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EIA of new and upgrading projects in four slums within Greater Cairo to support public services and infrastructures

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ABSTRACT

Slum or informal areas continue to be among the major challenges of urbanization, especially in the major cities. They are facing the most devastating impacts of local and global challenges, including climate change. This gives a high priority to upgrading projects in these areas. However, a special concern should be given to the environmental and social impacts of these areas and the required upgrading projects to achieve sustainability in the short-term and long-term. This research paper aims to extract the common environmental and social issues in four informal areas in great Cairo and identify the required upgrading projects in these sites. It relies on 31 EIA studies of upgrading projects in four slum areas within the Cairo metropolis the researcher share in their preparation; Izbit Khayrallah, Al Zawya Al-Hamraa, Ard Al-Lewa and Mît Uqba. The comparative analyses were used to highlight EIA outcomes and their added values that could support the sustainability in these areas and in similar projects of other slums in Egypt. Site visits and interviews with stakeholders and local people were accomplished, during the construction phase of these projects, to investigate the acceptance of mitigation measures. Finally, guidelines and learned lessons were extracted in order to enhance the whole EIA procedure within a similar context.

***Keywords*:** Environmental Assessment, Urban Upgrading, Quality of Urban Environment, mitigation measures..

Acronyms and Abbreviations:
EEAA: Egyptian Environmental Affairs Agency
EIA: Environmental Impact Assessment
GOPP: the General Organization for Physical Planning,
MSMEDA: the Egyptian Micro, Small, and Medium Enterprise Development Agency,
UN: United Nations,
UUU: Urban Upgrading Unite.

INTRODUCTION

According to the World Bank's recent records; slums in the world are hosting 828 million people, nearly 30% of the world's population (UN, 2022). Fast urban expansion in developing countries is expected to add up to 1.5 billion people living in slums by 2025 (UN, 2013). They are suffering from a deteriorated urban environment, lack of facilities, high densities and pollution. However, contemporary global challenges become even more intensive in these areas. There is clear evidence that the effects of global warming and heat islands are increasing with higher building densities and lack of urban spaces. Also, their weak building constructions and lack of infrastructure make them highly vulnerable to extreme climate events. More recently, the impact of COVID-19 is expected to be mostly devastating slum areas, where overcrowding makes it difficult to follow recommended social distancing (Chigbu and EugeneOnyebueke, 2021).

This could be even more complicated within metropolis/megacities, where the spatial distribution of urban

environmental problems has been found to be negatively correlated with the city's wealth (Josef, 1995). However, the ability to cope with such challenges differs upon their limited resources and the institutional framework in which they operate, however, this is even most complicated in metropolises. Social organisations, cultures, administrative traditions, planning conventions and political dynamics vary considerably from city to city, and country to country, (Stren and White, 1989; Stren, 1991). From the common perspective; these areas are considered a crucial cog obstructing city development. From a different perspective; informality could be an asset for the development, as their productive functions support their adjacent urban areas with some services with economic prices, such as car fixing, used spare parts, and different workshops (Amoako and Boamah, 2017; Muthoni, 2021; Gideon, 2021). Also, they host the most unwelcomed activities in other parts of megacities and carrying loads of pollution on behalf of the rest (Oteng-Ababio, 2012; Ferronato and Torretta, 2019; Asibey *et al*., 2019). From here, high priority has been given to slum upgrading projects, especially to meet Sustainable Development Goal 11-Target 1: ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums (UN, 2022).

However, a special concern should be given to their Environmental Impact Assessment "EIA" studies of such projects to achieve sustainability on short-term and long-term (Cronin, 2012; Peter and Riki, 2001; Gilpin, 1995). Although these projects aim to improve quality of urban environment on the long term their construction and implementation phases may carry some negative impacts, especially within the highly vulnerable context of the slum areas.

In Egypt; slums have been mainly a result of rural-urban migration, rapid urban growth and continuing poverty that created a massive demand for building inexpensive housing. Informal settlements bloomed since 1945, although the Egyptian government was concerned about providing public housing at that time (Khalifa, 2015).

Greater Cairo is the biggest megacity in Africa and the Middle East; taking 6th place in the world by a total population of 21.6 million (UN, 2018). It has attracted most of the internal migration, so it has witnessed the most obvious slum phenomenon in the country. The slums constitute approximately 40% of its residential areas, covering a total area of 22,500 acres, and their density is likely to reach 800 persons/acre (GOPP, 2012). Their urban environment suffers from different types of pollutions, deficiency of water and electricity supply, and lack of access to other public services (Ghoneim *et al.*, 2014).

