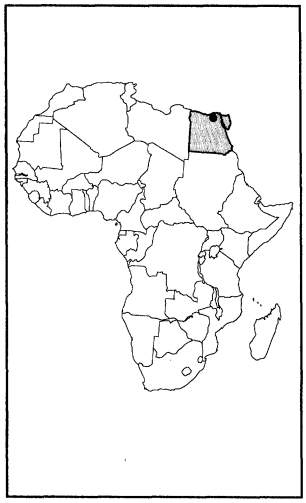
## An appraisal of environmental consequences of urban development in Alexandria, Egypt


Ahmed Hamza



*Environment and Urbanization* 1989; 1; 22
DOI: 10.1177/095624788900100104



# An appraisal of environmental consequences of urban development in Alexandria, Egypt

## by Dr. Ahmed Hamza

*Dr. Hamza is Professor of Environmental Health at the High Institute of Public Health, University of Alexandria in Egypt. A former Chief of the Environmental Co-ordination Unit at the U.N. Economic and Social Commission for Western Asia, he has also worked as a consultant to the World Health Organization, and the United Nations Environment Programme. He has published many papers on environmental management of industrial and domestic wastes, pollution control and other aspects related to environment.*

*Dr Hamza's address is: High Institute of Public Health, 165 El-Horria Av., Alexandria, Egypt.*

## I. INTRODUCTION

**THE LAST THIRTY** years have seen a large and rapid increase in urbanization in the Alexandria Metropolitan Area with resulting environmental deterioration, misuse of resources, inadequate community services and poor sanitation. A large number of the Metropolitan Area's inhabitants live in squatter settlements and many are illiterate and unskilled and have limited opportunities for employment and self-improvement.

Public expenditure on infrastructure expansion has been limited, as available resources have been concentrated on priority development projects; this has put a great strain on existing environmental control services.

Among decision-makers, there is an increasing awareness of the link between a better environment and socio-economic development, with a renewed emphasis on improving and extending basic sanitation. The present social and economic trends justify a reorganization of environmental management to provide a more comprehensive approach, but this will require a large infusion of funds, radical institutional and organizational changes, better assessment of cause and effect relationships and firmer action to counteract environmental pollution and its effects.

But improving environmental quality does not necessarily mean arresting metropolitan growth or even slowing down urban development. Urbanization in Alexandria is a dynamic process which will continue to develop progressively in the foreseeable future. However, there are increasing fears that if existing patterns of metropolitan growth continue within the present institutional framework, which already cannot cope with issues of urbanization either functionally or jurisdictionally, then even serious community and government efforts will only bring about limited improvements.

## II. PROFILE OF METROPOLITAN ALEXANDRIA

**ALEXANDRIA IS ON** the Mediterranean Coast, within the lower Nile delta. The metropolitan area has developed in a linear fashion along the coast, between a ridge and a marine lagoon, both of which run

parallel to the seashore. There are two seasons - summer (May to October) and winter in which most of the mean annual rainfall of 192 millimetres occurs.

## a. Population Growth and Urban Development

Alexandria's population has grown from 2.32 million inhabitants in 1976 to 2.71 million in 1980 and is expected to reach 5 million by the year 2005. Of Alexandria's various districts, Ameriya has a population density of 133 persons per square kilometre (with four percent of the population), the East District 7000 per square kilometre (25 percent of the population), the West District 32,000 per square kilometre (19 percent of the population) and the Middle District 60,000 per square kilometre (27 percent of the population), the latter level already exceeding the 'normal saturation level' of urban development. The other two districts, Gomork and Montazah, have 11.5 percent and 13.5 percent of the population, respectively.

