URBAN ENVIRONMENTAL HAZARDS AND ITS IMPACT ON THE URBAN DWELLERS – A MODEL FOR THE KLANG VALLEY REGION, MALAYSIA

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ABSTRACT

The Klang Valley Region is the most urbanized region of Malaysia. As such the region has experienced much increased in the intensity and frequency of environmental hazards affecting the major environmental subsystems. Deterioration of environmental parameters could be observed within the air, water, land and biological components of the environment. Deterioration of environmental quality is closely related to human tolerance levels whereby at certain threshold values the environmental parameter inherent in the major environmental components becomes detrimental to the urban dwellers comfort and eventual health. This paper describes the relationships between environmental deterioration, environmental hazards, and its spatial linkages with the urban dwellers, and the management options available. The discussion is based on studies on the urban poor of the Kuala Lumpur city as they are the most vulnerable amongst the urban population to the impact of urban environmental hazards.

KEYWORDS

Natural Process Regimes, Environmental Hazards, Human Tolerance, Urban Environmental Quality, Quality of Life, Urban Poor, Urban Environmental Management

1. INTRODUCTION

Urbanization provides the driving force and acts as a catalyst for growth and development of a region or country. As dynamic entities the activities within urban areas must be sustained. There are three main factors that regulate the continual growth of an urban area. These are often related to (1) urban commerce, (2) population increase – employment opportunities and (3) the transfer of goods and information. Urban growth and commerce are intricately linked. Although it is not entirely clear which fuels, which, urban areas usually provide a natural locus for economic growth. Commercial and industrial activities usually concentrate in urban areas because of the economies of scale these areas offer, besides, urban areas also provide fast, cheap transportation and flexible but highly productive labor markets. Urban areas also facilitate diffusion of products, ideas and human resources between urban, sub-urban and the rural areas. Industries and commercial activities in cities in turn, attract other ancillary services to support them and this interdependency provides the urban areas with more competitive advantages.
In addition to economic activities, population increase and other demographic forces too underlie urban growth. In most developing countries today, natural increase contributes as much as that by rural-urban migration to the increase in urban population. Another contributor to urban growth is the reclassification of city boundaries, which often result in dramatic changes in the urban size. The increase in the urban population has various social and economic implications, which in turn has their toll on the environment. By itself, rural-urban migration manifests many problems, closely tied to employment, housing and other basic amenities. Thus, although most migrants feel that relocation to the city has improve their situation, many others are unable to find work and forced to take up ill-paying or hazardous jobs, unable to generate enough income to meet their basic needs and thus join the ranks of the urban poor. The general consensus today is that, although poverty has for many years been concentrated in the rural areas, the shift of population from rural to urban has made poverty an increasingly urban phenomenon. The World Bank estimated that by year 2000, about half of the developing world’s absolute poor will be in urban areas. In Malaysia about 12 Million of its inhabitants live in urban areas. The United Nations Population Division reinforced this survey by stating that by 2020 the total number of the urban population would be closed to 20 million.

Finally and very closely related to the above is employment opportunities which remains a significant problem in most cities of developing countries, largely because the formal economies of these countries are unable to absorb the enormous influx of workers into the cities. Thus, a substantial number of the urban poor make their living through involving in the informal sectors.

Urban growth thus promotes economic advantages to other aspects of life: higher income, improved health, higher literacy, and improved quality of life to the less tangible advantages like access to information, diversity, creativity and innovation. However, along these benefits come environmental and social ills- including a diversity of problems from lack of access to clean drinking water to urban air pollution, green house gas emissions. These problems have become the major concern among social and physical scientists, policy makers and planners. The main issue of concern is the sustainability of the urban system both as a suitable habitat for mankind and in terms of their ecological and environmental support system. Evidences have shown that with the rapidity and the manner at which urbanization and urban growth is taking place, the general state of the environment as well as the quality of life in some parts of the urban areas are rapidly deteriorating.

