of this, the Brundtland Commission in 1987 coined the term ‘sustainable development’, which was taken to mean *‘development that meets the needs of the present without compromising the ability of future generations to meet their own needs’* (World Commission on Environment and Development, 1987 p.43). Several years later, SIDS (Small Island Developing States) were specially recognized in Agenda 21 and the Earth Summit held in Rio de Janeiro in 1992, regarding efforts in promoting sustainable development. This type of emphasis was placed on SIDS primarily because they are classified as being ecologically fragile and vulnerable. Small island states face specific and unique constraints due to their small landmasses, geographical dispersion and increasing vulnerability to natural disasters. Furthermore, fragile ecosystems, remoteness from

markets, difficulties with transportation and communications, lack of natural resources and heavy dependence on importations are other disadvantages that small, developing countries usually endure (UNESCO, 2001).

As stated at the Earth Summit, the Rio Declaration on Environment and Development outlined that in order to achieve sustainable development, environmental protection should therefore be carried out by developers and inhabitants alike, so as to safeguard and preserve the relatively limited amount of resources that are on the earth. Hence, Satterthwaite (1999) stated that in order to achieve sustainable development in Caribbean SIDS, long-term environmental stewardship of resources must be promoted. This is especially important as development usually involves the possibility of land-use activities causing a disturbance to the natural environment; hence all stakeholders need to be conscientious in carrying out urban development so as to minimize threats to their surroundings. Moreover due to the fragility of the ecosystems that exist in these small territories, the concern is whether governments in Caribbean SIDS are able to strike a balance between development and the environment, especially when these countries are noted to be more highly urbanized than other countries in both the developing world and the world as a whole (Potter, 2000).

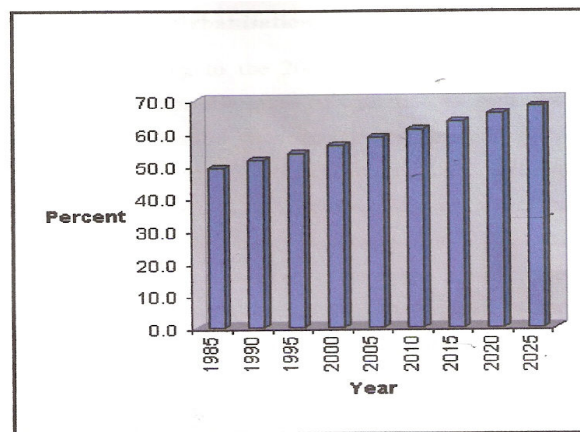
The World Travel and Tourism Council (2001) confirmed that of the 58 million people living in SIDS, 52%- a total of 30 million are currently living in urban areas. According to the United Nations Population Fund (2005), rapid and unplanned growth of cities caused by migration and natural increase has outpaced governments' abilities to provide basic services such as housing, physical infrastructure and social facilities- often causing a crisis in living conditions. This clearly exacerbates the problem of protecting the natural environment as a shortage of social facilities means that individuals have to find various means of survival, which frequently entails a compromise regarding the degradation of natural resources. The impact is even more appalling because urban areas in these small island territories tend to be coastally located, thus putting both land and marine resources under threat from population increase and accompanying land-use activities (Rakodi and Treloar, 1997).

## ANALYSIS & DISCUSSION

### **Population Growth Rates**

Empirical data suggests that urbanization has been on the rise in the small island territory of Jamaica. As illustrated in figure 3, since 1985 rates of urban growth have steadily increased over the years, and later projections also indicate that this will continue well into the future. As seen in the graph by the year 2020, over 60% of the projected 3 million population total would have been residing in various urban areas in the country U.N. Demographic Yearbook (2003).

