Environmental Adaption and Mitigation Strategies for Upgrading Industrial slums area.

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Abstract

The National Slum Upgrading Strategy is planned as an immediate reaction to Target eleven of MDG 7 which perceives that ghettos are an advancement issue, which necessities to be confronted and this calls for facilitated strategies and activities connected with ghetto updating. To begin with, the development of ghettos should be dialed back and in the end halted through legitimate and land market changes (to some extent to give security of residency) and patching up arranging and drafting guidelines and construction laws to make lodging more reasonable. Second, there is need to embrace preventive techniques which are tied in with dealing with the flood of urbanization and thwarting the difficulties of the severe metropolitan neediness embodied in ghettos. This paper focuses on urban and environmental problems and follows the following methodology on identifying and defining slum areas in industrial areas and identifying aspects and social, environmental, urban, and economic problems in informal industrial areas with the aim of developing adaptation and mitigation mechanisms to improve the environment in areas adjacent to industrial areas (Shubra Case Study - Mustorod District)

Keywords: Adaptation, mitigation mechanisms, environmental upgrading, industrial areas,GIS (geographical information system),

1. INTRODUCTION

The problem of environmental degradation of slums has become one of the most important threats facing the cities of Greater Cairo; the problem of environmental degradation of slums has become one of the most important threats facing the cities of Greater Cairo, However, the danger lies not only in the seriousness and deterioration of urban areas, but also in the environmental risk, which in turn leads to a danger to the health of the population in these areas , Hence, the definition of slums is not only the areas that suffer from urban degradation but also the areas of environmental degradation resulting from the pressures of human activities on the environment, which adversely affect the deterioration of environmental health in those areas (seham, mohammed, & nada, 2022). Several previous studies have proposed frameworks and ideas to develop urban slums without realizing the environmental issues and their effects that

cause environmental degradation, which affects the population of these areas, especially the deterioration of environmental health resulting from activities in these areas , Industrial activity is the most important urban activity affecting the environment, and there are 10 industrial zones in Greater Cairo which lead to many environmental problems and the deterioration of public health , The studies indicated that Greater Cairo is at the top of the list of pollution in the issuance of air pollutants, the concentration of 284 micrograms / cubic meter of particles 10 micron diameter, equivalent to 14.2 times the World Health Organization according to the safe limit, which causes this environmental deterioration to many health risks, Respiratory diseases of the population in those areas. (David, 2008) One of the most important affected areas in Greater Cairo is the Shubra area, which is one of the most important industrial areas in Greater Cairo, which contains the oil refineries, which is the largest refinery in the Middle East, but also one of the most slum areas in Greater Cairo and one of the main causes of pollution In addition to the occurrence of many diseases and the increase in the number of people with respiratory diseases, where respiratory diseases accounted for 23% of the total population of the region, followed by some diseases attributed to As a result of this environmental degradation.)National Academies of Sciences,) (The researcher based on the data of the GOPP) .(2020 International Journal of Environmental Health Engineering(

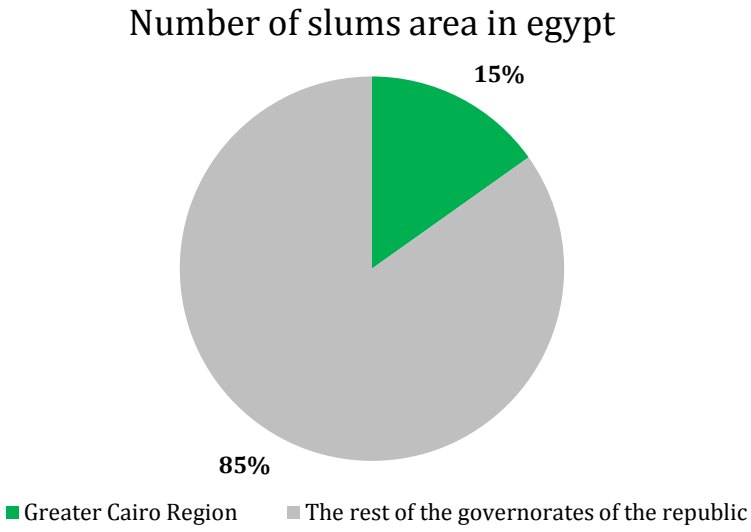


Figure 1 : Number of slums areas in Egypt
(The researcher based on the data of the GOPP)

The percentage of industrial areas in the Greater Cairo Region is the highest, so we go to rely on an area in Shubra, because it is the highest percentage in the industrial areas The study will be applied to it, as the percentage of slum areas in Shubra is about 44% of the total slum areas in the Greater Cairo Region. As shown in the following figure 1.