The Egyptian government has established several programs to deal with these problems, however, the most recent one is the "Unplanned Areas Upgrading and Employment-Enhancement" program funded by the EU/SFD/AFD to improve the living and working conditions and increase employment opportunities for residents and business in informal areas (TWC, EQI and I2UD, 2016). The program set three categories/components of upgrading projects reflecting their priorities: Component I supports Public facilities and infrastructure, Component II supports Financial Services, and Component III supports small Business Development Services. This research focuses on the upgrading projects under component I.

Since 2005, the EIA became a mandatory study that requires approval of the Egyptian Environmental Affairs Agency "EEAA" for all project types and sizes, including upgrading projects. The EEAA, classifies projects into four categories according to their environmental impacts; A, B, scoped B and C. (EEAA, 2021). The present work

includes 31 upgrading projects at the investigated four slums in greater Cairo. EIA of each of these projects varied from category A to Scoped B. A comparative study between EIA studies of similar projects in these sites have been done to evaluate their added values.

METHODOLOGY

Tasks and activities that have been conducted and the methodology followed to produce EIA reports could be briefly described in the following stages:

Data Collection

For each of the four unplanned areas, empirical data collection activities started with site visits and survey of specific environmental attributes (e.g. sources of pollution, fauna, flora, sold waste, etc.) to understand the context and explore the current environmental issues. However, interviews with the local communities and stakeholders were carried out to explore the expected socio-cultural impacts and investigate the most suitable and acceptable mitigation measures.

Also, maps, previous studies and environmental records were obtained to conduct the physical and natural studies of the baseline situation.

Description of Baseline Environmental Situation and Conditions

For each of the four unplanned areas, the environmental attributes were analyzed; and accordingly the baseline profile was developed. It includes description of: 1- Natural environment (i.e. topography, soil, climate, ground/surface water, fauna, flora, etc.); 2- Urban environment (i.e. urban form, urban growth, density, land use, pollution sources, air quality, noise, conditions of urban environment and infrastructure); and 3- Socio-economic context (i.e. population size, sectors of economic activities, employment/unemployment rates, etc. (Gilpin, 1995; Gilpin and West, 2000).

Compilation of Relevant Environmental Laws and Regulations

For each type of the proposed projects, relevant laws and regulations were compiled and analysed to identify limits and constraints. Accordingly, a summary of the applicable legal requirements and maximum allowable limits of environmental parameters and variables were prepared (e.g. Egyptian laws for Environment: Law No. 94 for 1994 modified by law 9 for 2009).

Description of Upgrading Project

The 31 projects of this study were classified into seven types according to their nature; Main roads, New Roads and Pedestrian paths, Recreation and Culture Services, Sewage networks, New Markets, Health and Education services and Water networks. Also each type of these projects varied in its EIA category from A to Scoped B according to the Egyptian EIA guidelines (EEAA, 2021; El-Sayed, 2009).

EIA for each project includes description of the project location, analysis of the surrounding activities, analysis of the project's components, main processes, activities, inputs and outputs carried out.

Analysis of project impacts

For each project, the potential environmental impacts were identified for its actions/activities. Characteristics of the proposed projects, environmental features of their locations and surrounding area were highly considered in this step, moreover the economic and socio-cultural characteristics of the local community. The positive and negative impacts of each project were analyised; the assessment included their significance (significant/ moderate/limited), duration (Temporary/ continuous), probability and the affected environmental dimension.

Mitigation plan

The environmental plan for each project includes summary of project

impacts, mitigation plan to reduce or eliminate these impacts, monitoring plan and institutional plan.

Comparative analyses

The comparative analyses were used in three stages of this research, as follows:

- The Baseline Environmental Situation: to extract the common environmental issues in the study areas.
- Impact Prediction and Assessment: a comparative analysis of different project types was carried out to identify the environmental aspects which would be affected in the construction and the operation phases of each project type.
- Mitigation measures that could be followed to mitigate the environmental impacts associated with each project type.

RESULTS AND DISCUSSION

Overview of case studies and upgrading projects:

The four case studies were chosen according to their priority as informal areas for upgrading according to the Egyptian National Programme "Unplanned Areas Upgrading and Employment-Enhancement". They are Izbit Khayrallah, Al Zawya Al-Hamraa, Ard Al-Lewa and Mît Uqba. As it is illustrated in Figure (1) they are located in Greater Cairo Metropolis with high population density. However, the program set three phases of upgrading projects for these areas, this research relied on 31 projects, which determined for phase1 upon Needs Assessment and Activity Design Study by TWC, EQI and I2UD (2016).

