

ENVIRONMENTAL CONCERNS FOR CONSTRUCTION GROWTH IN GAZA STRIP

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Abstract :

Gaza Strip region is a fragile ecosystem suffering from increasing environmental assaults due to the escalating population growth and the very limited natural resources available to support their development demands. Currently, there are a number of large scale construction projects being implemented in the process of newly developing Palestine. Environmental impact assessment of the proposed projects should include the social and economical dimensions. The major challenge in the development context is to maintain ecological balance which is often sacrificed when rapid economical growth is pursued putting enormous pressure on the natural endowments. This implies search for innovative and new building materials and construction technology in order to minimize the pressure on environment. The aim of this paper is to study the impact of rapid construction development on the environment in Gaza Strip. It is strongly recommended that Palestine should follow a program to promote sustainable development through the building of better institutions, and providing appropriate information and investment. It is necessary to assess the impacts of the proposed projects in Gaza Strip and to take certain measures to mitigate the negative impacts. There is a need for raising environmental public awareness and training.

Keywords: Ecosystem, sustainability, construction, emergency development.

1. Introduction:

In Palestine, environmental problems are dominated by the absolute need to better manage limited natural resources to meet the needs of its population. Such a population which is not only growing at a rate of 4.2% annually but also is adopting new life styles and consumption patterns which are more environmentally demanding. The fact that the population / resource variables are set on a collision course imposes the urgent environmental imperative of containing excessive population growth, and dictates a development strategy based on a more efficient use of limited physical resources (1).

Engineering team and construction contractors are responsible for the resource demands of the environment they create, on the other hand owners and occupants are accountable for the waste products they produce. Buildings have to be designed to

take into account ecological principles, such as the reduction of pollution, sustainable growth, recycling of waste and energy, energy effectiveness and conservation of resources (2). The design of infrastructure projects in Gaza Strip needs a sensitive analysis of environmental requirements, but the process of procurement, construction and operation also need careful judgment and development. Consultant engineers and manufacturers need to develop a green ethic which encourages donors and developers to plan a project in an environmentally friendly way.

Disputes still exist about environmental issues with respect to their causes, effects, acceptable levels, and the desirable measures. However, there is a basic agreement on the need to monitor the situation, seek to understand the complex processes involved and adopt suitable strategies. Most countries now follow the concept of sustainable development. They seek to ensure that economic growth is achieved without eroding the resource base, causing pollution or upsetting ecosystems (3). Analysis, synthesis and evaluation of social, economic, as well as technical issues, will be vital if a holistic approach for producing environmentally responsive buildings is to be achieved.

Building and construction in Gaza use scarce land and utilize many physical inputs. Their products are used for most productive and social activities and owing to their durability, continuously interact with the physical environment. Construction can be a vehicle for effecting schemes for protecting the environment. Environmental issues are seldom considered on construction projects in Palestine because of the emergency nature of the projects. However, most donors like the World Bank and EC require environmental impact assessment study during the planning stage for most projects in order to be considered.

The purpose of this study is to consider the implications of the increasing concern with the environment for construction industry in Gaza Strip.

2. Geographical Background:

Palestine, as it stands now, is divided into two distinct regions covering a total area of approximately 6,183 square kilometers (6 million dunums). These regions comprising the inland region known as the “ West Bank “, The coastal region known as the “ Gaza Strip “ and the proposed “ corridor “ connecting the inland and coastal regions.

The inland region has a maximum length of 137 kilometers a long the longitudinal axis between Zububa in the north and the southern most boundary line south of Al Samu. Its width varies from 31 kilometers along the latitude connecting Jerusalem with the northern tip of the Dead sea, to 58 kilometers along the latitude starting from Qalqilia along the western boundary and intersecting the Jordan River north - east of Zubeidat. The total population in the West Bank is estimated at approximately 1.6 million.