2. URBAN GROWTH AND THE DISRUPTIONS OF NATURAL PROCESS REGIMES

Urban areas can be regarded as “living systems” or “super-organisms” which need resources (environmental and human) to sustain them and also for their continual growth and evolution. However, growth is not only related to changes in form structure but also within the environmental setting where growth is taking place and by doing so obliterates and modifies existing environmental process regimes there and that of adjoining environments. Each form of urban growth is associated with different phases of development activities. These activities in themselves can either change the frequency and magnitude (intensity) of certain processes and can also contribute to the formation of
new processes. The increase frequency and intensity of urban floods are often related to the phases of activities associated with the development of urban built up areas. In another example the intensity of *corridor winds* are also associated with phases of activities associated with high-rise development, which not only realigned wind paths but also promotes convergence, thus increasing wind velocity and force. The disruption of natural process regimes can also bring about new processes into the urban system. The *urban heat island* phenomena is a classic example of new processes been injected into the urban system. Urban built up areas are generally made up of energy absorbing materials, such as asphalt, bitumen, glass, and concrete. Urban built up areas are generally denser and agglomerates toward the urban centers. During night time, the materials reemit back the energy thus creating a dome shaped temperature inversion within the urban areas. In the last decade the Klang River Basin also had experienced a number of man-induced processes that includes, riverbank slumping, rapid mass movement processes and urban pollution (air, water and land). Figure 1 shows how urban growth and the various development activities associated with it could disrupt the various natural process regimes within an urban area. This figure describes that urban resource development would involve a number of development activities. Each development activity can disrupt and be associated with a new process regime. Khairulmaini (1993), for example, describes the relationship between housing development and its associated phases of activities and the different process response regimes (Figure 2). In the study, it was observed that, the initial phases of land clearing and leveling subject the area to surface wash processes that culminate into rills and gullies, which eventually leads to much sediment removal from the area.

Urban resource development must lead to the generation of wastes and by products as a result of work performed, which is disposed of within and eventually outside of the Klang River Basin. The generation of wastes can occur in any of the major subsystems of the urban environment (Figure 3). For example urban pollution is associated with waste pollutants in the atmospheric systems, whilst industrial effluents are disposed of as wastewaters in urban streams and drainage networks. Plate 1 for example shows the relationships between urban wastes and its impact on the land system. Plate 1 also describes the interrelationships between the environmental subsystems of urban areas. Here, the immediate impact of urban wastes would be to impose new processes on the land system. For example, depending on the type and content of waste, toxicification of the land system would occur, which would eventually make its way into the adjoining groundwater subsystems or if the waste is burnt this would impose itself on the atmospheric subsystem. It is during this process of disruptions to urban environmental process regimes and the generation of wastes that the KRB generate environmental problems that cover over a range of human resident spatial scales- the household, community neighborhood, the city, the region and globally (Fauza and Khairulmaini 1995).
Figure 1. Urban Growth and the Disruption of Natural Process Regimes

Figure 2. The Relationships Between Development Activities and Environmental Degradation During a Housing Development Project
Figure 3. Urban Growth, Waste Production & The Urban Environment

Plate 1. The Relationships Between Urban Wastes And Adjoining Environmental Subsystems
3. PARAMETERS OF URBAN ENVIRONMENTAL QUALITY

Changing process regimes including the generation of wastes are related also to changes in the values of individual environmental or system parameters or the sudden intrusion into the system of a new environmental parameter. For example, in the case of urban floods, *time to peak* value describes the rate of change of the occurrence of an urban flood prior to the onset of a rainfall event. This *time to peak* value can change as a result of the urban growth processes mentioned earlier, which can be rapid/instantaneous or reduced.

Urban pollution, however, introduces new parameters into the system. This could include various types of gases, solids and also water vapour, which are generally nonexistent prior to growth. The change in values of urban environmental parameter or the introduction of new parameters describes the state of urban environmental quality. However, of more immediate concern here, is the effect of this quality of the environment on the urban dweller. Figure 4, for example describes how a change in the environmental parameters can be related to the state of environmental quality and its relationship to the urban dweller.

For example urban haze, often associated with vehicular emissions can contribute to an increase in carbon monoxide gases in the urban environment, which would be detrimental to the health of the urban dwellers. However, it must be understood here that at any single moment in time the state of environmental quality is dependent on the cumulative effect of all environmental parameters that are considered to be detrimental to human health.
What this means is that as the urban areas developed, sustained by urban population growth it would contribute more and more to the defilation of environmental quality.