At present, Metropolitan Alexandria's population is growing by about 65,000 inhabitants a year, a rate which requires a major housing development programme, particularly for low income groups. The Master Plan proposes extensive expansion to the west of the city to preserve the valuable agricultural land located to the south-east. The city occupies approximately 45 square kilometres or 1.6 percent of the total Alexandria Metropolitan Area of 2,716 square kilometres. The city currently has a shortage of 100,000 houses and the Master Plan envisages 620,000 units to meet the needs of an increasing population up to the year 2005.[1]

Most urban development in Old Alexandria has taken place around the natural harbours on either side of the Anfushi Peninsula; the area has now reached saturation point, resulting in considerable congestion and environmental degradation. Properties on the shorefront are being developed into high-rise buildings which further increases the burden on existing infrastructure and facilities. The area between Montazah and Abu Kir is unlikely to be developed as a residential area, owing to a recent government decision to ban urban development on agricultural land. However, Abu Kir itself is being developed rapidly and its population has increased tremendously in the past few years.

Industrial development has taken place along the western harbour to the west of the dock area in Mex, along the railroad and the Mahmoudia Canal to the south and in Abu Kir Bay. There has also been some low cost housing and commercial development in several of these areas.

## b. Road Network and Public Transport

Current traffic problems can be attributed to a number of factors: the disorderly expansion of the city and a rapid increase in the number of private automobiles; a serious shortage of public transport facilities and inadequate connections between different transport systems in the city; a shortage of car parks and a lack of road maintenance and management works. The Master Plan proposes a comprehensive network of circulation systems to link the city from east to west and to provide a number of axes through which the city can be approached and connected to a regional circulation network. Improving the road network will involve the construction of a highway by filling in the Mahmoudia Canal, building an elevated highway over the Abu Kir railway, an additional six car parks, and widening the corniche road

1. Urban Development Programme (1984), 'Comprehensive Plan, Alexandria 2005', Alexandria Governorate and University of Alexandria.

along the sea-front.

## c. Industrial Pollution

Alexandria's manufacturing industry accounts for about 40 percent of Egypt's industrial activity. Industrial complexes tend to be concentrated near the Mahmoudia Canal (Moharrem-Bey, Nouzha and Siouf complexes) and along the coastal areas of Mex and Abu Kir. In the past decade, fish production in Lake Maryut has declined by about 80 percent because of the direct discharge of industrial and domestic effluents into it. In addition, the lake has ceased to be a prime recreational area because of its poor condition and unsightly overgrowth of weeds. Similar environmental degradation is rapidly taking place along the sea-front as a consequence of the discharge of untreated waste waters from poorly located outfalls.

According to government records, about 1,243 industrial plants and production units are located in the Metropolitan Area, generating approximately one million cubic metres of untreated effluent daily; the paper, textile and food industries are mainly responsible for the presence of a heavy organic load. Approximately 4,500 tons per day of solid industrial waste are generated in the Metropolitan Area, 85.5 percent of which is inorganic, non-hazardous residues, 14.1 percent organic and food residues and 0.4 percent metal and miscellaneous hazardous wastes.[2] The General Organization for Industrialization has initiated a programme to control industrial pollution, the main target list including edible oil processing plants, textiles, inorganic chemicals, starch and detergents, and dyestuff and organic chemical production.

2. Hamza, A. and Gallup, J. (1984), 'Management of Industrial Solid Wastes in Alexandria, Egypt', *Hazardous and Industrial Waste Management and Testing*, Third Symposium, ASTM STP 851.

## d. Port Traffic

About 80 percent of Egypt's port traffic is currently handled through the port of Alexandria. Despite a nominal capacity of 19 million tons per year, records for 1983 showed it handled 30.8 million tons and the Port Authority has recently commissioned the first specialized container terminal in Egypt to service the latest generation of container vessels. The main approach channel is being widened and deepened and a new grain silo is being constructed adjacent to the port's existing facility, with a capacity of 100,000 tons. The port of Dekhaila is located 23 kilometres west of Alexandria and its first phase is scheduled for completion in 1988/89. The port will handle five million tons per year of bulk, general cargoes and containerized traffic. It will provide a facility adjacent to the Alexandria National Steel Company, which went on stream in 1986, with an initial output of 350,000 tons a year and with an ultimate output of 720,000 tons a year. The plant uses natural gas supplied from Abu Kir offshore fields.