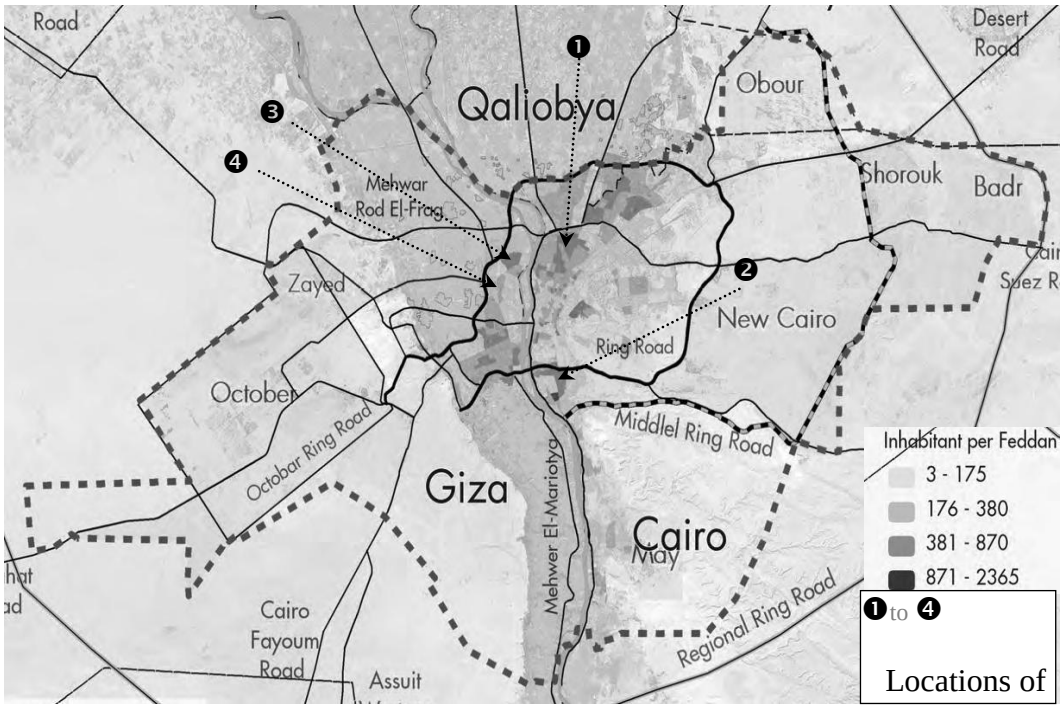


Fig. 1. Locations of the four study areas within Greater Cairo, Metropolis. (Source: Author based on GOPP, 2012).

Common Environmental Issues

The pilot survey showed that study areas are suffering from the deterioration of urban environmental quality, as there are sharing the same contemporary and historical pressures and drivers of negative changes.

Table (2). Summary of the main environmental problems in the investigated 4 slum areas in Great Cairo.

Main Environmental Problems
Deterioration of **narrow streets** that can't allow natural air circulation or natural sunlight Absence of an efficient **solid waste** collection system led to scattered piles of solid waste in roads and streets. Air pollution from accumulation of **solid waste**,
Noise pollution as a result of uncontrolled **industrial activities**
Visual pollution from several sources: accumulation of **solid waste**, uncontrolled industrial activities, and deterioration of infrastructure
Absence of **green areas** Misuse of **public spaces**
Heat islands: The high density of buildings and land coverage increasing effects of urban during summer
Natural hazards: Rocky Terrain Topography subject to land sliding hazards in Khairallah Unsafe building materials and facilities
Deterioration of **Sewerage** infrastructure and **sewerage** overflows
Deterioration of **potable water** As a result of contamination
Destroying **cultural and historical values**
Inadequate & deteriorated public services (e.g. **health, education, ...**)

Table 3. Environmental and social problems in the investigated 4 slum areas in great Cairo.

Environmental & Social problems	Slum Area			
	Al Zawya	Khirallah	Mit Oqba	Ard ellewa
1- Streets: A- Main roads	+++	+++	+++	_
B- New Roads & Pedestrian paths	+++	++	-	-
2- Sewage networks	-	-	+	+++
3- Water networks	+	-	+++	++
4- Health & Education services	+++	++	-	-
5- Recreation & Culture services	-	+	+	-
6- New Markets	+++	-	-	-

+++ Highly important ++ Moderately important + Important - Not important

Table 4. Nature, EIA category and No. of projects in each slum area in Great Cairo.