4. URBAN ENVIRONMENTAL QUALITY AND THE URBAN DWELLER

The state of the urban environment also creates a range of social impacts. Urban environmental quality may influence human comfort and impair human health, cause economic and other welfare losses, or damage the ecosystems on which both the urban and rural areas depend. Urban environmental quality is related to a change in environmental parameter standards. These changes affect the urban environmental quality, which would then affect the urban dwellers health. Firstly, changing environmental parameter standards would influence human well-being and comfort based on some level of human tolerance (Figure 5). Figure 5 describes the existence of threshold values in human comfort and health levels. These threshold values describe an upper maximum and lower minimum tolerance levels. These tolerance levels, however, would differ between individuals. The recent haze episode in the KRB, for example could be a serious discomfort to certain people and a severe health hazard to others. The relationship between tolerance, comfort and health, however, need not necessarily be in a continuum. Secondly, changing environmental parameter standards could also lead to the formation of destructive positive feedback loops which would eventually lead to a system’s destruction. Thirdly, the destruction of environmental subsystems would eventually lead to economic loss and failures.

Most urban environmental problems involve all three of these impacts, either directly or indirectly. For example, urban air pollution has a direct impact on human health, increasing the incidence of respiratory diseases. Its impact on economy is mainly indirect, arising largely from productive losses due to ill health.

Environmental problems within the KRB vary for area to area and are influenced by such variables as the area’s size and rate of growth, income, local physical setting, local climate, presence of institutional capabilities and more important the social structures and demographic profiles of the inherent communities (Figure 6). Especially where local governments are weak or under-financed, rapid economic and population growth in the area concerned can exacerbate these problems. Environmental management tends to be more difficult when the areas are located on marginal lands within the KRB. In such cases these areas are outside the responsibility of agencies that deals directly with environmental management.

In poor neighborhoods, the most threatening environmental problems are usually those close to home. The dangers of exposure to environmental risks are high, especially for women and children, the aged and those who are sick. Inadequate household water supplies are typically more crucial to people’s well being than
Figure 5. The Relationships Between Changing Values In Environmental Parameters & Human Threshold Levels

Figure 6. Determinants of Environmental Degradation

The State Of Urban Environmental Quality

- Income
- Location
- Solid & Toxic Wastes
- Urban Pollution
- Indoor Pollution
- Waste Disposal System
- Brown’s Agenda
- Sanitation & Water Supply
Polluted waterways. There is also often more exposure to indoor pollution and from uncollected wastes in these areas to pose as a health risk to the people there. These problems, so prevalent in the KRB, stems from a myriad of causes, including the inability or unwillingness of local governments to provide for the basic needs of the people in poor neighborhoods, which in turn stems from a lack of revenue-generating capacity. Another key factor is the poor’s lack of access to permanent land for housing. As income increases, urban households in the KRB consume far more resources, such as energy, water and building materials and generate far more of certain types of wastes. Yet the rich and those who can afford to do so devote part of their wealth to measures that protect them from environmental hazards. The problems close to home are the first to improve as income increases, because they are most threatening. However, while these improvements reduce personal exposure, they often simply shift the problem elsewhere. Household and commercial garbage for example are usually disposed at city dumps located within the vicinity of community neighborhood. Lack of investment in urban infrastructure, and weak enforcement of environmental protection laws and regulations tend to exacerbate these problems.

The geomorphological setting of the KRB is also a critical determinant of its environmental problems. The basin is bounded by highlands (The Melawati Range) toward the interior that prevent dispersal of air pollutants. In addition to this, it must also be understood that within the basin there is a natural mechanism of removal (air circulation systems and water pathways). Air circulation patterns associated with day-night cycles provides excellent modes of removal and so too the Klang River and its tributaries (Khairulmaini 2001). However, such cycles are also associated with energy gradients that are associated with only a certain amount of work. What this means is that the more pollutants and sediment that are in the systems the ability of the cycle mechanisms to perform as modes of transports would be severely limited and there is going to be a lagged in pollutant and sediment removal.