This paper focuses on urban and environmental problems and follows the following methodology on identifying and defining slum areas in industrial areas and identifying aspects and social, environmental, urban, and economic problems in informal industrial areas with the aim of developing adaptation and mitigation mechanisms to improve the environment in areas adjacent to industrial areas (Shubra Case Study - Mustorod District) (Mokhtar, Soheir, Nagwa, Fatima, Heba, & Abdel Fatah, 2015)

2. The aim of the research:

The aim is to the identification of adaptation and mitigation mechanisms to reduce the effects of the industrial zone in the most environmentally hazardous areas on the population to achieve the Environmental improvement of these areas by applying to the area of the Shubra by using the entrances of urban environmental assessment to the urban environment, which aims to encourage the application of more integrated assessment methods to guide the decision-making process and improve the environmental environment to improve the environmental health of these slums through a Series of basic stages: (of environmental assessment of industries in the region of Shubra - Studies of the current environmental Situation - Social and economic studies - The stages of the adoption of pollutants using mathematical models and

specialized Programs for urination - Measurement of the health effects of pollutants - Access to strategies and mechanisms for mitigation and adaptation to reduce the effects of industries in the area of Shubra and improve environmental health.

3. lecturer Review:

In this stage the paper will explain the issues which effect on sustainability in this area Determining and defining the slums in the industrial zones and defining the social, environmental, urban and economic aspects and problems in the slums in order to put in place adaptation and mitigation mechanisms in order to improve the environment in the areas adjacent to the industrial zones. Data from the Ministry of Housing in Egypt indicate that the number of "informal settlements" is about 15 million citizens, distributed over 497 residential areas throughout the republic, but a large percentage of them are scattered around "Greater Cairo", which includes the governorates in. (seham, mohammed, & nada, 2022) The summit of the Nile River Delta Triangle. These are Cairo, Giza and Qalyoub (Action area -Shubra), of which about 20% are in Cairo governorate, 13% in Giza governorate, and 8% in Qalyoub (Action area -Shubra) governorate. Slum areas and random markets, According to the Central Agency for Mobilization and Statistics, 12 million Egyptians live in graves, nests, garages, mosques, and under the stairs, according to a recent report. In Cairo's Al-Basateen, Al Tunisi, Imam Al-Shafi'i, Bab Al-Wazir, Al-Ghafir, Al-Mujawireen, Imam Al-Laithi, and Ain Shams cemeteries, 1.5 million Egyptians are lived . As shown in the following maps figure2) (The researcher based on the data of the GOPP) .(2020 International Journal of Environmental Health Engineering(

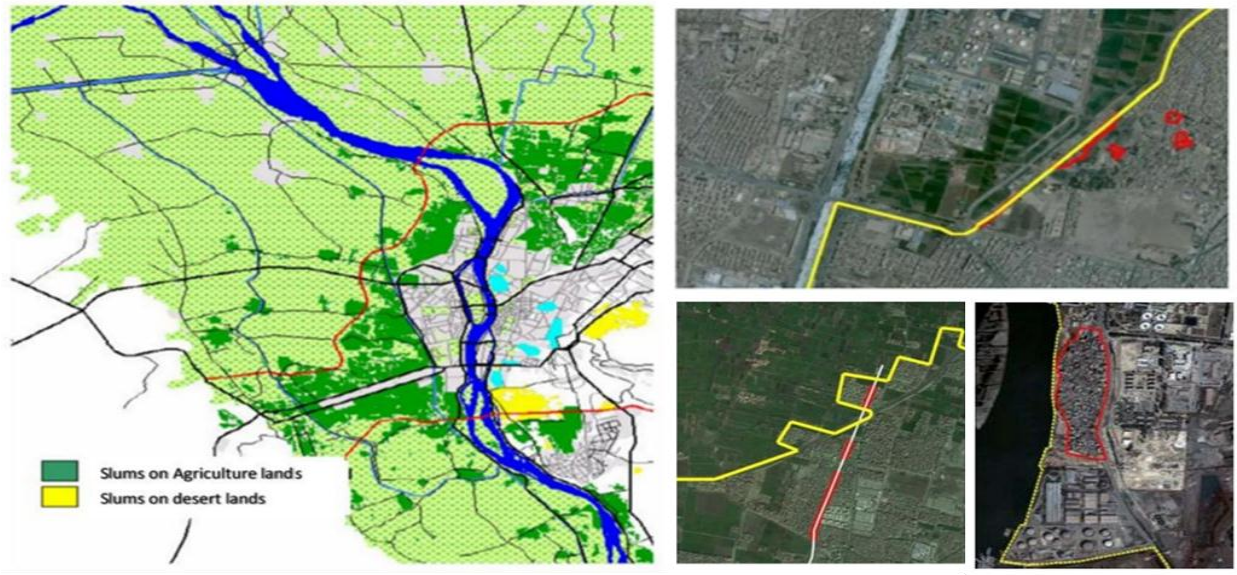


Figure 2. Map Distribution of informal areas in the Greater Cairo region, Egypt
(The researcher based on the data of the GOPP)

