



Management of World Heritage sites
Urban Regeneration Project for Historic Cairo

Environmental Risks Facing Historical Cairo

A part of preliminary studies for Conservation Plan

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Final report
Cairo, 20-12-2011

Urban Regeneration Project for Historic Cairo

Sector Study: Environmental Risks Facing Historical Cairo

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This report was produced in the framework of Urban Regeneration project for Historic Cairo – UNESCO, World Heritage Centre

The report was assigned to identify and classify the environmental risks present in Historic Cairo. The definition of risk was associated to the threat to safety, heritage values as well as to the quality of life in the historic city. A further differentiation is done between the hazards that are found throughout the greater Cairo region, and those instead that are specific to the historic city.

أُسند إلى هذا التقرير تحديد وتصنيف المخاطر البيئية الموجودة في موقع القاهرة التاريخية. ارتبط تعريف المخاطر بتهديد السلامة، والقيم التراثية وكذلك جودة مستوى المعيشة في المدينة التاريخية. بالإضافة إلى ذلك، تم التمييز بين المخاطر الموجودة في جميع أنحاء القاهرة الكبرى، وتلك الخاصة بالمدينة التاريخية.



Cairo has been a dominant political, cultural, commercial and religious capital throughout history playing a prominent role during Fatimids, reaching its golden age during Mamluks, and sustaining its cosmopolitan significance during Ottoman times. Due to its unique peculiar skyline, it has been known to scholars and historians as “City of the thousand minarets”.

Historic Cairo was inscribed on the World Heritage List in 1979 recognizing its “absolutely unquestionable historical, archaeological and urbanistic importance.” Upon ICOMOS recommendation, the inscription was based on the following criteria:

1. Several of the great monuments of Cairo are incontestable masterpieces;
2. The historic centre of Cairo groups numerous streets and old dwellings and thus maintains, in the heart of the traditional urban fabric, forms of human settlement, which go back to the middle Ages;
3. The historic centre of Cairo constitutes an impressive material witness to the international importance on the political, strategic, intellectual and commercial level of the City during the medieval period.

URHC Goals and Objectives In July 2010, UNESCO-WHC launched the Urban Regeneration Project for Historic Cairo (URHC) in the framework of a larger program of technical assistance to the Egyptian Government concerning the management of the World Heritage Site, focusing on the following objectives:

1. The preparation of a Conservation Plan for Historic Cairo’s “Core and Buffer Zones”, which would include the Management Plan required by the WH Operational Guidelines;
2. The establishment of an institutional framework to undertake and develop a sustainable urban conservation policy, promoting coordination and collaboration amongst different institutions, administrations and agencies concerned with the management of the World Heritage Site;
3. The creation of an appropriate and shared information platform for urban conservation.

To achieve these goals, an interdisciplinary team of local and international consultants are collaborating with the concerned bodies to develop a set of protection measures in order to uphold the site’s Outstanding Universal Value, to prevent further decay of the historic urban fabric and to enhance the socio-economic conditions of Historic Cairo.

Preface

Historical Cairo is a world heritage site which is still a living entity, due to this live, it faces several environmental risks; threatening the value of the area and the sustainability of its monuments on one hand, and threatening the safety and quality of life of its inhabitants on the other. Some of these risks are general to the whole city of Cairo, such as air pollution, while some others have a more specific relevance to historical Cairo, such as Fire risk and increasing ground water level. Any conservation plan for the Area should account for reduction of these risks and mitigation of its impacts.

This document specifies these environmental risks, and classifies them defining the priorities of handling in the conservation plan.

Within the framework of the programme Safeguarding of Cultural Heritage in Egypt, in close consultation and cooperation with the UNESCO World Heritage Centre, responsible national authorities and project team of “Urban Regeneration Project for Historic Cairo” (URHC project), the expert shall carry out a preliminary study on environmental risks in Historic Cairo. In particular, the study will:

1. **Define the criteria** for the identification of the areas which present relevant environmental risks, particularly affecting the urban hygiene and safety, i.e. large vacant areas used as informal waste disposals; areas with risks of fire/explosions, due to the presence of uncontrolled cumulus of inflammable materials, etc.
2. In connection with the preliminary field survey, and based on the criteria above, **identify some sample areas** within the different types of conservation zones in coordination with the URHC team, to illustrate the **most critical issues**;
3. **Evaluate the potential for regeneration and reuse of these vacant or derelict lands** for public facilities and services (i.e. parks, parking, community services and utilities ...), making reference to the areas above;;
4. **Outline the program of a comprehensive study** on the whole WH site of Historic Cairo, including the necessary field survey and technical studies;

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Section 1:

Criteria for the Identification of the Areas Presenting Relevant Environmental Risks

This section lists the typical environmental risks facing any urban area, evaluates the relevance of the threats in Historical Cairo, Hence outlining which environmental risks should be primarily accounted for during the development of the conservation Plan. Hence defining the criteria on which sources of risk

Section 1: Criteria for the identification of the areas presenting relevant environmental risks

A- Environmental risks in Historical Cairo

Physical Environmental risks

Lithosphere risks:

- Earthquakes
- Land and rock slides
- Soil

Hydrosphere risks:

Atmosphere risks:

Anthropogenic risks

- Fire
- Pollution
- Electrical and electromagnetic Risks
- Collapsing buildings
- Construction and demolition process
- Accidents and Crime

Ecological Risks

B- Criteria for defining environmental risks

Local sources of Environmental Risk

- Rock fall Risk
- Fire Risk
- Pollution Hazard
- Unsafe Buildings

Local Areas threatened by Environmental Risk

- Inaccessible Areas
- Areas facing Ground Water Rise
- Areas facing sensual pollution

A- Environmental Risks in Historical Cairo

Physical Environmental risks

Lithosphere risks: this include earthquakes and volcanoes, land and rock slides, soil risks including sinkholes, and moving sand dunes.

Among these the area faces no risk of volcanic eruptions, crust cracks nor sand dunes, but it faces some others:

Earthquakes

Cairo faces earthquakes in a significant magnitude and frequency, it was reported historically that some monuments have collapsed during historical earthquakes, among them the two minarets of el Mo'ayyad sheikh mosque landmarking Zuwayila gate, which collapsed more than once, the last significant earthquake stroke Cairo in 1992 claiming lives of 500 people in Cairo, most of them in Historical area due to large number of deteriorated buildings. Most monuments suffered different levels of destruction, an emergency plan was implemented saving the most endangered buildings, some of the monuments are still under restoration.

New building codes in Egypt enhanced capabilities of new buildings to face earthquakes, but existing buildings including monuments does not have a similar code, residential buildings dating back to 19th and early 20th century are prone to failure due to earthquakes, this threatens lives and valuable buildings, some of these buildings are already listed as Valuable buildings according to Egyptian law 144/2006 (although not Antiquities), no measures have been developed to protect them yet, all new buildings -specially the high rise ones- are a threat to adjacent monuments and listed building during earthquakes because of differences in rigidity and elastic behavior, measures for protecting old buildings from new ones needs to be developed.

Mitigation of effects of earthquakes on urban level needs development, lack of vehicular accessibility for large portions of Historical areas blocks the rescue efforts during emergency, evacuation is hard, ambulance and fire-fighting squads or machinery for lifting debris are not able to reach large portions of historical Cairo, development of an innovative system for providing safety in these areas is a big challenge for any conservation plan. It might combine localized civil defense with specially designed emergency vehicles that can enter narrow winding streets of Historical Cairo.