**Figure 3 Showing Trends of Urban Growth in Jamaica from 1985-2025**



Source: U.N. Demographic Yearbook (2003)

In Jamaica, Kingston has been unmistakably identified as the city with the largest urban concentration. Along with the neighbouring sub-urban parish of St. Andrew, the population in these parishes totaled almost 720,000 in 2001 (Statistical Institute of Jamaica, 2008). Notably, these are the two smallest parishes in the country, accounting for 28% of the population size. This therefore illustrates the magnitude of the population that is concentrated in what is termed the 'economic stimuli' of the island. Such high population growth rates mean increased reliance on the natural environment, particularly in the urban area where density is most significant.

Another neighbouring parish that has experienced rising growth rates is that of St. Catherine-found to the southwest of Kingston. In 2001, close to 45% of the population of Jamaica was concentrated in this parish along with Kingston and St. Andrew (Government of Jamaica, 2003). The parish has since been noted as the fastest growing peripheral area in the island, which can be attributed to its close proximity to the capital city, where the relatively recent Portmore Housing Development took place. The satellite town which recently received municipality status has been developing for the last 30 years, wherein it has accomplished a growth rate of over 5% per annum. Notably, extensive mangroves had to be removed to create space for this massive housing project which recorded a whopping 160,000 residents by 2001 (Wade and Webber, 2002).

### ***Impacts of Urbanization on Land Resources***

According to Davis-Mattis (2005), approximately two thirds of Jamaica's population live in coastal towns and cities. High and rapid levels of urbanization have led to major problems such as traffic congestion resulting from poor infrastructure, contributing to environmental pollution and urban decay. Moreover, inadequate social services and poor housing are consequences of over-population and high population densities, often leading to the proliferation of squatters in major cities (GOJ, 2003). This scenario is often times intensified when high housing prices force people who are in the lower income strata away from the formal land market and towards illegal squatter settlements frequently situated in forbidden, environmentally sensitive areas; usually state-owned, yet seldom monitored. Bernstein (1994) argues that compared to other urbanized lands, these areas are usually most vulnerable to natural and anthropogenic hazards.

For instance, Wade and Webber (2002) observed that flooding in the city of Montego Bay occurs quite frequently due to deforestation by squatters in the lower watershed areas. Research has shown that deforestation for residential purposes along with 'slash and burn' farming by agricultural squatters in watershed areas have led to the degradation of 17 out of the 26 existing watersheds in the island; eventually leading to a reduction in fresh water resources (The Jamaica National Environmental Action Plan, 1999). This can also be attributed to poor land management practices and inadequate institutional arrangements by the state. Tinidigarukayo (2004) adds that rapid urban growth along with the inadequate provision of housing facilities has resulted in the increasing presence of informal settlements along gullies and on river banks in Jamaica. Clarke (2006) describes an unsightly 'rash of huts' appearing along the flanks of the lower part of the Sandy Gully- one of the main drainage systems implemented in the Kingston Metropolitan Area (K.M.A.). Squatters are then faced with the challenge of proper garbage and sewage disposal as the majority of these shacks do not have access to proper disposal facilities. This then leads to waste being disposed in gullies or nearby water channels, as this method would seem to be a feasible way of getting rid of garbage, since it virtually 'disappears' downstream. However, this causes major problems for the environment as polluted drains increase the risk of flooding and also pollutes coastal waters. As cited by the U.N. (2005: p.1) *"The seas and oceans [of the world] are under increasing pressure from pollution. Much of this pollution comes from urban centres, and it creates environmental problems which threaten the viability of the cities themselves."*

Drakakis-Smith (2000: p.89) posited that *"The consequence of so much poverty is a large and increasing number of urban residents who simply seek to survive as best they can, seemingly oblivious of the cost to the environment."* The World Bank also noted that the poor who make up 30-60% of urban population in developing countries are the ones who are most affected by degradation of the physical environment; much of which is also caused by them. It has been said therefore that the poor are both victims and agents of environmental degradation.