## e. Public Health

Recent statistics show that the infant mortality rate in the Metropolitan Area exceeds that of the country as a whole and these help indicate the serious urban environmental health situation. Typhoid, paratyphoid, infectious hepatitis and dysentery are all endemic.[3] Poor sanitary conditions in the water supply system, the waste disposal system and food processing and handling all contribute to poor public health. Some of the most notable deficiencies are the absence of sewers and the inadequate disposal of industrial effluents in some

3. Directorate of Public Health (1988), 'Vital Statistics of Alexandria Governorate, 1987', Alexandria Governorate.

densely populated areas of the city; frequent leaks of sewage into drinking water canals; the widespread use of contaminated surface waters for municipal purposes in the poorest communities; and the formation of sewage-filled ditches in areas lacking sewers, because of the topography of the land.

## f. Water Supply and Sanitation

Until 1934, the Rond Point water supply treatment works (360,000 cubic metres per day) was the only facility serving Alexandria. Then the Siouf works were built to cope with the expansion to the east and in 1961 the Forn El-Garya plant was built, followed by the Manshia, the Maamoura and the Maryut plants. By 1990, the water treatment capacity will have increased to 2.5 million cubic metres per day, serving 4 million inhabitants. Surface water of a quality suitable for municipal and industrial uses is available in large quantities from the Nile and is being used at all the treatment plants.

The management of the water supply system is beset by various problems.[4] First, the Alexandria Water General Authority is accountable to six ministries and to the Governorate of Alexandria for its operational activities, which means it has little freedom in such vital areas as rate setting, operating procedures, service areas and external accountability. Secondly, the unrealistically low water rates have prevented the organization from achieving financial self-sufficiency. Thirdly, service areas are usually annexed to it by decree and an area such as the Western Desert represents an appreciable financial and operating burden.

Moreover, accountability to outside agencies emphasizes procedures rather than results and in several instances internal decisions were overruled by outsiders who were not fully aware of the organization's needs. Also, state financial subsidies are generally unpredictable, which makes long-term planning difficult and affects internal cost controls and conceals the real impact of unrealistic tariffs. Finally, delinquent payments by large users present a problem in that although they represent less than one percent of total customers, they account for 25-30 percent of total revenue.

With regard to sanitation, at present about 40 percent of Alexandria's population has sewerage services. Repairs to and expansion of the sewer system and treatment works are essential to meet the needs of the rapidly expanding industrial base, population growth and increased tourism. There are two sewage treatment plants. The eastern plant provides secondary treatment for 60,000 cubic metres per day of industrial and domestic waste. This is already causing problems such as sludge accumulation, the clogging up of the sewer network, the inhibition of biological treatment processes and a reduction in treatment efficiency. The western plant provides primary treatment for about 85,000 cubic metres per day of waste; this is to be expanded to 220,000 cubic metres per day, with the effluent going to Kait Bey pumping station for discharge into a submerged sea outlet.[5] Large volumes of untreated waste are discharged at Abu Kir, Kait Bey, the western harbour and Lake Maryut. In addition, there are many local points of discharge into the Mediterranean for shoreline overflows. This is mainly primary sewage, except in the winter months when the sewage is diluted with storm run-off water.

There are various constraints on the proper management of the system. These include a fragmentation of activities which limits the development of cohesive policies and programmes and creates the

4. Hamza, A. (1984), 'Strengthening Urban Environmental Management: Case Study of Alexandria Metropolitan Area', UN Economic Commission for Western Asia, E/ECWA/ECU/84/2.

5. Wastewater Consulting Group (1983), 'Predesign Report for Alexandria Sea Outfall', Alexandria General Organization for Sanitary Drainage.

potential for overlapping responsibilities and a duplication of activities (there is no clear line of responsibility or level of authority for managers and technical staff, which leads to inconsistencies and a lack of direction); low priority for training and management development; and inadequate educational and experience levels for staff in most technical and managerial positions. Certain units are ineffective due to overstaffing and a lack of knowledge as to what to do, and a lack of incentive and pressure upon supervisors to improve productivity.