3.1. The most important issues of slums in Greater Cairo.

Although slum areas differ in terms of location, area, size of population and level of services, they share common problems with basic problems that can be summarized as follows: a lack of organisational planning, basic facilities and services, a low standard of living, the rise of poverty and illiteracy, as well as a decrease in values and traditions where they prevail. Sick and dangerous social behaviors that threaten the family's and society's stability, the most important of which are: lack of respect for the privacy of neighbors and the violation of their privacy, the spread of theft, bullying and mutual violence, the Increase in crime rates in general, drug trafficking, child labor, (Mokhtar, Soheir, Nagwa, Fatima, Heba, & Abdel Fatah, 2015) this is in addition to the lack of privacy, and the low level of cultural and educational awareness. In addition to the deterioration of the environmental conditions, where the house is considered unhealthy when there are no health conditions suitable for those who live in it in terms of: space, number of individuals in one room ventilation, lighting, cleanliness, lack of facilities, water, and waste placed on these nests to protect them from rain This creates a suitable environment for the spread of diseases, and all kinds of audio, visual and air pollution. (Rawan, Tarek, & Seham, 2021) These health problems are also reflected in the vicinity of these informal areas as they receive part of the human and animal wastes, and household wastes due to the lack of a garbage collection system. Slumps also constitute a load on the infrastructure and public facilities networks of the state, and this leads to the failure of these

facilities to do what is required of them well and to their inability to fulfill their obligations, which leads to the need to carry out a process of continuous replacement and renewal of these networks, which costs large sums of money that fall on the state (Mohammed, Farzad, & Majid, 2020). As for Sanitation, it is considered one of the most inferior services in those areas and badly affects public health as these areas depend on the so-called trenches or ground tanks in the sewage, and these tanks are made of red bricks without a lining, which leads to the Leakage of wastes into the soil and in some often wastewater is mixed with drinking water. As for electricity, the widespread method is the theft of electricity from public sources, and there is a percentage of the residents of those areas who use kerosene to light their homes (0222, pasture).)National Academies of Sciences,) (The researcher based on the data of the GOPP) .(2020 International Journal of Environmental Health Engineering (

1- Urban problems in Slum areas

- Lack of space surfaces that can be used as an outlet for air to reduce the impact of pollution The severe overcrowding of these gatherings and workshops and the resulting waste. The interference of some uses with residential areas, such as the overlap of commercial and industrial activities Craftsmanship with accommodation. High population density with a lack of existing services. (World, 2006) The lack of urban planning for the area with the high building density of the area and the poor condition of the building .The weakness of the infrastructure networks and the poor condition of the drainage networks in homes and roads Weakness of street lighting networks. Poor road conditions. (Adel, 2008)(The researcher based on the data of the GOPP)

2-Environmental issues in Slum areas

- Due to a lack of health awareness, the large number of diseases resulting from the high quality of professional activities such as workshops and foundries Lead, doc, plumbing, marble, plastic material manufacturing, tanneries, and slaughterhouses ... And others, which are activities that result in severe air pollution with smoke, fumes, gases, many highly toxic chemicals and some heavy metals Such as lead and cadmium, in addition to the noise that results from these activities (WHO, 2016). In these gatherings, sound environmental conditions are not observed, and the population is overcrowded and unavailable It has clean drinking water, sanitation services and roads, and piles of garbage that are often burned, and solid waste, and it lacks services such as education, health and playgrounds (Hussein, 2015))National Academies of Sciences,) (The researcher based on the data of the GOPP)

3- Economic and social problems

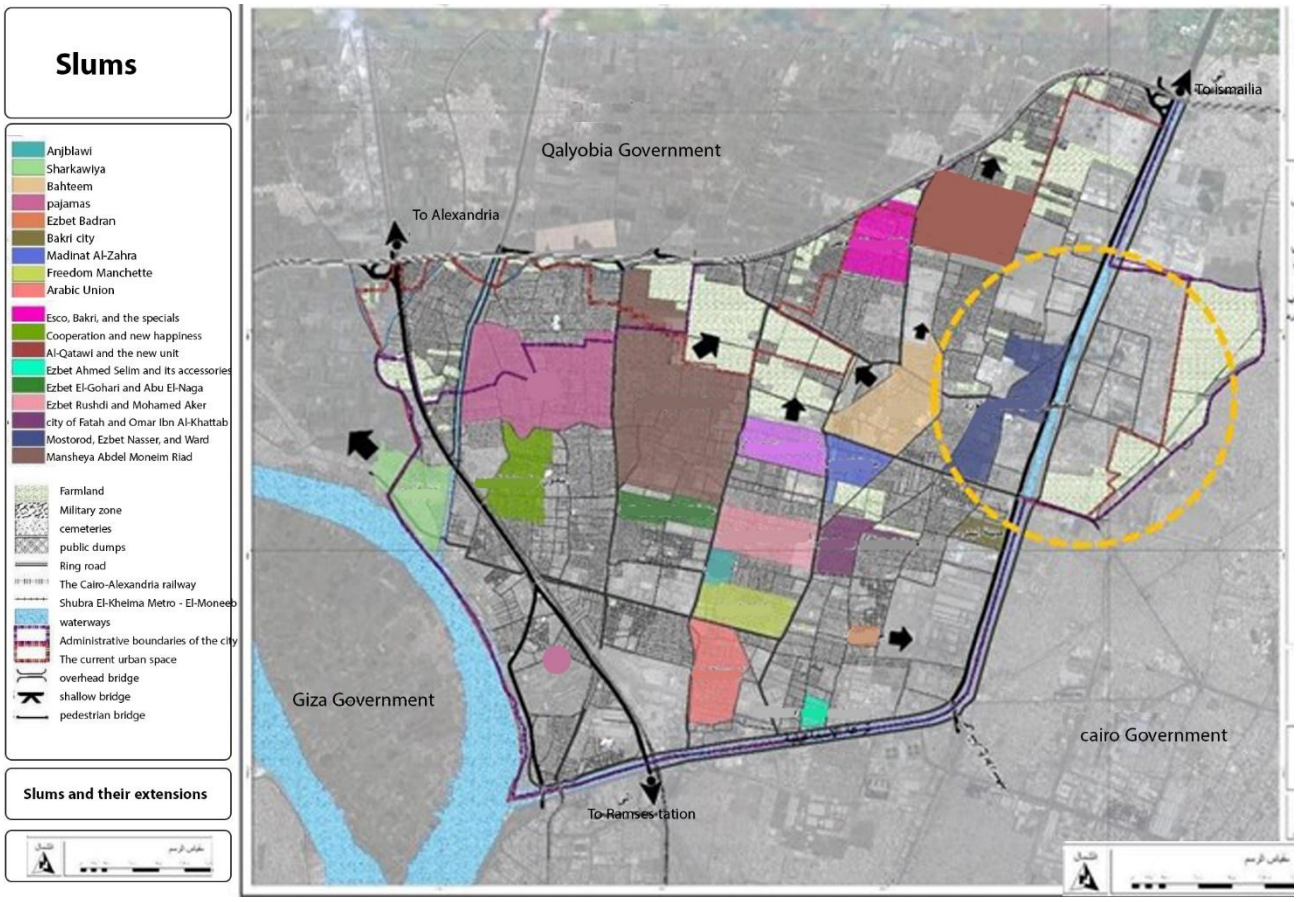
-Increase the percentage of family disintegration. The high rate of illiteracy in the region. The high crime rates. The economic level of the inhabitants of these areas decreased, so they tended to build nests. Increase the dropout rate. An increase in the unemployment rate (Brunner, 2012). Lack of interest in moving towards collective education Increase the divorce rate. Lack of interest in female education. The trend, handicrafts, to increase earning money while not paying attention to the health and environmental impacts Resulting from it (SINGH, 2016) (The researcher based on the data of the GOPP)