Land and rock slides

parts of Historical Cairo on the Mokkattam mountain or underneath its edges are threatened by frequent rock falls of the edges, claiming lives and threatening monuments. el Gyoshy mosque and Mohammad Ali Fortress are built on the edge of the mountain, Lo'loa mosque and some tombs are on the sharp slopes, historical cemeteries are Underneath the ridge. (Saladin citadel is built on a smaller part of the same mountain)

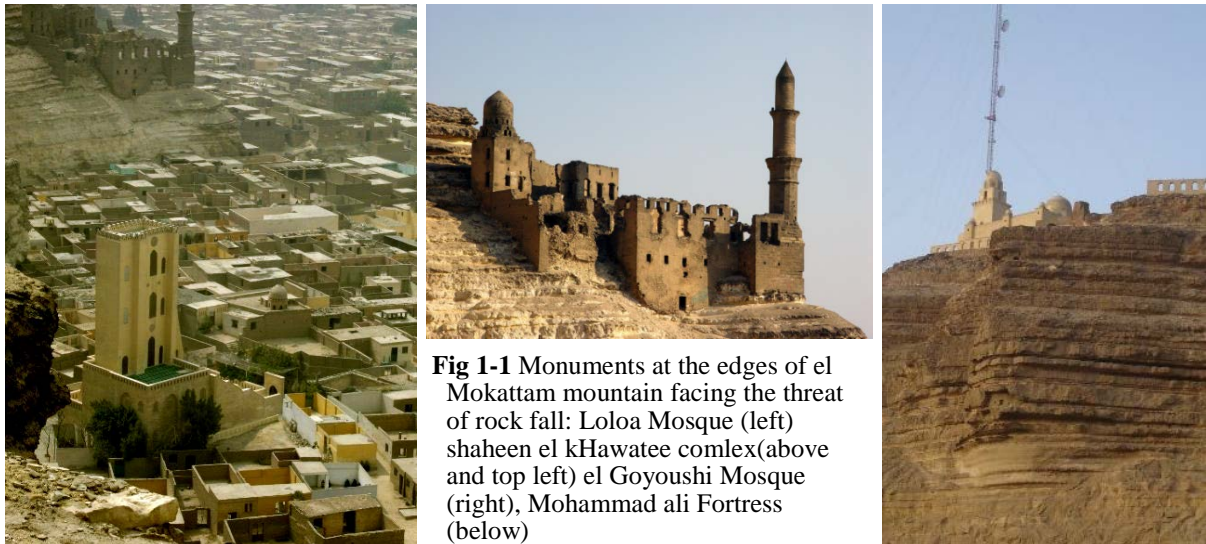


Fig 1-1 Monuments at the edges of el Mokattam mountain facing the threat of rock fall: Loloa Mosque (left) shaheen el kHawatee complex (above and top left) el Goyoushi Mosque (right), Mohammad ali Fortress (below)



Sporadic urbanization on and around el Mokattam changes the hydrological balance of the sedimental rock, clay and marl mountain, that have a sharp ridge (almost vertical) of 130 m, hence threatening the area with rock falls, and raise of ground water level as will be mentioned later in the document.

Measures for protecting these areas should be considered in conservation Plan

survey to define threatened areas are essential.



Fig 1-2 Rock fallen on el dowaika informal housing area in 2005 killed more than 70 people



Fig 1-3 Monuments at the edges of el Mokattam mountain facing the threat of rock fall

Soil

Soil in the area is sand, clay, or rock, in lowlands clay is more found, while rock appears closer to el mokkattam mountain, generally there are no severe soil problems except for ground water rise and fluctuations, but there are several spots with special soil conditions, for example; al Azhar park is an extremely unique case, its soil is the residuals of burned solid waste of cairo that accumulated for centuries on el Darrasah hills outside the Cairo defensive wall, it is not evident if the same soil exists elswahere. But the sustainability of the parks depends heavily on the understanding of its special soil type.

Sinkholes happens infrequently in areas where large water canals have been filled such as Port Saied st. where al Khalig el Masry canal used to pass, in few cases buried basements of demolished buildings causes surprising problems specially during infrastructure projects.

This does not need special measures in the conservation plan, but warnings to building and infrastructure builders should be mentioned, and extensive boreholes for soil analysis should be used for any project to avoid local changes due to historical interference layers.

Except for some specific locations such as examples mentioned above, There is no general high risk due to soil in the area, the plan should tackle the issue as a second priority, mainly as a byproduct of the **High priority Hydrological study**.

Hydrosphere risks:

Historical Cairo is safe from most hydrological risks because it is an Inland Area 200 km from the Mediterranean sea and 120km from suez gulf, the river Nile used to form a flooding threat to low lands for centuries, and created swamps to the west of Cairo, but after several Nile control projects crowned by the high dam in 1970, this threat is no more valid. Flash floods are not a significant risk either, the only drainage basin that may threat HC is part of el mokattam mountain drainage system, which in general has a limited encatchment area and it is not connected to other larger drainage systems in eastern desert mountains. The topography of the west side of the mountain may suppress the flow of a flash flood if it ever happens.

The real hydrological risk is created by increasing ground water level, the high dam caused general increase in ground water level in most of nile valley, befor the dam, nile worked as a source of water during flood time, then acts as a drain for the rest of the year after its level subsides. After the dam the river level became almost fixed, and irrigation canals worked as a permanent water source, while the nile became the main drain to most lands, causing increase in ground water level. Historical Cairo faced the same problem in addition to other factors affecting its aquifer, Urban expansion of Cairo around the historical core caused extra inputs to the aquifer, Garden irrigation, seepage from water and sewage systems and informal areas with no sewage systems all contribute to the aquifer input, while output to the nile (+18m) has no increase in drainage channels, the urbanization of high lands such as the adjacent el mokkattam mountain (+200m) and el Fostat park (+52m), or far nasr city (+60 to 130m) increase piezometric pressure causing more increase in ground water level under HC which is mostly around +30 to 40m, with some low areas such as el fostat excavations (+25m) were swamps and ponds are found and Ain el Seerah lake (+28m) which increases

rapidly drowning some Important monuments such as Mashad Aal Tabataba Tomb dating back to 9th century. Most of the cemeteries of el fostat is theated by high ground water level, specially the burial chambers below grade. The higher areas (more than +40m) faces less problems.



Fig 1-4 El Fostat area facing high water level, lakes are created, excavation site is a pond, el fostat Park, mokattam mountain (east) and Informal housing (south and east) contribute to aquafir charge, while evaporation from lakes and River Nile (west) are the only drains.

The ground water level is a severe problem in all historical sites in Egypt, from Asawn to Rosetta, HC is not an exception. Increase in ground water Threats safety of monuments and other valuable buildings; it causes Consolidation of the soil, Flooding of basements and ground floors, increased water content of walls and foundations threats their stability, increased humidity encourages growing of life organisms casing deterioration of wooden and other organic building materials. In addition to health problems to the inhabitants.