## g. Refuse Collection and Disposal

About 30 percent of the population use a private service for refuse collection, although the service is diminishing in certain areas because of a lack of personnel and the low rates charged. The rest of the population and most commercial establishments dump their waste onto the streets or into refuse container boxes. Most recent estimates show that the amount of refuse collected ranges from 1,500 tons per day in the winter to about 2,100 tons per day in the summer.[6] Refuse is then taken to 'transfer points' within the city for sorting and separation of recyclable materials. The residue is trucked for disposal at three land reclamation sites in the suburbs. The salvage of reusable materials is important as it saves on imports of plastics, paper and metals and a lot of the organic matter is used as fertilizer on farmland. There is a higher rate of recycling of solid waste, and at a lower cost, in the Alexandria Metropolitan Area than in other metropolitan areas.

There are various constraints on the present refuse management system. For example, refuse collectors working for private contractors obstruct the traffic and constitute a health hazard; the Governorate of Alexandria lacks the personnel and equipment needed to remove waste from the streets; and piles of solid waste in the streets, at sorting sites and open dumps are breeding areas for flies and create an unhealthy and unpleasant environment. Although a pilot composting plant is operating, a wider use of refuse composting will be delayed because of financial constraints. Composting would allow for the efficient recovery of valuable materials and the production of a high quality compost with reduced volumes; it would also exclude private garbage collectors from the system and would provide efficient control on scavenging, as the system would be under the direct control of local municipalities.

The Metropolitan Area lacks a coherent solid waste management scheme which ensures the enforcement of legislation, the training and development of personnel, the acquisition of necessary equipment and facilities and the long-term planning of refuse management in the city. [7]

## h. Air Pollution

Rapid and extensive industrial development has increased the occupational hazards and air pollution problems in several areas. The main existing industrial areas are located in El Mex, Dekhaila, Nouzha, Smouha, Siouf and Abu Kir, with further development taking place in Amria, along the northern edge of Lake Maryut, in Dekhaila and along Abu Kir Bay. An industrial-free zone is developing in Amria, with anticipated increased air pollution problems in the area. A major petroleum transfer station is located in the western part of the Governorate and a nuclear energy project is planned to the west of it. Toxic gases, vapours, dust and fumes are generated by various manufacturing operations and in-service trades which use chemicals.[8]

6. JICA (1986), 'The Feasibility Study on Refuse Collection, Treatment and Disposal in Alexandria of the Arab Republic of Egypt', Japan International Co-operation Agency, SDS/CR 5/86-13.

7. Hamza, A. (1987), 'Management of Urban Solid Wastes', Proceedings of Seminar on *Urban Solid Wastes in Western Asia.*

8. El-Dakkani, A. (1983), 'Air Pollution in Alexandria', High Institute of Public Health, Alexandria University.

High densities of low income housing and commercial development also occur in several of these areas. Enough cases of chronic bronchitis, emphysema and lung cancer have been diagnosed among people who have lived in these sub-standard, densely populated areas for long periods of time to constitute epidemiological evidence of injury from polluted air.

## III. REVIEW OF ENVIRONMENTAL ACTIVITIES AND PROGRAMMES

**ENVIRONMENTAL ACTIVITIES IN** the Alexandria Metropolitan Area have been arbitrarily divided into two major groups: public services and activities related to promoting and maintaining a favourable environmental quality.[9]

9. Hamza, A. (1988), 'Environmental Management in Alexandria', in Arabic, *Environment and Development*, Egyptian Environmental Affairs Agency, no.5,19, April.

Master plans have been developed for the Metropolitan Area for water, sewage and public health, while those for transport, housing and refuse are being prepared and will soon be completed. In the development of a master plan, projected community needs are set against available resources and co-ordinated with other environmental activities to arrive at a comprehensive plan for specific public services.

Implementation depends upon appropriate technology to produce practical solutions. Except for water and health, it is clear that most of the environmental technology available to public services is either inadequate or requires substantial upgrading. Relying on less efficient technology produces a negative impact on public services, regardless of the efforts put into improving other programme components.

For most environmental activities, satisfactory objectives and standards of quality, quantity and effectiveness have been developed in the light of community needs and available resources, except in the case of limiting industrial pollution. Establishing industrial emission criteria requires a critical assessment of local capabilities and environmental protection needs. Factors such as cost, level of technology, available resources and pollution loads must be considered when establishing practical criteria for industrial pollution control.

