

Using the Green Infrastructure as an Economic Sustainable Tool for Improving Urban Life in Emerging Countries Urban Poverty Areas Greater Cairo Case Study

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Abstract:

Through the last decades rapid urbanization in the emerging countries was producing bad urban quality. This urbanization of poverty is responsible of the phenomenon of the current spreading of slums in those countries main cities, Yet the common urban solutions for improving the urban life in those areas always require a high-cost budget which usually surpassing the financial ability of the local governments. The study main objective is to evaluate the possibility of using the Green Infrastructure as an economic sustainable tool for improving the urban life in urban poverty areas of emerging countries. An analytical study was done based on the case of Greater Cairo city informal areas as urban poverty areas.

The study has clarified how the elements of the Green Infrastructure could be used as an effective economic and sustainable tool through its environmental, urban, and social roles, for the improvement of urban poverty areas in the emerging countries main cities, Also has shown that the Green Infrastructure depends on available local natural elements, local experts experience and the most important. Its affordable cost, which make it an effective economic tool.

Key Words: Green Infrastructure, Economic Sustainability, Emerging Countries

1. Introduction

Over the past 40 years many of the emerging countries in Africa, Asia and in East Europe has managed to improve its economic and social conditions, which could be observed clearly through its main cities chaotic urban development. The rapid urbanization process in many cases has caused some negative urban phenomena; the most significant was the spread of the informal urban areas, The city of Greater Cairo like many other main cities of emerging countries is facing the same urban problem which has led to the phenomenon of the urbanization of poverty through informal urban areas with bad quality of urban life. The urban experiences through more than five decades has shown many disadvantage in dealing with urban poverty areas, the common disadvantage was the high cost budget which marked all conventional urban solutions relatively. Recently the priorities which those conventional solutions were based on has changed to be more aware of the environment needs, Thus this study hypothesis based on the possibility of using Green Infrastructure (GI) as a new economic sustainable tool

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for improving urban life in urban poverty areas, to suit the economic conditions of emerging countries, and to assist in raise the efficiency of the common urban solutions. Greater Cairo was chosen as the case study, the city is a peculiar case of an emerging country's main city suffers of the phenomenon of urban poverty areas spreading, and the local governmental authorities has a long deep experience with dealing with those areas.

2. Urbanization in Main Cities of Emerging Countries

By 2050 as projected by the United Nations, 64.1 % of and 85.9% of the developing and developed world respectively will be urbanized (Economist, 2012). So, is the urban life as a product of the urbanization process has the same urban characteristics in both developing and developed countries?, and what about the emerging countries?. The quality of urban life as a product of the urbanization process is related to the economic social condition of each country, thus the urban life characteristics is vary, the quality of urban life in developed countries main cities is not the same in developing countries. Although in many developing countries, cities natural population growth is the major contributor to urbanization, rural-urban migration is still an important factor (de Haan 1997), in the case of emerging countries which have some characteristics of developed countries, the process of urbanization is rapid as more inhabitants are moving from rural to main cities where the work opportunities are available, therefore during the last decades the process of urban sprawl has accelerated in emerging countries, this is why the phenomenon of the informal urban areas where urban poverty exist is mainly located in emerging countries main cities, like Mumbai in India, Rio de Janeiro in Brazil, and Greater Cairo in Egypt. Today many of the emerging countries' main cities like: Delhi, Mexico City, Sao Paulo, Shanghai, Mumbai, Rio de Janeiro, Greater Cairo and Lagos are already among the biggest 20th urban agglomeration of the world (Kotkin & Cox, 2013), and are projected to attract more emigrants, beside the natural population growth, which mean more chaotic rapid urbanization in the near future, the local governments in those countries are in need to control this urban sprawl to avoid the problem of the urban poverty areas with bad urban life quality.

2.2. Urban poverty, an overview

Poverty in urban areas refers to cities, thus the term refers to poverty living in cities, where the insufficient income exceeds the family's ability to cover basic costs of living in city, including food, shelter, clothing, education, health care, utilities, transport, and other social activities related to urban life in cities. The United Nations now defines poverty as follows: *‘Fundamentally, poverty is a denial of choices and opportunities, a violation of human dignity. It means lack of basic capacity to participate effectively in society. It means not having enough to feed and clothe a family, not having a school or clinic to go to, not having the land on which to grow one’s food or a job to earn one’s living, not having access to credit. It means insecurity, powerlessness and exclusion of individuals, households and communities. It means susceptibility to violence, and it often implies living in marginal or fragile environments, without access to clean water or sanitation.’* (United Nations, 2011). According to UN definition, and from an urban perspective, urban poverty areas are those urbanized human settlements where the inhabitants are living in bad quality of urban life, where social and economic conditions are reflecting this bad

quality of urban live. Socially, inhabitants, have experienced social exclusion, disempowerment and inability. Economically, inhabitants suffer of limited access to employment opportunities and income, insecure housing and services, the problems of land tenure, and, in particular, the low income which affected the inhabitants' consumption habits negatively (Masika, de Hann,& Baden 1997).