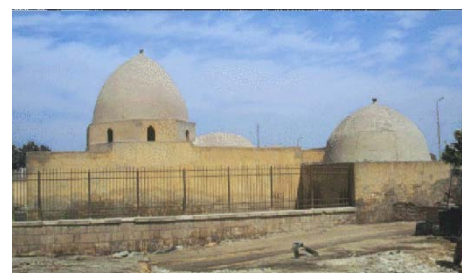


Fig 1-5 Mashad Aal Tabataba, one of oldest Islamic monuments in Cairo is half drowned in ground water seeping from adjacent Ain el Seera Lake which is rising rapidly. Large Trees can be planted in vacant lands around to absorb water and reduce its level

Conservation plan should account for that, extensive survey and study for the aquifer balance, its charge and discharge rates should be conducted, careful dewatering projects to increase discharge may be a part of conservation Plans, sewage systems for informal areas close to HC such as mansheyet Naser may decrease recharge rate of the aquifer as well as enhancing local sewage system inside HC, subsurface drainage to al Fostat Park may cut one of the recharge sources, using ground water to irrigate it may be a positive solution if water chemical properties are tolerable, Al azhar Park is a good example of an Isolated and well drained park, using forests or Planting cemeteries with trees of high water demands and tolerance to salinity may be useful, but choosing tree species having a root system that does not threat the valuable buildings is a real challenge to planting specialist.

Atmosphere

Egypt in general does not Face great climatic risks, cyclones and tornados does not Happen, rain storms are rare, precipitation is generally low, lightening is rare and fires caused by it are not reported. But on the other hand; dust and sand storms are frequent.

dust from dry clay soil on Nile delta is dark and is carried by wind from the north all year long, it usually affects the visual quality of the buildings –specially Monuments- by covering them with layers of dirt, scarce rain is not able to wash it but rather moves dust from horizontal surfaces to facades, inexperienced cleaning for this dirt may cause deterioration of the building skin. The fine particulates of dust are a health risk when they enter respiratory system, accumulation of this dust in the vacant lands and unmaintained roofs makes the area itself a local source of dust, decreasing the air quality.

Sand storms and street gradual elevation

Sand storms are less frequent and usually happens on spring, they cause erosion of stone and brick and most building materials.

Sedimentation of sand and dust on horizontal surfaces such as roofs and streets is heavy, decades and centuries of accumulation of sand and dust on streets increase their level gradually, making older building gates becomes below street level and ground floors become a sort of basements, new buildings replacing demolished old buildings have higher ground floors, repeating this makes historical buildings depressed beneath street level making them a drain for surface water and local sources of ground water!

Accumulation of dust and sand as well as solid waste on unmaintained roof tops makes them elevated garbage dumps with all its subsequent ecosystems and risks such as fire hazards, the weight on these roofs rapid their deterioration.

In modern day, sandstorms are not the only cause of street elevation, repeated paving adds almost 5-10 centimeters of asphalt every 10-20 years, causing an increase of 25 to 100 cm per century!

Management plans should find a way for regular cleaning of sand and dust depositions, regulations should prevent new layers of paving to cover older one, but to replace them, there is a need to expose monuments to streets with their original level, restoring streets to their

original level is a challenge, it may have conflicts with current infrastructure and new buildings entrances, balancing is not a simple task.

Anthropogenic risks

Fire

Fire risk is one of the most fatal threats to Historical Cairo, in recent past some of the most precious monuments was lost due to fire, such as el Mosaferkhanah Place (where Khedive Ismail was born). a fire in a nearby vacant land used as a garbage dump, spread to the wooden parts of the building to destroy it totally.

People in the area face the risk as well, compared to other areas in Cairo, Historical Area is specially more prone to fire risk due to a vast amount of fire sources and fuels, and because of lack of fire fighting and mitigation means , this is detailed for several reasons:

- 1- Compact urban Fabric with attached buildings, that causes fast spread of fire from a building to another, specially with a lot of combustible materials dumped on roof tops.
- 2- Low accessibility in this fabric makes it harder for fire fighting equipment and vehicles to reach the fire on time. Ambulance face same access problems, delayed time of reaching victims of burns to medical care increase casualties and long term damage.
- 3- Impermeability of the Fabric reduces paths of fire escape, roads with dead end becomes a trap for people inside if the fire happens close to the entrance.
- 4- Vacant Lands which are informally used as waste dump, which may provide a high risk of catching Fire, waste provides fuel to fire as well as a fire source, a fire might be started by any casual flame, or self combustion can start without even ignition flames, due to exothermic Chemical reactions releasing heat during decomposition process.
- 5- Mixed use is a part of the area's Urban Character, that allows economic activities to exist in the same buildings and areas with residents and monuments, some crafts use fire, such as casting, welding, metal cutting, etc. in addition to some domestic services such as bakery houses, Ironing shops, etc. all these activities use fire sources and combustible materials and even Oxygen cylinders, gathering all three components of a fire, any mistake can cause a fire that can extend to shops and houses.
- 6- Existence of high rise buildings (most of them against law) in narrow streets that can't give access to firefighting vehicles with leaders that can reach these heights.

Conservation plans should seriously tackle this problems, accessibility, fire fighting plans and equipment designed specially to this area, handling parts of the city inaccessible to vehicles as a single (Large Building or mega structure) mixing fire codes of buildings with fire fighting on Urban level, providing local firefighting equipment (water Hoses with enough pressure, chemical fire distinguishers, etc.) and training for local residents and workers to be able to resist fire.

The most significant urban planning methods is control of vacant lands filled with waste which are threats that may be converted to opportunities, eliminating the fire and biological risks caused by them, and using them as public spaces.

Pollution

The area faces many types of environmental pollution, sometimes pollution is generated elsewhere but impacts HC, some other times pollution is generated within the area.

Air pollution:

Cairo in general faces Air pollution due to misplacement of Industries on the north of the city and heavy traffic of Cars and busses with very low dependence on electric Public transportation, in addition to high density,

Some air pollution is generated within the area, burning of solid waste (Intentionally or by self combustion) odors and fumes from decomposed solid waste adds to air pollutants, activities using fire within the area generates exhaust gases and undesirable odors such as leather industry (el Madabegh adjacent to magra al oyoun historical Aquaduct) even some food cooking generates evaporated oils and bad smells. HC has an extra problem of compact urban fabric that reduces air speed, which would have diluted air pollutants generated in the area, lack of green areas inside or around HC increase concentration of most pollutants.

Air pollution has well known health risks, but it has special effect in HC, some chemical air pollutants are Erosive to monuments building materials, others react with its surface changing its color and appearance, cleaning this surfaces may need use of abrasives that gradually erodes the surface, protection of such types of pollution is challenging to restoration engineers.

Water and soil pollution

The area includes several polluting industries, such as leather industry (el Madabegh adjacent to magra al oyoun historical Aquaduct) which uses chemical substances for treating raw leather, the waste water there is heavily polluted, gold lamination industry in Haret el Yahood in Al Khoronfesh uses acids and chemicals in their process that pollutes water and soil, solid waste pollutes soil and may pollute ground water if it lasts enough to dispose its decomposition liquids into ground.

Conservation plan should put some measures for reducing onsite generated pollutants and dilution of them, some activities may be prohibited, technical enhancement for some others may reduce pollution as well as fire risks, enhancing solid waste collection system will improve air quality significantly.

Sensual pollution

Mainly visual pollution, in addition to audible, smell and lighting pollution degrades the historical and touristic –hence economic- value of the area, undesirable sensual stimuli degrades the value, views of garbage dubs, deteriorated buildings, dirty roads and public spaces, and many others degrades the outstanding value of the area, noise and undesirable sounds, undesirable odors and smells makes a similar effect, lighting pollution means excessive lighting during night preventing people from having a naturally dark night.