Enforcement of environmental legislation lies with the Alexandria Governorate, whose responsibility it is to draw up specific environmental protection guidelines and set up the necessary administrative machinery for enforcement and follow-up. Factors limiting the effectiveness of the legislation include an apparent lack of environmental awareness among some officials, who fail to recognize the consequences of environmental degradation. There is also an unwillingness to impose legislation retrospectively to penalize old industrial operations which were originally designed and operated without considering their environmental impact and which are heavy polluters. There is also no viable monitoring system and a lack of resources for effective enforcement.

The development of training and management has received low priority in almost all environmental organizations. This, along with the continuous drain of expertise to private enterprises and to rich Arab countries has led to a shortage of personnel for key technical and managerial positions and public service operators. More consideration should be given to improving labour skills through apprenticeships and on-the-job training.

In-house monitoring is essential in major public service institutions. However, monitoring programmes are mainly designed to meet specific operational requirements rather than to satisfy the need

**A good institutional set-up for control, planning and communication constitutes the corner-stone of an integrated environmental programme.**

for integrated environmental control in the Alexandria Metropolitan Area. Monitoring should be seen as an essential tool for feedback, control and problem evaluation. It also provides technical information which constitutes the scientific base for the development of suitable environmental criteria in the Alexandria Metropolitan Area.

A good institutional set-up for control, planning and communication constitutes the corner-stone of an integrated environmental programme. However, good quality managerial staff, who are crucial for effective implementation of environmental activities, are still lacking. The channelling of feedback information is inadequate and this affects the response to public demands and reduces the effectiveness of resource utilization. The unpredictability of government subsidies affects planning and internal cost controls. And, finally, the national regulations on the administration of personnel in public service institutions, which seldom consider the special nature and unique expertise required for certain environmental activities.

There are problems of co-ordination among the various institutions because of the absence of an institutional set-up for environmental management, a lack of clear responsibility for strategic environmental planning, a fear of interference with other agencies' programmes and poor communication between key managers and decision-makers. Records show adequate government subsidies for major public service institutions and there is substantial international aid for water, sewerage and public health services. However, some services and environmental improvement projects are suffering from a lack of funding because of low or non-existent operational revenues and inadequate government appropriations. Elaborate procedural safeguards against possible misuse of public funds have affected the performance of most agencies; the centralization of accounting functions in some organizations has made them cautious. However, several agencies are currently operating on a post-audit basis which allows checking of expenditure against budget after the fact; this decentralization of financial controls gives flexibility to day-to-day operations and accelerates the implementation of work programmes.

Several United Nations and international organizations are providing technical and financial support for major public service programmes in the Alexandria Metropolitan Area. They include the World Bank (water), USAID (health, sewerage and industrial pollution), the Japan International Co-operation Agency (refuse disposal), the World Health Organization (health) and the Italian Government (transport).

The implementation of public service maintenance and expansion schemes faces severe constraints. Managers, faced with a lack of finance, equipment and personnel are often forced to alter implementation schedules. Some agencies encounter serious problems because of delays in importation and custom clearance of equipment and spare parts, the unavailability of some construction materials, a scarcity of expertise, and insufficient funding for renovation and expansion projects. A lack of co-ordination between the availability of resources and the timing of project implementation means wasted resources and dissatisfaction among idle staff. Administrators should address this problem through the development and use of a Programme Planning and Implementation Scheme (PPIS) which involves initiating the various components of a programme according to a schedule. The use of PPIS will allow managers to concentrate on major activities, relegate less important ones, minimize wasted expenditure and maximize the utilization of equipment and manpower.

There is a need to strengthen and promote applied research and field

studies in the areas of water supply, appropriate sewage treatment and disposal technologies, refuse management, industrial pollution, transport, and food hygiene. Research programmes should be co-ordinated between existing research institutions to avoid any overlap and to meet emerging research needs for various environmental activities in the Alexandria Metropolitan Area. The following research activities should receive special attention:

- the identification of trace constituents in potable water and selective treatment technologies for their removal;
- treatment studies of industrial waste to assess the need for on-site treatment and joint treatment with domestic waste;
- assessment of occupational hazards and remedial measures;
- a survey on air pollution sources and the testing of appropriate control measures.

