

Urbanization and Environmental change: Local Effects of the International Coastal Road (ICR) on Burg Elburullus City

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Abstract Between 1950 and 2050, the percentage of the world's population that lives in towns is predicted to increase from 30% to 66%. This rapid increasing has urbanization and environmental consequences for local communities. Coastal slums especially deltas are one of the most affected zones by urbanization. The Nile Delta in Egypt is an example of such a growing area. In 2002, the International Coastal Road (ICR) was established in the north of the Nile Delta.

Due to its geographical location on the south of Mediterranean Sea coast and EL-Burullus Lake, Burg EL-Burullus city was affected by the (ICR) construction. (ICR) added a large area to the old city of Burg EL-Burullus. The ICR had many positive effects locally and internationally, But if the (ICR)'s side effects are not avoided by well studying, the problems will be further complicated by another urbanization project like proposed railway line.

The use of time series maps shows that the city of Burg ELburullus is one of the cities that has undergone the most Environment and physical changes, since the area which is cut off from the lake and used as an extension of the city. The added area has reached half the area of the old city. The researcher's observation numerous changes in the new expansion area. The changes had significant impacts at all economic, social, and environmental levels, but the focus of the study was clearly on the environmental and physical impacts, then the research reaches to reflections of urbanization in environmental Impacts on Existing urban areas.

Keywords: Urbanization, Environmental impacts, Physical changes.

Received: 1 March 2022/ Accepted: 20 March 2022

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1. Introduction

In 2008, 50% of the world's population lived in urban areas. This concentration is likely to increasing. Expectations show that urbanization, in addition to world population growth, could add an additional 2.5 billion person to urban areas in 2050 (figure 1)(Nations, 2018).The Expansion in unplanned urban areas and zones to accommodate this rapid growth, beside unsuitable land use planning, vulnerable geography (river mouth, morass areas, big beaches of rivers, etc.), and difficult regulation of building standards, contributes to the over-vulnerability of urban areas and populations.(Heinzlef et al., 2020).

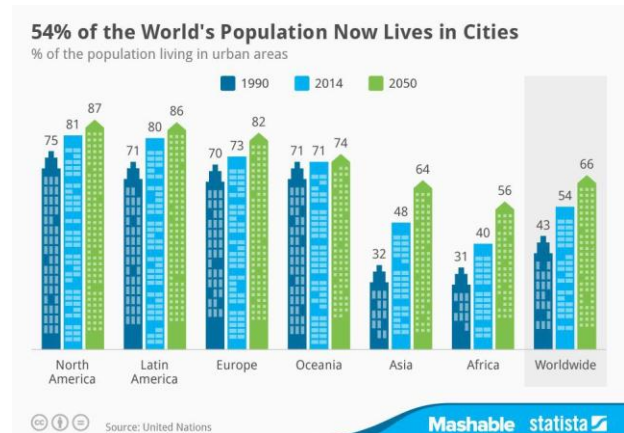


Fig. 1. World Population to 2050, (Nations, 2018)

While the process of urbanization has important implications for changes in demographic characteristics and the reshaping of the physical landscape, unplanned, unsystematic and rapid urbanization can have profound impacts on various economic, social and environmental components.

Africa, long considered a predominantly rural continent, has a larger urban population than Northern America-and nearly two-fifths of its population lives in urban areas (United Nations, 2006). Moreover, the continent's largest cities are concentrated in coastal regions.

Recently, due to rapid urbanization around the world, Egyptian decision makers have determined that the Nile Delta Coast is the most important and suitable region for

huge investment projects in various fields as well as for the development of existing projects.

The Nile Delta Coast is located in the central zones of the Mediterranean coast of Egypt trapped between Abu-Quir in the west and Port-Said in the east with a total length of about 240.0 km. (Masria et al., 2014). Thus, in recent years, the Nile Delta has undergone significant physical changes. Some of these are natural, others anthropogenic in origin. For example, there is erosion along the Delta coast, (Syvitski et al., 2009); (Frihy et al., 2008) and drying up of wetlands, (El-Asmar & Hereher, 2011), Either by nature or humans, especially as cities expand to accommodate the growing population (Masria et al., 2014).