4. Methods and materials.

In light of the increasing urban expansion and through the analysis of the urban study of the Shubra region, the study area has become dense urban, and slums occupy more than 70% of the residential areas as they spread over areas ranging from 11 acres to 400 acres with a total of 1,810 acres, representing more than 24.9% and The total area of the district is 7,257.43 acres, and the total population is 784,273 acres, representing 63.3% of the total. (Rawan, Tarek, & Seham, 2021) . The population of the study area was estimated at 1239,260 people distributed over the entire city. By studying the city of Shubra El-Kheima 19 unplanned areas in the city, divided into 5 areas in the western neighborhoods, with an area of approximately 884 acres. The population of these areas is about 352,270 people, and they are Manshiyat Abdel Moneim Riad, Ezbet El Gohary, Abu El Naga, Bejam, Al Taawun,Al Saada Al Jadida and Al Sharkaw. (0222, Al-Amrani) .(2020 International Journal of Environmental Health Engineering(

Shubra El-Kheima is one of the important industrial cities that is famous for its petroleum products industries, an industrial area in Shubra, spinning and weaving, and Eid among other industries. The area of industrial uses in the city reached 1092.95 acres, Shubra, spinning and weaving, and Eid among other industries. The area of industrial uses in the city reached 1092.95 acres, glass industries are spread in the rest of the city. (Guttikunda, Nishadh, & Jawahar, 2019) The map presents the following table: classification and analysis of industries in glass industries are spread in the rest of the city. The map presents the following table: classification and analysis of industries in the city and their environmental impacts using GIS (seham, mohammed, & nada, 2022).

As for the other unsafe areas in the eastern neighborhoods, there are 14 areas with a total of 926 acres and a population of about 43,003 people, including the Shubra area, which has an area of 123.16 acres with a total population of 77,283 people. The total number of units is 16,101 units. Residential buildings dominate the exploitation of the craft and commercial ground floor and the residential upper floors. Urbanization in this area is dominated by poor and deteriorating buildings. (0222, Al-Armani))National Academies of Sciences,) (The researcher based on the data of the GOPP) .(2020 International Journal of Environmental Health Engineering(



Air pollution in the city of Shubra El-Kheima, specifically in Shubra , is due to the huge growth in the mining and manufacturing industries, and the attendant increase in the amount of industrial waste and fumes from factories. A high air quality index was observed in the most of the year ,As a result, the air quality in the region deteriorated, having a negative impact on residents' health and making it more difficult to breathe deeply and strongly. When taking a deep breath, it produces shortness of breath and pain. (Environment, 0222)

-Coughing and ulceration are common side effects.