On the other hand, various upper class residential developments contribute just as much to degradation of natural resources in the island. Due to the scarcity of land on a whole in the urban areas of Caribbean SIDS- the K.M.A. being no exception; many affluent persons choose to build their houses on steep slopes situated on the outskirts of the city. For instance the Long Mountain Range located to the north-east of the CBD, is home to a watershed that contributes to the recharge of four of its wells; a host of biological species and indigenous animals such as the *coney* and also a breeding site for migratory birds such as the Black Throated Warbler. It is for these and other reasons why Jamaica has been placed fifth among the islands of the world due to the unique bio-diversity of the country.

Regardless of this, from the late 1990s developers seem to be outbidding environmentalists for the use of the area; termed by the latter as “the capital's last remaining green space”. Since 1997 the area has been earmarked for two housing development projects; after which about 85 hectares (just under 1 sq. km.) of the estimated 15 square kilometers on the mountain was to be excavated to provide over 550 housing lots. The National Water Commission (N.W.C.) - the main distributor of potable water- stated that such developments threaten the water supply of the K.M.A. They believe the projects would cause damage to and contaminate the Mona Reservoir, which is one of the main water storage areas in Kingston. It is for this reason that the area was zoned as a Public Green space; a factor that should have prevented its selection for development (Neufville, 2001).

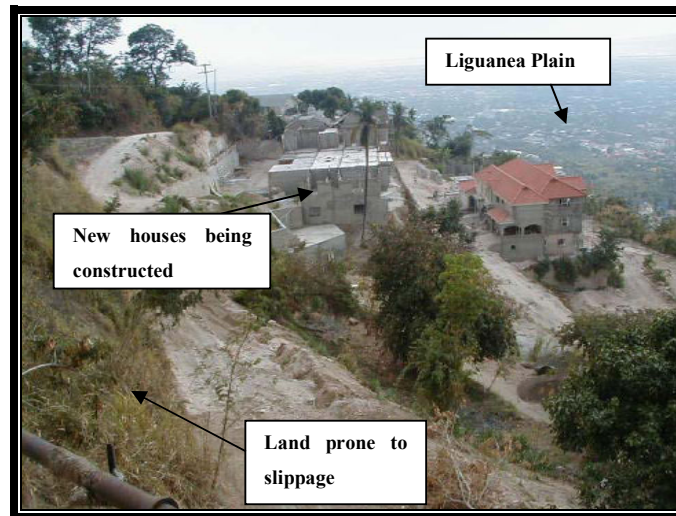
A subsequent Environmental Impact Assessment (EIA) found that residential properties too close to the reservoir could in fact cause contamination by sewage. Furthermore, the EIA noted, active faults in the area make it vulnerable to earthquakes and construction pressures that could cause the reservoir to leak. This is in no way keeping with the 1992 Dublin Principles on Water Management, which states that water is an economic and a social good essential for the sustenance of human life, and therefore must be treated accordingly. Hence a holistic approach needs to be taken by all sectors, recognizing the value of this natural resource and avoiding such developments that encroach on the nation's valuable water supply. Furthermore if this potable supply becomes contaminated by human effluent, individuals who consume it may contract serious illnesses such as cholera and typhoid. This affects public health and safety which should be the paramount goal of planners as well as all stakeholders in society.

Other developments have also been noted on Hellshire Hills found North West of the Kingston Harbour, which was the natural habitat of the now extinct *iguana*. Several mining quarries have been operating in an area on the hills that was supposed to be protected under the Environment Protection Act. This shows the need for more adequate institutional management and better monitoring of these environmentally sensitive areas by the relevant authorities. Housing development is also set to take place in the Hope area, known to be the nation's oldest and best known botanical gardens. According to scientists, this is in fact the last remaining piece of dry tropical forest this side of the world (Neufville, 2001).