2. Research Important

The occurrence of environmental and climatic changes as a result of physical changes at the global level and rapid urbanization, the physical changes increase the vulnerability of the coastal areas regard to environmental, social and economic aspects. (Iskander & Water, 2017). Along this costal line, Egypt has taken care of developing the infrastructure to be the basis for the establishment of mega projects (figure 2) such as new cities, tourist beaches, private universities, various ports, and major industrial and commercial areas(Salem M., Osman T. 2016). Among the major infrastructure projects is the international coastal road in 2002, the EL-Burullus power station in 2010, New Mansoura city, New Al Almeen city and etc.,

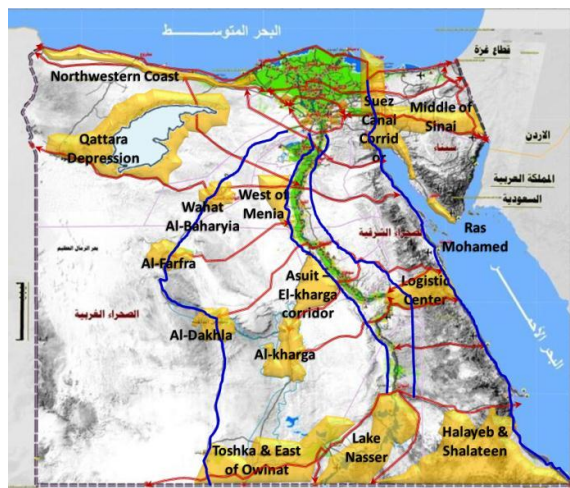


Fig.2. Development areas priority in Egypt, (Salem, 2016)

3. Research Problem

We can summarize the research problem in identifying and knowing the environmental and physical changes facing the city of Burg ELBurullus associated with infrastructure projects such as the international coastal road. All the cities that the road passed through were affected differently, especially the cities and villages that

became isolated from urbanization and were left without planning. The topic increases in importance with the lack of research to address it, as well as the proposal to build a railway parallel to the international coastal road.

4. Research Question

Why is Burg EL-Burullus city one of the most cities physically changed?

To what extent The International Costal Road Affect Burg EL-Burullus City?

5. Methods

Environmental impact study is useful for understanding the potential magnitude of the impact of a proposed change and the likely responses of those affected if the change occurs. It can be used to know the impacts of a wide range of changes, from a project to construct a new highway to a proposal to change access to a natural resource. This understanding can help develop mitigation strategies to minimize the negative impacts of a change and maximize the positive impacts.

Discussion rapid urbanization and its impact on cities, particularly in the north of the Nile delta, and the reasons for choosing this coastal strip as the most suitable area for mega-development projects in Egypt.

Time-series maps allowed us to analyse the physical changes of the international coastal road as a prerequisite for urbanization in the northern delta. The city of Burg ELburullus is one of the cities that may be show physical changes according to the analysed map.

The observation as a second tool to survey environmental problems at ELGOUNA area.

6. Study Area

In the north coast of Egypt southern Mediterranean, there are some of natural lakes; three of them are located within the Nile Delta region (figure3). These lakes have earned special environmental, economical, and social importance. As a connecting zone for salty sea water with the fresh water of the Nile, they have a unique environmental status and host a rich potential and ecosystem. However, with increased pressure of development requirements and human interventions, coastal lakes are more over loaded with deteriorating effects. In addition to, expectation in the fourth report which announced by the Intergovernmental Panel on Climate Change(IPCC) (Abayazid, 2012). The amount of fish production from natural fisheries (marine water, lakes and fresh water). 373.3 thousand tons in 2018. The quantity of fish production for the cities of the Delta coast from only the Mediterranean Sea, Burullus Lake, Manzala Lake and Edko Lake was 56730, 71409, 65113 and 7872, respectively, at 54% of the state's production as well as Burullus Lake achieving the first ratio. (Elrazi, n.d.)

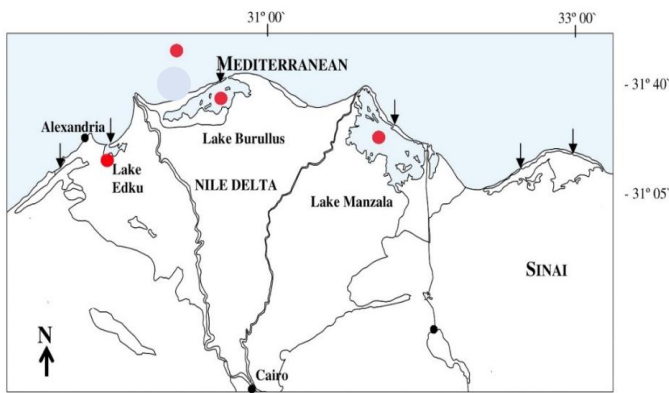


Fig.3. Lakes exists in the Nile delta, (Shaltout, 2010)

6.1. International Coastal Road (ICR)

The International coastal road crosses through the northern Egypt country in the west from Libya country to the east where Palestine country. This project was started in April 1995 at different sites and finished in June 2002. The aim of this project was to connect the northern African Mediterranean countries with the southern countries of Europe (figure 4). The most benefit of International coastal road is that it will decrease transportation times both inside and outside Egypt (figure 5). In another side, from the perspective of urban planning, it will attract communities alongside it. Thus it is very important to monitor these physical changes as they occur. The northern part of the Nile delta coast is keeping an eye on for many reasons some of them is the following reasons: it contains the main income national sources of Egypt from trades, industries, agricultures, fish farms, social, and tourist area.