The Brown Agenda is another critical determinant of environmental problems in urban areas such as the KRB. Indeed, over the past two decades the global agenda has shifted away from local and regional problems such as air pollution and inadequate water supplies to urban flash floods toward vast global concern such as ozone depletion, climate change as well as loss of biodiversity. Aware of this shift from the “green” agenda toward the problems confronting urban areas, a number of researchers, international donor agencies, and non-governmental organizations over the past few years have advocated a renewed focus on the “brown” agenda – that is, the problems of pollution, poverty and environmental hazards in urban areas. The adverse effects of indoor pollution on child mortality and female life expectancy are of no less global proportion than say, the destruction of tropical forests, and in immediate human terms, they may be the most urgent of all worldwide environmental problems (Rossi et. al. 1991). This is not to argue for less attention to global concerns, but for the recognition that urban and global concerns are intertwined and must both be address accordingly.

One of the greatest threats to urban dynamics and human health is the quantity and quality of water resources in the KRB. Industrialization areas, commercial centers and housing estates require ample supply of water for their daily cycle of activities. The KRB still faces problems in terms of water supply even though the existing dams operate at
maximum capacity. The proposed development of the Selangor Dam is a step towards overcoming of this problem. However, the worst affected would be the marginal areas in the KRB – the squatter settlements in the basin. In the KRB, the number of urban residents at squatter settlements with access to an adequate water supply is still considered poor. Definition of what constitutes an adequate amount of safe drinking water and sanitation could be problematical. Although the local government classify the existence of water tap within 100 meters of a house is adequate. Such a tap does not guarantee that the individual household will be able to secure enough water for good health. Neighborhood communities are often served by one tap. In some cases communal taps only function for a few hours per day, so residents have to wait in long lines to fill even one bucket. Households cannot obtain sufficient water for washing, laundry, and personal hygiene if it takes too long to fetch and if the water has to be carried over long distances. The only remedy would be to use the rivers. The proportion of the urban squatter population covered by sanitation services is even smaller. Poor sanitation poses health hazards through several dimensions, including direct exposure to faeces near homes, contaminated drinking water, ingestion of fish from polluted waters, and ingestion of produce that has been fertilized by wastewater (White 1994). Inadequate access to water and sanitation facilities is the main cause for the intestinal diseases – diarrhea and intestinal worm infections that is not uncommon at such areas.

In the KRB, wastewater treatment is still not 100 percent being carried out. Disposal of domestic and commercial wastewater remains a major problem. During heavy rainfall, untreated wastewater is released through overflow drains and sewers. This problem becomes quite acute in the marginal squatter areas. Data are scarce on the contribution of indoor pollution to regional pollution and of its impact to immediate communities especially in the marginal squatter areas. However, in 1992 the World Bank identified indoor pollution as one of the four most critical global environmental problems. Indoor pollution contributes to acute respiratory infections in young children and chronic lung diseases and cancer in adults. Trapped heat and smoke within very cramped housing conditions observed in most squatter homes must aggravate discomfort and induced low health status amongst the squatters especially the poor (McGranahan 1993).

Urban air pollution remains as one of the biggest determinants of environmental degradation in urban areas. The KRB is exposed to a cocktail of industrial, vehicular and energy generating sources. Urban air quality in the KRB has generally improved over the last decades, largely from advances in controlling emissions from stationary sources such as industrial plants. Rising motor vehicle use, in part reflecting the increasing dynamism of the KRB now poses the greatest threat to air quality. Here a number of stringent controls have been enforced such as car pooling, expanding public transport systems and the use of unleaded petrol. Urban air pollution not only impairs human health but also damages crops, vegetation and man-made structures, including historic monuments. These effects are more difficult to quantify. However, acid rain and transported air pollutants from vehicles and heavy industries have been known to have contributed to decline of forest tract downwind of urban areas. Urban areas generate tremendous amounts of solid waste and these amounts increase with the most affluent business and commercial centers and the richer housing estates. In low-
income squatter settlements, garbage collection is often nonexistent, either because these settlements fall outside “official” service areas or because garbage trucks are unable to maneuver along narrow, unpaved and very poor streets. Uncollected domestic waste is the most common cause of blocked urban drainage channels, increasing the risk of flooding and vector borne diseases. In the KRB, the urban population is serviced by municipal waste collection. However, with their higher consumption levels, they confront ever-increasing mounds of garbage. The problem of allocating land for garbage disposal thus posed an immediate problem in the KRB. In some instances illegal garbage dumping have contributed to river and groundwater pollution within the basin. Municipal solid waste sites often handle both domestic and industrial wastes, including hazardous wastes. Without proper disposal, toxic chemicals can leach into water supplies. The health effects of hazardous wastes remain controversial, yet are generally believed to pose a far smaller threat than those associated with biological pathogens in the urban environment.