-Inflammation and damage to the respiratory airways

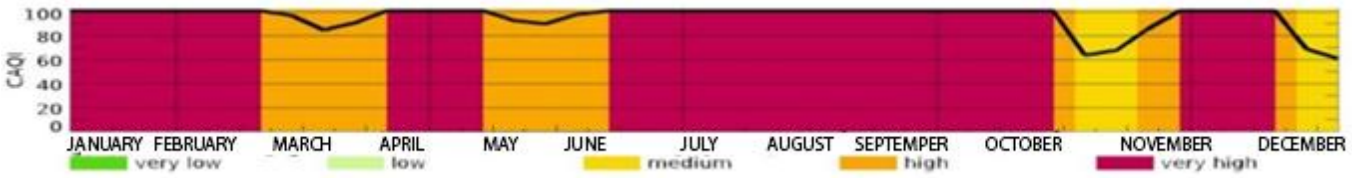
-Increased frequency of asthma attacks -Make the lungs more prone to infection

-Continue to damage the lungs even when symptoms are gone

-Increased frequency of asthma attacks -Make the lungs more prone to infection -Continue to damage the lungs even when symptoms are gone -

-Chronic Obstructive Pulmonary Disease (COPD) is caused by a variety of factors

As shown in the following figures 4,5,6,7,8 (World, 2006)



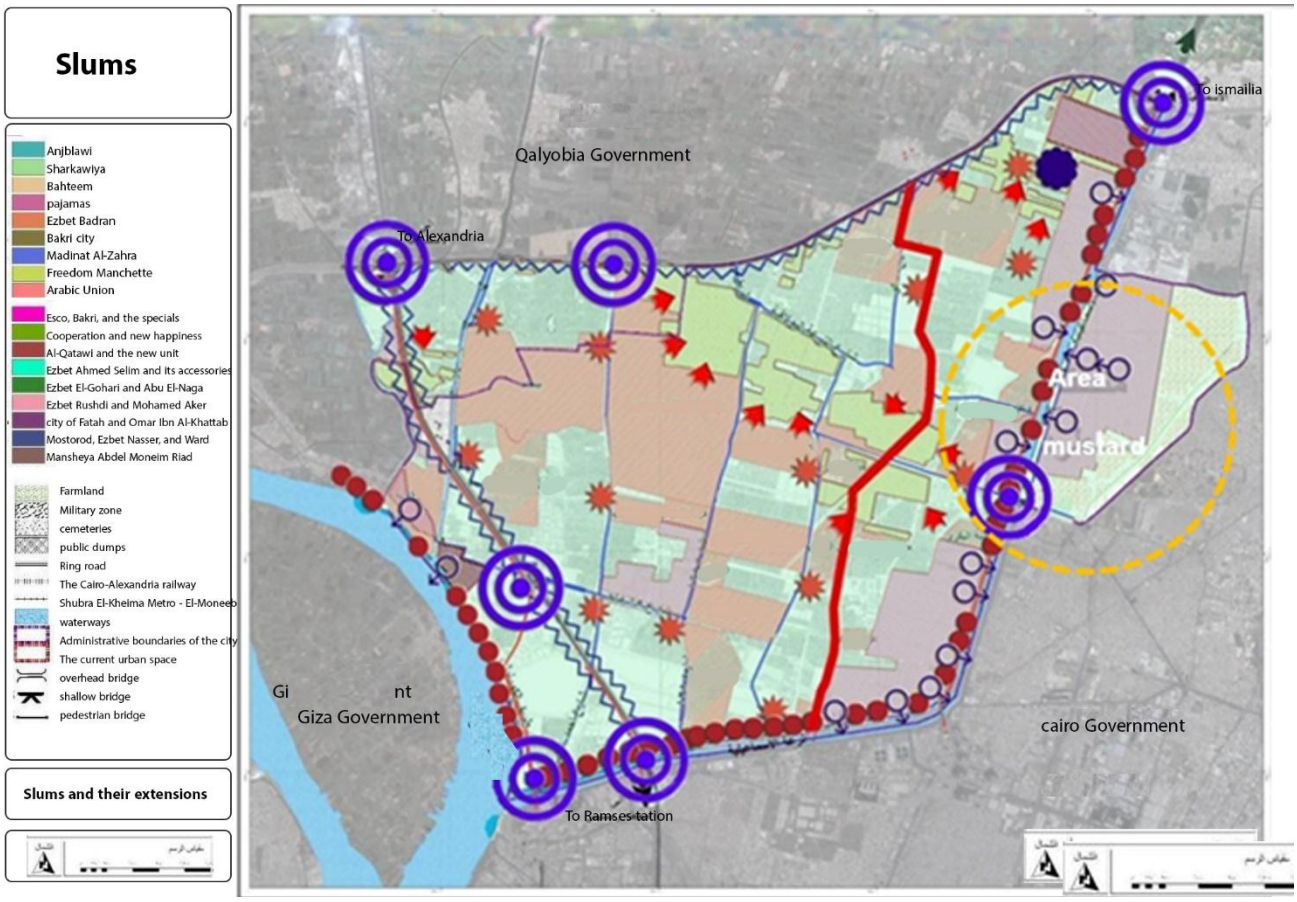


Figure4: environmental analysis of the city of Shubra El-Kheima using Gis
(The researcher based on the data of the GOPP)

Industry Type	Number %	
High pollution industries	23	33%
Medium pollution industries	26	38%
Low pollution industries	20	29%
Total	69	100%