Six governorates or administrative units are located in Nile delta in Egypt which are consider as an important part. It contains four Lagoons they are (Maryut, Edku, Burullus and Manzala). This lagoons contains high variation from biodiversity of natural plants, wetlands and birds. But it has suffered from many problems such as climate change, beach erosion, land subsidence, sea-level rise, water pollution, land encroachments, water logging, and bad management. (Dewidar, 2004) and other environment impacts.

Despite the advantages of establishing the international coastal road, one of the factors that led to the existence of such problems may be the construction of the international coastal road without studying the changes that occurred due to its construction.

6.2. Burg Elburullus City

The Burullus area lies on the eastern side of the Rashid branch of the Nile River, occupying a central site along the Mediterranean Nile delta coast of Egypt. It extends between longitudes $30^{\circ}30'$ and $31^{\circ}10'$ E and latitudes $31^{\circ}21'$ and $30^{\circ}35'$ N. The total space of Burullus area is approximately 2068 km², includes El Burullus Lake. Burullus Lake is considered the second largest lake

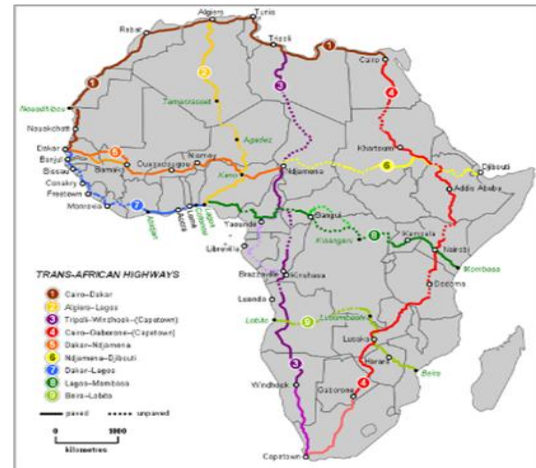


Fig.4. Global link: as a part of international road connecting the northern African Mediterranean countries.



Fig.5. National link: to connects eight Egyptian governorates on the sea cost.

of the Nile delta in Egypt, which is about 53 km long, 13 km wide and has water depths ranging from 0.5 to 2.5 m (figure 6) (Frihy and Dewidar 1993).

Burullus Lake is meet with the sea at its north-eastern edge through the Burullus inlet al bugaz, which is about 250 m wide and 5 m deep.

The Burullus area consists of the old city, the new area (El Gouna) and Lake Burullus, As a former water-loaded El Gouna area with numerous deep channels that connect the resident to their fishing activities in the lake, the newly established land faces complicated structural challenges. Based on authorized reports, El Gouna soil is a soft clay in nature with a stress factor of 0.4 kg/cm². Moreover, the aforementioned deep channels complicate the structural options. Hence, deep foundations are the mandatory approach for buildings more than two floors. Due to the high costing of deep foundations with the absence of authority's responsibilities, most of El Gouna residents established their own buildings on shallow foundations, ignoring the potential structural challenge. Consequently, some of El Gouna buildings showed partial subsidence and distortion. Furthermore, accumulation of soil salts and uprising of underground water level downgrade the environmental safety.

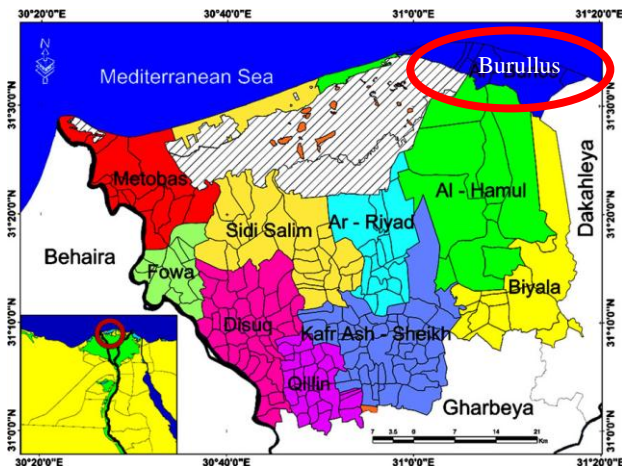


Fig.6. Location and administrative subdivisions of Kafr El Sheikh Governorate (Hassaan, 2013)

7. Data and Analysis

The ICR passed through the Burg EL-Burullus city that haven't any additional area to expand in the future because of its geographical location nature as semi-island. The ICR separates between the old city and EL-Burullus Lake, cutting a triangular part of the lake called EL-Gouna (Dewidar, 2004). Two elements are studied to understand the physical change that occurred:

- The size of physical change.
- The Environmental changes of EL Gouna triangle.

