Combining Traditional Knowledge and Expert Assistance in Environmental Planning and Management: A Case of Msimbazi Flood Hazard in Dar es Salaam City, Tanzania

William Rugumamu

Abstract

This article aims at advocating an urban environmental planning and management process that integrates community initiatives and urban professionals in generating durable solutions to environmental disasters with special reference to hazardous sites. The study employed a Participatory Rural Appraisal approach as a methodology to achieving that goal in the flood prone Msimbazi river valley, in Dar es Salaam City. This area experiences flash floods as a micro-scale environmental disaster in an unplanned area. Field evidence revealed that the interplay of storms, high tides, mangrove clearing and the blocking of available open drainage canals, as well as housing densitification coupled with urban poverty contribute to disastrous flash floods. To this end, a PRA team action plan and development strategy based on a comprehensive integration of natural and human factors were formulated by the Msimbazi residents and the urban professionals to respond to the impact. It was concluded that a bottom-up cum top-down approach that intricately integrates available traditional knowledge and expert assistance is capable of reducing disaster impacts and promoting sustainable urban development in such fragile ecosystems.

Introduction

Failure of urban authorities in developing countries to ensure planned and serviced residential areas is a development challenge of the New Millennium. Dar es Salaam, Tanzanias major commercial, industrial and urban center is one of the burgeoning Third World urban cities faced with the problem of generating planned settlements to meet the escalating demand. Geographically, the City is located on the western coastline of the Indian Ocean and experiences a tropical humid climate.

Department of Geography, University of Dar es Salaam

The physical growth and development trends of the City have been influenced by natural, socioeconomic and cultural factors characterized by three complementary processes namely, a finger-like linear trend into the degraded landscapes; in-filling of hazardous lands; and vertical growth through construction of multiple storied buildings (Figure 1). Under the Sustainable Dar es Salaam Project (SDP) which is supported by the Sustainable Cities Programme (SCP) of the United Nations Habitat (UNHCS, 1996) plans are in place to improve the environmental planning and management capacity of its three Municipalities and their development partners for sustainable development. This article addresses the issue of management of unplanned settlements, especially faced with a multiplicity of micro-level environmental hazards as a contribution to the sustainable cities programme.

It is postulated here that the gravity of a disaster impact to humans and/or the environment is a function of the site vulnerability and prevalence of a hazard. For Dar es Salaam City the major natural hazards include beach and soil erosion, low-lying terrain, cyclones and floods that threaten mother nature, human activity processes and infrastructure in the fragile ecosystems (Rugumamu, 1992). Like in similar areas elsewhere in the world, as cities become larger and more densely populated, they become increasingly vulnerable to natural and human-made hazards. The resulting loss of environmental productivity triggers off a series of serious socioeconomic and biodiversity risks and disasters, which mitigate against sustainable urban development (WCED, 1987; UN, 1994).