2.3. Urban poverty in Greater Cairo

Greater Cairo the capital of Egypt, is its main city and the economic cultural hub, consists of three governorates, Cairo, Giza, and Qalyubia. During the last four decades the economic social conditions has improved in Egypt, Greater Cairo where economic opportunities are concentrated has attracted domestic migrants. Those rural poor migrants have become the main residents of the urban poverty areas of the city. Poverty incidence in Cairo governorate was estimated to be only about 5% in 2005, and its depth considered relatively shallow. However, if one investigates conditions in Greater Cairo, where many of the urban poor in Egypt live, one immediately encounters a markedly different world. The urban poor are much more prevalent than commonly assumed. The populations of urban poverty areas are increasing, both in absolute numbers and relative to the rest of the city's population, The estimated population of these areas within the city of Greater Cairo at present time is more than five million people(Sabry, 2009). Urban poverty areas have significant urban characteristics make those areas unique in comparison with other emerging countries urban poverty areas, those areas are not shanty towns or makeshift huts, typical informal housing structures are made with permanent materials, in most cases skeleton buildings of reinforced concrete and are multiple stores high, therefore those areas have cost high investments, that upgrading plans should consider these investments, also government in many cases has supplied these areas with basic infrastructure, in particular, electricity, and drinking water, the following table is showing informal investments of urban poverty areas in Egypt in comparison with Greater Cairo:

Table 1:

Total, informal housing stock (urban and rural):	845 billion EGP	85 billionEuro
Total, urban informal housing stock:	685 billion EGP	69 billion Euro
Total, Greater Cairo region:	280 billion EGP	28.5 billion Euro

(Source: De Soto, 1997)

2.3.1. Types of Urban Poverty areas in Greater Cairo

There are two main types of urban poverty areas in Greater Cairo, this classification is based on the land soil type that the settlement was urbanized on, First type are informal settlements on former rich agricultural land, mostly land tenure is legal, are exist mainly in the west and north side of Greater Cairo in Giza governorate, and Qalyobia. Second type are informal settlements on former desert state land, this type is mainly located in east side of the city, urban poverty areas are growing on the vacant desert state land whether inside the urban mass or in the outer skirt of the city, see fig,1 and 2.

