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INTEGRATED SPATIAL AND ENVIRONMENTAL ELEMENTS FOR IMPLEMENTING SUSTAINABILITY IN GARBAGE COLLECTORS, GREATER CAIRO REGION, EGYPT

Magdy M. El-Bastawisy
Department of Architecture, Faculty of Engineering, Port-Said, Suez Canal University

ABSTRACT

This paper explores using integrated spatial and environmental elements for implementing sustainability in garbage collectors by enhancing ecosystem approach, Greater Cairo Region (GCR), Egypt. Garbage collectors are found in and around the GCR as a result of informal urban growth. In garbage collectors, the ecosystem is highly tensed and has affected the environment and people' health because the structure and functions of the garbage collectors are linked with significant planning and socio-economic issues. To define the importance of implementing sustainability in the garbage collectors, an analysis is conducted, including defining the causes and impacts of spatial issues on their environment; and policies applied for developing slums. The results indicate that the interactions between main function of garbage collectors and daily socio-economic conditions; and lack of services and infrastructure have led to environmental deterioration and occurrence of diseases in these slums and other adjacent districts. The analysis also defined that planning is unable to cope with this phenomena, although considerable efforts have been implemented during the last few decades. Decreasing stress of ecosystems and improving environmental quality of garbage collectors, thus, became essential for continued existence and humans well-being, especially, through decreasing the environmental deteriorations. The appropriate policy found for achieving this objective is ecosystem approach because it could be employed by management to integrate spatial and environmental elements in slums and their adjacent districts. The definitions and concepts of ecosystem approach, thus, are investigated to define its capabilities in promoting sustainable use. Development objectives, criteria, and guidelines are also outlined for implementing ecosystem approach in garbage collectors in GCR.

KEY WARDS: Spatial and Environmental Elements, Ecosystem Approach, Sustainability, Garbage Collector, Greater Cairo Region (GCR), Egypt

1. INTRODUCTION

In garbage collectors, stressed ecosystems are found, on which people depend for their lives and livelihood. Stressed ecosystems normally have negative impact on the environment and human health. It is likely that the potential sources of contamination are found in the functions and structure of the living space itself. This is because the structures and functions of slums are associated with significant planning and environmental issues such as: poor sanitation and ventilation, lack of waste disposal facilities, poor

indoor and outdoor air quality; the interrelationships between the main function of the slums (handling garbage) and daily social activities, especially within working areas and housing units; the impact of the pattern of slums on the health of the residents; limitation on hygiene within the living space, and lack of infrastructure and/or education. This pattern of living spaces has likely contributed to the incidence of diseases such as cholera, small pox, tuberculosis, typhoid fever and respiratory; and water related diseases such as severe diarrhea, dysentery, dengue and other contagious diseases. These kinds of diseases affect not only the people living in s1ums, but they are a threat to the health of more people living in other districts within the same city.

In Egypt, slums have been grown and spread in and around main urban areas, which generate environmental and health issues. The Egyptian government, therefore, applied several development policies for improving slums, particularly within the Greater Cairo Region (GCR). Despite some significant efforts implemented by the government in coordination with nongovernmental and international organizations (NGOs), planning is still unable to cope with such an alarming situation. Existing policies for upgrading and developing slums are still very much top-down and focus almost exclusively on the provision of infrastructure and services rather than integrating them with socio-economic and environmental issues. There are difficulties in linking lessons learned from local experiences into national policies. They do not provide any analysis to the interactions between slums and their cities and regions. These policies, thus, are incomplete because it is important for urban and city development to have a general perspective explaining the interrelationships between urban areas and their regions. In addition, when the government prepared a new national vision in 2005 to achieve slums upgrading, it provided a broad policy, which does not take into concern the special features and characteristics of garbage collectors, although their existing size and number are quite considerable.

Based on the fact that nature and people welfare cannot be separated from their physical environment; the United Nations, in 2003, proclaimed that all elements of an ecosystem are essential for the continued existence and wellbeing of humans. Some elements are encouragement, such as clean air, safe water, rich agricultural soils, and social behavior that demonstrates caring attitudes. It is important to recognize that not all health risks arising from the environment are the product of human activities. Many such hazards are an inherent part of the ecosystem, but can be minimized through judicious ecosystem management. As a result, integrating resources; physical/spatial (land use, infrastructure) and environmental elements; in a management development approach is found as the most applicable approach for decreasing the stress of ecosystems and, in turn, implementing sustainability in garbage collectors in GCR. The ecosystem approach as a participatory development approach, within this process, could play a crucial role because it could be employed by management to improve environmental quality in garbage collectors and their impact on adjacent city and/or regions. This approach is also capable enough to integrate management of land and living resources and promote conservation and sustainable use equitably.

1. 1. Purpose and Methodology

The purpose of this paper, therefore, is implementing environmental sustainability in garbage collectors in GCR by adapting the ecosystem approach. To achieve this purpose, the following methodology is applied: 1) analyzing concept, definitions, principles and capabilities of ecosystem approach as a defined policy for integrating spatial and environmental elements of garbage collectors; 2) assessing the growth of slums in GCR, in terms of trend, size, location, etc.; 3) investigating policies applied for the development of slums in GCR to figure out their objectives and limits; and define requirements for improving the garbage collectors environment; 4) analyzing spatial and environmental issues associated with the growth of garbage collectors to define the importance of implementing sustainability; 5) defining development objectives of garbage collectors; and 6) outlining criteria and proposing guidelines for implementing ecosystem approach in the garbage collectors in GCR.

2. BACKGROUND

To clarify the concept and objectives of the ecosystem approach to human health, investigating related definitions is found essential.

2. 1. Related Definitions and Concepts:

Sustainability: The use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations.

Biological Diversity: The variability among living organisms from all sources including, inter-alia, terrestrial, marine and other ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.

Ecosystem refers to both natural and human resources within some geographical boundaries with emphasis on the interrelationships among and between human and natural resources.

Urban ecosystem includes people among living things (plants, animals, microbial organisms), and structures they build among nonliving things (sunlight, nutrients, soil, water, wind). In an urban ecosystem, humans influence ecological factors; living and nonliving; and human decisions; where to build houses, parks, highways, schools; are influenced by ecological factors. Urban ecosystems are not well understood, but they are absolutely critical to health, economy and quality of life of people who live in urban areas.

Urban ecology is a branch of environmental studies that seeks to understand the natural systems of urban areas and the threats they face. Urban ecology helps people see their city in a new way, as part of a living ecosystem with valuable resources that promote better health and quality of life. Its information helps urban residents and policymakers create informed decisions and take action to restore these resources.

2. 2. Definitions and Concept of Ecosystem Approach

Ecosystem approach to human health is a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way, Figure 1. One important advantage of the ecosystem approach is that it encourages a much broader concept of disease prevention and health promotion. In other wards and to improve human health and wellbeing while simultaneously maintaining a healthy ecosystem, the emphasis of this approach is on the design of solutions based on ecosystem management rather than health sector interventions. The underlying hypothesis of this approach is that its application will be less costly than many medical treatments or primary health care interventions.