Sensual pollution might be caused by elements that are not undesirable by themselves, but are rather incompatible with the urban character, a high rise modern building with glass curtain wall is not bad in itself, and it is a part of Urban character of New York or Dubai, but it is not compatible with historical Cairo. Replacing Souk el selah (arms market) with activity of motorcycle fixing gives a conflicting industrial sense different from the original activity, use of modern material and colors in shop facades may break the sense of time and the historical Urban Environment.

Although sensual pollution is sometimes less sharply defined as chemical pollution, but it harms and degrades urban environment with a similar -if not bigger- magnitude, Audible noise for example creates health risks and safety risks in crowded places due to inability to distinguish audible alarms.

Conservation Plan should concentrate on defining the sources of sensual pollution inside and around HC in order to reduce their impacts, either by elimination or by masking.

Electrical and electromagnetic pollution

No specific electromagnetic risks face HC, no High tension electric lines pass through the area, Mobile phone antennas are a visual pollutants more than electromagnetic one, but sporadic wiring of lighting, power and communication electric wires creates a big fire hazard when they intermix, Spaghetti like crammed wiring exists in some commercial streets such as Khan el Khalili sometimes create huge fires, it street faced a dangerous fire in April 2010 due to sporadic wiring.

Collapsing buildings

Deteriorated old buildings in the area is a big risk, buildings may collapse or some parts may fall causing direct fatalities or injuries, during the earthquake of 1992, most fatalities occurred in deteriorated houses which Collapsed during the earthquake. Sometimes a falling building may destroy an adjacent deteriorated building causing a chain reaction, if the falling building are attached to a monument, it becomes a threat to its safety.

Construction and Demolition Process

Construction process generates a lot of sensual pollution, visual, noise, smell and others, in addition to risks to the safety of adjacent buildings, deep digging for foundations work may undermine the foundations of another old building.

This applies everywhere, but it has special significance in HC that have large numbers of adjacent deteriorated buildings that some times (Lean on each other), demolishing a building may affect the safety of other buildings. Demolishing process sometimes is as risky as a falling building

Accidents

The area in general is safe and faces accidents similar to any other place in Cairo, but lack of accessibility makes mitigation harder, usually social cooperation plays a big role during emergency events.

Crime

The area in general is safe from urban crime, although some risky spots do exist in the peripheral zones (el gayyarah, ezbet abou Karn,...) the social studies can handle this aspect better than environmental study.

Ecological Risks

The area is safe from Predators or aggressive animals, although the garbage areas creates its own ecosystem, the last part of life cycle includes decomposition; bacteria, flies, worms, rats, ..etc do their role in nature, but this is not inevitable inside urban areas, usually wastes are carried out of the city for natural decomposition or the similar man-made process of recycling.

Some urban animals such as cats and dogs change thier instinctive feeding behavior to become decomposers feeding on waste, un controlled waste dumping gives feeding to them as well as rats and weasels, causing large increase in their population, these animals can transfer dangerous diseases to humans (as dangerous as plague) , in addition to occasional aggression against humans -specially children- that reduces the feeling of safety, Flies and other insects can transfer Microbiological health risks generated in waste dumps, the conservation plan should give priority to eliminating the waste disposal areas within HC, a reliable and sustainable system for garbage collection is a must.

Plants

Few plants exist in HC, very few trees may threat safety of some buildings due to their roots, this is usually treated on case by cases basis, but if historical Cairo will be regenerating some of its old parks , attention should be taken to avoid non native trees and these causing allergies and similar problems. Trees planted near buildings should have safe roots that does not make a threat on the long term.

Lack of green areas and deterioration of the few existing ones

Green areas play an essential role in enhancing urban environment, Lack of rain and dependence on artificial irrigation limited green areas in historical Cairo to small private gardens and few large scale parks, most of them has been lost. historically known Kafour park has been lost during the Fatimid era while el Remila square park -which had been irrigated by Magral Oyoun Aqua duct- was lost in the modern days), street Trees and trees along the canal cutting through Historical Cairo (el Khalieg el Masry) was its main green way. During the 19th century, new parks has been added where swamps around cairo has been filled and dried, among them, el Ezbakeya pond was converted into a European style park on the connection between Ottoman Cairo and Khedevian Cairo, representing a significant part of the city ecosystem and its memory. This park has faced several cuts of area in favor of building some urnan aminities: National theater complex, Telephone central, Traffic administration, multistory paring garage and similar uses. During the past few years the park has been fully dug to host a central underground Metro station, the historical Park has been lost during the first decade of the 21st century, the heavily forested park used to influence urban environment and attract some bird species to become a center of urban ecology, even covering the metro station with green lawn will not restore the environmental effect of an urban forest like original Ezbakea park. Let alone to restore its historical value, All heritage parks in historical Cairo should be strictly protected, even new parks of outstanding value

such as al Azhar Park should be protected by the conservation Plan, adding more greens to Cairo is essential to its urban environment.

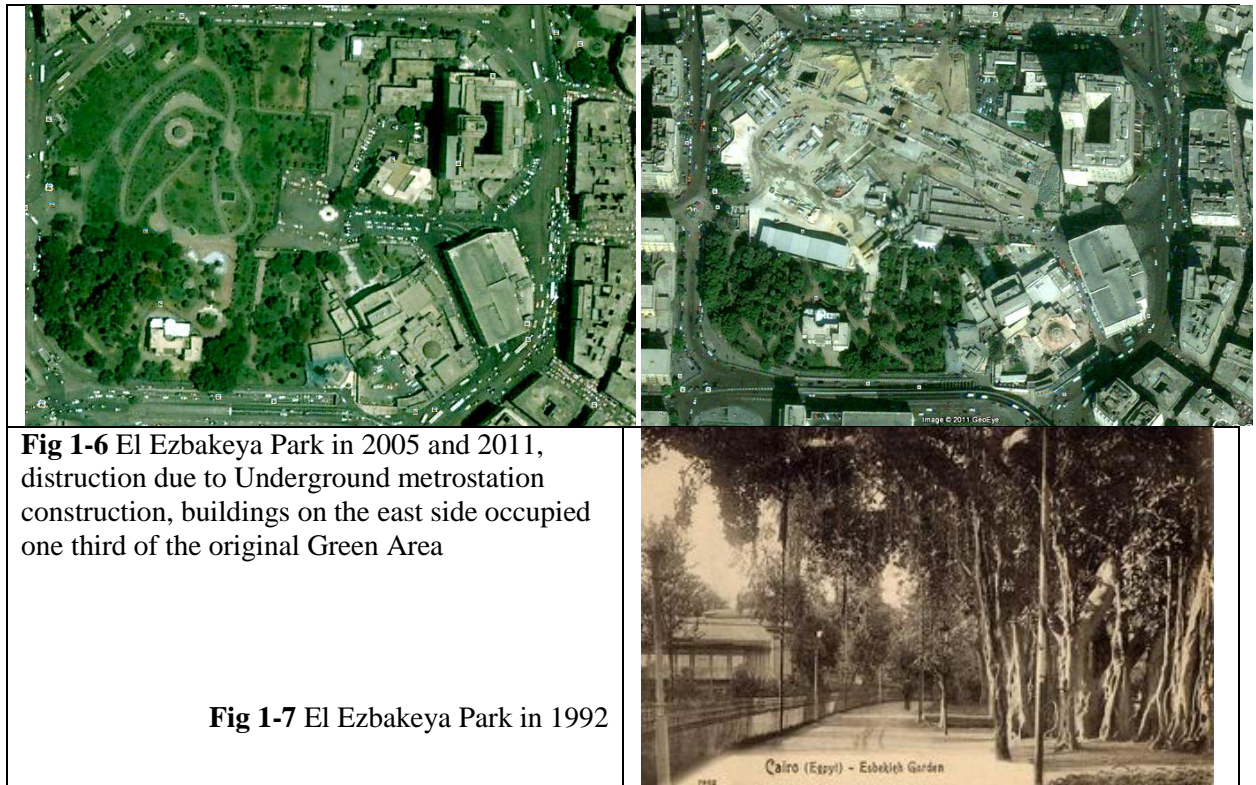


Fig 1-7 El Ezbakeya Park in 1992



b- Criteria for defining environmental risks

The previous section listed the internationally known Environmental Risks common in Urban Environments, and evaluated their significance in Historical cairo.