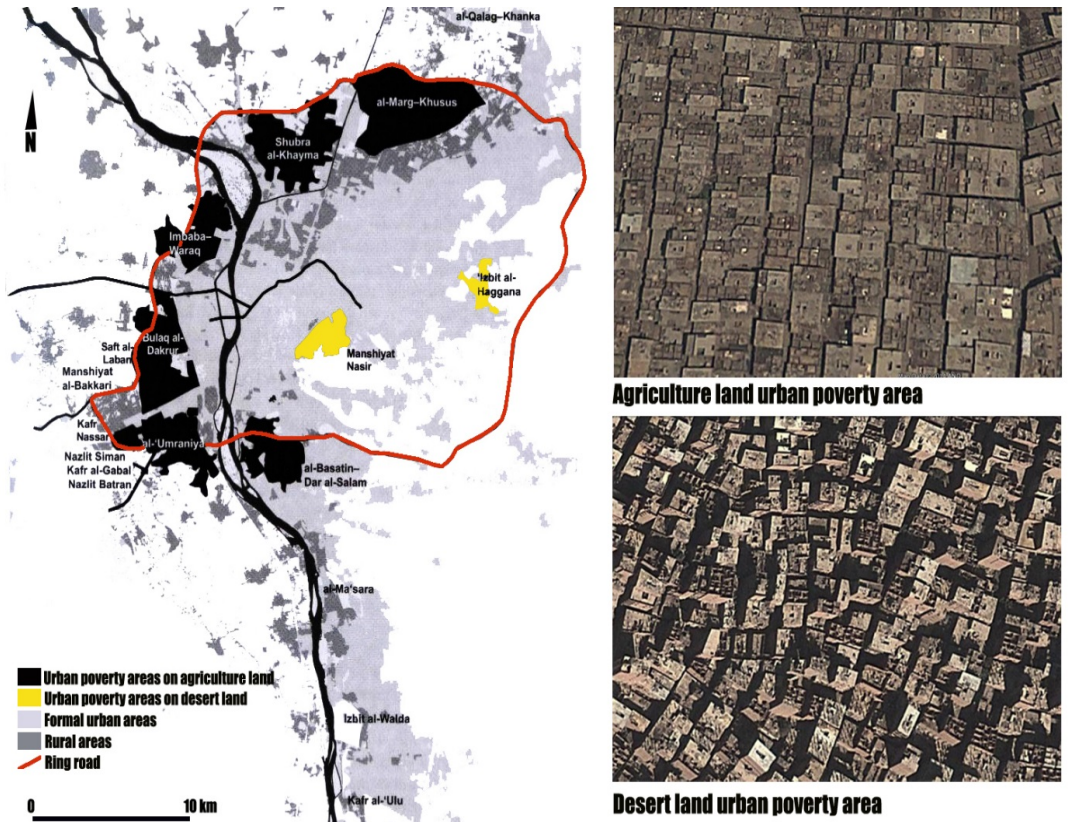


Fig.1 Greater Cairo map showing both types of urban poverty areas (Sims, 2010)

2.3.2. Urban life characteristics in urban poverty areas of Greater Cairo

In Greater Cairo one of the main factors that linked to urban life characteristics in main cities, is the high cost of living in comparison with rural areas, rural migrants are trying to find their opportunity in Cairo, thus urban poverty areas inside Greater Cairo are forming a special case of urban life which has been affected by the habits of rural life, these effects could be observed through urban life characteristics as follow: First employment and livelihoods conditions, Greater Cairo has become attractive local site for gaining wealth and welfare, thus why more migrants are heading towards Cairo, where a large number of multinational companies, international finance and global consumerist trends are exist, however a large percentage of labor force of urban poverty areas are illiterate and unskilled like other emerging countries cases. This kind of labour force cannot be absorbed into the growth channels of the city's economy, notably: capital and knowledge intensive sectors, IT, banking and financial services (RoyChowdhury, 2011). This is why this labour force mainly depends on the informal economic sector for obtain their livelihoods, therefore informal economic sector usually exist in urban poverty areas, the domains in which that informal sector depends are; self-

employment in petty trade, low capital, self and family labour, this domain include workshops of varies activities, and in some cases unanticipated activities like sorting of garbage and recycling activities in some urban poverty areas of Greater Cairo, also light industries and construction field, like ready-made garments, buildings construction. But the ability of the informal sector to absorb the unemployed is limited, besides the urban environmental problems related to daily socio- economic activities of the informal sector, which is responsible of the emissions of Greenhouse gases and other pollutants in the city. Secondly, environment and consumption patterns. Inhabitants of urban poverty areas in general have the same primary aspects of the quality of life, they are looking forward to comfort in their daily urban life through consumption patterns, environment and urban sustainability is not in their priorities, this is also clarify the neglecting of the GI natural elements in Greater Cairo urban poverty areas, which has affected the urban environment negatively. *Primary aspects of the 'quality of life' for most consumers are health, freedom of choice, safety, luxury and comfort. Environment is secondary* (Karwala, 2005). The rapid process of economic growth during the last decades has accelerated the consumption rates and at the same time to neglect the importance of sustainable development, thus the most polluted, bad life quality areas in Greater Cairo are the areas of urban poverty, where inhabitants are practicing unsustainable patterns of production and consumption, see fig.3. *Polluting industries and land uses are disproportionately sited in low-income and minority communities* (Di Chiro, 1996).



Fig.3 Right, aerial view of an urban poverty area in west of Greater Cairo, note the absence of GI elements, left the bad quality urban life in urban poverty areas of Greater Cairo