The ecosystem approach to resource management and human health is defined by the Canadian Council of Ministers of the Environment (1996) as: "*for purposes of planning and information gathering, the user, according to the task at hand and the scope of the process, may define the limits of a given ecosystem. While in general the limits selected will circumscribe an ecological space such as a watershed or a region, we can also designate a farm, an urban subdivision or a rural community as an ecosystem*".
The ecosystem approach, moreover, can determine links between human health and activities or events which disturb ecosystem state and function. Examples include: landscape disturbance in agriculture, mining, forestry, urbanization, and natural disasters. An understanding of these links can provide guidance

for management interventions and policy options that promote human health. An ecosystem approach to management must be adaptive because of uncertainty in ecosystem function, Figure 2.

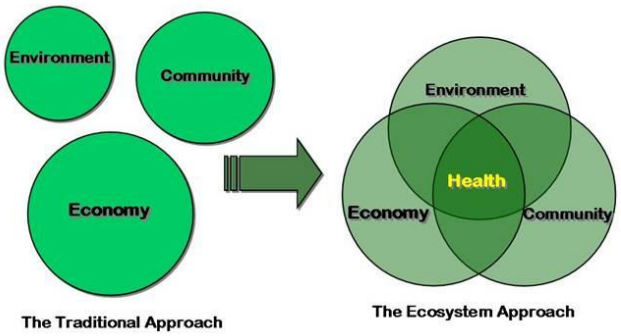


Figure 1: Concept of Ecosystem Approach for Human Health
Source of Figures 1 and 2: International Development Research Center (IDRC), 1996.

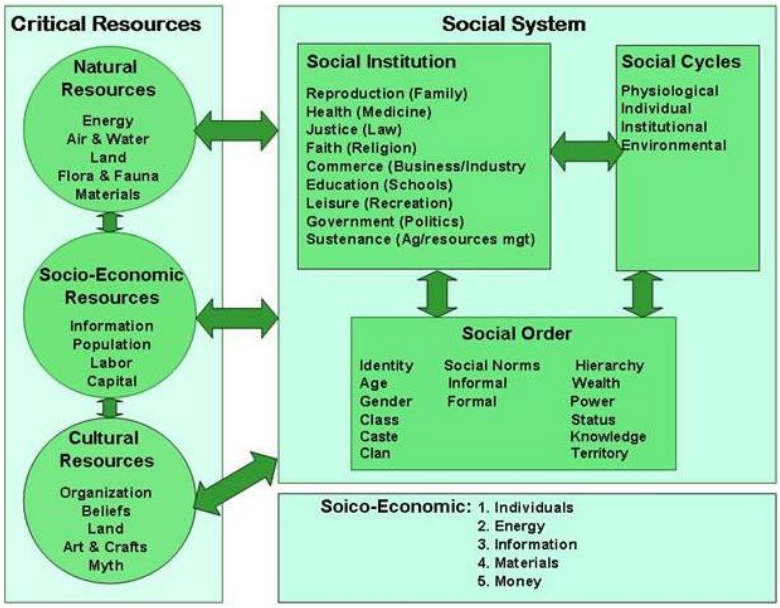


Figure 2: Structure of Ecosystem Approach

3. GROWTH OF SLUMS IN GREATER CAIRO REGION

Slums, informal housing and squatting areas in Egypt have been grown and spread, particularly in and around the capital and its region. In Egypt, urbanization is mainly a result of rural-urban migration and partially of high rates of natural increase. In 1947 the size of urban inhabitants was 33 % of total Egyptian population, rising to 43% in 1976, 44 % in 1986 and 43 % in 1996. The United Nations (UN) estimated that the urban population in Egypt would exceed 50 % of the total population by the year 2010. Cairo and Alexandria have dominated the urban system with a gap between these two cities and the remaining urban settlements, Figure 3. The urban concentration index increased from 0.696 in 1960 to 0.700 in 1966, 0.730 in 1976, 0.723 in 1986 and 0.706 in 1996. In 1996/97, in addition, UNDP estimated 46.8 % of all economic and social establishments and 23% of the total labor force are located in Cairo and Alexandria.

Cairo expanded rapidly and reached more than 1 m inhabitants in the late 1920s, 5 m in 1970 and more than 6.80 m in 1996. Moreover, a large metropolitan area was formed, including the city of Cairo, its extension in Shubra El-Khima to the north and Giza city to the west of the Nile. The boundaries of this metropolitan area were later extended to include more surrounding areas and settlements, forming the Greater Cairo Region (GCR). By 1976, the population of GCR was 6.7 m, then 8.56 m in 1986, 9.9 m in 1996, and about 15 m in 2005 in addition to about 2 m daily commuters. Thus, Cairo's share of the national population increased from nearly 9% in 1940 to 18% in the 1960s and 1970s, to 21% in 1994, and to about 20% in 2005. It has become the largest urban centre in Africa and the Middle East, Figure 3.

The overall density in Cairo has ranged from 20,000 to 23,000 persons/sq km between 1966 and 1970. Overall densities have increased to reach 32,000/sq km in 1994, ranging from 109,000/sq km in the most densely populated districts, to under 15,000/sq km in the least. GCR has highly affected by the socio-economic conditions in Egypt, which started in 1952. Since then, the share of the industrial sector in the total economy increased from 8% to 22% in 1961 and to 42% in the late 1970s. In 1980 and 1985, it has decreased to 25% and 28% leaving the lead to the service sectors. Most of this industrial development was

concentrated in the major urban centers, particularly in the GCR. In addition, a major part of "open-door" economic policy was directed to Cairo and its region during the 1970s, fostering further rapid urban development. As a result, in 1976 more than 55% of Egypt's industrial establishments, 48% of industrial employment, and 51% of industrial output were located in the GCR. Although these percentages have fluctuated since then, industries are still highly concentrated in the GCR.

This concentration of socio-economic activities has encouraged large-scale of rural-urban migration. Urban governorates, especially the GCR, suffer from high level of rapid urban growth. The size and rapid growth of the GCR have resulted in serious problems in most aspects of its population' life. One of these problems is the random appearance of new districts in the north, south, and west parts of the city, Figure 4. Informal housing appeared during this period in many areas within and on the outskirts of the city. Since the 196Os, small agricultural areas on the fringes of Cairo began to be subdivided and sold to individual owner builders. This accelerated dramatically after the 1974 open-door policy was proclaimed, fuelled by ever increasing flows of remittances from the hundreds of thousands of Egyptian working mostly as laborers in the Gulf and in other oil-rich economies. Such trends continued in the 1980s and 1990s. Over half of the GCR population resides in private housing that is constructed on agricultural land and areas, without subdivision plans and building permits. Plot coverage of 100% and incremental (room by room and floor by floor) reinforced concrete construction are the norm. While the quality of construction of housing is generally good, there is a very common trend of increasing the density of areas over time and a parallel phenomenon of serious overcrowding.