Some of these risks are generated within HC, all risks generated in locations within HC should be surveyed and mapped at the early phases of preparing the Conservation plan.

Some areas in HC are prone to environmental risks, (whether generate locally or regionally) the most affected or threatened areas should also be defined and mapped

Local sources of Environmental Risk

that Include:

Rock fall Risk

- Buildings or urban areas above sharp cliffs
- Buildings or urban areas beneath sharp cliffs

Fire Risk

- Gas stations
- Gas Cylinders storage

Bakeries

Vacant lands used for garbage dumping
Casting, welding or metal cutting workshops or similar workshops using fire
Areas not accessible to firefighting vehicles
high rise buildings (above 5 stories)

Pollution Hazard

Vacant lands used for garbage dumping: land, air, water, biological & visual pollution,
Casting workshops
Metal lamination workshops (chemical)
Chemical materials stores or workshops
Noise generating Workshops
Extremely high rise buildings (visual)

Unsafe Buildings

Ruins (may contain biological hazards such as snakes or rats...)
Buildings apparently collapsing
Any leaning buildings (differential settlement)

Local Areas threatened by Environmental Risk

Inaccessible Areas

These areas face the highest level of risk of several types of risks among them fire, earthquakes, collapsing buildings, acute and emergent health risks, these areas are prone due to hard or delayed mitigation efforts:

- areas with narrow streets (4m or less) or wider streets containing curbs that cannot allow an emergency vehicles to pass are considered inaccessible.
- Dead end streets longer than 15 m

Areas facing Ground Water Rise

Low areas (below +30 m altitude)
Buildings with excessive moisture content
Indoor water ponds (in basements or low level ground floors)
Street water ponds: Biological pollution

Areas facing sensual pollution

Areas facing visual pollution
Areas facing noise pollution
Areas facing smell pollution

Section 2:

Sample areas illustrate the most critical issues

A- Core Area of Historical Cairo

Sample area from the core of Historic Cairo has been scanned for vacant lands that can be potentially an environmental risk; maps indicating these candidate lands is illustrated in figures 2-1,2 and 3. That indicated the existence of several vacant lands of different types, excavation lands being searched for monuments, ruins of buildings that are demolished or collapsed, vacant lands used temporarily as storage or parking garages, courts and internal spaces of some buildings. Some of these public or private vacant lands are used as solid waste dumps, causing a real Environmental Risk.

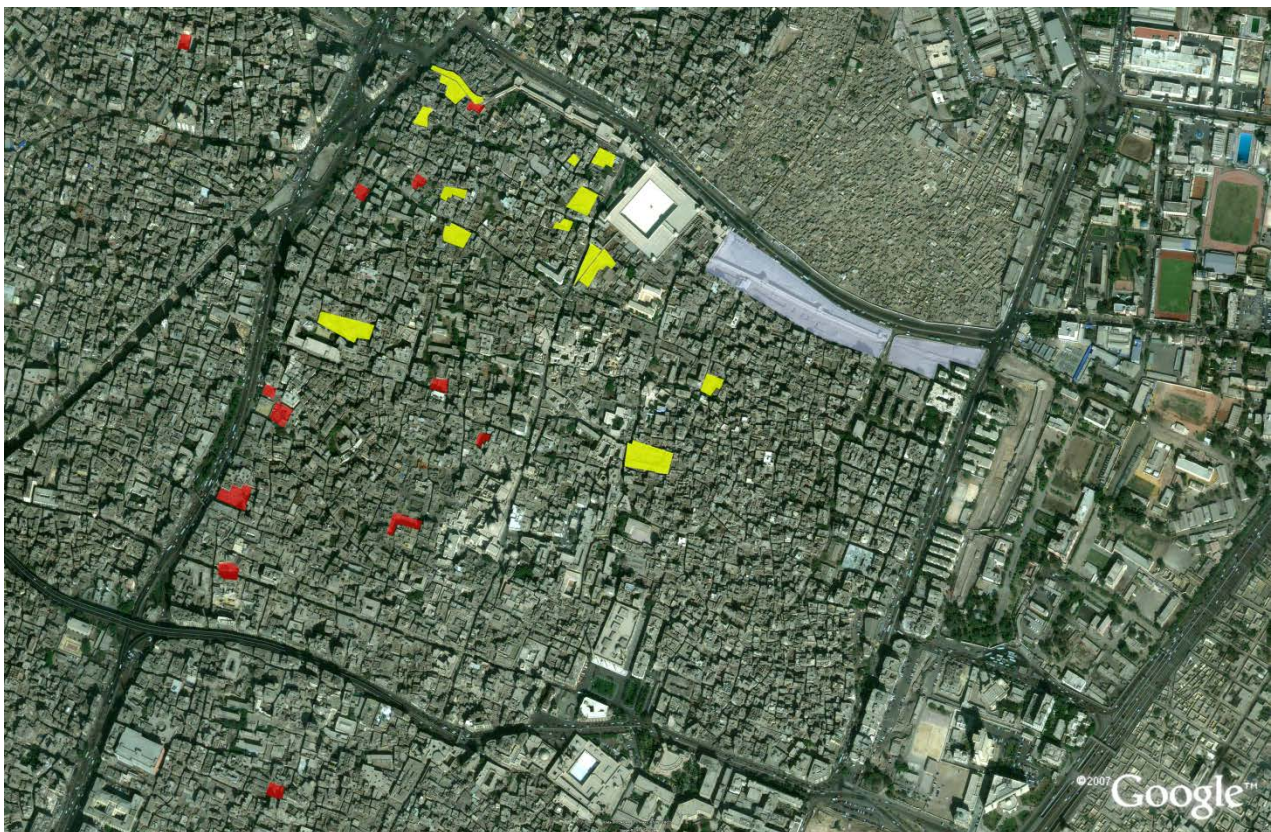


Fig 2-1: North Part of Fatimid Cairo Showing Vacant Lands (red) and Ruins, single story deteriorated buildings (yellow) or monuments and archeological excavation Areas (light blue)