Type of project	Nature	EIA Category	No. of projects in each slum Area				Total
			Al Zawya	Khirallah	Mit Oqba	Ard ellewa	
1. Streets: A- Main roads	Upgrading	Scoped B	2	2	2	-	6
B- New Roads & Pedestrian paths	New	Scoped B	2	1	-	-	3
2. Sewage networks	Upgrading	Scoped B	-	-	2	7	9
3. Water networks	Upgrading	A	1	-	3	2	6
4. Health & Education services	Upgrading	A	2	1	-	-	3
5. Recreation & Culture services	New	Scoped B	-	1	1	-	2
6. New Markets	New	B	2	-	-	-	2
Total			9	5	8	9	31


Rocky edges subject to land sliding hazards - Khairallah

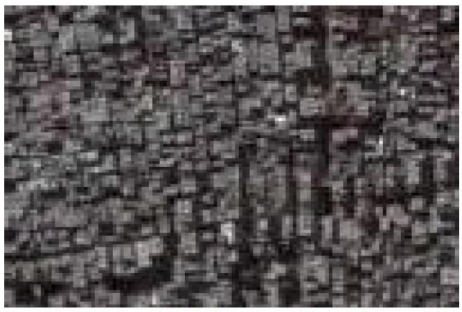

Unsafe building materials and misuse of public space –Mit Oqpa


Visual, Air, and soil pollutions due to deteriorated sewage network -Met Oqba


Deterioration of sewage network, unsafe electricity connections, & unhealthy streets – Alzawya& Mit Oqpa


Misuse, pollution, unhealthy streets- Ard Ellewa


Huge sold waste problem - Ard Ellewa


Lack of green, high density of building - Alzawya


Unhealthy too narrow streets that lack of natural light and air circulation, moreover accumulation of solid waste. Picture from Alzawya, however, this is Commonly found in the four study areas.


Destroying the cultural and historical values- Khairallah


The noisy environment due to uncontrolled industrial activities and workshops – Mit Oqba

Also, it is commonly found in the four study areas.

Source: Author (field visit as a part of baseline situation for the EIA studies in Sept 2019)

Fig.2: Examples of the environmental issues in study areas recorded by the pilot survey

Summary of Impact Assessment

Tables (5 & 6) show a summary of the predicted impacts according to project types and phases. For all projects, the construction phase shows a high concentration of almost all of the predicted negative impacts. However, most of these impacts are moderate to limited. Only the "establishment of a new road" project in Khairallah case" includes a significant impact on air quality due to the difficult topography and rocky soil of this area, which require huge amounts of cutting and filling. All impacts of this phase are reversible, direct, and timely limited to their associated actions during construction. Air quality, visual image and sound environment are the most environmental dimensions that could be affected during construction. The cultural dimension is not expected to be affected during construction because of the time limits of this phase, while baseline conditions of flora in all of the study areas already lack green areas and trees. Replacing sewage networks and establishing the most projects impacting different environmental dimensions during construction. However, almost all the predicted impacts during the operation phase are positive, contentious, and their effects extend to enhance the environmental characteristics of the wider area. This supports achieving objectives of upgrading projects, especially enhancing the urban environment and reducing pollution. Few negative impacts were predicted during the operation phase that represents the normal unavoidable impacts of some activities/functions of this projects, such as the noise produced by open market places or new road due to vehicle movement. However, the operational stage has positive impacts for all environmental aspects and socio-cultural dimensions, with moderate to significant effects for the visual image, urban quality, accessibility, and air quality. Establishing new Cultural and Recreation facilities, including the creation of green open spaces and children playgrounds have the most significant positive impacts on most environmental and socio-cultural dimensions.