7.1. The size of physical change

From 2005 to 2021, El Gouna's buildings were gradually constructed in four stages determined by the government. These stages were divided only into residential plots, which were neglected for the elements and foundations of urban design. The residential plots were sold through a public auction, which led to an increase in land prices due to increased demand and limited number of plots (Emarah, 2021). The plots in the first three phases have been sold, but the fourth phase has not yet been sold. Some owners of the sold plots have not yet built on them due to administrative and financial reasons. Only about 55% of El Gouna's land area has been built on, so it is considered a great opportunity to study and understand the region more and determine the most important changes that have occurred in it and that can be benefited from in the future.

In the interviews conducted by the author with (Abdelfatah, 2021), (Abdelwakeel, 2021) and (Emarah, 2021), they mentioned that the passage of the international coastal road created the EI-GOUNA triangle, which is a great physical change for the city. On the other hand, on an ecological level, the separation of this large area of the lake led to many environmental problems, as the nature of the soil was not suitable for the current buildings.

The area of the ELGouna Triangle is approximately 50% of the old city area (figure 7), representing a major physical change for this city of limited area. The successive Time-series maps of the Burullus region were studied through the following stages.

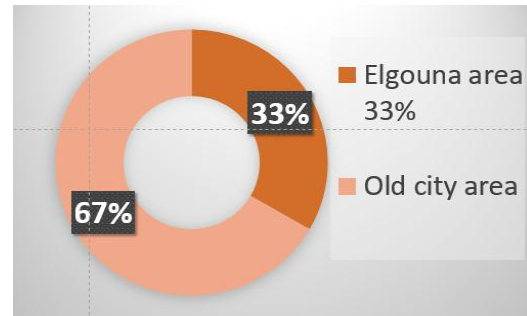


Fig.7. El gouna area percentage to old city, (Author & Google earth, 2021).

7.1.1 The first stage in 1998

Through the 1998 map, the old Burullus appears confined between the Mediterranean Sea in the north, Baltim city in the east, Motobas city in the west, after Al-Bogaz and Lake Burullus in the south, before the establishment of the international coastal road, where the city was directly connected to the lake (figure8). The connection between the lake and the sea.



Fig.8. Map of the Burullus region in 1998 before the establishment of ICR, (Author & Google earth, 2021)

7.1.2. The second stage in 2004

Through the 2004 map, the construction of the international coastal road appeared, which was established for many reasons, and with it the emergence of a new area that takes the form of a triangle, sandwiched between the international coastal road and the old city (figure9), which led to a greater expansion of the urban area of the city as a horizontal extension. After filling in that area, and the beginning of the separation between the residents and fishermen and between Lake Burullus, the international coastal road in the Burullus region is a road and bridge at the Bughaz region to the west, which connects the lake with the Mediterranean Sea.

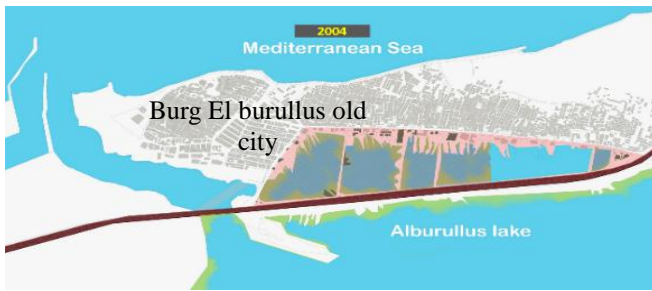


Fig.9. Map of the Burullus region in 2004 after the establishment of the international coastal road, (Author &Google earth, 2021).

7.1.3. The third stage in 2005

Through the map of 2005, the new area was divided into 4 main areas for residential use by the state each area has a set of cadastral plots (figure10), which were offered for sale through an auction. All the plots were sold in the first three stages, while the fourth stage still has pieces, there are no designated open areas inside El Gouna.



Fig.10. Map of the Burullus region in 2005 after dividing the new area into four main areas, (Author &Google earth, 2021).