In citing another example, Geologist Ahmad (2005) stated that “the decade of 1991-2001 has witnessed utilization of narrow river valleys, faulted mountain fronts, and land-water interface as a preferred site for both formal and informal housing development.” The author describes housing development on steep slopes such as Jack's Hill, a suburban area just outside Kingston as a disaster waiting to happen (see plate 1). This is because research has shown that this area is dominated by geological faults and landslides. Processes of rock fracturing and weathering have resulted in relatively weak bedrock, which makes the area prone to land slippage. This has been accentuated by vegetation alteration and deforestation which is predominantly associated with urban developments. This is a major environmental concern as removal of the surface cover will lead to the loss of fertile soils by soil erosion. Furthermore, the increasing impervious surfaces concomitant with urbanization on the slope; and the channeling of a number of gullies that are often filled with rainfall -induced debris and mud flows have increased the occurrence of flash floods on the Liguanea Plain (Ahmad, 2005).

Notably, of the 7 major gully systems in the K.M.A., only the Sandy Gully has been designed to accommodate massive flood discharge. The rest of the gullies have rather low discharge capabilities, making the city even more volatile to flooding (Ahmad, 2005). This is due to the process of ‘decapitalized urbanization’ which entails a lagging in infrastructural developments regardless of a rapidly growing population, particularly noted in emerging countries.

**Plate 1 Showing Residential Developments on the Steep Slopes of Jack's Hill**



Source: Ahmad (2005)

***Impacts of Urbanization on the Coastal Zone***

Bernstein (1994: p. 12) notes that: “As urbanization occurs, land development exerts pressure on surrounding ecosystems. The negative impacts of such development may include the loss or destruction of wetlands and wildlands (together with their rich genetic diversity) and degradation of coastal zones.” The destruction of ecologically important wetlands for urban development has potentially negative effects on the environment. These natural defense systems which account for about 6% of the global land area are the transitional areas between terrestrial and aquatic environments, and are one of the world’s most productive natural ecosystems. Wetlands are beneficial in that they provide protection from hurricanes and storm surges, pollution control, wildlife habitat, increase ground-water recharge and shoreline stabilization.

Notwithstanding the vast benefits of wetlands, they are still the most threatened among environmental resources. In developing countries, wetlands have been undergoing rapid conversion into urban residential and industrial use over the last 30 years (Bernstein, 1994). For instance, Mycoo (2002: p. 238) posits that “*wetland ecosystems come under the most threat from land-use and land reclamation in Trinidad*”. Back in Jamaica, Wade and Webber (2002) describe the removal of large portions of mangroves in Hunts Bay for the purpose of urban development. Large-scale mangrove destruction was again observed by the researchers in the housing development described earlier for the municipality of Portmore, Jamaica. Similarly, in the 1960s in the Bogue Lagoon in Montego Bay there were 14 mangrove islands in existence. Today only 4 are left because of tourism development, the creation of a major cruise port, the Freeport industry and also for luxury up-scale apartments along the coast. In addition, in 1947 the Donald Sangster International Airport in the city was also built on land formerly colonized by mangroves. This shows that land reclamation because of urban development has been taking place in the island over an extended time period. Such activities increase coastal vulnerability of the already vulnerable landmasses of SIDS to hurricanes and storm surges, when mangroves which act as shock absorbers for the land are destroyed.

In another instance, Williams (2008) stated that the Palisadoes- a naturally occurring spit adjoined to Kingston- was once covered with mangroves, whose intricate root systems help to keep the sandy soil together. However over time, much of this vegetation was removed mainly to facilitate road construction. This exposed the coastline and the land to "the full forces of nature". Currently, the side of the road towards the Kingston Harbour is now being slowly eroded by the sea, while the southern side is being washed away fast by rough waters. Eventually, a reef near the strip of land that used to break the force of the waves was destroyed, putting the foreshore under constant threat of erosion. As for the remaining fraction of mangroves in the area, massive deposits of garbage that wash down to the coast usually get trapped between the roots, contributing significantly to the pollution of the coastal environment which reduces the chance for coastal organisms to flourish.

According to Davis-Mattis (2005), inadequate urban infrastructure, high levels of poverty, and a reliance on coastal tourism have all contributed to the degradation of coastal habitats caused by the production of marine debris and the consequent pollution of coastal waters such as the Kingston Harbour. The harbour, situated to the southeast of Kingston is known to be the seventh largest natural harbour in the world. It is also the third largest port in the Caribbean, hence being an important transshipment point, generating millions of dollars in revenues annually.