Thirdly the urban social life which is a product of urban life quality, due to poverty, inhabitants can hardly think about recreation and socializing, they rarely participate in the city's cultural activities. So the open public spaces which are free of charges are the available alternative for practicing their social activities, However one of the significant urban characteristics is the lack of public open spaces, this include the public gardens, playgrounds, and other public recreational spaces, the absence of enough public open spaces has a direct impact on the inhabitants social activities to be mainly indoor instead

of normal outdoor social activities, see fig.3. This special case of social life has led to social isolation and a weakening of the community, which has affected the upgrading projects negatively, as inhabitants did not care to participate for lack sense of belonging to their communities. Fourthly, housing and land tenure, the most significant housing characteristic is the typical housing structures that are not temporary or makeshift huts but well-constructed permanent skeleton buildings of reinforced concrete and multi storeys (Elewa& Elgarhy, 2012). But as in other urban poverty areas this housing case also facing the lack of access to secure and safe housing. Legal land tenure provides communities with official status and documentation to live in their settlement, the lack of legal land tenure has forced the majority of the labour force to join the informal sector, weaken their ability to earn enough livelihood, also has caused the lacks of the essential needs for healthy life this includes provision for drinking water supplies, sanitation, drainage, removal of garbage, and health care, Housing of urban poverty in Greater Cairo is well constructed with poor or non-existent services. Fifthly infrastructure, transportation and basic services, urban poverty areas of Greater Cairo have developed without previous planning, and out of the local governmental authorities' control, beside the problem of illegal land tenure. Thus the infrastructure, transportation, and other basic services have been declined in investment. But in Greater Cairo the local government in many cases has provided those areas with main infrastructure notably electricity and drinking water and advanced communication as priority needs, and on the other hand has neglected the environmental social issues such as the existing of open public spaces and GI elements. Finally the existing of Green Infrastructure elements, due to the high prices of land in some areas as it is former rich agricultural land and the illegal land tenure in other areas, has directed inhabitants towards achieving the maximum economic benefit of the land, thus the buildings density is high and the open spaces are limited to be street network and vacant areas that used for socio-economic purposes which makes economic benefits. This is why the lack and sometimes the absence of GI elements is a significant urban feature of urban poverty areas in Greater Cairo, See fig. 3.

2.2. Dealing with Urban Poverty Areas in Greater Cairo Through Time

The awareness of the urban poverty areas problem in Greater Cairo was started back to the mid of the 20th century, but due to local circumstances of facing successive wars, the government has started to deal with urban poverty areas late in the 1970s. The Egyptian local governmental institutions has followed the same strategies and policies that were broadly used in other developing countries, which were in line with those used by the World Bank in urban sector lending (Amis, 1995). During the 1970s local government has followed the policy of demolition and evacuation of the inhabitants which were in line with slum clearance policy during the 1960s, one of the significant urban features of this era in Greater Cairo was the conventional housing projects which were built in the same sites of the demolished areas. In the 1980s the strategies and applied policies has been changed to be more economic, as it was a global trend at that time, through taking advantage by the upgrading of consolidated informal settlements with installation of infrastructure and services. In the 1990s era the same main strategies of upgrading urban poverty areas has continued but with more concerning of the whole city, this was through integration into city wide policies and institutional reforms by

broaden the role of local governments in urban development management, the implemented plans were basically depend on programmatic lending and citywide development strategies with a long-term perspective, which have aimed to make efficient property markets, setting appropriate regulations and standards, and building local capacity. By the beginning of the new millennium the global awareness of the environmental problems has changed the priorities towards sustainability of human settlement as a global interest notably for the first world and developed countries. While in Greater Cairo case and other emerging countries the priorities yet still the same, the financing of urban poverty areas upgrading projects still the main issue and come first, secondly the environmental issues.

2.3. The Need for New Economic Suitable Strategies and Policies

The strategies and policies of dealing with urban poverty areas in Greater Cairo through more than four decades have aimed mainly to deal with the physical components of the urban poverty areas, the prevalent principle that previous urban experiences based on, was to improve housing and infrastructure, neglecting environmental issues or to be second priority, but always the financial resources was the main constraint. All the followed strategies have acquired a high-cost budgets which usually surpassing the financial ability of the local governments, thus financing for environmental issues was always neglected. The urban experience through time has introduced urban lessons, the most notable lesson was the big gap between the theoretical framework and the implemented plans, and yet the funding barriers are still the major problem for converting the plans into implemented projects, in Greater Cairo and other main cities of emerging countries the priorities as described before are not in line with the rich world, but at the same time there are shared goals, among them the need to protect the environment and to achieve urban sustainability, and of course, even in rich countries, to reduce the cost, "*The new economics reflects the growing worldwide demand for new ways of economic life and thought that will conserve the Earth and its resources, and empower people to meet their own needs and the needs of others.*"(Robertson,1997). It is time to rethink about the current urban strategies and policies for urban poverty areas. Emerging countries need new methodologies that have two approaches; first the economic approach, there is a need for new economic tools to enhance the current upgrading experience to be within the reach of emerging countries, secondly, the environmental approach, there is a need for new sustainable tools which achieve the enhancement of the urban quality of life with affordable cost.