Figure 3: Location of Greater Cairo Region

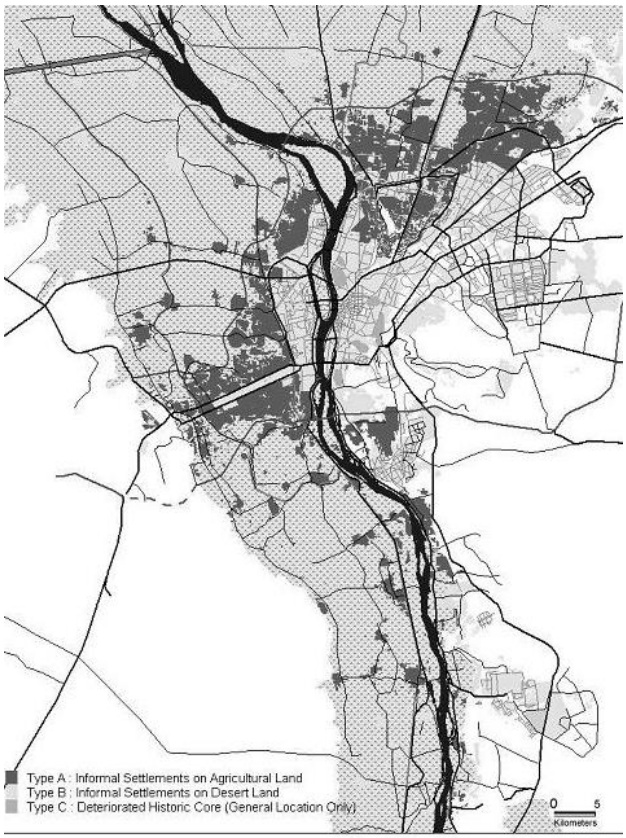


Figure 4: Distribution of Slums and Squatting Areas, GCR Source: Sims, D. (2003). UN-HABITAT: Development Planning Unit.

As a result, the size of informal areas and slums in and around GCR became quite significant. According to the General Organization for Physical Planning (GOPP) in 2005, the number of the informal areas is about 81 informal/slum areas of population size of about 62% of the total population size of GCR. The sizes of population and land of these areas widely various from a few hundred persons per hundreds square meters to 170,000 persons on 8 sq kms in Manshiet Nasser, a garbage collector slum, within GCR. The GCR showed considerable housing stress, with rents and prices rising substantially while incomes fell, probably corresponding to higher occupancy rates. In addition, slum areas increased in most cities, and the rate of slum improvement was very slow or negligible in most places. The government has attempted both to decentralize population and activities from Cairo and to reorganize and manage its growth at the national, regional, and local levels.

4. POLICIES APPLIED FOR DEVELOPING SLUMS IN GREATER CAIRO REGION

As a result to the growth of informal settlements and slums; massive industrial and housing projects were undertaken and slum development programs have been initiated by the government, mostly in Cairo. During the period of 1974-1985, the government addressed the booming of informal areas by preserving state and agricultural lands from encroachments and launched its new towns policy. In addition, the government with association of NGOs started improving the life quality of slums by providing physical development.

In 1992, the government launched a program to improve informal areas in Egypt. The government sponsored programs and social safety nets targeted toward poverty alleviation, including: National Program for Integrated Rural Development: SHOROUK, Nasser Social Bank, Sadat Pension Scheme, Mubarak Social Solidarity Program, Productive Families Project and the New Valley Development Project of Tushka. The efforts of the government to control the city growth have not been sufficient and it kept growing in most directions, especially to the west and north. Different NGOs supported the Egyptian government technically and financially in improving slums, particularly in the GCR. These NGO’s are the Mega-Cities Host Institution, the World Bank and the United Nations Development Program (UNDP). The development includes Ezbet Bekhit, Manshiet Nasser, Gamalya, Hikr El Sakakini, Al Assal and Izbet Girgis as follows.

- The Mega-Cities Host Institution was founded in 1981 to meet the urgent need for environmental protection in Egypt and neighboring countries. Primarily concerned with the promotion of economic development, it encourages initiatives that improve people's standard of living while preserving, replenishing, and even revitalizing the area's cultural and natural resources.
- Extent Environment and Development Program for Slums was launched to improve the living conditions and build the capacity of the traditional garbage collectors in the Moqattam settlement, the Zabbaleen, while creating a more efficient solid waste management system for Cairo. The Moqattami settlement houses half of Cairo's Zabbaleen, and is the largest of the settlements of its kind. The program consisted of a number of projects initiated over a span of ten years. Activities were targeted at improving environmental and living conditions, promoting enterprise development, increasing the service capacity of the Zabbaleen, and instituting low cost technological innovations.

These efforts followed by extension of physical development policy for the same area, which initiated in 1992 and financed by the Egyptian Government in cooperation with the World Bank. The Mega-Cities Host Institution also mapped out the settlement and the government constructed basic infrastructure and facilities, including piped water, electricity, sewerage networks, paved roads, a primary school and a health center. In an attempt to recover costs for the infrastructure and facilities construction and to provide residents with land security, community members were offered a thirty-year installment plan for the purchase of land on which their families resided. Work then began towards meeting the goal of an improved solid waste collection system for Cairo.

- In 1993, the government initiated a national policy for upgrading slums, with goals of: improving the living standards of informal settlements; integrating slums within the formal city; and providing slums with basic needs in terms of infrastructure and roads and sometimes services.

- In 1998, a project was jointly started and financed by German financial and technical cooperation. The objective is to solve the most urgent housing and environmental problems in densely populated areas of Ezbet Bekhit, with 40,000 inhabitants and as a part of Cairo's largest informal settlement Manshiet Nasser. It is envisaged to have an overall duration up to 9 years. The outline of Deutsche Gesellschaft fur Technische Zusammenarbeit (GTZ) initiative consists of a nation-wide program to improve the national upgrading policy towards informal settlements. The GTZ approach focuses on poverty-oriented, participatory process-oriented and self-help in urban upgrading.

Zeinab Nour-Eddine in her Master Thesis in 2003, Participatory Urban Upgrading the Case of Ezbet Bekhit, Cairo, Egypt; criticized the implementation of the project, particularly the quality of the data and methods used for data collection. This is because the Goal Oriented Project Planning does not include an intensive effort to understand and stimulate community, especially the housing conditions and socio-economic profiles. These low quality data, in addition, would be reflected on the setting in motion of the community to be active at the start of the implementation process. Nour-Eddine recommended that the community of Ezbet Bekhit should be considered as the transitory type taking into consideration socio-economic heterogenic status of its groups; and to have different plans of action which response to the needs of the different groups in order to stimulate them to participate in upgrading activities.

- In 1997, the UNDP introduced the Sustainable Livelihood Approach SLA to the GCR. Several case studies were selected, including: Hikr El Sakakini in Sharabiya district with total area of around 31500 sq m and occupied by around 12,000 people; Al Assal and Izbet Girgis in Shubra district of 160000 sq m and estimated population size of 30,290; and Manshiet Nasser (a garbage collector slum) with total area around 8 sq km and residents number of about 169,990. The SLA program development, moreover, was mainly concerned with alternative strategies for urban poverty reduction through integrating the most use of slums assets in an environmental development concept. Accordingly, SLA encourages communities to look at their assets in an integrated way, using complementary capital; including physical, social, economic or natural in an efficient and effective way to safeguard the interests of current and future generations. It provided a development framework of measures and indicators to monitor improvements in livelihoods systems of the urban poor and the extent to which these are sustainable.

In 1997, the Ministry of Housing initiated a project for the Rehabilitation and Upgrading of Slums to coordinate efforts with the above mentioned international organizations. The project consists of nine phases; establishing new 70,000 housing units; relocating a percentage of inhabitants into another planned community equipped with all services and amenities; and rehabilitating and upgrading existing slums. With the completion of this project, slums will be fully equipped with complete piped networks of water supply and sanitation, roads network, open space, vocational training and heath care centers, libraries, schools, phone service network, and environment friendly crafts workshops. Moreover, residents will be provided with a soft loan, 90% of which is required to be paid over 40 years giving the residents a sense of ownership. The project also is based on participatory socio-economic survey and mechanisms of transparent dialogue with local residents in both the planning and management processes.