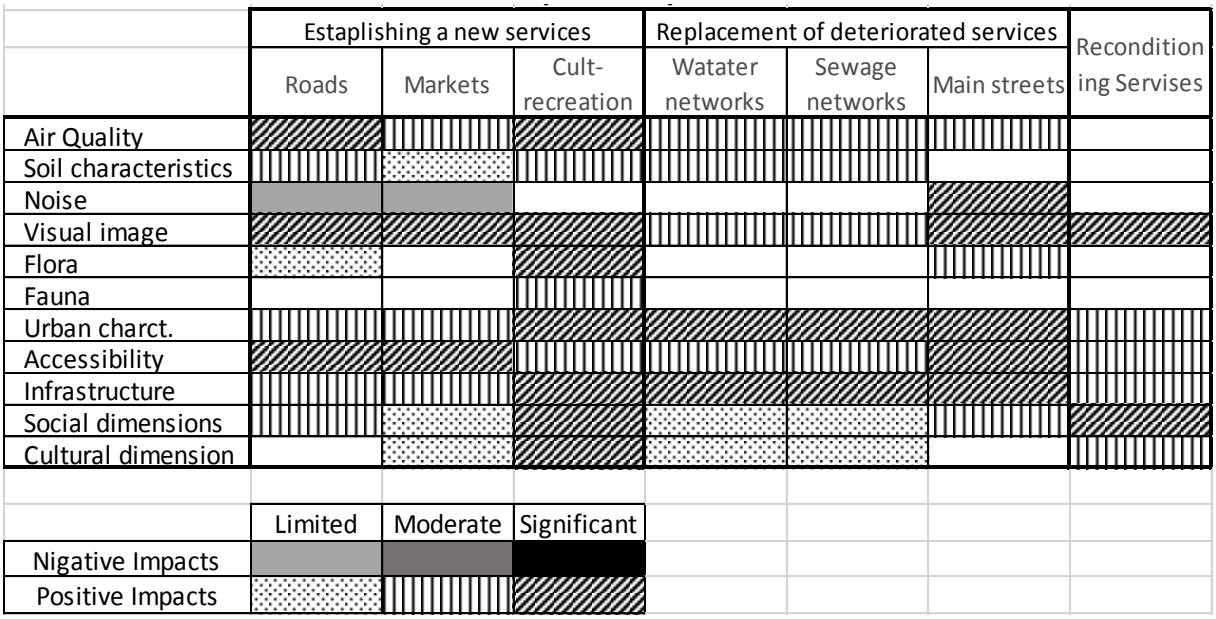
Table 5: Summary of the identified Impacts for Construction Phase in each project type.

	Estaplishing a new services			Replacement of deteriorated services			Recondition ing Servises
	Roads	Markets	Cult-recreation	Watater networks	Sewage networks	Main streets	
Air Quality							
Soil characteristics							
Noise							
Visual image							
Flora							
Fauna							
Urban charct.							
Accessibility							
Infrastructure							
Social dimensions							
Cultural dimension							

	Limited	Moderate	Significant
Nigative Impacts			
Positive Impacts			

Source: Author

Table 6: Summary of the Identified Impacts for Operation Phase in each project type.



Source: Author

Summary of Main Impacts Mitigation Measures

For each project type; a comparative analysis of the identified negative environmental impacts during construction, their associated actions, and suggested mitigation measures was carried out to extract the common impacts and the most suitable measures. However, in-site interviews with users/local community were conducted to explore levels of social acceptance of the suggested mitigation measures. Tables (7 & 8) summarize the impacts and mitigation measures for construction and operation phases of each project.

Table 7: Main Impacts Mitigation Measures of Construction Phase

Environmental impacts	Mitigation measures
1- Construction of New Roads:	
Dust &fugitive emissions during site clearance Digging, Cutting & Filling	Reusing most of the rubble in filling processes in-sit Sprinkling of water should be carried out on regular basis
Chemical emissions during Paving process	Limiting the work times and space /areas.
Noise & air pollution during material & equipment transportation to the site	Covering of the trucks/dumpers to avoid spillage of material . Speed control on vehicles used during transportation of material
Inconvenience due to noise pollution during construction phase especially while cutting, Filling actions	Working time of these activities should be restricted to working hours of 08:00hrs and 17:00hrs on weekdays, prohibited on Fridays and Public Holidays
Delay of trips due to heavy traffic due to movement of heavy transportation of materials & equipment to/from the site.	Avoiding peak hours Recusing the transpiration movement from site by reusing materials in site
Inconvenience due to cuts of service during installing pipes lines of water, sewage, elect…	Adjacent residents must be notified enough time before the start of the related activities