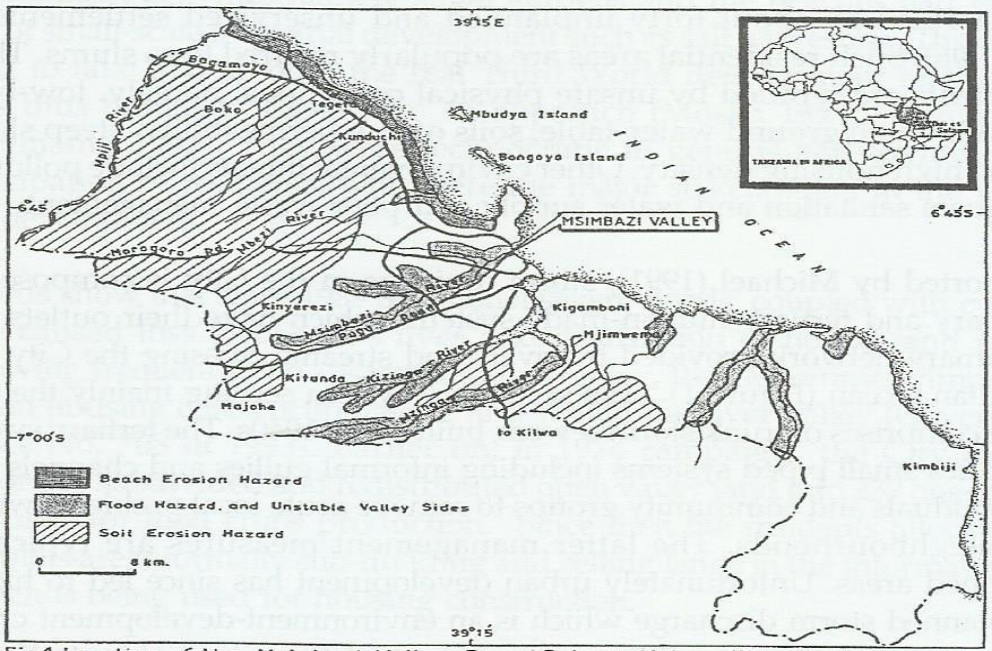

Fig.1. Location of the Msimbazi Valley, Dar es Salaam Metropolitan Region.

Further, uncontrolled urban growth into hazard-prone areas intensifies the already serious socioeconomic and ecological problems (UNCHS, 1996; ICPQL 1996 ; French 2000). This process, renders urban settlements susceptible to land, air and water-related health hazards resulting in diseases and loss of lives and property.

As correctly noted by Kreimer et.al (1992) a complex combination of economic and political factors force the low-income populations to inhabit illegal sites on hazardous areas. Several eloquent cases are cited to demonstrate the adverse effects of degraded environments in urban areas of Third World countries in Africa, Latin America and Asia. In all these examples, it is observed that rapid environmental degradation resulting from rapid expansion of human activity processes has increased the vulnerability to risks posed by the fragility of nature as conditioned by the socioeconomic and political structure of a particular society. According to Anderson (1992) all these processes arise from and are propelled by the activities and densities of metropolitan life. Under strategic planning, the same set of processes that increase the likelihood of natural and human-made disasters, namely selective concentration of humans in urban areas, improved technologies, and higher income are indeed the same ones that reduce these risks.

Environmentally hazardous lands are estimated to constitute (17575ha.) which is 12.6% of the total area of the Dar es Salaam City. These areas are characterized by about forty unplanned and unserviced settlements, of (URT1996). Such residential areas are popularly referred to as slums. These settlements are typified by unsafe physical conditions, namely, low-lying areas with high ground water-table, soils of low permeability, steep slopes and too high housing density. Other environmental threats include pollution, inadequate sanitation and water supply and poor waste management.

As reported by Michael (1991), storm drainage in the City is composed of secondary and tertiary human-made systems which have their outlets into the primary network provided by rivers and streams crossing the City into the Indian Ocean (Figure 1). The secondary system serving mainly the City Centre comprises of trunk storm sewers, built in the 1940s. The tertiary system constitutes small piped systems including informal gullies and channels dug by individuals and community groups to remove acute local problems within their neighbourhoods. The latter management measures are typical in unplanned areas. Unfortunately urban development has since led to higher than planned storm discharge which is an environment-development crisis. It was reported that about seventy percent of the city residents live in

unplanned areas (URT1996). This figure may have increased significantly to-date in the light of the recent youth influx from the countryside. In some of these shanty enclaves and suburbs the poor residents relentlessly struggle to meet their daily needs predominantly from exploiting nature. Along side these vulnerable groups are local and foreign investors whose enterprises are greatly dependent on the environment, their growing "unplanned" human activity processes exacerbate risks and vulnerability in those sites. This state of affairs is gradually being recognized by sub-national, national and international communities, whereby the way forward depends upon how cities, municipalities, towns authorities and development partners plan to interact with the environment and utilize natural resources for sustainable development.

Urban Environmental Planning and Management Process

In order to better deal with the future, there is the need to understand the past that has given rise to the contemporary state of affairs. In Dar es Salaam City, history reveals that development management initiatives were stipulated by the Project Planning Associates LTD (PPA) (1968) and later by the Marshal Macklin Monaghan LTD (MMM) (1979), which were referred to as City Master Plans. According to these plans, hazardous lands included deep valleys, steep slopes, swamps, marshes and other lands subject to floods during rainy seasons. By that time, the flood-prone Msimbazi river valley areas were under minor development activities namely small gardens and the beaches had isolated sites of small-scale industrial development such as salt harvesting. These plans failed to take into account the real Third World development realities and were thus branded "top-down" in approach (Mosha 1993; Haonga 1991; Rugumamu 1997). They were technocratic in genesis and excluding the participation of residents, who were the major stakeholders in the growth and development.