The coastal region, Gaza Strip, is a semi - arid coastal land of roughly 240 kilometers of arable land along the eastern Mediterranean Sea, the total area is about 365 square

kilometers. It has an average maximum length of 45 kilometers between the boundary near **Beit Hanoun** in the north, and Rafah on the Palestinian - Egyptian border in the south. Its width varies from 6 kilometers along the line transferring through Deir El - Balh in the **center**, to 13 kilometers along the Palestinian - Egyptian boundary in the south. In this narrow strip, almost 1 million of the Palestinian people live and work. There are 575.000 refugees in the Gaza Strip, of which about 32.000 live in eight refugee camps. The population density in the camps is one of the highest in the world and varies from 30.000 to 100.000 persons per square kilometer.

The proposed connecting “corridor“, which is essential to ensure territorial integrity and viable socio - economic integration, has an area of around 136 square kilometers and extends from Idna in the south - west of the inland region to **Beit Hanoun** in the north - east of the coastal region. It has a total length of about 35 kilometers and an average width of 4 kilometers.

3. Environmental Situation:

Environmental conditions in Gaza appear to be among the worst in the Middle East. Serious environmental problems exist in several sectors, e.g. water, wastewater, and solid waste. Successful economic recovery will require effective integration of environmental, cultural and tourism resources into the development process. In Gaza Strip there are more than 500 industrial units which dispose their waste (solid and liquid) either into improper sewage systems or on the ground, causing pollution of the soil with organic and inorganic chemicals and other pollutants (4).

The major source of air pollution is the exhaust of about 30.000 to 35.000 motor vehicles, most of which are more than 15 years old outdated. The exhaust contains large quantities of carbon monoxide, carbon dioxide, nitrogen oxides, hydrocarbons and lead that are detrimental to the respiratory and nervous systems (5). Domestic and agricultural solid wastes are dumped freely, with the resulting **leachate** adding to the ground water pollution. Some of the wastes are burned, causing air pollution.

Fresh water is a scarce resource in Gaza. The main water resources are the coastal plain aquifer and the water transmitted from other locations. The quality of the ground watering the Gaza Strip is poor. Water quality is deteriorated due to infiltration of sewage, solid waste leaches and agricultural chemicals. Water quality in Gaza fails to meet international guidelines (chloride content 200 - 1000 mg/l, 77% of wells with nitrate concentrations greater than 50 mg/l and 44% greater than 100 mg/l) while although water quality in the West Bank is generally satisfactory at present, sewage infiltration creates local problems (6).

Sewage ponds, and the Mediterranean Sea are used for the disposal of domestic, agricultural and industrial waste water. More than 50% of the raw sewage is discharged untreated into the sea, causing sever water pollution. Most areas in Gaza Strip still have unsatisfactory waste water collection and treatment system, there is great reliance on septic tanks, cesspits and percolation pits that are usually designed to serve a single home or a small group of homes. These alternatives require frequent discharge by vacuum tankers, and also pose a great threat to ground water (7).

In Gaza City the sewerage network only covers 65% of the residents. While the villages of Jabalia, Beit Lahia, Beit Hanoun, and Nazla are currently being connected to sewerage systems, only waste water collected from Jabalia and Nazla is transferred to Jabalia treatment plant. Some residents in Rafah are connected to a sewerage system which pumps the collected waste water from the Tel El - Sultan pump station to a lagoon in the area.

Per capita water consumption in the Gaza strip is expected to increase due to the housing and building projects which aim at extending the water supply network and providing a rather continuous supply to the customers. Many locations in the Gaza Strip suffer from broken water supply where they receive water for a few hours per week. The projects which purpose to provide a sewage collection network will also cause an increase in the domestic water consumption. The reason is that many houses face a problem in disposing off their wastewater due to the use of unsealed vaults of a limited capacity (8).

The rapid growth of population and development in the Gaza Strip have contributed to the magnification of solid waste problems. Estimates of the quantities, composition and density of solid waste produced by Palestinians is still very limited, with estimates ranging between 1.4 and 1.7 liters per capital daily. It is further estimated that up to 60% of this waste is organic (9). Table 1 shows the composition of solid wastes in Gaza Strip. Currently, solid waste management is the responsibility of the Palestinian municipalities and village councils, The United Nations Relief and Works Agency (UNRWA) has been responsible for services necessary for the refugee camps (10).