3. Green Infrastructure and Urbanization

Realizing the relationship between GI and urbanization will reveal and clarify how to use GI as a development approach for improving urban life in urban poverty areas, GI from an urban perspective, and as an urban landscape design process can become a mainstream planning practice. Using GI as an urban development approach has been started early in the first decades of 20th century, that the exemplar designs of Frederick Law Olmsted and Ebenezer Howard were fundamental to the development of GI thinking (Davies, McGloin, MacFarlane, &Roe,2006).There is a triangular

relationship between urbanization, environment and GI, in which GI is an urban design approach that neutralizing the negative impact of urbanization.

3.2. Green Infrastructure, the intended meaning in this article

The term Green Infrastructure (GI) maybe associated at first glance with infrastructure that being defined as, “the substructure or underlying foundation, especially the basic installations and facilities on which the continuance and growth of a community depends” (Benedict & McMahon, 2002), it is instead an alternative form of infrastructure that seeks to produce economic, social, and most importantly, environmental benefits (Kingma, 2012). The term does not have an unanimous definition, As will this term is used by diverse disciplines, among them urban planning, landscape, ecology, nature conservation, risk management through dealing with storm water management and other related disciplines, Although those diverse disciplines has produced varies definitions but they were through with the same main thought about the meaning of GI which refers to the natural and human made elements that supports the ecosystem and social life in urbanized areas. This understanding of GI is supported by many other definitions which clarify deeply the intended meaning of GI as a designing field that linking ecological capacity and social opportunities, where there is an integration of form and function that leads to GI multi-functionality. This idea of the multi-functionality roles of GI has been emphasized through many experts and institution's definitions of GI, among those definitions the following; *GI is an interconnected network of green space that conserves natural ecosystem values and functions and provides associated benefits to human populations*(Benedict,& McMahon, 2002), *GI is the network of designed and natural vegetation found in our cities and towns. It includes public parks, recreation areas, remnant vegetation, residential gardens and street trees as well as innovative and emerging new urban greening technologies such as green roofs and green walls*, University of Melbourne Green Infrastructure Research Group(Bosomworth, Trundle, & McEvoy,2013), Previous definitions have clarified the intended meaning of GI in this article as a development tool with positive economic and environmental impact on urbanized areas.

3.3. Green Infrastructure elements

The intended meaning of GI has also determined its elements, as two basic categories; first the natural elements, secondly the human made elements which include planned open urban spaces, and also the products of engineering techniques, technologies that mimic natural processes in order to enhance overall environmental quality and provide utility services. Natural elements include; natural vegetation found in our urbanized areas, woodlands, street trees, wetlands, natural water courses and any other natural components. Human made elements of GI include urban open spaces, parks and private gardens as pre-planned spaces, hard landscape, artificial watercourses, trails, green roofs, green walls, permeable pavements and any other products that support natural elements to act its environmental and social roles.

3.4. How Green Infrastructure act as a development tool in urban poverty areas

GI acts as a development tool via its triangular relationship with urbanization and environment, where GI is neutralizing the negative impact of urbanization on environment. GI directly and positively affects quality of life for built environments via the ecosystem services and psychosocial restoration they provide. GI has social and environmental roles, that having improvement impact on urban life, beside its positive impacts on economic development which make it suitable for the case of emerging and developing countries. *GI can be sited in a manner that alleviates many of the problems associated with urban poverty* (Kingma, 2012). There is now a substantial literature exploring the social environmental benefits and values of GI. Evidence shows that GI through its elements can provide numerous social, environmental and economic benefits to urbanized human settlements. Much of this evidence has been generated by survey methods; however, evidence from wider sociological and anthropological qualitative studies is also valuable (Dandy, Marzano, Moseley, Stewart, & Lawrence 2010).

3.4.1. Social impact of Green Infrastructure on urban poverty areas

Evidence suggests that one of the key benefits associated with GI elements notably green spaces and street trees, (the building blocks of 'green networks'), is their capacity to generate social interaction. GI has a key role in supporting social activities in urban communities, and in particular poor communities, There is a potential relationships between these forms of social action, by thinking through how the social action generated by GI elements such as green public spaces and street trees might transform into social action focused on the improvement and expansion of the green networks of which they are a part (Dandy, Marzano, Moseley, Stewart, & Lawrence 2010). These effects may be achievable not only through use of greens paces as a main element of GI but also simply through access to views of green areas. The existence of green spaces and networks in urban areas also provides benefits in terms of improvements in the aesthetics of the urban landscape, with vegetation making areas more pleasant to live (Chen & Jim, 2008). This can help people of urban poverty areas feel proud for their local area; *"There is now a growing body of evidence that green space scan help to facilitate social interaction and address issues of social inclusion, cohesion and community empowerment"* (Dandy, Marzano, Moseley, Stewart, & Lawrence 2010). This can explain the important role of GI elements to the urban poverty communities where the inhabitants need to be more connected to their communities, which is helping in make them engage and participate in improving their urban areas.