Records show that since 1989 occasional severe floods, coupled with cyclones have caused loss of people's lives and destruction of houses and nature. Following frequent flood disasters in this valley, the Government imposed a ban on housing construction along and within the river valley (Government Notice No. 708 of 1993). Earlier on, in 1974 campaign the City Council authorities subdivided and redistributed open valley land into 239 one-quarter acre plots for food crops production. Since then the residents allocated the said plots are informally sub-dividing and selling lands in the informal market - which is being used for housing construction.

Field studies revealed that by 1996 about 10,000 people were living in approximately 1000 houses worth about Tanzanian Shillings two billion (Rugumamu 1997). By Tanzania standards this is too heavy a socioeconomic investment to ignore. There is ample reason for seriously reconsidering the implications of a wholesale implementation of the MMM of 1979, the Government Notice of 1993, and the Land Act of 1999, all of which prohibit human settlements in the valley and such hazardous sites. Further to the Land Act of 1999, the Government Notice number 348 of July 2002 maintains that the Msimbazi valley is dangerous for human habitation and urges valley residents to vacate voluntarily or face eviction. This order which came into effect on the 19th October 2002, like the previous ones has not been honoured by the land users. In essence, the City and Central Government authorities have not been able to achieve their goal of creating safe urban zones for human habitation everywhere in the City, which falls short of peoples' right to a safe environment. This situation calls for re-examining, the enormous costs to be incurred by the authorities (City/Municipal Council and/or the State) to hire bulldozers, pay workers and the police force, demolish and clean up the environment, and subsequently reallocate internally displaced persons (IDPs).

This management problem may perhaps result from the fact that the urban/national authorities sometimes respond to on-site fragile conditions rather than to the root causes of problems. It seems that the Municipal Authorities have ignored the real needs, demands and development aspirations of the majority urban poor in addressing the management of the socio-economically and ecologically fragile areas. There is an urgent need for an alternative to planning and management of hazardous lands. This calls for a holistic ecosystem approach that comprehensively integrates natural, socioeconomic and cultural factors and processes, including stakeholders' spelt needs and aspirations in the formulation of settlement management objectives and the identification of strategies and instruments.

It is in this light that the concept of a hazardous land calls for a critical scientific inquiry. In this article, an environmentally hazardous land is conceived as an ecosystem (area) which due to natural and/or human induced factor, is unsafe for human habitation and could hence potentially disrupt the functioning of socioeconomic activity processes and ecosystem functioning given the available technology. Ultimately the bottom-line is the achievement of sustainability and even enhancement of the integrity and productivity of both humankind and the ecosystem.

On the City environment-development scene, there are four major role players

to be involved in environmental planning and management at ecosystem level (Rugumamu 1997; 2000). These include, the Central Government, the City Council and her three Municipalities, the City residents and development partners (UN system, Donors, NGOs) (SDP1996).

Inspite of their representation in the Central and Local Governments, experience has shown that local peoples' voices are not heard at the level of decision-making in development planning (Rugumamu, 1992, 1997).

In this regard, this article advocates an environmental planning and management process that integrates community level initiatives and professional assistance seeking to generate durable solutions to socioeconomic and ecological problems of hazardous sites. The primary **objective** is to promote an urban environmental planning and management process that integrates community initiatives and urban authority professionals in generating durable solutions to socioeconomic ecological problems of fragile ecosystems. The experiment carried out in Msimbazi valley, is an example of the micro level disaster management in an urban setting. It is **hypothesised** that when effective spatial planning and management of fragile urban landscapes is based on a scientific examination and analysis of on and off-site specific process-response relationships within a catchment framework and conducted by the key stakeholders with the support of facilitators, a sound settlement management framework may be generated. The conceptual framework underscores the internal and external factors and processes existing between land units (and indeed their soil-water-gravity interactions) and human activity processes within the socioeconomic political context. The ecosystem processes are those operative from the interfluve to the floodplain and indeed to the Indian Ocean coastline wherein the local people and their development partners are effectively involved in searching for disaster management measures.