In 2000, the Ministry of Housing announced the completion of 15000 residential units in addition to another 25000 units that are expected to be completed later on. The ministry also put an integral plan to pave all the streets that will take three months. On the other hand, the ministry will start implementing

another plan involving sewage services and installing other services in all houses in Manshyat Nasser. The Cairo Governerate announced that it will open 3 projects to increase the amounts of drinking water in the Foustat, Rodh El-Farag and Materya water stations to expand water networks to deprived areas.

In 2005, the new vision for slums upgrading in Egypt with the support of UNHABITAT and World Bank sets an integrated urban policy to achieve sustainable development and addresses Cities Alliance (CA) for Proposed National Program with the following goals: securing land and housing tenure; real community participation; cost recovery to ensure sustainability; integrate approach and urban upgrading; environmental development (infrastructure provision); good urban governance; actual decentralization, empowering local government in managing urban development and having financial autonomy; and enabling urban poor to have access to land and housing credit.

5. IMPORTANCE OF IMPLEMENTING SUSTAINABILITY IN GARBAGE COLLECTORS

In Greater Cairo Region GCR, garbage collectors have traditionally been communities gathering, sorting and recycling a substantial part of the city's waste stream. Main garbage collectors have been randomly appeared and grown up such as Manshiah Nasser, Moetamdiah, Torrah, Al-Nakhel, Al-Bragil, Helwan, Ain-Al-Sirah, etc.; as a part of a massive random growth of squatting and slums areas in and around the GCR. The estimated population size of these garbage collectors is approx. 600,000, who have been handling this kind of service since the 1960s. This urban pattern is a result of uncontrolled growth of the GCR, which has become one of the largest cities worldwide, with a population of about 15 m. The GCR's immense size and explosive growth result in political, socio-economic and environmental imbalances that negatively affect the quality of its urban environment. As a result, huge strain has been put on basic services, especially the collection and disposal of solid waste because the demand for services is gigantic. The GCR generates around 6000 tons of daily solid waste. Garbage collectors collect the waste and transport it to their settlements, where it is sorted and recycled or used for animal fodder.

The major problems of garbage collectors were the terrible living conditions in their settlements. The garbage collectors have no water supply, and partially supplied with electricity. Sorting waste inside houses leaves them cluttered and often filthy. The conditions of the roads are heaped high with waste paper, piles of animal manure mixed with organic residues, tin cans, and often-animal carcasses. Some streets cannot be seen at all due to layers of wastepaper or tin cans strewn, often a foot or more deep, across large areas. Others are divided down the middle by piles of organic residues. Millions of flies swarm about, and the air is usually filled with the smoke of fires, which have either been set deliberately to dispose of unwanted paper or result from spontaneous combustion of organic residues Figure 5 and 7.

However, to clarify the importance of improving garbage collectors, an example of a garbage collector was selected and analyzed, in terms of environmental hazards and human health risk in relation to activity process and physical conditions. The selected garbage collector slum called El-Nakhel Village (Palm Trees Village). The land of El-Nakhel was an agriculture land full of palm trees until mid 1970s. It is located in the northwest of Cairo, on the border of Cairo and Qalubiah Governorates, Figure 6. Internal migration to the village started in 1959. The rent started at LE 350/feddan when the value of a feddan was LE 500. The new comers built shanty houses with crabbed metal sheets for walls and ceilings and called it Zeriba (animal house), with a rent of LE 36 for about 425 m2. The internal functionality organization of each shanty is mixed. In these houses families operate garbage process: dump, separate and pack; and live normal daily life rise up children and animals, cooking and eating almost within the same place. These types of houses, moreover, suffer from the absence of toilets, washrooms and kitchens, Figure 7.

When garbage people moved to this area first time, the rent and value of land was almost equal. Therefore, land owners preferred to rent the land rather than selling. By time and as a result of booming of land value,

the landowners tried hard to evacuate the tenants to sell the land. Therefore, about 75% of the garbage collectors owned their houses' land and rebuilt their old shanty houses with either metal sheets with brick or concrete with brick. Currently, El-Nakhel Village consists of different types of buildings such as shanty, mix of shanty and brick and concrete with brick without external paint or finishing. These houses were randomly distributed with unshaped, unpaved narrow streets that would not allow any service vehicles to enter. The population size of the El-Nakhel Village, in 1999, was about 45,000 with an area of about 147000 sq m. The average density is about 45000/0.147 sq km (1286 person/acre).

El-Nakhel Village provides a good example of a garbage collector slum of livelihood associated with environmental and health issues such as lack of hygiene methods as a result of mixing daily life activities with processing garbage, particularly during preparing food and eating, and rising up children; contaminated houses and streets filled with garbage; absence of washroom and kitchens, sewage disposal system and potable drinking water network and facilities; and air pollution as a result of garbage burning and smells. These environmental issues are highly likely to initiate airborne transmission diseases, which are transformable not only within the slum but also to the adjacent neighborhood/s of GCR. The final result, therefore, is a real threat to human health and life, particularly for children, in slums and rest of the metropolis area of Cairo, Figure 5.

Medication, within this process, could be suitable only for the short-term solution, which, in turn, will have additional environmental and human health impacts. For long term and permanent urban development, medication is not the right method for eliminating environmental impact in slums and cities. This is because cities are a good example of an ecosystem. Cities are dynamic complexes of human and plant communities situated within a given environment; and their boundaries often have more to do with the parameters that humans set arbitrarily according to the scientific, management or policy question they wish to examine rather than with physical dimensions.

On the other hand and within the garbage collector, poor health resulting from contaminated environmental factors is one of the major impediments to individuals' success. Besides affecting the overall socio-economic development of these areas, disease will undoubtedly impact negatively on an individual’s social mobility, Figure 5. Garbage collectors, to a large extent, are a physical and spatial manifestation of urban poverty, and the fundamental importance of this fact has not always been recognized by past studies and policies aimed at either the physical eradication or the upgrading of garbage collectors. Future literatures and policies should go beyond the physical dimension of slums by addressing problems underlying human health and the interrelationship with the physical and spatial environment in urban areas and cities.

Moreover, the United Nations Development Program (UNDP) and the World Bank in a joint publication in 1999 identified that the message emerges from linking environment and health is clear: a clean environment supports good health, while a degraded environment increases the likelihood of death and disease. The toll environmental degradation exacts on human health is heavy, especially for children in the poor regions of the world. In the poorest countries, one out of every five children dies before reaching fifth birthday, usually because of environmentally related and largely preventable diseases. Improving environmental conditions could thus do much to reduce both death and disease. Environmental health problems also place significant economic and social burdens on both individuals and societies. In some large urban areas of the developing world, the estimated economic losses each year from air pollution and congestion alone range from U$500 million to U$3.5 billion. Exposure to infectious and chemical agents can abuse physical growth, damage cognitive skills, and decrease educational participation and performance, thereby reducing the future potential of individuals and, perhaps, of society as a whole.