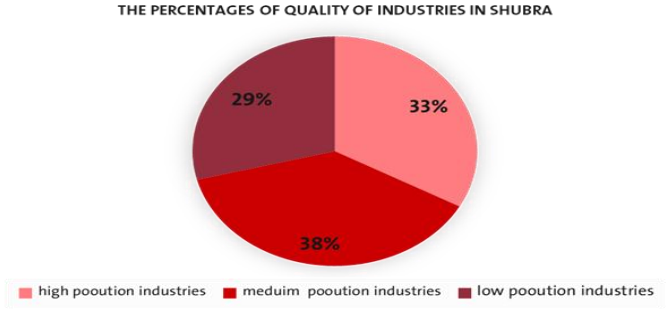


Figure 5 : the percentages of quality of industries in Mustorod.
(The researcher based on the data of the GOPP)

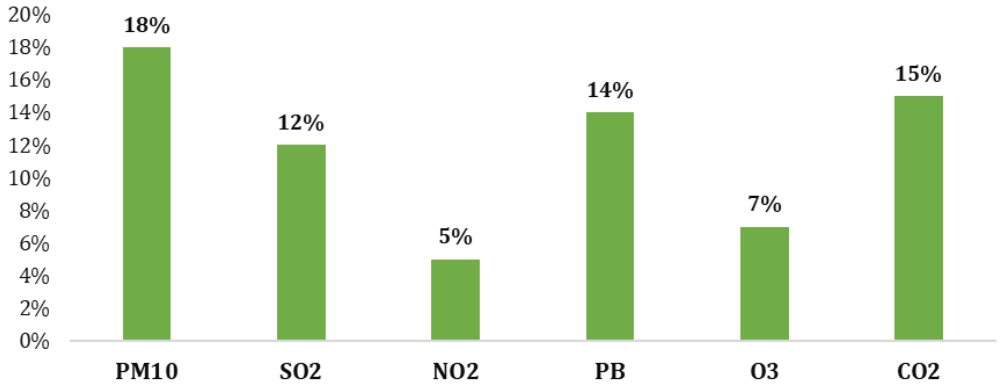


Figure 6 : Exposure rates to concentrations in excess of emissions.
(The researcher based on the data of the GOPP)

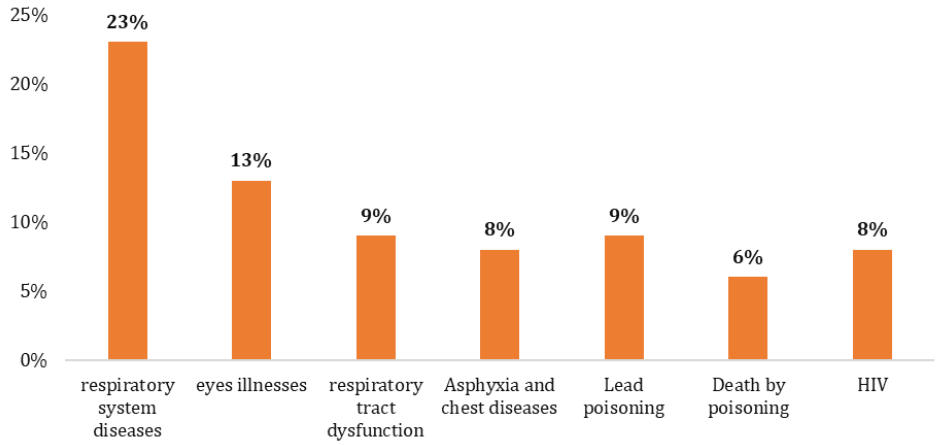


Figure 7 : Diseases resulting from exposure to concentrations in excess of emissions

(The researcher based on the data of the GOPP)

The slum problem is one of the most important urban challenges facing Third World countries. Most of the urban population has become slum dwellers. These areas consume a lot of resources and poor conditions. Then it was necessary to turn them into sustainable companies in order to save resources and improve their quality of life (Gasparatos, El-Haram, & Horner, 2008). The study aims at urban environmental upgrading As a means of achieving quality, environmental health and improvement in informal localities. Use of the three pillars of sustainability (Abbasi, Keshavarzi, & Moore, 2019)

The urbanization of the city has been deteriorated. The state has completely withdrawn from the field of urban development and housing Construction in Shubra El-Kheima, at a time when the city has witnessed a steady growth, as the population of the second district of Shubra El-Kheima tripled from 1976 to 1996 as a result of the increase in internal migration rates and the turnout of people To live in it due to its close proximity to the various work centers in Cairo, especially after the construction of the ring road, which helped link Shubra El-Kheima with all parts of the capital. (Huynen , Martens, & Hilderink, 2005). In the absence of the state, informal housing began to grow with all its energy, devouring the area of agricultural land that has long provided a lot of agricultural products For the city of Cairo..the figures indicate an increase in the number of housing units in the city from 88000 in 1976 to 180,000 in 1986.. an estimated rate of 100%. It is estimated that about 76% of these housing units are informal units and include more than 54% of the population of Shubra al-Kheima (Until 1987) this is considering that many of the houses belonging to the spinning and weaving companies in the public business sector are threatened with collapse.) (The researcher based on the data of the GOPP) Nhunget al., 2020; Shahsavani et al., 2020). .(2020 International Journal of Environmental Health Engineering(

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Figure 8: The development of industries and the decline of agricultural areas in Shubra El-Kheima
(The researcher based on the data of the GOPP)