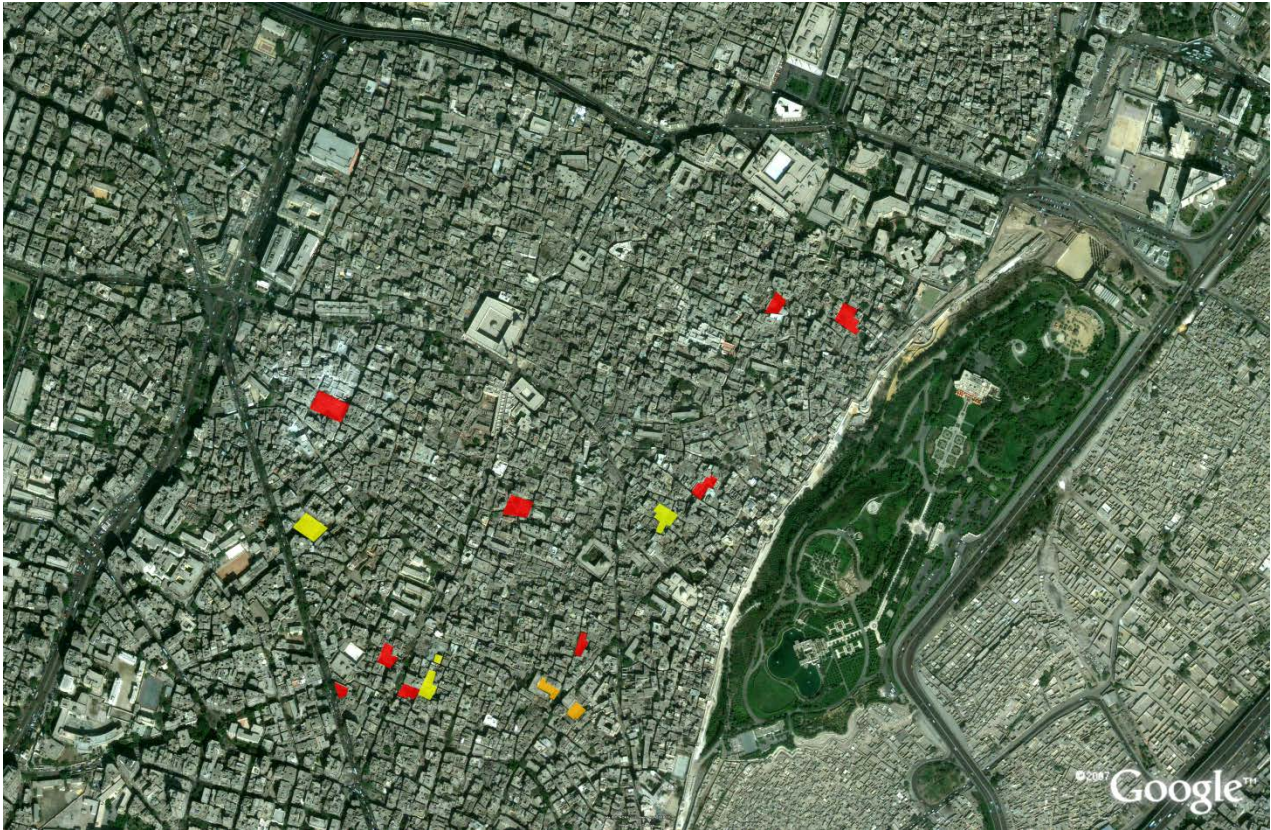


Fig 2-2: South of Fatimid Cairo Showing Vacant Lands (red) and Ruins, single story deteriorated buildings (yellow) or monuments and archeological excavation Areas (light blue)

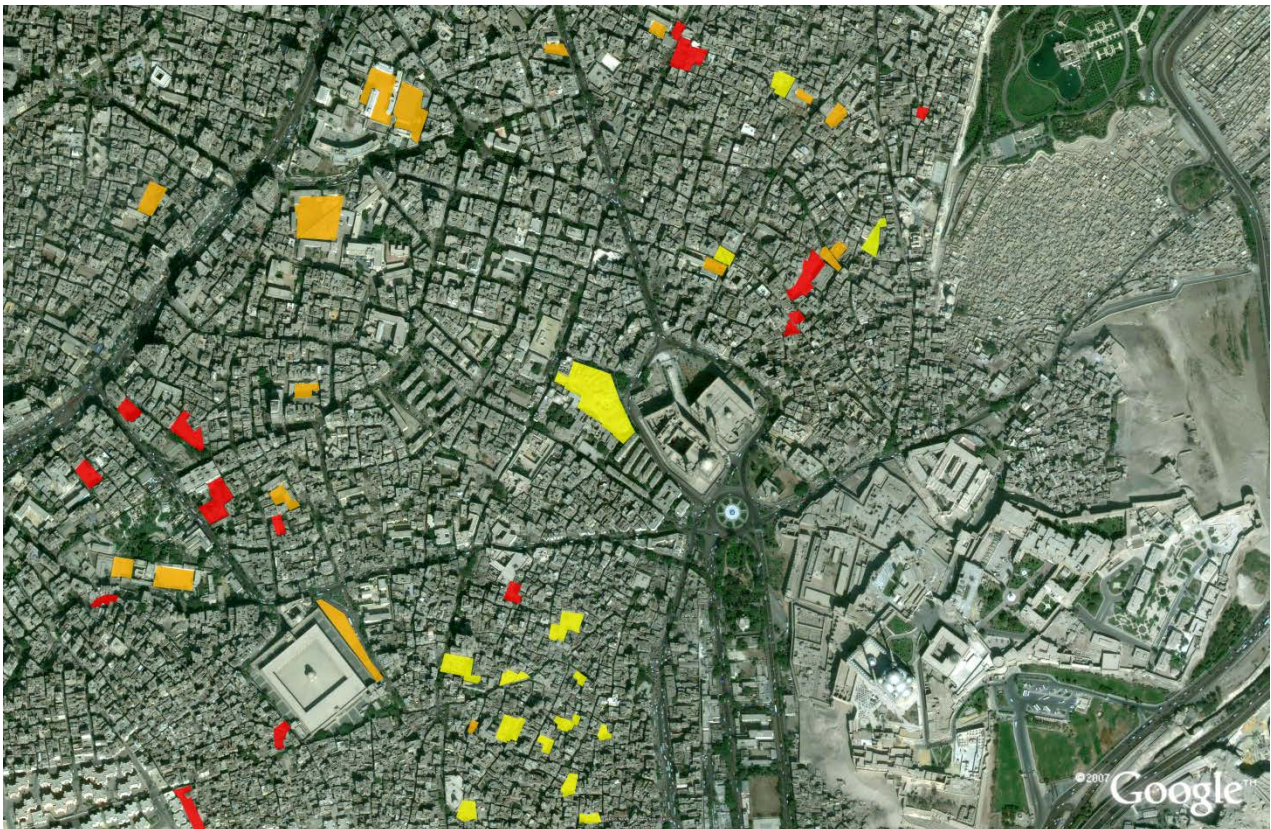


Fig 2-3: Citadel and el Khalifa Area Showing Vacant Lands (red) and Ruins, single story deteriorated buildings (yellow) Courts and public spaces (Orange)

A field survey was conducted for the area of el Darb el Ahmar and souk el Selah, which has shown some significant results, the area is illustrated in Figure 2-4