Mycoo (1997) posited that sewage disposal is a major concern for Caribbean SIDS including Jamaica as only 30% of the population is served by sewerage systems, primarily in the urban areas of the K.M.A., Portmore and Montego Bay. However millions of gallons of partially treated sewage are discharged into the harbour on a daily basis from various semi-functioning sewage plants (National Environment and Planning Agency, 2008). This poses a threat to coastal resources as sewage pollution leads to eutrophication which creates harmful algal bloom that severely depletes oxygen levels in the water. This causes a general deterioration of water quality thus affecting marine life and the aesthetic appeal of the coast. Research by N.E.P.A. has revealed that much of the marine life formerly found in the Kingston Harbour has disappeared due to the degraded state of the harbour. Recently, efforts have been made to restore the quality of the harbour as a massive clean-up exercise was carried out in which over US\$350 million was spent to remove garbage and other pollutants from the coastal area (Wade and Webber, 2002).



## RECOMMENDATIONS

As put forward by Bernstein (1994: p. 4), *“For cities undergoing rapid expansion... one of the most important challenges is to achieve a proper balance between urban development and environmental protection”*. Essentially, this highlights the need to strive for and achieve sustainable development which relates to positive socio-economic change that does not undermine the ecological and social systems on which a society is dependent (Stren, et al 1992). From this, the term ‘sustainable urbanization’ has been derived which is a term used by Drakakis-Smith (2000) to describe the well-balanced relationship between the social, economic and environmental agents in society, so as to accomplish sustainable urban development.

This approach is vital in a Caribbean island such as Jamaica where rapid urban growth and development have by and large impacted negatively on the natural environment. If this trend is not curbed then it is the impoverished that will suffer most, as they are the ones who often tend to live on marginal lands, not being able to do much to recuperate in times of crisis. Since planning basically revolves around the health and safety of people in society, it is imperative that steps are taken to achieve a sense of balance as it relates to land-use development in our fragile ecosystem.

Notably, population policies, environmental conditions and land ownership patterns all directly affect urbanization rates. Countries with ineffective or non-existent family planning programs are therefore faced with rural populations under greater pressures to migrate to cities. In the case of Jamaica, the government needs to learn from best practices seen in other countries. For instance countries like South Korea have adopted national development strategies aimed at balancing urban and rural needs against available resources. Several land-use and industrial location policies were put in place in the 1970s to reduce the country’s reliance on Seoul, the capital city. Furthermore, the Korean government initiated the New Village Movement which was geared towards raising rural incomes to discourage migration from rural areas; out of which more than 450 rural industries have since been established (Brown, et al 1987).

China offers another example of a country that has successfully regulated the growth of cities by restricting migration and investing heavily in the countryside. As a result of the government’s strong support for agriculture, incomes of many rural Chinese are higher than those of their urban counterparts. However the challenge here is that many Third World states including Jamaica are moving away from primary industries like agriculture, towards secondary and tertiary industries that are usually concentrated in the city.

In turning to water as a finite resource, it can be said that this commodity is certainly one of the most vital yet ironically, it is probably the most abused urban resource worldwide. The competition between cities and the other major water consumers such as industry and agriculture is rising just as the quantity and quality of available water is declining rapidly. Still cities are notorious for their waste and misuse of this precious resource as few incentives or taxation mechanisms exist to conserve water or protect it from pollution (Brown, et al 1987). As such, the Government of Jamaica needs to ensure that stringent taxation measures are put in place to alleviate the problem of water pollution, both by residential and agricultural squatting in environmentally sensitive watershed areas. This is also necessary to drastically reduce the emission of untreated industrial and domestic waste into coastal waters, as this harms the marine environment and consequently has severe implications for humankind. The state therefore needs to put in place stern measures for industries that do not comply with waste treatment guidelines prior to dumping waste in coastal waters such as the Kingston Harbour.