Table 1: Composition of solid wastes in Gaza Strip

Composition	by wet weight %
Organic Materials	67%
Paper	1.5%
Metal	1.5%
Glass	1.5%
Cloth	1.5%
Plastic	2%
Sand	23%
Other	2%

(source : UNRWA, 1993)

In many areas, solid waste is left in near by fields, abandoned plots and streets creation dangerous odors and providing breeding grounds for pests in the summer time, especially mosquitoes and rats. No system exists for collecting and disposing of waste from construction sites. Stones debris and powder resulting from stone processing are scattered throughout the countryside. The impact of poor solid waste

management systems on human health and environment could be considerable in Gaza Strip.

4. Environmental and Social Concerns:

Environmental regulation and promotion of the efficient use of infrastructure projects help reduce adverse consequences from existing infrastructure. More options are available with new projects, although investment decisions can be consistent with environmental objectives only if environmental impacts are identified and assessed. Experience with environmental assessments in Gaza Strip demonstrates that construction projects are least likely to impose stress on the environment if such assessments occur early and influence the design of individual projects.

As the scale of construction projects grows, environmental consequences became increasingly significant. Environmental assessments should take a broad perspective capable of **recognizing** regional effects and induced economic impacts, as well as the potential consequences of broad economic conditions for the project. Moreover, even though large investment programs may be broken down into sub-components and implemented in sequence, it is usually necessary to conduct the environmental assessment on the basis of the overall program (11).

Environment friendly building and construction are essential for improving living standards and offering public health protection. With sufficient care, providing the infrastructure in Gaza necessary for growth and poverty reduction can be consistent with concern for natural resources and the global environment. Well - designed and - managed infrastructure can promote the environmental sustainability of human settlements. The relationship between infrastructure sectors (water, power, transport, sanitation) and the environment is complex. The most positive impacts of infrastructure on the environment concern the removal and disposal of liquid and solid wastes. But much depends on how disposal facilities are planned and executed (12).

The fact that environmental damage hurts people, both today and in the future, provides additional grounds for rethinking our measurement of progress. Indeed it raises special concerns, for unlike education, health, nutrition, and life expectancy, which tend to be improved by economic growth, the environment is sometimes damaged by that growth. Furthermore, the people suffering from the damage may be different from those enjoying the benefits of growth. They may be today's poor, or they may be future generations who inherit a degraded environment. For these reasons it is essential to assess the costs to human welfare of environmental damage and to take account of the distributional impacts of policies (13).

Sustainable development is development that lasts. It has been argued that the adverse impact of economic growth on environmental degradation can be greatly reduced. Poor management of natural resources is already constraining development in the Gaza Strip, and the growing scale of economic activities will pose serious challenges for environmental management. But rising incomes combined with sound environmental policies and institutions can form the basis for tackling both environmental and development problems. The key to growing sustainability is not to

produce less but to produce differently. Uncertainty is an inherent part of environmental problems. To reduce it, decision makers need better information about environmental processes and social preferences (14).

5. The Impact of Construction on the Environment:

Construction operations and products have an impact on the environment in - several directions, these are:

- Resource deterioration, e.g. dereliction of land from quarrying and extraction of sand, clay and limestone, use of energy in the production of materials.
- Physical disruption, e.g. soil erosion, silting of reservoirs, disruption of ecosystems, climatic changes, noise pollution.
- Chemical pollution, e.g. particles released in the production and transportation of materials, pollutants produced in manufacture of some building materials.
- Social disruption, e.g. dislocation of inhabitants of the sites of roads.
- Undesirable residual impact on the environment from temporary structures, uncompleted buildings and untidy sites.