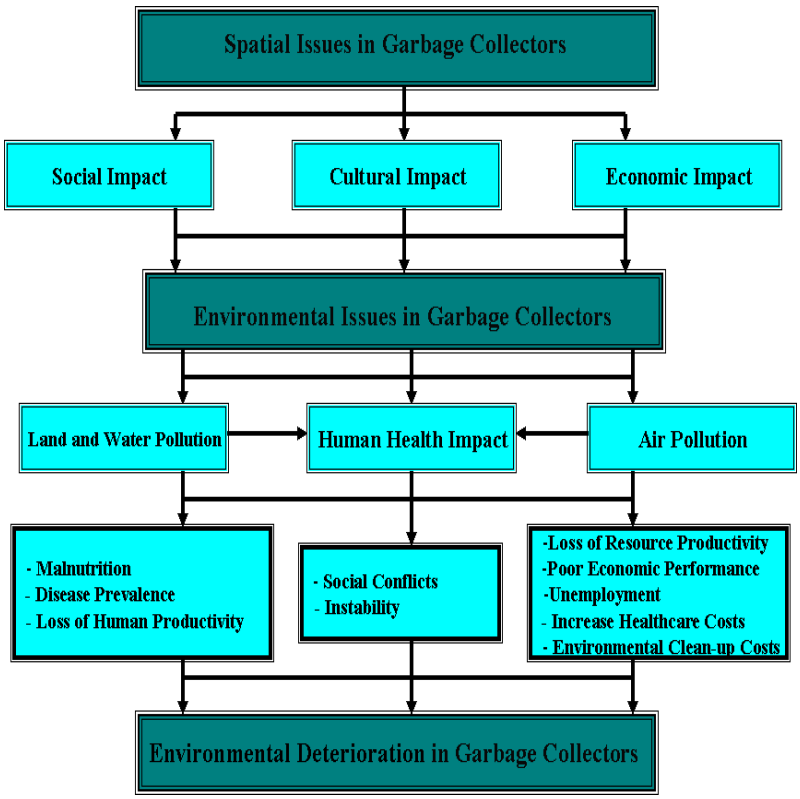


Figure5: Conceptualization of Stressed Ecosystem in Garbage Collectors

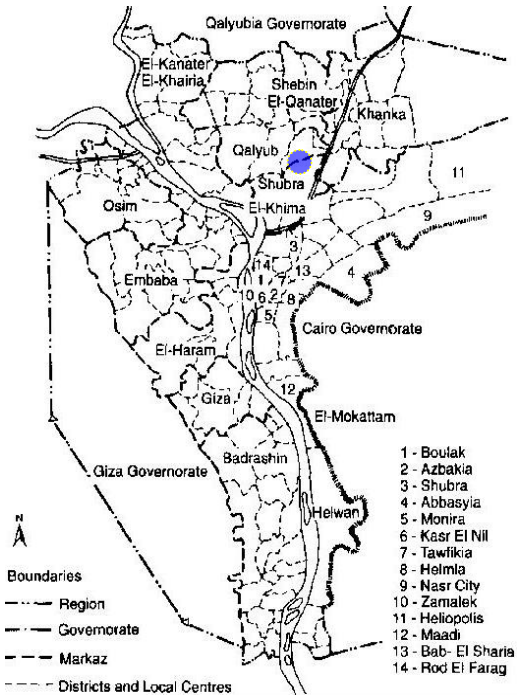
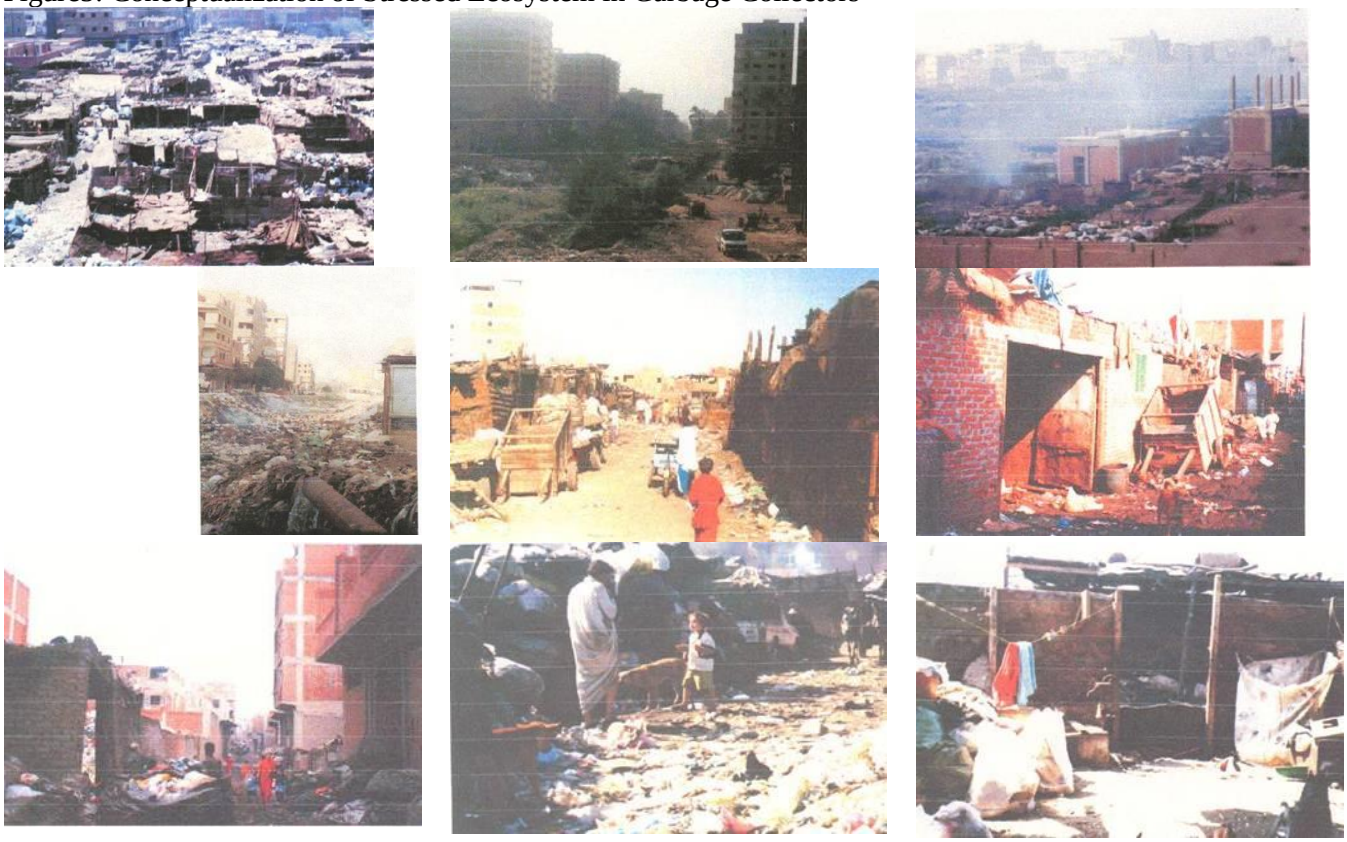


Figure 6: Location of El-Nakhel Garbage Collector



Figures 7: Photos from El-Nakhel Garbage Collectors

6. DEVELOPMENT OBJECTIVES OF GARBAGE COLLECTORS

The above analysis show that the level of population and economic concentration in Egypt is critical because Egypt has a significant population and economic concentration which has led to growth of slums in and around main urban centers with massive environmental hazards and, in turn, human health impact. Egypt, as a result, possesses a complex urban tradition that is currently in transition. At this juncture, the question arise: what is the better policy for developing the environment and human health in the garbage collectors in GCR, which, meanwhile, is capable enough to be integrated and coordinated with the current development policies; and achieve development starting from the family level of a local community to the settlement and adjacent districts or/and regions?