Methodology

The Msimbazi valley case study seeks to demonstrate a micro level participatory planning in an economically and ecologically fragile urban ecosystem. The river runs for about 35 Kms from Pugu hills in Kiserawe District in the west and drains her waters into the Indian Ocean at the Salender bridge (Figure 1). The river has a catchment area of nearly 300 kms^2 but, for technical reasons, the area covered in the City plan is the whole lowland stretching from the Ocean at Ras Upanga inland to Segerea which is only 1600 ha. A recent study reports that there are about 9100 houses (at an occupancy rate of 10 people) and hence a population of nearly 91000 in the Msimbazi valley (Rugumamu 1996).

The major economic development activities in the Msimbazi valley on the Nelson Mandela Express Way, are typified by industries including the Al-Hamza factory manufacturing textiles and cosmetics, Auto-Mech Ltd for automobile spares, Coastal Millers Ltd for food processing, Timber Works. A now dormant agro-complex managed by the Chama Cha Mapinduzi (CCM) commercial wing, SUKITA occupies a large floodland resource.

This enterprise was not environmentally friendly before grinding to a halt. Other developments include warehouses (AMI; Cargo freight). There are also small-scale industries and smallholder urban gardeners producing mostly vegetables. Petty traders traverse along a short stretch of the Nelson Mandela Express Way.

Further, a portion of the floodplain along the Morogoro Road is occupied by KAJIMA; a construction company where there are an office complex, storages facilities and stone crushers for construction materials. Part of this area is also used for public meetings and sports grounds. Already a 23 hectares plot has been earmarked for a major sports complex, up-country lorry trminal etc.. Some of these unplanned economic activities have greatly contributed to block natural drainage systems especially in illegal/informal settlements, thus compounding the flood disaster.

The methodology employed in linking traditional knowledge and expert assistance in planning and management of hazardous sites was based on the Participatory Rural Appraisal (PRA 1991) approach. The PRA tools do allow for effective involvement of all stakeholders in problem and solution identification and programme and policy design, implementation and evaluation. The project design was organised around community participation and focused at a micro-catchment as a pedogeomorphic unit (Conacher and Dalrymple 1977). Based on the flood disaster incidences as well as its socioeconomic and ecological complexity (Rugumamu 1997) including limited resources, the team defined the project model area as Sunna Subward. The project zone extends from the Salender bridge estuary to the west of the Indian Ocean bordered by the Ali Hassan Mwinyi road to the Morogoro road, in the Jangwani area (Figure 1).

Data collection process included two operations, first, secondary data about the study area were gathered before the beginning of fieldwork whose main sources were published and unpublished reports, maps and photographs. This data collection activity enabled the PRA team, especially the facilitators, to gain an overview of the state of the art and the stakeholders to better

understand the study area as a planning and management entity (an ecosystem). The second operation, fieldwork incorporating Rapid Rural Appraisal (RRA) techniques (Jackson and Ingles, 1998) sought to collect data through mobilising and encouraging the participating members to think systematically about their problems and possible solutions and assist the research team to better comprehend the material conditions in the study area and together analyse problems and present options for addressing them.

Based on this approach, it was subsequently expected that the community as a whole and her development partners would adopt the plan for implementation and hence minimise the occurrence and severity of the flood disaster, promote the quality of life of local residents and maximise biodiversity (CBD, 1992; French, 2000).

Output of the Linked Traditional Knowledge and Expert Assistance

The following were the findings of the PRA team led by the author under the City Commission (now the City Council). It identified hazardous process-responses that were on going in these land facets of the ecosystem albeit at different spatio-temporal scales, intensities and durations. These entailed flooding, sedimentation, stream bank erosion and rapid growth of the number of poor residents. The elements at risk included residents (especially the vulnerable family members) and properties like, buildings, infrastructures, vegetable and fruit gardens.

On the spatial level, the team identified the valley landscape as constituting areas that were totally at high risk, those at slight, risk, the peripheral ones, and those which were safe. The hazardous land facets, which were identified for action as vulnerable to floods, were the fragile areas with potential to severely disrupt the functioning of socioeconomic activity and ecological processes. Further, the mushrooming illegal settlements characterized by rudimentary technology, services and facilities and increased overcrowding and rampant disease incidence linked to an unhealthy environment and diseases, like malaria, cholera, schistosomiasis were also included in the category of vulnerable facets.