In terms of protecting fragile ecosystems, the relevant authorities need to create buffer zones around environmentally sensitive areas and closely monitor them for any signs of unpermitted

development that may occur. In addition instead of opting for regularization, the Jamaican government needs to take a zero tolerance approach to squatters on marginal lands, as regularizing them in situ will only lead to the future degradation of the environment on which we all depend. Furthermore as noted by Birkland (2003) the most promising way to yield ecological benefits while mitigating damage to people and the environment is to discourage inappropriate land-use such as intensive agriculture and residential development in floodplains and on steep slopes. Hence even with upper class residential development, the planning division should ensure that no built development is approved for construction above the 300m contour line and on slopes in excess of a 1:6 gradient. This will help to curtail the problems of hillside deforestation, soil loss and land slippage, that often trigger a chain reaction on plains such as the Liguanea Plain where flooding usually occurs due to excess siltation in the drains and water channels.

It is also recommendable that a natural hazards management programme be incorporated into the planning process so as to reduce the risk of disaster occurrence in the event of a natural hazard. The Disaster Preparedness and Emergency Management Act of 1993 states that such a programme is necessary to provide a framework for integrating hazard mitigation into all policies, programmes and plans at both the national and community levels. So far the government has taken an important step by drafting a National Hazard Risk Reduction Policy for Jamaica, which will help to mitigate development that could trigger or worsen the effects of a natural hazard. Environmental enhancement projects should also be encouraged which would sensitize the public of the importance of conserving and protecting our natural resources. For instance more community projects should be developed for carrying out mangrove replanting geared towards rehabilitating the coastal environment especially where built development has been on the rise.

## CONCLUSION

According to the World Bank: *"The speed of urbanization and the enormous numbers involved make it one of the major development challenges of the 21<sup>st</sup> century"* (Rakodi, et al 2002: p. 47). In Jamaica, it has been observed that rapid urbanization and urban development have affected natural resources in many regions of the island. This has resulted in the degradation of many sensitive resources; occupation of hazard-prone areas; loss of open space and prime agricultural land; and also excessive urban sprawl. In most cases, the causes of these problems emerge from inappropriate regulation, lack of secure tenure, inadequate infrastructure, and weak and poorly coordinated actors in the land market (Bernstein, 1994).

In Kingston where immigration rates persist, residential and industrial developments continue to take a toll on the fragile ecosystem thus hindering its conservation for future generations. In this city which is the primary generator of economic growth for the country, effective urban land management is therefore needed to balance environmental protection and economic development, while meeting basic housing needs for the poor so as to prevent them living on marginal lands.

Although the process of urbanization often means accelerated economic performance for a country, the vast majority of land-use developments often cause stress on the environment, leading to the degradation of vital natural resources. In any case it is crucial to maintain a balance between development and the environment on which we all depend, for the use of both present and future generations. Consequently, all stakeholders must bear in mind that for there to be sustainable development in the island, serious efforts must be made to achieve and maintain the crucial element of sustainable urbanization (UNHABITAT, 2002).