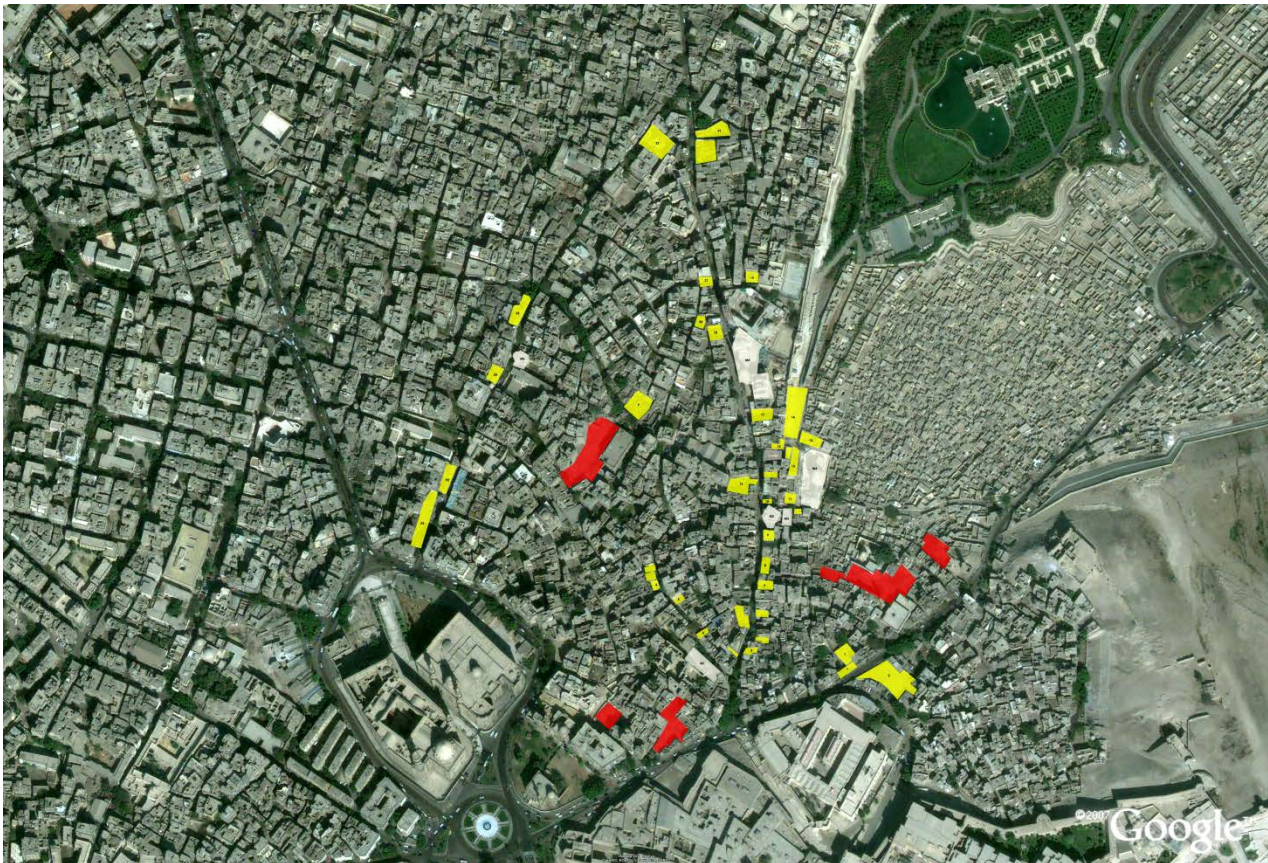


Fig 2-4: El Khalifa (el Darb el Ahmar and souk el Selah) Area Showing Vacant Lands (red) and Ruins, single story deteriorated buildings (yellow)

A land in darb el mahgar is a real example of waste dumps, it is fenced by the ruins of a wall 2m high which is the only thing left from a collapsed house, this fence enabled the garbage to accumulate for its height of 2 meters, this exceeded the critical depth required for self ignition, the neighbors reported the frequent fires happening there and the panic they cause, when a fire fighting cars came few month ago, they used a huge amount of water to wet and cool the heart of the pile, but water was excessive to cause damage to the neighboring buildings, according to residents of these buildings. The dump was actually burning again during our field survey, smoke was rising from the garbage pile, fig 2-5,



Fig 2-5 Ruins and Some roofs has become a garbage dumb creating a high risk (bab el Wazer st.)



Fig 2-6 Vacant Lands becomes a dump for solid waste hosting some feeding anilals and creating a strange urban ecosystem (bab el Mahgar st.)



Fig 2-7 Vacant Lands becomes a dump for solid waste (darb el Mahgar st.)



Fig 2-8 Garbage dumps creates its own ecosystem, usually it is not a safe nor welcome ecosystem within urban environment



Fig 2-9: Vacant Lands become a dump for solid waste, self ignition starts fires that are extremely hard to prevent or mitigate, threatening resents and historical Monuments (darb el Mahgar st.)



Fig 2-10 maintenance or even production of motorcycles in souk el silah replaced original Arms casting, an activity which is inconsistent with the historical nature of the area degrading its visual quality. welding may cause fires due to unsafe process, specially by children or uneducated young assistants, welding means existence of flames and combustible fuel in addition to Oxygen cylinders,

the perfect set for an explosive fire! Hammering cause audible pollution. bakeries and other types of uncontrolled economic activities can cause fire as well

B- Boulack Area

Boulack Area, a suburb of Ottoman Cairo on the river Nile where the Port was located, several Ottoman mosques and monuments still exist in the Original Urban fabric and street pattern, during Mohammad Ali rule the area became an industrial base, water front is now invaded by sky scrapers, office builings and Hotels are replacing old houses, workshops and stores, the area is adjacent to el sapteayh steel wholesale trade, and workshops for forming steel is spread sporadically within the area causing fire risk and pollution, the area lacks streets or parking lots, vacant spaces is rare and rapidly built with high rise buildings trying to grab a view of the nile, the area is not widely perceived as a part of historical cairo, because of its spontaneous street pattern and deteriorated buildings and poor residants it is usually considered deteriorated area, only when it was listed as part of historical Cairo are of outstanding value according to law 119/2010, plans for total demolishment was slowed down, the area has several vacant spaces that can be utilized as public spaces, but more deteriorated workshops and stores give more potential, specially if steel forming workshops were eliminated when the steel market is moved out of central Cairo as planned.



Fig 2-11 vacant spaces that can be utilized as public spaces, deteriorated workshops and stores give more potential

C- Khedevian Cairo

Khedevian Cairo is the west extension to Core Area of Historical Cairo (Fatimid to Ottoman) it started in the second half of 19th century by Khedive Ismail, that gave it its name, its urbanization continued till the early 20th century, the eastern parts represents the interface between traditional Urban fabric and the modern one, the western part is Cairo's water front on the River Nile.



Fig 2-12 El Tahrir square and adjacent streets have several vacant lands, most of them are used temporarily as Parking, a 4 level underground parking is under construction in the large space in Tahrir square, some spaces are used for marginal uses (single story garages) or gas station.

Reutilizing these spaces may relieve the traffic pressures in the area and provide more space in the khedevian Cairo, some of these land is privately owned, generous compensation with Lands in new districts can convince some of the owners to leave these lands for public use

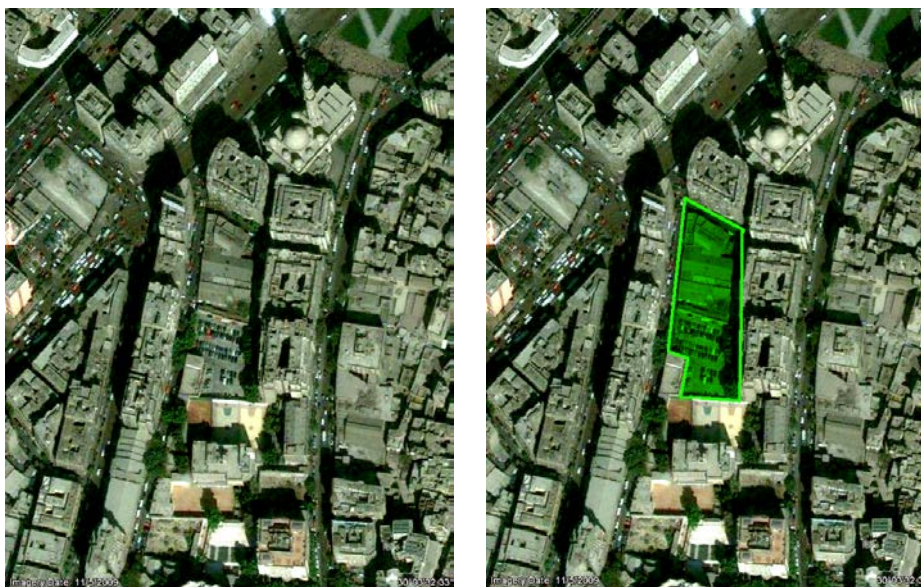


Fig2-13 Near Ramses square, behind the khedevian buildings lies a space occupied by marginal uses, Open air parking, few workshops and a single story Garage, using this space as multi level underground parking lot can create a large public open space on street level, values of surrounding buildings will increase.