Environmental improvements at the household and community level, according to the World Bank and the World Health Organization (WHO), would make the greatest difference for global health. The World Bank has specifically calculated that improvements in local environmental conditions facing the poor could lower the incidence of major killer diseases by up to 40%. Given the strong correlation between environmental health risks and poverty, one strategy to reduce these risks is to raise incomes and improve the distribution of wealth. Implementing policies to eradicate poverty remains a top priority for improving health. Many organizations such as national governments, the UN, (NGOs), and foundations have marshaled considerable force toward this end. Environmental management, at the same time, need not wait until economic development reaches a certain level. Environmental management is a critical tool for improving public health both today and in the future. By targeting policies that help to reduce environmental threats that contribute both to ill health and poverty, it is possible to produce good health long before income growth could do so on its own. Improving the conditions of daily life may by itself help to reduce poverty. In other words, removing the environmental hazards that make people sick could keep people working and raise incomes.

The connection between the environment and human health was clearly made in 1992, although the term environment appeared on the world's agenda at the UN Conference for the first time in 1972. The UN Conference on the Environment and Development in Rio de Janeiro (Agenda 21) in 1992 clearly interpreted the close link between human health and the environment. In 2002, the World Summit on Sustainable Development in Johannesburg, health was one of its five priorities because it is impossible to improve the environment without including the human population, with its inherent social, cultural, and economic concerns, in the management of resources. The economy, the environment and community requirements affect the health of the ecosystem. Focusing on just one of these factors to the detriment of others compromises ecosystem sustainability. Co-management of human activity and the environment is essential, which requires that disciplines draw together to study the human environmental relationship. Therefore, for improving the environment and human health in garbage collectors in GCR, integrating spatial and environmental elements by the ecosystem approach could play a significant role. This is because ecosystem approach promotes positive action on the environment that improves community well-being and health.

7. CRITERIA FOR IMPLEMENTING ECOSYSTEM APPROACH IN GARBAGE COLLECTOR

According to the development objectives of development of the garbage collectors, promoting ecosystem approach will look at the environmental deterioration and their impact on human health, implication of individual behavior, role of culture, and policies of urban and regional planning. It is an assumption that appropriate policies for sustaining the environment of the garbage collector will arise from this conceptual and analytical framework. Ecosystem approach, mainly, is focused on urban planning and management policies; and recognized that appropriate policies may need to involve other areas such as socio-economic

since planning in Egypt often has a strong bias toward physical infrastructure and land use. Adapting ecosystem approach, therefore, would depend on operational criteria as follows:

* A much better knowledge of the garbage collectors' ecosystem functions and structure, and component roles of environmental diversity, is required, in terms of understanding: ecosystem flexibility and effects on environmental fragmentation; underlying causes of habitat loss; and determinants of local diversity in management decisions. To facilitate this knowledge, the ecosystem approach requires first defining a certain garbage collector; and an assessment that should involve defining, describing, and evaluating the ecosystem of this garbage collector, including physical patterns and socio-economic conditions. The assessment should be achieved via a teamwork that operates in a multi-sectoral team of urban planners, social science, environmental and health specialists; and creates a methodological model and establishes a data base by using the integrated ecosystem approach in the garbage collector.

* The findings would be the basis for establishing development goals and operating objectives of sustaining the garbage collector; selecting appropriate indicators and developing measurement methods. Management must be guided by these appropriate indicators in order to achieve goals. Different performance indicators may need to be adapted to stakeholders' specific needs, policy-makers and scientists. The findings would also be the basis for determining alternative approaches and policies to manage spatial and environmental elements of the garbage collector; and could be used in verifying the value of using ecosystem approaches in cities and how are they relevant to sustainable cities rather than other approaches already available?

* The ecosystem approach should involve all relevant sectors of the garbage collector. The assessment, accordingly, should be performed in the context of the stakeholder goals that are to be pursued. It must select those factors that are most relevant to the goals of the plan and incorporate perspectives from different disciplines. It must integrate links in a socio-ecological framework that could be the base for designing interventions acceptable and incorporated into policy and decision-makers and social response at different levels and, in turn, ensure sustainable and equitable development. The assessment should also identify the different partners that will need to come together for the implementation of the ecosystem approach such as local official and stakeholders, and national concerned organization or/and ministry/s.

* An ecosystem approach is a functioning unit that can operate at any scale, based on addressed issues, which should define the suitable level for management decisions and actions. The ecosystem approach could facilitate practical management by ecosystem managers, whether local or national policymakers. Conceptualizing local culture and knowledge of the garbage collector should be the base for designing interventions acceptable to and likely to be adopted by local residents, local authorities and decision-makers.

* The management plan of the garbage collector as a part of the ecosystem approach should:

- Monitor priorities in relation to objectives and continuing the interaction between management, governance, agencies, and stakeholders, so as to facilitate adjustment to evolving circumstances.

- Increase inter-sectoral communication and cooperation at a range of levels, government ministries, management agencies, etc.

- Address areas like policy interventions, indicator development, measurement, assignment of responsibilities, accountability, governance and communication strategies. The management plan involves coordination with other organizations previously involved in improving the garbage collectors in Egypt would need investigating previous policies and studies provided for developing garbage collectors in Egypt and in particular in GCR to avoid any duplication of efforts, to cover

planning, environmental, socio-economic and health issues; and achieve compatible development with previous policies applied for garbage collectors.

- Involve a learning process that helps to adapt methodologies and practices to the ways in which these systems are being managed and monitored. This is because ecosystem processes and functions are complex and variable. Their level of uncertainty is increased by the interaction with social constructs, which need to be better understood.

8. Guidelines and Recommendations for Implementing Ecosystem Approach in Garbage Collector

The experiences gained through the above analysis offer an opportunity to increase the prospects of sustaining the environment of the garbage collector. The following recommendations and guidelines, thus, are based on the findings of the above analysis and development objectives of garbage collectors; and concept and scope of the ecosystem approach. The guidelines and recommendations suggested that the approach should be bounded by spatial and temporal scales that are appropriate to the objectives. Boundaries for management of a selected garbage collector, as a start for implementing ecosystem approach, must be defined operationally by users, managers, scientists and indigenous and local people. Moreover and since the ecosystem approach is based on hierarchical nature of environmental diversity characterized by the interaction and integration of species and ecosystems; connectivity between areas should be promoted where necessary. The principal features of an adaptive management process for proper management of ecosystems are: ecosystem assessment; participation of stakeholders; development of a management plan; and implementation, monitoring and adjustment, Figure 8.