- Urban Challenges

AAlthough adequate housing is a crucial role in children's social and psychological development, the reality in all of these squatter communities is a miserable life with insufficient lighting and ventilation, overcrowding, and living and cooking in the same area or near each other. Slum structures are all composed of low-quality materials and do not meet construction codes. (WHO, 2016) The majority of people share a single room with their entire family, making the slum extremely cramped. According to the most recent assessment, the population density in these slums and slums is family for each dwelling, with a minimum of 5 people sharing a room and a maximum of 8 people sharing a room, making it extremely congested and unhygienic.(2020 International Journal of Environmental Health Engineering((The researcher based on the data of the GOPP)

Figure 9: crumbling brickwork, and empty buildings

- Environmental Challenges

In recent years, the region has faced several of the common environmental issues that have avoided the city's attention. The continual increase in population has resulted in an ever-increasing demand for basic civic services and facilities, which has contributed to many of these environmental issues. Housing, shelter, water supply, and sanitation, on the other hand, have a direct impact on the living conditions of the urban poor.. (Guttikunda, Nishadh, & Jawahar, 2019)Only 38.2 percent of the people in the slums has access to appropriate sanitation services, as well as water and drinking services, in addition

to environmental contamination caused by polluting industries in the neighbourhood. Shubra's impact on the petroleum refinery factories. (The researcher based on the data of the GOPP)

Figure 10: Water pollution resulting from the leakage of oil factories in the Ismailia Cana
(The researcher based on the data of the GOPP)

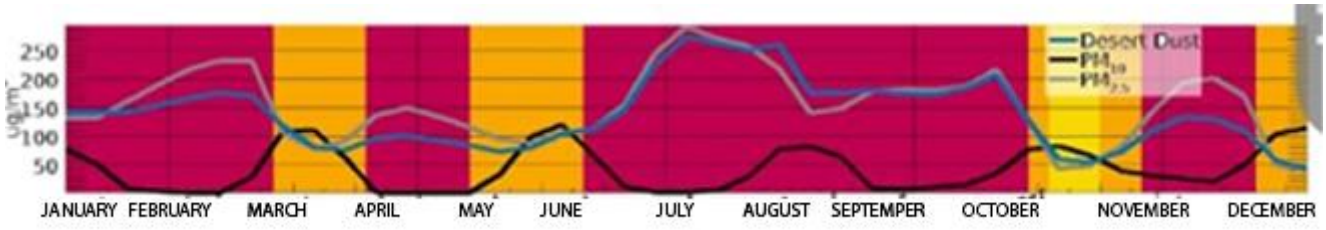

Figure 10: The concentration of suspended particles in the air.
(The researcher based on the data of the GOPP)

5. Conclusion:

In urban areas, adaptation measures are implemented through urban planning and management sectors that focus mainly on zoning, building codes, water quality, flood protection, and surface runoff management Adaptation also includes measures that increase the indoor climate comfort of buildings – such as heating, ventilation, and air conditioning (HVAC) and cool roofs (white and green) that address the UHI (McEvoy et al., 2006) – as well as green (vegetation, permeable surfaces) and blue (bodies of water) measures to increase climatic comfort, control flooding, and enhance urban biodiversity. (David, 2008)

Climate Policy	Practical measures by sectors	Examples of synergies between adaptation and mitigation	Examples of conflicts between adaptation and mitigation	Examples of sectors affected by implementation of measures	Source
Building and Infrastructure					
Mitigation	Building orientation, height and spacing	Reduced need for conventional air conditioning		Urban Planning, Health and Security, Energy	Barbhuiya et al. (2013)
Adaptation	Urban greening and green infrastructure practices	Carbon sequestration and reduction of heat stress, air pollution and flooding	High space demand	Urban Planning, Agriculture, Forest and Biodiversity (AFB), Water Management, Health and Security	Thornbush et al. (2013)
Adaptation	Ventilation and air conditioning	Passive cooling combined with night ventilation	High energy demand	Energy, Health and Security	Gupta and Gregg (2013)
Water Management					
Adaptation	Open storm water systems via urban wetlands		High space demand	AFB, Health and Security, Urban Planning	Laukkonen et al. (2009)
Adaptation	Water pumping to control flooding		High energy demand	Energy, Building and Infrastructure	Sugar et al. (2013)
Adaptation	Flood protection walls, dams, etc.		Emissions through material production and construction, biodiversity loss	Energy, AFB, Building and Infrastructure	Kenwayet al. (2011)
Adaptation	Water saving	Reduction of energy use for water treatment/extraction		Energy, Infrastructure	Kenwayet al. (2011)
Urban Planning					
Mitigation	Urban densification		More built mass, less urban drainage, heat gains, storm water and flood risks, discomfort and health risks, more emissions from transportation, water pollution via poorly planned dense cities	Energy, Water Management, Health and Security, Transportation, AFB	Dymen and Langlais (2013); Hamin and Gurran (2009)
Energy					
Mitigation	Solar, wind, and wave energy	Reduction of risks of widespread power loss or peak power loads under storm events and temperature extremes		Building and Infrastructure, Health and Security	Hamin and Gurran (2009); Laukkonen et al. (2009); McEvoy et al. (2006); Sugar et al. (2013
Transportation					
Mitigation	Multimodal and public transportation	Synergy if built along urban green corridors*		Energy, Health and Security	Sugar et al. (2013); Thornbush et al. (2013)