5. URBAN ENVIRONMENTAL QUALITY AND QUALITY OF LIFE

The relationships between urban environmental quality and the well being of urban dwellers in the KRB can be depicted through a series of process response linkages. The use of a canonical diagram in this case facilitates a quick appreciation of the sequence of process response relationships that occur between urban growth, resource utilization, environmental degradation and hazards within the basin. Figure 7 describes the general linkages of environmental degradation within the KRB. It must be stressed here that environmental hazards – situations in the environment (state of environmental quality) where system’s parameter standards increased or decreased in values making the environment detrimental to human comfort and health occurs at different spatial scales and would affect not only the different hierarchy of human occupancy in the basin but also the different social structures and demographic profiles of the KRB population. For example, indoor pollution – which could be attributed to increase in heat, smokiness, increased in certain type of gases and smell would be more critical amongst the urban poor in the KRB especially amongst the women, children, the sick and the aged. Open-air pollution, however, would be felt at a larger scale such as the city limits and would posed a threat on the comfort and health amongst the residents of the KRB irrespective of social structures and their demographic profiles (Packer et. al. 1994).

Figure 7 also shows that environmental hazards are situations that reflect a depreciation of environmental quality within each major subsystem of the environment. For an urban area this could be viewed based on the (1) general classification of environmental subsystems into air, water, land and biological, or (2) the naturally occurring spatial units of drainage basins and its subsystems. For example smell pollution from uncollected rubbish heaps within the vicinity of a neighborhood is attributed to an increase of certain type of gases for example hydrogen sulphide in the environment as a result of decomposition of rubbish. The strength of this form of pollution is dependent on the amount of this particular gas been released as a result of composition. This means that environmental degradation can be quantified and measured. However human environmental quality tolerance level could also is a subjective matter as human beings have different tolerance levels, which thus influence the comfort and health levels of human beings.
6. URBAN ENVIRONMENTAL MANAGEMENT

The complex determinants of urban environmental problems and the process response linkages they have on environmental quality and human well-being (comfort and health) underscore the magnitude of the urban environmental management challenge in the KRB if not the world. In terms of global impact, the most pressing need would be to improve well being of the urban poor in their local settings, especially the aged, children and women. However urban environmental management must cater also for the need of all inhabitants irrespective of social structure or demographic profiles as most urban health problems are derived through vector borne sources and touches every one of the urban areas inhabitants.

Improving environmental health and quality of life will require a significant departure from the piecemeal approach that has dominated urban management in this country since the 19 Century, in which each problem is considered in isolation. Most discussions of urban environmental management still resort to a listing of priority problems, as if each exists independently. Recognizing the synergistic factors affecting the quality of life of the urban population especially the poor, there is increasing attempts within the KRB to devise integrated strategies. These activities tend to incorporate diverse municipal agencies, often under an umbrella structure, that work with different stakeholders including local communities to improve local infrastructure such as water and sanitation services, along with providing of health programs, preschool education, and consciousness amongst local communities. To some extent these project activities represent a step forward in urban environmental management planning. However, there are many obstacles to multi-sector strategies for improving environmental health of urban areas. Chief amongst this is the difficulty of integrating disciplines as diverse as engineering, medicine, social welfare, and economics. Multi-sector approaches to urban environmental management pose a major challenge to both local governments and international lending agencies, which must coordinate responses and overcome the political divisions within urban areas. To succeed, any strategy must not only address the actual concerns of the community affected -which may not match the priorities of the government or the development agency sponsoring the project, but also in order to maintain a long lasting effect any urban development programme must adopt an approach based on the understanding of natural system dynamics rather than the traditional – sectoral approaches based on either administrative or economic criteria (Fauza and Khairulmaini 2000).
An integrated approach towards urban environmental management can help remedy these problems. There are two levels to this approach:
1. The need for a comprehensive understanding of natural process response dynamics within a defined framework of natural system boundaries, for example, drainage basins (Khairulmaini and Fauza 1998),
2. The implementation of good urban governance within an overall framework of drainage basin development planning and management.