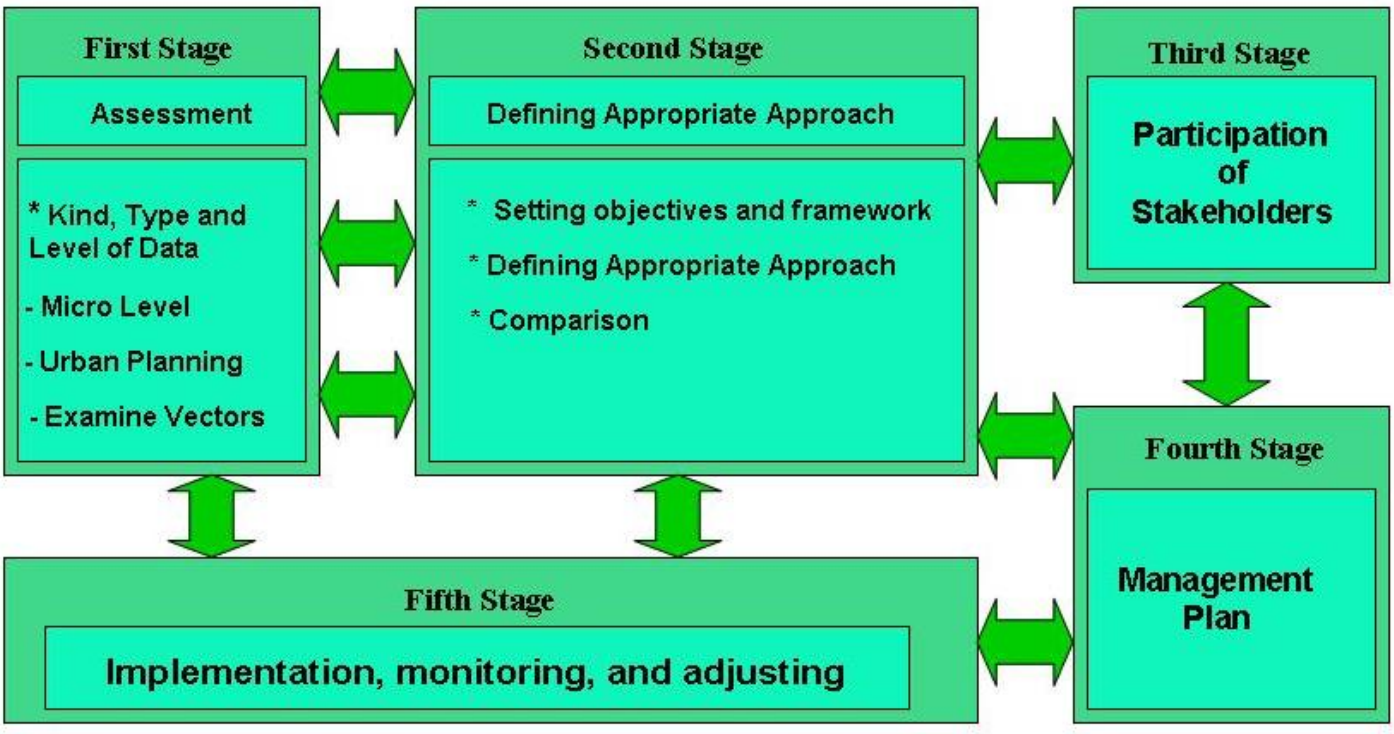


Figure 8: Guidelines and Recommendations for Implementing Ecosystem Approach in Garbage Collector

8. 1. Assessment

* Assessment should be in question, which involves defining, describing, and evaluating the ecosystem, in terms of physical and socio-economic profile, preparing the conceptual model and establishing a data base. A multi-sectoral team of urban planners, social science and environmental health specialists should be created from well experienced organizations or/and institutions, including the following disciplines: urban planners, architects and urban designers, environmental specialists and food nutrition specialists. This teamwork will facilitate objectives achievement and, meanwhile, enhance knowledge, experience and information exchange. This interrelated teamwork will develop a methodological model applicable for adapting the ecosystem approach through proposing alternative approaches and defining appropriate management policies for sustaining the environment in the in the selected garbage collector through the management of its natural resources and integrating them within the urban development in an environmental development concept.

***** To explore environmental issues in a wide range of time periods and for analytical purposes, specific years should be selected as time indicators to determine the evaluation of spatial profile and environmental hazards of the garbage collectors, particularly structure in relation to garbage processing (function) and the environment as of the following: past period to analyze history of environmental impact and human health; and future period: of one year, starting from the first day of work, to monitor the existing environmental conditions of the garbage collector. This is to provide concrete evidences for the impact of environmental hazards on human health in the garbage collector. These evidences will also be the bases for defining the appropriate approach for improving the garbage collector.

***** The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices. Information from all sources is critical to arriving at effective ecosystem management strategies. A much better knowledge of ecosystem functions and the impact of function are desirable. All relevant information from concerned areas should be shared with all stakeholders and taking into account. A participatory process for gathering information, accordingly, should be designed, defining the type of data and defining the appropriate approach for improving the garbage collector as of the following: methods of data collection; kind, type and level of gathered data such as physical, social, economics, culture, etc. relevant to the environment at the levels of micro, neighborhood, etc; and defining appropriate approach for sustaining the environment in the garbage collector, which could be explained as follows:

- Kind, Type and Level of Data:

- Micro Level (house and neighborhood): The teamwork should assess living space and its interrelationship to environmental and health impacts such as cross contamination, and then examines the relationship of the living space to streets, with a focus on ambient and other environmental health risks and hazards. In addition, the ecosystem approach assesses external factors within the neighborhood, which may influence human health, e.g. waste disposal sites, work site conditions, location interventions, etc. Different sectors of society view ecosystems in terms of their own economic, cultural and society needs. Indigenous peoples and other local communities living on the land are important stakeholders and their rights and interests should be recognized. Both cultural and environmental diversity are central components of the ecosystem approach, and management should take this into account. Societal choices should be expressed as clearly as possible.

- Urban Planning (pattern, land use and regulations): To provide a wide image of the impacts on the environment and human health, the ecosystem approach should analyze the use of land and space in relation the environmental factors. Some of relationships can be assumed to exist between location of garbage disposal, air circulation and location of residential units. Green spaces and their location as well as use and maintenance are another relationship which may be fruitful to pursue. This is because the

condition of the house as well as the facilities and the infrastructure, both inside the house and at the neighborhood level are determinants of the environment.

- Establishing a profile of ambient contamination and incident of diseases: checking resources and statistics; and assessing water, air and soil qualities. Different methods are needed for conducting the data gathering: Investigating health records from yearly and ten-year statistics at local clinics, city hospitals, and governmental and national statistics; and on site assessing water, air and soil quality.

- Examine Vectors, May Transmit or Act to Transmit to a Wider Area: It is hypothesized that a possibility of transmitting environmental hazards from the garbage collector, as a contaminated environment, to adjacent areas is quite applicable. Therefore, examining vectors that may transmit or act to transmit from the selected garbage collector to a wider area is a part of the ecosystem approach.
- Methods of Data Collection: a database could be defined as follows:
- Questionnaires, interviews, and seminars and workshops. These methods should be conducted with selected respectable people of the garbage collector residents, official at local and ministry levels and local physicians and the Ministry of Health.

8. 2. Defining Appropriate Approach for Improving the Garbage Collector
* **Setting objectives and framework**: In order to provide a strong policy formulation framework in the garbage collectors, setting objectives for sustaining the environmental and human health should be identified based on spatial and environmental issues and specific elements against which they can be measured.