Probability of health infections due to spread of dust & air pollution during construction phase especially while cutting, filling actions	Adjacent residents must be notified enough time before starting work All employees should be given adequate Personal Protective Equipment
Upgrading main streets	
Chemical air pollution and asphalt emissions resulted during pavement process	Prevent pedestrian movement during this stage Using water based asphalt, organic and recyclable materials Enforce site workers to follow the industrial safety directions
Visual pollution of solid wastes resulted from removing the old asphalt layer	Removing the wastes outside the location on a regular base.
Noise resulted from the used machines during	Limiting the constricting activities to certain hours during day time
Dust resulted from cutting and filling action would affect the air quality	Sprinkling of water should be carried out on regular basis
Difficult/limited accessibility due to accumulation of materials and machines on the main road and sidewalks	Removing the wastes outside the location on a regular base. Keeping a lane free or suitable path for pedestrian
Unexpected cuts of water or electricity supply due to work accidents	Coordination with electricity and water supply technical support
Delays of trips on this road and other parts of network linked to it	Avoid working during peak hours Using signs to alter the vehicle movement to alternative paths
3- Construction of sewage & water networks	
Soil contamination & air pollution due to the water leaks from the old network in trenches during the digging and installation steps.	Taking leaking water off site
Water leaks from the old network in trenches during the digging and installation steps.	Taking leaking water off site
Difficult accessibility between the two sides of the working line & probability of walking accidents.	Conducting all work during daylight Covering tranches with stable wood overnight in case of unfinished parts. Use safety tools to avoid accidents Limit the length of working distances to 10 m or less
Foundations of the adjacent buildings could be affected by deep digging/ excavation	Support excavation sides with walls of wood or bars
Visual pollution of solid wastes resulted from excavation	Removing the wastes outside the location on a regular base.
Odd smiles resulting from uncovering old deteriorated sewage network	Coordinate the work to the minimum acceptable lengths Covering tranches with stable wood during night in case of unfinished parts

4- Construction of Open Markets	
Sprinkling of water should be carried out on regular basis	Air pollution and dust emissions during site clearing, digging, filling & leveling procedures
Maintaining barrier fences around the site	Visual pollution due to accumulation of materials, machines in the site
Working during the day time and avoid holidays Providing silencers or enclosures for noise generating machines such DG sets, compressors	Noise during most of the construction phase
Giving priority to effected employment and shop owners in the new market with affordable new places Providing financial support during to them until restarting commercial activities after construction	Temporary loss of shop places and decrease income of the existing ad-hoc commercial activities in the project site during construction.
5-Construction of culture and recreation services	
Dust emissions during and air pollution site clearing, digging, filling & leveling procedure	Sprinkling of water should be carried out on regular basis Moving unneeded soil resulted from cuts directly outside residential areas
Visual pollution due to accumulation of materials, machines in the site	Maintaining barrier fences around the site
Noise during most of the construction phase	Working only during the day time and avoid holidays Providing silencers or enclosures for noise generating machines such DG sets, compressors
Difficult traffic near by the project site which affects time of trips and accessibility during construction	Avoid working during peak hours Using signs to alter the vehicle movement to alternative paths
6-Construction of health & education facilities	
Noise resulted from machines and tools used in site	Limiting the affecting activities to few hours during the day.
Stopping the service during construction	For the schools (education facilities): it is highly recommended to finish all activities of construction phase during summer holidays. For local health centers (health facilities): it is recommended to work in part of the building/ space and continuity of service in the others.
Limited effects of air quality in site due to the building and painting materials during work	Avoid the affecting activities during the working hours of this facility.
Primarily of site accidents in case of working in part of the building/ space and continuity of service in the others.	Isolate the working place from public. Avoid the affecting activities during the working hours of this facility. Finishing all activities of construction phase in schools during summer holidays.

Source: Author

Table 8: Main Impacts Mitigation Measures of operation Phase

Environmental impacts	Mitigation measures
1-Opertion of New Roads:	
Noise pollution	Limit the allowed time for tracks
Dust pollution	Using trees along both sides of the new roads
Air pollution	Using trees along both sides of the new roads Limit the allowed time for tracks
2-Operation of Upgraded main streets	
Noise pollution	Restrict tracks from passing through the local streets.
Dust pollution	Using trees and plantations Maintain nice pedestrians walk in one or two sides of the streets using interlock for the sidewalk.
Air pollution	Using trees and plantations
3- Operation of sewage & water networks	
Leakage of sewage	Regular maintenance of the sewage network
Leakage of water in networks	Regular maintenance of the water network
4- Operation of Open Markets	
Noise pollution	Controlling all activities inside the market area that produce noise Limit the time of moving mass products to the market place to the minimum. Limit the operational hours of the market during daytime.
Dust pollution	Using trees, plantation, and possibly water items to avoid dust pollution. Spray water on market floor
Air pollution	Using trees and plantation
Solid waste production	Daily check and maintain the market's solid waste management system Monitoring and imposing fines on polluters
Liquid production	Daily check and maintain the market's sewage network system
5-Operation of culture and recreation services	
Solid waste production	Solid waste management system should be included, which ensures daily monitoring and imposing fines on polluters are recommended.
Liquid waste production	Daily check and maintain water cycles and sewage system Monitoring and imposing fines on polluters
6-Operation of health & education facilities	
Solid waste production	Solid waste management system should be included.
Liquid waste production	Regular maintenance of the sewage network of these facilities.