7. CONCLUSIONS

It has been accepted globally that urban areas play a vital role in the social and economic development of any country; this is especially true in the case of the Klang River Basin – the premier urban region of the country. Urban growth and the urbanization process of this basin builds diversified and dynamic economies which raise productivity, create jobs and wealth, provide essential services, and absorb population growth, and had become the key engines of economic and social advancement in the country. Thus, to become a more efficient and productive urban region essential for national economic growth and welfare, equally strong urban economies generate the resources needed for public and private investments in infrastructure, education, health and improved living conditions. However, the development potential of the KRB is increasingly threatened by environmental deterioration. Aside from the obvious effects on human health and well-being, environmental degradation directly impedes socio-economic development. Air,
water and land pollution and biological manifestations, for example, impose extra costs on business and industry, and on households as well as public services. Inefficient use and depletion of natural resources raises input prices and operating costs throughout the economy, and also deters new investment. Heightened risk from environmental hazards has the same effect. In terms of impact, it is usually the poor who suffer most cruelly and directly from environmental degradation, although the lives and health of all urban residents can also be affected. Failing to deal with the problem today, moreover, leads too much greater problems (and cost) in the future because of the phenomenal growth rate of the KRB. For development achievements to be truly “sustainable”, cities and urban regions must find better ways of balancing the needs and pressure of urban growth and change with the needs and constraints of the environment. There are many encouraging signs, however, that environmental deterioration is not a necessary or inescapable result of urbanization and economic change. However in KRB such success seemed to be short lived, as environmental degradation tends to be rather synergistic with the rate of economic development in basin. Indeed, mounting evidence from all structures and levels of society including perceptions of non-governmental organizations in the KRB shows that the fundamental challenge has to do with urban governance: learning how to better plan and more effectively manage the process of urban development, avoiding or alleviating problems while realizing the positive potentials of city growth and change. New and more positive approaches to urban management can help to mobilize and effectively apply local resources at all levels of the urban society.

A common focus of many innovative and effective ideas and approaches being worked out today is a central concern with the actual process of urban environmental planning and management. Experiences from all over the globe – despite their vast differences in physical, economic, social and political situations seemed to increasingly converge on this same viewpoint. This evolving framework of Urban Environmental Planning & Management (EPM) can be characterized as comprising, in general, four closely interrelated elements or aspects:

- Identification and Prioritization of Urban Environmental Issues and Involvement of Stakeholders
- Formulating Urban Environmental Management Strategies
- Formulating and Implementing of Environmental Action Plans, and
- Institutionalizing Urban Environmental Planning & Management

Based on information gathered from a wide variety of cities and urban regions, a number of “Urban Environmental Planning and Management Guidelines” (UEPMG) can be suggested, each of which reflects the knowledge and insights – the “lessons” – gained through different experiences. These guidelines identify and describe ways which cities and urban areas have found to be effective in moving towards sustainable development and thus comprise a useful framework for a regional / global approach to implementing the urban environmental agenda. The UEPMG can be grouped under five main categories,

- Better Environmental Information and Technical Expertise
  - Preparation of basic overview information
  - Involvement of stakeholders
  - Setting of priorities
  - Clarification of priority issues
• Better Environmental Decision Making
  o Clarification of issue-specific policy options
  o Consideration of implementations options and resources
  o Building broad-based consensus on issue-specific objectives and strategies
  o Coordination of environmental and urban development strategies
• Better Implementation Of Environmental Strategies
  o Application of full range of implementation capabilities
  o Agreement on action plans for implementation

8. REFERENCES