Note: Urban green corridors are networks of green areas within the city and its surroundings. In addition to adaptation and mitigation functions (e.g., flood protection, carbon capture and storage, and surface temperature regulation), they provide many

References

- Adel, A. (2008). AN ANALYTICAL STUDY OF PATTERN OF INFORMAL REGIONS.
- A.Khalifa, M. (2011). Redefining slums in Egypt: Unplanned versus unsafe areas.
- Exploring household participation in waste management. Journal of Consumer Policy 19, 45–67.
- 1999, O. (Paris). Environmental indicators for agriculture.
- 2020 International Journal of Environmental Health Engineering
- National Academies of Sciences, Medicine, E., 2018. Environmental Chemicals, the
- Human Microbiome, and Health Risk: A Research Strategy. National Academies
- Participatory Upgrading of Informal Areas A Decision-makers' Guide for Action.
- Benjamin Edokpolo, NA-B. (May 2019). Developing a Conceptual Framework for Environmental Health Tracking in Victoria.
- IDENTIFICATION OF ACTION AREA PLAN FOR ENVIRONMENTAL UPGRADING OF INDUSTRIAL SLUMS.
- Othman, M., Latif, M.T., 2020. Pollution characteristics, sources, and health risk assessments of urban road dust
- Shahsavani, A., Tobías, A., Querol, X., Stafoggia, M., Abdolshahnejad, M.,Mayvaneh, F., Guo, Y., Hadei, M., Hashemi, S.S., Khosravi, A., Namvar, Z.,
- Yarahmadi, M., Emam, B., 2020Al-Malky, R. (2009). Editorial: The slums of Cairo. Daily News Egypt: Egypt's Only Independent Newspaper in English.
- UN-Habitat. (2003a). The challenge of slums: Global report on human settlements 2003. Nairobi: UN-Habitat.
- UN-Habitat. (2003b). Slums of the world: The face of the urban poverty in the new millennium. Nairobi: UN-Habitat. UN-Habitat. (2008). State of the world's cities 2008/2009 harmonious cities. London e Sterling, VA: United Nations Human Settlements Program.
- City of Chula Vista. (2011). Climate adaptation strategies implementation plans, May 2011. Accessed August 5, 2014: http://38.106.5.202/home/showdocument?id=5443.
- Egyptian approach to informal settlements development. Informal settlement development facility.
- Hussein, W. (2015). Slumps Issues in Egypt: An Approach to the Application of Green Building Concepts.
- Developing National Environmental Health Indicators; Department of Health and Aging.
- Health Impact Assessment: Concepts and Guidelines for the Americas.
- United Nations Development Programme. (2014). Human Development Index (HDI). Accessed April 30, 2015: http://hdr.undp.org/sites/ default/files/hdr14_statisticaltables.xls
- Technological means in construction as a basic determinant for upgrading slums in Egypt. (20). (Ali, Y.M.2020
- (2020. (Al-Omrani, A. A.) Al-Khaimah Shubra, the strategic plan for the city Cairo: The General Authority for Urban Planning

- Abbasi, S., Keshavarzi, B., & Moore, F. (2019). Distribution and potential health impacts of microplastics and microrubbers in air and street dusts from Asalueh county iran . *environ pollut*, 153-164.

- Brunner, P. H. (2012). Substance flow analysis -A key tool for effective resource management. *J .Ind . Ecol, 16*(3), 293-295.

- David, j. b. (2008). Environmental Health . *Biomed Central*, 7-61.

- Gasparatos, A., El-Haram, M., & Horner, M. (2008). A critical review of reductionist approuaches for assessing the progress towards sustinability . *Environ impact Asses*, 286-311.

- Guttikunda, S. K., Nishadh, K., & Jawahar, P. (2019). Air pollution knowledge assessments(APnA) for 20 Indian cities. Urban Climate . 124-141.

- Huynen , M. M., Martens, p., & Hilderink, H. B. (2005). The health impacts of globalization a conceptual framework. *Globle Health*, 1-14.

- Mohammed, H. V., Farzad, F., & Majid, K. (2020). Long-term Health Import Assessment of PM2.5 and PM10. *International Journal of Environmental Health Engineering*, 14-20.

- Mokhtar, Soheir, Nagwa, E., Fatima, A. S., Heba, Y., & Abdel Fatah. (2015). The Effects of the Environmental Pollution in Egypt. *International Journal of Environment, 4*(1), 21-26.

- Rawan, A. Z., Tarek, A., & Seham, M. Q. (2021). Environmental Strategies for Air Pollution Mitigation in Industrial Areas Using the Clean Development Mechanism. *International Design Journal, 11*(6), 217-224.
- seham, M. Q., mohammed, S. A., & nada, S. M. (2022). A proposed environmental indicator's system for assessing the environmental sustainability. *International Design Journal, 12*(1), 153-164.
- WHO. (2016). Ambient Air Pollution A G lobal Assessment of Expoure and Burden of Disease. *WHO Geneva*.
- World, H. O. (2006). Air quality guidelines for particulate matter ,ozone ,nitrogen dioxide and sulphur dioxide .