The team identified and delineated two major hazardous areas in the field. These were the least hazardous areas constituting small shallow basins or depressions, undetermined channels and hand-dug canals, as well as the severely hazardous areas constituting the river course and its banks. The densification of houses in this flood-prone zone renders people and their

property more susceptible to flood disasters than ever before. Further, increase in the resource poor population compounds the hazard through unplanned housing extensions and dumping of solid wastes in the river and in the canals, which block the watercourses.

On the temporal scale, the team found out that amongst valley residents there was no worthwhile apprehension time because not every April rains (wettest month) were associated with flooding. The residents also never knew nor predicted the hour the water would jump off the riverbed. The flood disaster, almost always took the valley residents unawares. It was reported that in some houses flood residence time ranged between two and three hours and then subsided making the homes ready for re-occupation. In other homes the disaster last for three to four days. In all these circumstances, the survivors moved to their neighbours' or relatives' homes for safety. The disastrous effects always left imprints both on the ecosystem's land units and on the victims' and their development partners' mindscapes.

The team thus identified three major negative consequences of flood disasters. The first related to the degradation of the hazardous land units. The river banks were reported to be always severely eroded and the transported materials deposited in the lower members of the catena or the depression sites. The depressions, on the other hand, were flooded and sedimented by these colluvial alluvial materials. These fluvial processes impact adversely on space and on the residents and their property. The second constituted the micro level disaster impact - psychosocial problems. In this case the affected individuals and families experienced suffering and distress of pre- and post-flood impact. These included great fear of the threat prior to the onset, as well as forced resettlement in new environments after the State/City Council had demolished their shelter houses, making them internally displaced persons and hence poorer than before. The reported onset impact included the victim's physical body injury, loss of their homes, and damage to property. As noted above, the impact was recorded on the mindscapes of those who experienced the disaster as an indelible scar. These factors alone, however, proved inadequate as a driving force to influence the residents to mitigate the flood disaster either by engineering design or out-migration.

The third was the macro-level impact, which involved public institutions and national and international private organisations in response phase of the disaster management. Whereas the State insisted on the out-migration measures stated above, like the private sector, it also provided rescue and relief supplies. As a matter of fact, these humanitarian responses reinforced the habitation of

the hazardous area as reflected by the newly constructed homes.
The field evidence revealed that the severity of floods in the lower Msimbazi valley ecosystem may be attributed to a complex combination of natural, human-induced and human-made factors. A combination of heavy storms, typical of Dar es Salaam Metropolitan Area, coupled with mangrove clearing along the beach, and blocking of available open drainage canals and housing densification of the settlement, produces disastrous flash-floods. When these factors and processes further interact with recent development activities, such as the construction of the Salender bridge and the Msisiri high-rise estate, as well as resource scarcity amongst most residents, the risk factor is compounded and so is the degree of vulnerability and disaster. At the centre of the rapid urbanisation of Dar es Salaam is the intensification of urban poverty due to economic liberation and globalisation.

As factories grind to a halt, the public service sector becomes privitised and workers become retrenched, whereby squatting turns out to be the order of the day. It is against this background that a multidisciplinary and trans-sectoral approach was sought in the search for a framework to address the impact of the flood disaster on urban development.

The PRA Team Action Plan

The PRA team resolved that there are ample opportunities for flood disaster reduction in the lower Msimbazi valley if an appropriate community based action plan (CAP) is implemented. Such a plan has to involve the following strategies:

(i) To rehabilitate all drainage canals in this zone and ensure that they are kept clean.

(ii) To upgrade the settlement through the construction of access roads.

(iii) To raise public awareness on environmental sanitation, especially the management of solid and liquid wastes and construction and use of latrines. (iv) To demolish about 700 houses and to resettle almost 7000 people located on the hazardous areas. The residents in these zones were to seek assistance from the Municiple/City Commission and her development partners to settle in planned areas, preferably in the north and west of the City.

Having identified two planning areas, the PRA team resolved to draw a development management strategy. The first step was formulation of a Development Control System. The City Commission was to register as legal

(right of tenure) all houses remaining in the area after the launching of the plan. Then the local leadership was to be responsible for stopping infill of new houses as a DC measure. Further, over-spill population was to be assisted to form clusters in the new settlement in order to maintain community cohesion. Furthermore, tenants on the other hand were to be involved through their own contribution in putting up their own homes in the new sites for self-development.