Some materials, such as asbestos, could be harmful to the labors handling them, and occupants of buildings. Of the constituents of paints, first lead, and more recently, benzene and formaldehyde, have turned out to be hazard (15). Moreover, building services and insulation materials account for about 50% of all global chlorofluorocarbon consumption (16). Great amounts of energy are also used in the production of materials such as bricks, plastics and paints. The single largest and product of the construction industry, buildings, greatly affect the environment since they use around two - thirds of all energy used. In addition, the construction of new buildings accounts for around 5% of total energy consumption during their production processes. Buildings in use and the construction of buildings consume vast quantities of natural resources and are responsible most significantly for many undesirable environmental effects.

An unfortunate consequence of construction industry is the prevalence of developers who favor the use of new green field sites in the Gaza Strip. Whilst this is understandable in the context of ease of development and cost effectiveness, the effect upon the environment is simply one of leaving existing buildings, structures and sites in derelict and ruinous condition. Land use has also a great environmental effect on construction industry. There is no doubt that habitat destruction lies at the root of much vehement public condemnation of construction.

Environmental effects from construction industry can result from inappropriate construction site practices that discharge pollutants, e.g. oil waste into water courses or through contaminants that go into land which feed into natural water resources. Waste emanating from construction industry is a major problem leading to detrimental environmental effects. Around 11% of all waste in the Gaza Strip results from

construction demolition which is deposited in land - fill dumps or just dumped on the streets.

Environmental effects of construction result in a number of comfort disturbances to individuals living and working the environs surrounding any construction project. These are included: noise of construction equipment, dust from operations and traffic, nuisance from temporary dwelling and construction traffic, and hazardous contamination from toxic wastes.

The end products of buildings do give rise to environmental effects through the need for water and sewage treatment plants, water supply and storage facilities and the environmental effects associated with supplying and maintaining water resources to new and developing infrastructures. These lead to the knock - on effects of development.

6. Looking Ahead:

Gaza Strip is one of the areas of the region which is expected to undergo considerable economic development in the coming years. In planning a strategy towards the protection of environment and sustainable development, Palestinian are faced with many of the same issues confronting other developing nations. Foremost among these are population growth and adequate water supply and sanitation, both of which are quite critical. In Gaza Strip, as in other developing countries, there is a considerable lack of environmental public awareness about the interrelated nature of all human activities and their effects on the environment. This is due to lack of education, inaccurate or insufficient information and in some cases disinterest because of severe poverty and inhuman living conditions.

The environmental effects from construction industry have to be tackled on different levels: political, economic and educational. These three variables are independent. Without theoretical and practical knowledge, people will never achieve environmental and ethical awareness, values and attitudes. Skills and behavior should be consistent with sustainable development and necessary for effective public participation in decision making.

While basic education provides the underpinning for any environmental and developmental education, public awareness raising and training should be incorporated as an essential part of learning. It should have a job - specific focus, aimed at filling gaps in knowledge and skills that will help individuals to find employment. At the same time, training programs should promote a greater awareness of environment and development as a two - way learning process. The need for raising public awareness and for training is also strongly emphasized in Agenda 21, UNCED and the Declaration and Recommendation of Tbilisi Intergovernmental Conference on Environmental Education (UNESCO and UNEP 1977).

Palestine should follow a program to promote sustainable development through the building of better institutions, and providing appropriate information, investment, and

incentives. The current and proposed projects have both positive and negative environmental impacts. It necessary, therefore, to assess the impacts of the projects and to take certain measures to mitigate the negative impacts. An action plan for the future should establish program priorities and goals over the long - term, and delineate a framework for policy, planning and research based on collaborative efforts of international and local agencies as well as universities.

As Gaza Strip has scant economic resources, it is recommended to examine the potential for the reuse or recycling of construction materials. The Production of construction derbies should be minimized so that only waste of the best quality possible, which has good recycle or erase possibilities may remain. Environmental impact assessment should be taken into consideration on every construction project. Further studies to analyze the impact of construction materials and construction derbies on the environment are required.

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