Source: Author

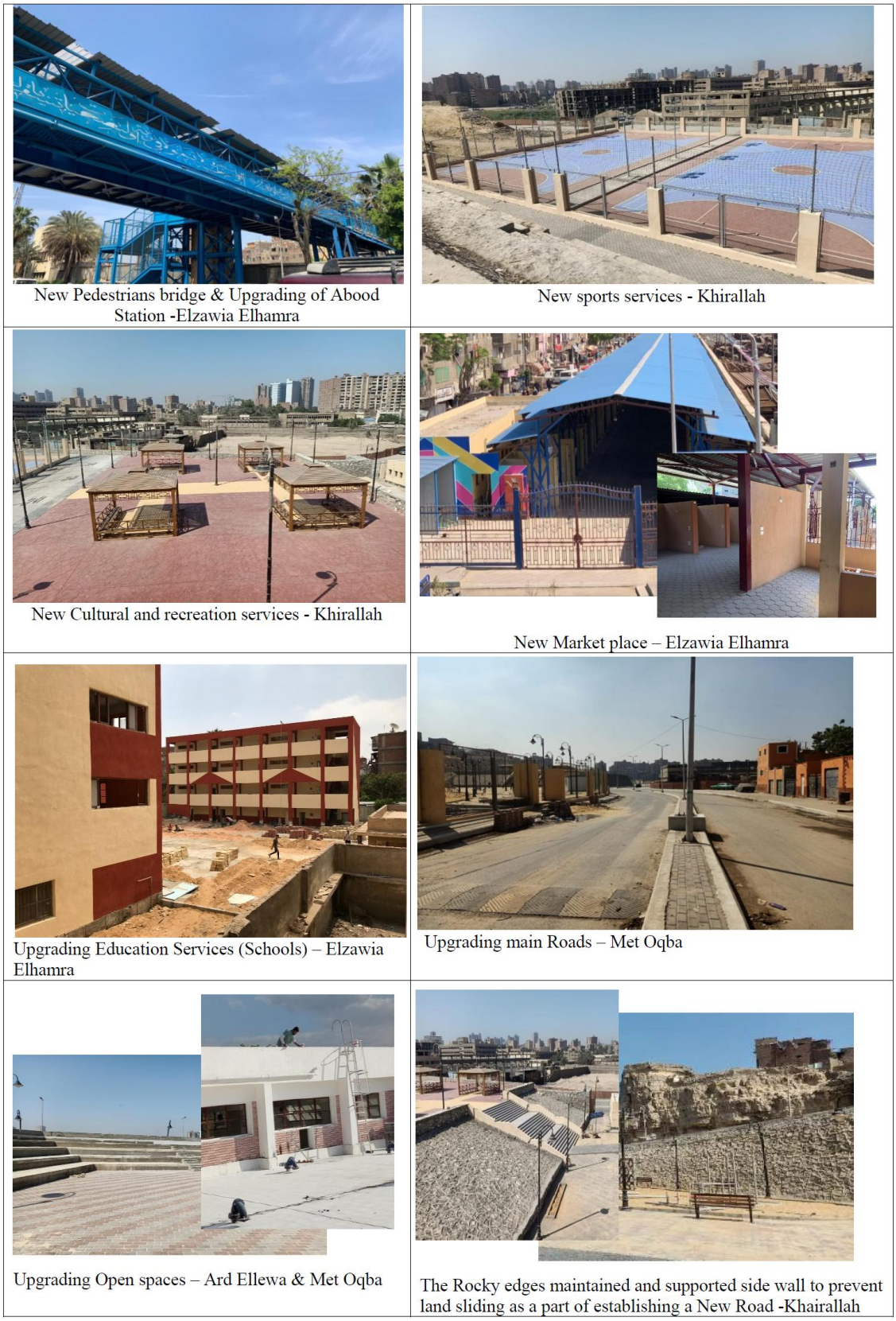


Fig.3: Some pictures of the current status of the projects- almost ready for opening
Source: Author (recent field visit in June 2022)