The second step resources mobilization. Because development includes improved quality of life, it is the responsibility of the city residents and their development partners to raise the adequate resources needed. Measures to avail the necessary resources to the local community are indeed poverty alleviation initiatives. Basically, the stakeholders are a function of coordinated efforts and commitment by the residents, the City Authority, the State, the private sector, the NGOs and CBOs, and the Donor Community. The major areas addressed included (i) Capacity strengthening of stakeholders to undertake the formulation and execution of safety standards, construction codes and building regulations including other urban based activities through education, training and communication and empowerment of residents in decision-making. (ii) Provision of building sites and services and long term title deeds including loans to support the urban housing (development) initiatives - infrastructure development (safe water, sanitation, access road, power). (iii) Reclamation and conservation of degraded sites through such uses as scientific farming that promotes employment, nutrition and health standards and keeps the environment greener.

The PRA Team's Development Strategy

The Community Action Plan (CAP) drawn by the PRA team proposed the following development guidelines for safeguarding the CAP. (i) Creating a programme which will protect the habitat and designate protected areas, which cannot be developed for housing by way of formulating a land use management plan of a particular hazardous area. These initiatives require a land suitability evaluation based on physical, socioeconomic and environmental considerations (ii) Restoration ans reclamation of degraded areas. Mitigation investment should be seen in the context of resources for sustaining human and environmental productivity. There is need for ensuring that resources are readily available and efficiently used in designing, implementing and sustaining eco-development initiatives. This also calls for inter-agency coordination - that is flexible and responsive to

the changing context of management and conservation of the environment. (iii) Ensuring active participation and involvement of all stakeholders and development partners in nature conservation for long term habitat management. (iv) Creating an environment whereby local investors in eco-tourism, irrigation and fish farming and agroforestry, can generate material benefits through such eco-development schemes. (v) Environmental education, training and communication as key to all stakeholders managing the urban environment. By way of institutionalizing disaster mitigation stakeholders should develop a disaster safety culture, in which the general public is fully aware of hazards, chooses to protect itself as fully as possible, and can readily support protective efforts made on its behalf through expert support. (vi) The Municiple/City Authority has to coordinate services for stakeholders' interests with such other groups as investors, educationists, communicators and academics to promote the value of eco-development in view of the fact that development is a life-long process. (vii) Rules and regulations that change people's behaviour to be in place democratically to promote safety by using controls, penalties and incentives. Restrictive measures promote environmental safety by making some actions or developments unlawful or prohibitively expensive. (viii) Traditional Environmental Knowledge Systems (TEKS) and Modern Environmental Knowledge Systems (MEKS) be efficiently integrated in flood control measures to achieve sustainable use and enhance efficient management of hazardous lands, as well as improved quality of life of stakeholders. (ix) Regular meetings at all levels of Municipal/City management (from Sub-ward to City Council and even Parliament) to monitor and evaluate development programmes of local, national and global importance.

It was advanced by the PRA team that the protection of these multi-million shillings worth investments in this zone is rationally unquestionable. Further, the mitigation of flood hazards calls for an entire catchment management strategy as a fluvial system to be under the management of the stakeholders. The current approach whereby each developer improves the environment in a small part is not likely to lead to sustainable productivity of human and land resources in such floodplain ecosystem (ICPQL 1996).

Conclusion and Recommendations

Given the pedogeomorphic location, a flood hazard in the Msimbazi river valley is there to stay. The risk level will undoubtedly rise as the number of residents, increase, and indeed, if conditions of poverty remain unaddressed. From the above observations, it is advisable that successful environmental planning and management of hazardous lands in urban areas should be

ecosystem based. It also ought to constitute community participation in the analysis of problems and solutions, thereby intricately combining traditional knowledge (TEKS) and expert assistance (MEKS) coupled with good support from development partners. This is a bottom-up cum top-down strategy with lateral networking and vertical linking up which produces a middle-level solution to problem identification and solution search. These activity processes form the basis for influencing the behaviour of individuals, communities and their development partners over time and space when addressing environmental and socioeconomic issues in developing sustainable cities programmes.

In this regard, the next research agenda's objective on urban environmental planning and management of hazardous lands is to establish an enabling environment for hundreds of thousands of ecologically suited Msimbazi residents, as well as in other hazardous lands for their socioeconomic takeoff under the current economic globalisation. Such a project is essentially inter-disciplinary and inter-institutional and seeks to enable the urban residents to be more creatively and actively involved in the design, implementation, monitoring and evaluation of action plans to promote their livelihoods to robust economic ventures. These initiatives may further lead to the development of informed policy and legal instruments to propel future response options.