3.4.2. Environmental impact of Green Infrastructure on urban poverty areas

GI positive impact on the environment as described before acquires more importance in the case of urban poverty areas, where the environment has been affected negatively by the bad urban life quality, for example in Greater Cairo the high density of buildings has caused the phenomenon of urban heat island (UHI), the absence of the sewage has caused water and soil pollution, also the daily socio-economic activities has caused air pollution, by producing large amounts of greenhouse gases (GHGs), most

notably CO₂ as a consequence of these activities, beside the bad condition of the streets network which are unpaved and causing the phenomenon of urban dust dome (Elewa, 2012) and the high amount of particulate matter (PM) suspended in the air, Greater Cairo was the most polluted city in world with PM (world bank, 2004). GI through its natural elements and its techniques such as green roofs, green walls, street trees can alleviate heat-induced, reduce the fuel consumption of heating and cooling, also to reduce air, water and soil pollution, the adding of trees and other green spaces in the city can help reduce effects of air and soil pollution. Tree buffers streets can impede vehicle exhaust from being carried by the wind into adjacent urban poverty areas. Carbon sequestration by trees can also reduce air pollution, generally the existing of GI elements in the urbanized areas enhance and improve the environment.

3.4.3. Economic development impact of Green Infrastructure

GI is an economic development tool, particularly when compared to other conventional tools of urban development. Evidence shows that well-designed GI enhances the economic attractiveness of commercial precincts, increases residential property values, and creates improved opportunities for tourism and economic regeneration (Ely, & Pitman, 2012). The monetary value of benefits provided by GI are calculable, the amenity or replacement value of the green asset can also be calculated, Many examples has given us evidence of economic characteristics of GI through its elements; GI elements notably natural elements are available with affordable cost as they are local natural component of the urbanized local areas, for example urban vegetation like planting street trees. For a planting cost of \$250-600 (includes first 3 years of maintenance) a single street tree returns over \$90,000 of direct benefits (not including aesthetic, social and natural) in the lifetime of the tree (Burden, 2006). In Greater Cairo case the cost is less according to the local prices, planting a growing tree (about 250 cm) of *Delonix regia* or *Jacaranda* costs less than 4 euros per tree, which emphasis the advantages of GI elements as an economic tool to improve urban life in urban poverty areas. GI also increases inhabitants correlation of their region through their participation in development, a good example from USA, which is more suitable to emerging countries case, increased green space and retrofitting creates opportunities for low-income individuals to find employment, either through construction, installation, or maintenance. President Obama's American Reinvestment and Recovery Act ("stimulus") gave subsidies to green industries, projecting that by 2020, 6.9 million green jobs will be created (Dunn, 2010).

4. Discussion and Conclusion

As more countries in Asia, Africa, South America and East Europe are transforming from developing to emerging countries, there will be more chaotic urbanization which are not under the local governments control, Greater Cairo case has showed that current strategies and policies of dealing with urban poverty areas have disadvantages mostly related to the high cost budgets and neglecting sustainability, these disadvantages represents the weaknesses that face the actual plans during and after

implementing, and clarify the gap between the theoretical framework and the actual implemented plans. The study has clarified the need for new economic sustainable tools for dealing with urban poverty areas which are appropriate to emerging countries priorities. GI through its social, environmental roles, and economic development impact can act as a development approach for improving urban life in urban poverty areas, Conventional solutions that depends on dealing with physical aspect of the built environment need to be planned through a GI urban design approach as a new economic sustainable methodology. Due to GI advantages as a development approach, GI should function as the framework for an economic sustainable development. A more clear view of GI's values will help communities decide where, when and to what extent GI practices should become part of future planning, development and redevelopment. Yet, using GI as an urban development approach has not been experimented enough in emerging countries case, the available data of GI rely on the developed countries experience, notably in USA, UK, and Australia. Developing more concrete mechanisms for ensuring GI is central to the planning process, are the next challenges for GI planning (Mell, 2008).

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