* **Defining Appropriate Approach**: Alternative development approaches should be defined that can be employed to improve environmental quality in the garbage collector. These alternative approaches, in order to maintain ecosystem services, should be based on the conservation of ecosystem structure and functioning as a priority target of the ecosystem approach. This is because the greatest threat to environmental diversity lies in its replacement by alternative systems of land use. This often arises through market distortions, which undervalue natural systems and populations and provide perverse incentives and subsidies to favor the conversion of land to less diverse systems.

*** Comparison between Ecosystem Approach and other related Management Approaches:** The analysis should verify the value of using ecosystem approaches in cities and how are they relevant to sustainable cities than other approaches already available? Different approaches, therefore, should be investigated and compared to the ecosystem approach such as: How to Make Cities Healthier; Healthy Communities Movement Bridging the Gap between Urban Planning and Public Health; Sustainable Livelihoods Approach SLA in Urban Areas; Initiatives for Source Separation and Urban Organic Waste Reuse; etc.

8. 3. Participation of Stakeholders: To achieve understanding and acceptance of the ecosystem approach, the management will need to ensure that stakeholder representatives can play an effective role in developing and applying this approach in the garbage collector. This will require more attention to presenting the issues being studied within the frameworks in ways which are more willingly understood by the representatives of various stakeholders. It is particularly important for proper assessments of the environment, and required as a basis for all policy decisions.

* Teamwork will need to work with the other management authorities to develop better systems of collaboration, including systems for developing the framework to establish the full range of management measures necessary for implementing the ecosystem approach in the GCR.

* Parties will need to ensure that they involve stakeholders of the garbage collectors in the development of their national thinking and make clear the relevance of what is being done within the frameworks.

8. 4. Management plan: A management plan should be identified, which could imply integrated or holistic approaches to overcome spatial, environmental, social and human health issues identified in the selected garbage collectors. To simplify achieving management objectives, attention should be given to the environmental conditions that limit natural productivity, ecosystem structure, functioning and diversity. The limits to ecosystem functioning may be affected to different degrees by temporary, unpredictable of artificially maintained conditions and, thus, management should be appropriately cautious. Management should attempt to determine the extent to which the approaches address the health implications of both living quarters and neighborhood land use. Local, regional and national environmental and urban planning policies and approaches should also be considered. The objective is to gain a clear understanding of how an ecological, holistic approach could influence policies and approaches at the various decision-making levels.

8. 5. Implementation, monitoring, and adjusting: implementation of the management plan of the garbage collector involves monitoring priorities in relation to objectives and continuing the interaction between management, governance, agencies and stakeholders, to facilitate adjustment of evolving circumstances. Management will include ongoing research components.

* Measure and monitor the quality of the environment and its compartments, the activities and inputs that can affect that quality and the effects of those activities and inputs, and to assess what is happening in the environment of the garbage collector as a basis for identifying priorities for action.

* Collect the necessary information and developing and producing indicator reports, thematic assessments of specific issues and periodic general assessments of the whole of the environment of the garbage collector as a basis for the policy decisions on managing the human activities that impact on ecosystems.
* Assessment and monitoring programs of the garbage collectors should continue to contribute to the improvement of understanding of the environment processes, and on this basis will keep the implementation of strategies and the pursuit of ecological quality objectives under periodic review in order to improve and update them and to determine the need for further measures.

* Management must recognize the change is inevitable, including population abundance. Thus, management of the garbage collectors should be adapted to the changes. Apart from their inherent dynamics of change, ecosystems are overwhelmed by a complex of uncertainties and potential surprises in the human and environmental realms. Traditional disturbance regimes may be important for ecosystem structure and functioning, and may need to be maintained or restored. The ecosystem approach must utilize adaptive management in order to anticipate and cater for such changes and events and should be cautious in making any decision that may foreclose options. At the same time, it should also consider mitigating actions to cope with long-term changes such as climate change.

* Management plan should be decentralized to the lowest appropriate level because decentralized systems may lead to greater efficiency, effectiveness and equity. Management should involve all stakeholders and balance local interests with the wider public interest of the garbage collectors. The closer management is to the ecosystem, the greater the responsibility, ownership, accountability, participation, and use of local knowledge. Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems or regions. Management interventions in ecosystems of the garbage collectors often have unknown or unpredictable effects on other ecosystems or regions; therefore, possible impacts need careful consideration and analysis. This may require new arrangements or ways of organization for institutions involved in decision-making to make, if needed, appropriate compromises.

9. Conclusion

The study discussed using integrated spatial and environmental elements for implementing sustainability in garbage collectors, Greater Cairo Region (GCR), Egypt. It also illustrated employing ecosystem approach through management to achieve this objective. The results defined by the analysis of the causes of planning and environmental issues and their impacts, and policies applied for developing slums; show that the intervention of main functions of garbage collectors and daily socio-economic activities; and absence of infrastructure and services have negatively affected the environmental components and human health in the garbage collectors and in other adjacent districts. In addition, development planning policies are unable to handle this vital situation because they are top-down and focus almost entirely on supplying infrastructure and services. Decreasing the environmental deterioration in garbage collectors, therefore, became a perquisite national development objective.

It is not merely decreasing the environmental deterioration, but also the implementation of environmental sustainability in the garbage collectors. In fact, the response to environmental deterioration and complexities, and health challenges require a more integrated thinking in urban planning. Integrated responses need to involve a set of interventions related to socio-economic and environmental aspects, and stressed ecosystem that create diseases. There is sufficient evidence to suggest that spatial issues lead to environmental deterioration and, in turn, negative impact on human health. These conditions suggest the need to address improving the environmental quality and prevention of disease. Attention to certain group/s, e.g. garbage collectors, provides a context in which to recognize how behavior, socio-economic conditions and the way environmental resources are managed or mismanaged. The success and sustainability of interventions will depend to a great extent on the degree of social participation, existing health system, ecological conditions and involvement of policymakers and other relevant stakeholders.

The results, moreover, focus on the nature of sustainable approaches, which could be applied to integrate spatial and environmental elements for implementing sustainability in garbage collectors. The ecosystem approach, as a participatory development approach and within this process, takes the land resource bases, demographic issues and the interests of the local population into account. It also integrates management of land and living resources that promotes conservation and sustainable use in an equitable way because it encourages a much broader concept of disease prevention and health promotion. In fact, when promoting an ecosystem approach, responses to the disease are not based solely on improving biomedical clinical diagnosis or treatment, or to be directed exclusively through health services, but encompass a holistic, systemic and participatory approach to addressing the planning and environmental issues. By going beyond health services responses and moving the research and interventions through the use of stakeholder participation approaches, there is an increased possibility of greater connectivity with, and ownership of, the direction of change by those affected.

In addition, the Egyptian government planned a new national vision for slum upgrading to achieve sustainability without any special application to garbage collectors. The findings of this study, as a result, could be directly applicable in the formulation of this environmental policy and legislation in particular to garbage collectors. The procedure developed could have a wide application to other garbage collectors in Egypt. Similar socio-economic conditions and planning and environmental issues exist in and around other main urban areas in Egypt. Their resources also have been facing pressure due to the potential sources of contamination from the functions and structure of the living space itself, which associated with significant planning and environmental issues.

Future directions for further research on implementing environmental sustainability in a defined garbage collector, finally, can include procedure for public participation during the process of preparation of its

planning management policy and, in turn, developing detailed objectives and aims, and specific planning management policy according to the procedure of the ecosystem approach.

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