The project thus seeks to address development institutions to direct their efforts toward the enhancement of stakeholders' capacity, promoting their security of tenure and advocating community based environmental conservation, which are pivotal to "rapid implementation and quick impact development programmes" over time and space in a globalised economy. To this end the involvement and coordination of efforts of individuals, the public and private sectors in addressing the flood hazard and settlement up-grading in the Msimbazi river catchment and in similar vulnerable settlements is a contribution to the development challenge of the Millennium.

References

Anderson, M.B. 1992 Metropolitan Areas and Disaster Vulnerability: A Consideration for Developing Countries. In. Kreimer, A. and Munasinghe, M. (Ed) Environmental Management and Urban Vulnerability.The World Bank. Washington, D.C

French H. 2000 Coping with Ecological Globalisation in. Brown, L.R., Flavian C. and French H. The State of the World 2000 . W Norton & Co. Inc. New York

Homanga, E. B. 1990 A Study of Uses of Dar-es-Salaam Sea Front: A Case Study of Oysterbay Beach. Unpublished Dissertation, Ardhi Institute , Dar es Salaam.

Independent Commission on Population and Quality of Life (ICPQL) 1996 Caring for the Future: A Radical Agenda for Positive Change. Oxford University Press.

Jackson, W.J. and Engles, A. W. 1998 Participatory Techniques for Community Forestry: A Field Mannual. IUCN, WWF, AUSAID.

Kleimer, A. Munasinghe, M. and PreeceW.A. 1992 Reduducing Environmental Vulnerability and Managing Disasters in Urban Areas. In Kreimer, A. and Munasinghe, M. (Ed) Environmental Management and Urban Vulnerability.The World Bank. Washington, D.C.

Marshal Macklin Monaghan LTD (MMM) 1979 Dar es Salaam Master Plan, Tanzania.Main Report.

Mhina, A S. 1991 Public and Private Sector Partnership in Housing Delivery in Dar es Salaam City. Unpublished Dissertation, Ardhi Institute Dar es Salaam.

Michael, B. M. 1991 The Feasibility of Extension of Services and Infrastructure to Unplanned Areas in Dar es Salaam, Keko- Machungwa Temeke. Unpublished Dissertation, Ardhi Institute Dar es Salaam.

Mosha A. C. 1993 Uncontrolled Urban Settlement in Tanzania. in UNO and UDSM (ed) Population, Environment and Development. pp 129-141.

PRA 1991 Participatory Rural Appraisal. World Resources Institute; Clark University,Worcester; Egerton University, Kenya.

Project Planning Associates LTD (PPA) 1968 National Capital Planning Dar es Salaam TS. Physiography and Natural Resources.

Rasmussen, J.C. 1992 An Analysis of the Climate Change Issue. The Geneva Report on Risk and Insurance 17 (No 64) pp 371- 385.

Rugumamu, W. 1992 Environmental Profile for Dar-es-Salaam City: Hazard-prone Lands. Unpublished SDP report. Dar es Salaam.

Rugumamu, W. 1997 A Strategy for Managing Hazardous Lands in Metropolitan Dar es Salaam. UNDP-HABITAT Sustainable Dar es Salaam Project. Dar es Salaam, Tanzania.

Rugumamu, W. 2000 Managing Environmental Disasters: A Search for an Institutional Framework for Tanzania. Journal of the Geographical Association of Tanzania. No. 29: 79-93

Stephen, R. S. 1991 Disasters and Development. UNDP Disaster Management Training Programme

Temple, P. H. 1970 Aspects of the Geomorphology of the Dar-es-Salaam Area. Tanzania Notes and Records 71.

United Republic of Tanzania (URT) 1996 Report on Human Settlements Development in Tanzania for HABITAT 11

United Nations (UN) 1996 Habitat 11, The City Summit. UNO New York.

United Nations Organisation 1992. (CBD,) Convention on Biological Diversity. General Assembly, New York.

United Nations (UN) 1994 World Conference on Natural Disaster Reduction. Yokohama

World Commission on Environment and Development (WCED) 1987 Our Common Future. Cambridge University Press.