Challenges

- **Social resistance:** due to the problematic local context of slum areas within metropolis, which makes them highly attractive to hidden illegal activities, including drug commerce. Socio-economic problems including poverty and employment, illiteracy and lack of awareness have attracted this kind of activities. This could be considered the main challenge facing research activities, EIA fieldwork, and some of the stages of the upgrading process.
- **Unsafe nature:** the situation is even worse in some slum areas are, especially those facing natural hazards including seasonal floods or land sliding. One of the case studies (i.e. Khairallah) is located just adjacent to an unstable edge of Moqattam Mountain, which caused massive land sliding accidents and a huge number of deaths during the last decade, and still at risk.
- **Unclear classification of some projects:** the EEAA classified EIA projects into 3 categories according to the level of expected impacts. However, the description of each category is clear, the guide lists of projects for each of the A & B categories are incomplete. So, some difficulty was met to determine the category of some projects and took time to get a response from the EEAA. It is recommended to update the EIA guiding lists of projects upon the feedback of practical applications.
- **Combining or separating similar projects in the same areas:** There was an issue of combining the same type of projects located in the same study area into one EIA study or not. It could be recommended to do that to save time in both procedures; conducting the EIA study/studies and finishing the formal EIA revision procedure at the EEAA.

Conclusion and recommendations:

This research paper presented a blueprint for EIA of slum upgrading projects within 4 areas in Egypt metropolises, especially those related to infrastructure and facilities/services. This is very important to ensure the sustainability of upgrading projects and their function in the long term. However, the mentioned projects aim to improve the quality of the urban environment and enhance socio-economic contexts of slums; this research identified several negative environmental impacts for each project type during their construction phase. Also, it suggested suitable and socially acceptable mitigation measures for the identified impacts and their associated actions. The research followed a multi-case study methodology, applied comparative analyses, and relied mainly on empirical data collected from field visits and interviews with local people during construction. While going through the EIA procedure, the research identified the common environmental issues, the challenges, and the learned lessons, to ensure environmental and possibly socio-cultural sustainability of slum upgrading projects within metropolises.

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EIA of new and upgrading projects in four slums within Greater Cairo to support public services and infrastructures

تقييم الاثر البيئي لمشروعات الارتقاء العمراني بأربعة مناطق غير مخططة في نطاق القاهرة الكبرى لدعم الخدمات العامة و البنية التحتية

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المستخلص

لا تزال المناطق الغير مخططة أو العشوائيات بين التحديات الرئيسية التي تواجه المدن و خاصة المدن الكبرى. بينما تتعرض هذه المناطق بضراوة للتحديات المعاصرة على المستويين المحلي و العالمي و تتأثر بها بشكل أكبر نظرا لهشاشة تكوينها. مما يعطي أولوية عالية لمشروعات الارتقاء العمراني فيها. و مع ذلك يجب إيلاء إهتمام خاص لتقدير الاثار البيئية و الاجتماعية لمثل هذه المشروعات، لتحقيق الاستدامة على المديين القصر والطويل. ومن هنا تستهدف هذه الورقة البحثية تحديد القضايا البيئية و الاجتماعية المرتبطة بهذه المناطق و كذلك التأثيرات البيئية المشتركة لمشروعات الارتقاء العمراني بها، و ذلك من خلال أربع حالات دراسية تقع في نطاق القاهرة الكبرى و هي: عزبة خيرالله، الزاوية الحمرا، أرض اللوا، و ميت عقبة. حيث تم إقتراح مجموعة مشروعات إرتقاء عمراني بالخدمات والبنية التحتية بها بإجمالي 31 مشروع. ومن ثم تم إعداد دراسات تقييم التثر البيئي لها و قد شاركت الباحثة كخبير و رئيس فريق عمل تقييم الاثر البيئي لهذه المشروعات. و قد إعتمدت هذه الورقة البحثية على البيانات هذه الدراسات كمدخلات للبحث و الذي إعتمد بشكل أساسي على التحليل المقارن بشكل أفقي بين حالات الدراسة من الحيث الخصائص والقضايا من جهة. ومن جهة أخرى التحليل المقارن بشكل رأسي بين التأثيرات البيئية للنوعيات المختلفة من مشروعات الارتقاء العمراني المقترحة. و بالتوازي مع ذلك تم إجراء زيارات ميدانية و مقابلات مع اصحاب المصلحة والسكان المحليين خلال مرحلة التشييد لهذه المشروعات للتحقق من قبول تدابير التخفيف المقترحة والتي تم إعتمادها. ومن ثم يستخلص البحث الارشادات و الدروس المستفادة لتعزيز إجراءات عملية تقييم الاثر البيئي بالكامل في سياق مشابة لتعظيم القيمة المضافة لهذه المشروعات وتحقيق الاستدامة.

الكلمات المفتاحية: التقييم البيئي، الإرتقاء العمراني، جودة البيئة الحضرية، إجراءات التخفيف