Section 3:

Potential for regeneration and reuse of vacant or derelict lands

Historical Cairo lacks outdoor spaces. Any small side walk is used as a coffee shop, children's leisure tools exist at any tiny square, people use simple shades to create an outdoor mosque, outdoors are used as extension to a small workshop, or a storage space, many uses compete for an outdoor space in HC, even private spaces are used as temporary storage, garage or a garbage dump!

Changing these marginal uses of vacant lands into a public space converts a threat into an opportunity, even privately owned spaces can be used temporarily by local administration to satisfy public need for an outdoor space. Using the space as a coffee shop may be income generating.

The problems of property and ownership are hard to handle, but not impossible, small lands which can make a large difference in HC can be traded for a much larger land parcel which is worth more in a new district, temporary use by leasing can be managed, and legal enforcement of specific land use can be done. Using vacant lands and ruins as public spaces makes a small change in urban fabric, but enhances environmental conditions in general. If the urban fabric is to be strictly preserved, the spaces created from building parcels can be lightly separated from the streets by a low wall or arcades, elevating the land by a few steps gives an impression of partial separation between the space and street. Spaces facing monuments have a special importance, they are station points for the monument, where the monument can generate better income by encouraging coffee shops to use such spaces.

The potentials of these spaces should be explored in detail during the plan process, the issues of negotiation with local can be achieved if the political system succeeded to create some sort of mutual trust with people.

A- Vacant Lands Used Temporarily as Open Space for outdoor activity



Fig 3-1 As soon as a building is demolished, its temporary use as open space begins



Fig 3-2 temporary multi use in a vacant land



Fig 3-3 A vacant space used as an outdoor mosque



Fig 3-4 any space is used for outdoor activity



Fig 3-5 any space is used for outdoor activity

B- Vacant Lands Used Temporarily as Parking



Fig 3-6 vacant land used for parking

C- Vacant Lands Used as Parks



Fig 3-6 vacant land used as a park

Section 4:

Program Outline of Environmental study for a comprehensive conservation plan for Historical Cairo

This section aims to outline the program of a comprehensive study on the whole WH site of Historic Cairo, including the necessary field survey and technical studies; this focuses primarily on studies and surveys required for environmental risk mitigation.

A- Planning to Face Physical Environmental risks

Earthquakes

Conservation plan should account for Earthquake risk mitigation, codes to enhance existing buildings and monuments may be developed. development of an innovative system for providing safety in these areas is a big challenge for any conservation plan. It might combine localized civil defense with specially designed emergency vehicles that can enter narrow winding streets of Historical Cairo.

Land and rock slides

Measures for protecting these areas should be considered in conservation Plan, survey to define threatened areas are essential.

Soil

Priority of soil study is moderate, There is no general high risk due to soil in the area, the plan should tackle the issue as a second priority, mainly as a byproduct of the **High priority Hydrological study**. but warnings to building and infrastructure builders should be mentioned, and extensive boreholes for soil analysis should be used for any project to avoid local changes due to historical interference layers.

Hydrosphere risks:

Conservation plan should account for that, extensive survey and study for the aquifer balance, its charge and discharge rates should be conducted, careful dewatering projects to increase discharge may be a part of conservation Plans, sewage systems for informal areas close to HC such as mansheyet Naser may decrease recharge rate of the aquifer as well as enhancing local sewage system inside HC, subsurface drainage to al Fostat Park may cut one of the recharge sources, using ground water to irrigate it may be a positive solution if water chemical properties are tolerable, Al azhar Park is a good example of an Isolated and well drained park, using forests or Planting cemeteries with trees of high water demands and tolerance to salinity may be useful, but choosing tree species having a root system that does not threat the valuable buildings is a real challenge to planting specialist.

Atmosphere (dust and sand storms)

Management plans should find a way for regular cleaning of sand and dust depositions, regulations should prevent new layers of paving to cover older one, but to replace them, there is a need to expose monuments to streets with their original level, restoring streets to their original level is a challenge, it may have conflicts with current infrastructure and new buildings entrances, balancing is not a simple task. A survey should be conducted to specify streets which needs level change

B- Planning to Face Anthropogenic risks

Fire

Conservation plans should seriously tackle this problems, accessibility, fire fighting plans and equipment designed specially to this area, handling parts of the city inaccessible to vehicles as a single (Large Building) mixing fire codes of buildings with fire fighting on Urban level, providing local fire fighting equipment (water Hoses with enoght pressure, chemical fire distinguishers, etc.) and training for local residents and workers to be able to resist fire.

Conservation Plan should define the areas with high risk of fire due to sporadic electric wiring, a system for rewiring safely should be conducted. Public lighting systems should be developed to reduce dependency on private lighting.

The most significant urban planning methods is control of vacant lands filled with wastem which are threats that may be converted to opportunities, eleminationg the fire and biological risks caused by them, and using them as public spaces.

Air, Water and soil pollution

Conservation plan should put some measures for reducing insite generated pollutants and dilution of them, some activities may be prohibited, technical inhancement for some others may reduce pollution as well as fire risks, inhancing solid waste collection system will improve air quality significantly.

Sensual pollution

Conservation Plan should concentrate on defining the sources of sensual pollution (specially visual pollution) inside and around HC in order to reduce their impacts, either by elimination or by masking, trees and plants have a special importance for masking visual pollution because they don't look like masks to residents in buildings or workshops being masked. Birds nesting in trees such as doves, pigeons, twitters etc. create sounds that can mask noise.

Collapsing buildings

A survey for defining this building is required, checking official lists of endangered buildings is a must. Developing administrative, financial, and technical strategies and policies for saving these buildings or reducing the risk they are causing are required.

Construction and demolition process

Measures for protecting the Urban environment and monuments during construction processes should be included in conservation Plan.

C- Planning to Face Ecological Risks

the conservation plan should give priority to eliminating the waste disposal areas within HC, a reliable and sustainable system for garbage collection is a must.

D- Plantation and Green Area plan

A plantation and green network plan should be prepared, historical Cairo can regenerate some of its old parks, new parks and forests can help to reduce increasing groundwater table and air pollution, separating visually distinctive areas by trees may reduce visual pollution. Attention should be taken to avoid non native trees and those causing allergies and similar problems. Trees planted near buildings should have safe roots that do not make a threat on the long term. Visually they can hide negative views, inframe nonuments and valuable views, they should not block these views.

All heritage parks in historical Cairo should be strictly protected, deteriorated ones such as Ezbakeya park should be reconstructed, even new parks of outstanding value such as al Azhar Park should be protected by the conservation Plan, adding more greens to Cairo is essential to quality of its urban environment.

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