Research should also be initiated into the toxicological and epidemiological effects of water pollution; recycling of wastes; renewable energy sources; the economic impacts of environmental pollution and the potential for applying primary treated sewage onto land.

## IV. INSTITUTIONAL ORGANIZATION AND ENVIRONMENTAL PLANNING

**THE RAPID GROWTH** of the Metropolitan Area's population will create more pressure on public services, particularly sanitation, by the year 2000. Large investments are needed to maintain and expand existing services and infrastructure but, although local government has already formulated policies and master plans for most public services, environmental impacts have rarely been incorporated into the planning process.

Co-ordinating environmental services is beset with difficulties because of the absence of an institutional set-up for environmental management. This problem is further exacerbated by the absence of long-term regional environmental planning, poor communication between city managers and decision-makers and by the number of single purpose public service agencies within the executive branch of local government. Environmental planning would avoid conflict and the overlapping of services, would allow better scheduling and execution of interrelated projects, and may eventually result in the creation of an administrative focal point for the development of long-term environmental goals. A recognition and understanding of the unique local organizational, financial, legislative and socio-economic features is essential for the implementation of an adequate environmental management scheme in the Alexandria Metropolitan Area.

**The need, then, is for the integration of environmental concerns into urban development programmes.**

The present preoccupation with the severe problems of community services and public needs often results in further neglect of environmental programmes because of a concentration of resources on the more visible service projects. The need, then, is for the integration of environmental concerns into urban development programmes and for the establishment of a new administrative mechanism within city management to provide a central point of leadership for co-ordinating and planning activities relevant to the protection and enhancement of the environment.

**If present urbanization trends continue, by the year 2000 the Alexandria Metropolitan Area will be more populated, more polluted and more vulnerable to ecological disruption.**

## V. CONCLUSIONS AND RECOMMENDED ACTIONS

**IF PRESENT URBANIZATION** trends continue, by the year 2000 the Alexandria Metropolitan Area will be more populated, more polluted and more vulnerable to ecological disruption. It is unlikely that housing, sanitation, water and other community services will be able to keep pace with this rapid growth and, unless prompt action is taken to alter current trends, public amenities and the environment at the turn of the century will be more precarious than it is now.

Long-term planning can guide urbanization and redirect internal and external migration to enhance rather than impede development; it should emphasize self-reliance and the full use of the existing economic potential of the region.

The present organizational tangle of administrative agencies responsible for public services contributes to ineffective urban management in the Alexandria Metropolitan Area. A new environmental management set-up should be established with a clear idea of the major environmental problems and with sufficient flexibility for identifying possible solutions and devising appropriate environmental control measures. The institutional mechanism should make decision-makers more accountable to, and more aware of, the public.

Present efforts offer little hope of an early solution to the housing problems and government projects will not ease the shortages in the foreseeable future. Land policy should aim at mobilizing the necessary financial resources for development, and the participation of the private sector should be encouraged by removing rent restrictions and ensuring a supply of construction materials at realistic prices.

Legislation to control pollution and the setting of emission standards should be appropriate to local conditions. At the outset, standards should be more relaxed than those of more developed countries but should be reviewed gradually and upgraded to meet stringent environmental quality requirements in the region.

The negative consequences of industrialization can be alleviated by the enforcement of appropriate emission standards - which also implies the installation of pollution control equipment and effective monitoring of major polluting industries. A concerted effort towards recovering secondary materials would help solve the waste problem and could provide a substantial source of raw materials. Recycling of recoverable materials should be encouraged by taxing new materials. Urban planning should allow for an adequate area for the long-term needs of refuse disposal.

Measures are needed to limit the number of noisy and polluting vehicles and for the continued development of roads and for the extension of the public transport system to the suburbs.

Local government must support attempts to provide recreational facilities in the Alexandria Metropolitan Area; public awareness of the social, cultural and health values of recreation must be increased, whilst measures to reduce the impact of tourism on the fragile environment of Alexandria should be taken.