## REFERENCES

1. Ahmad, R. (2005) *Protecting Built Environment in a Natural Hazard-Prone City*, Kingston: U.W.I. Press
2. Bernstein, J. (1994) "Land Use Considerations in Urban Environmental Management", *UNDP/UNCHS/World Bank Urban Management Programme*. Vol. 12. No. 3
3. Birkland, T. et al. (2003) "River Ecology and Flood Hazard Mitigation", *Natural Hazards Review*. Vol. 4. No. 1
4. Brennen-Galvin, (2001) *The Future of the World's Mega-Cities: Global Outlook*, Washington: Woodrow Wilson Centre for Scholars
5. Brown, L. et al. (1987) *Worldwatch Paper 77: The Future of Urbanization: Facing the Ecological and Economic Constraints*, Worldwatch Institute
6. Clarke, C. (2006) *Kingston, Jamaica: Urban Development and Social Change: 1692-2002*, Kingston: Ian Randle Pub.
7. Clarke, D. (2000) "World Urban Development: Processes and Patterns at the End of the 20<sup>th</sup> Century", *Geography* 85. No. 1
8. Davis-Mattis, L. (2005) *Marine Debris: Jamaica's Response*. UN Open Ended Informal Consultative Process on Oceans and the Law of the Sea (6<sup>th</sup> Meeting). NY
9. Drakakis-Smith, D. (2000) *Third World Cities: 2<sup>nd</sup> Edition*, London: Routledge
10. Government of Jamaica. (1994) "Towards a Land Policy for Jamaica", Green Paper Vol. 94. No. 4
11. Leitmann, J. et al. (1992) "Environmental Management and Urban Development : Issues and Options for Third World Cities", *Environment and Urbanization*, Vol. 4 No. 2
12. *Map of Jamaica: Showing all Major Towns*.  
[http://www.sangstersrealty.com/jamaica\\_map.htm](http://www.sangstersrealty.com/jamaica_map.htm)
13. Mycoo, M. (1997) *An Overview of Caribbean Urbanization*, Global Management Solutions Incorporations, Trinidad
14. Mycoo, M. (2002) "Adopting *Integrated Coastal Planning and Management – A Case of Trinidad*", *International Development Planning Review*, Vol. 24. No. 3
15. National Environment and Planning Agency, (2008) <<http://www.nepa.gov.jm>>
16. Neufville, Z. (2001) *Jamaica: Fight to Save Long Mountain Continues*,  
<<http://forests.org/archive/samerica/fitosave.htm>>
17. Potter, R. (2000) *The Urban Caribbean in an Era of Global Change*, Aldershot: Ashgate Pub.
18. Pugh, C. (2002) (Ed). *Sustainability: the Environment and Urbanization*, London: Earthscan Pub.

19. Rakodi, C. and Lloyd-Jones, T. (Eds). (2002) *Urban Livelihoods: A People Centered Approach to Reducing Poverty*, London: Earthscan Pub.
20. Rakodi, C. and Treloar, D. (1997) *Urban Development and Coastal Zone Management : An International Review*, Third World Planning Review
21. Satterthwaite, D. (1999) *Sustainable Cities*, London: Earthscan Pub.
22. Statistical Institute of Jamaica. (2008) *Demographic Statistics 2006*, <http://www.statinja.com>
23. Stren, R. et al, (Eds.) (1992) *Sustainable Cities: Urbanization and the Environment in International Perspective*, U.S.A.: Westview Press Inc.
24. Tindigarukayo, J. (2004) *An Attempt to Empower Jamaican Squatters: Environment and Urbanization*, Vol. 16
25. United Nations, (2003) *United Nations Demographic Yearbook*, Washington D.C.
26. UNESCO, (2001) *Small Island Developing States: Trends Since Rio: A Paper by the Alliance of Small Island States (AOSIS)*
27. UNHABITAT, et al. (2002) *Sustainable Cities: Achieving Agenda 21*
28. United Nations, (2005) *Coastal Area Pollution and the Role of Cities: Involvement, Influence, Implementation*, UNEP and UNHABITAT
29. United Nations Population Fund (2005) *Urbanization: A Majority in Cities*, <http://www.unfpa.org/pds/urbanization.htm>
30. United Nations, *World Urbanization Prospects: The 2003 Revision* (2004) United Nations, N.Y.
31. Wade, B. and Webber, D. (2002) "Coastal Zone Management" in Ivan Goodbody and Elizabeth Thomas-Hope (Eds.), *Natural Resource Management for Sustainable Development in the Caribbean*, Kingston: Canoe Press
32. Williams, P. (2008) *Palisadoes in Peril: U.W.I., N.E.P.A. Replanting Mangroves*, The Jamaican Sunday Gleaner Archive
33. World Commission on Environment and Development (1987) *Our Common Future*, New York: Oxford University Press
34. World Travel and Tourism Council (2001), London