7.1.4. The fourth stage in 2015

Through the 2015 map, the El-Gouna area began to appear more, which represents approximately 50% of the area of the old city (figure11), and people built their own plots, but randomly the requirements and standards for construction were not respected, as well as reliance on building methods that were not suitable for the nascent area and the construction height was irregular.



Fig.11. Map of the Burullus region in 2015 after Random construction starts in El Gouna area, (Author &Google earth, 2021).

7.1.5. The fifth stage 2021

Through the map of 2021 and the disappearance of shallow water and ponds from the El Gouna area (figure12) as a result of landfill by the population and building on it, which led to many environmental, economic and social impacts as a result of the physical change that occurred in the area, This was demonstrated through a field survey and observation of the situation now on the ground, through a set of photographs and documentation.



Fig.12. Map of the Burullus region in 2021, El Gouna area and its full appearance, (Author &Google earth, 2021).

7.2. Environmental Impacts of El Gouna triangle (Observation)

Aspects of environmental Impacts are many, varied, and related to other factors. The author, who lives in the city, can mention the most features environment impacts through observation, As a result of the physical changes that occurred (ICR) and the intervention of human activity, which will identify some places in the following map where the changes occurred:

- The impact of the natural resources in the area, such as water pollution in Lake Burullus to drain the sewage, which affected the fish in the lake, leading to the spread of diseases.
- Difficulties in the drainage of rainwater, an excess of groundwater and numerous environmental problems.
- Affecting the air quality, agricultural land and the ecosystem in the area due to the large spread of garbage and waste, which leads to an imbalance in the ecosystem.
- The built environment and buildings are affected as a result of relying on construction systems that are not suitable for the nature of the site without referring to specialists to choose the appropriate systems and methods for construction.

- Many buildings have been constructed and finished and are not yet in use.
- Random construction in the new area without complying with the requirements and laws.
- The fourth phase of the land of el Gouna has not yet been sold.
- The lack of the El Gouna region for many services, public and open places, and parks that guarantee the quality of life in it. Many structural problems with the buildings are evident in the slopes and inclines of many of El-Gouna's buildings.
- The road and street network in El Gouna needs more efficiency and improvement, providing appropriate paths for all users, including residents and fishermen, and providing alternative ways to reach the lake and fishing places.

This environment impacts has many effects on the region, the physical changes are directly affected by the environmental impacts (figure 14) in the new area (ELGouna).



photo 1,2,3 and 4 from El gouna area T.B the author, 2021 which indicate to some environmental change due to physical change in the area as shown in figure 14.

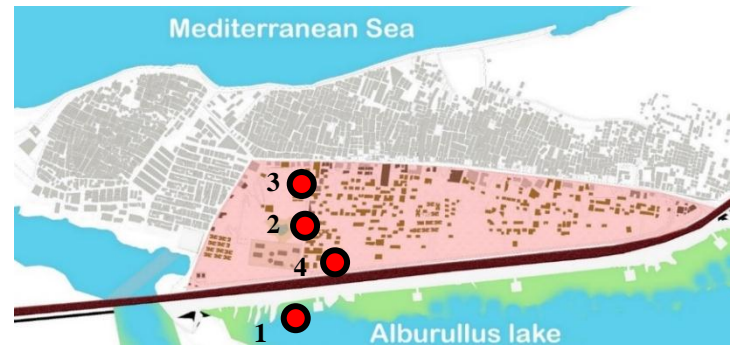


Fig.14. Features environment impacts through observation through the places shown on map, (Author &Google earth, 2021).

8. The results (Reflections of urbanization in environmental impacts on existing urban areas):

Through the previous study and analysis of some of the physical changes that occurred in the region as a result of urbanization like passage of the international coastal road (ICR) through El burullus region (as shown in part 7.1), as well as environmental changes that occurred in El burullus region, the following results can be drawn:

- Gradual physical changes occur in the Burg Al-Burullus city as a result of International coastal road construction.
- Separation of Lake Burullus from the old city due to International coastal road.
- The emergence of a new area has been added to the city called El-Gouna which take the shape like a triangle, to be an urban extension to the old city.
- The area of El Gouna is approximately 50% of the area of the old city of Burg Al-Burullus.
- Dividing the El Gouna region into four areas for residential use as country divided.
- Construction on the land of El Gouna by the people without commitment to the application of the requirements and standards for construction.
- Emergence of many environmental problems as a result of randomness during building construction.
- Making illegal corridors and roads to reach the lake from the bottom of the Bogaz Bridge.
- Construction Building methods in EL GOUNA different from the types in the old city.
- The increase in groundwater and the difficulty of draining rainwater drained into the lake.
- The lack of open spaces, which the city desperately needed
- Leaving construction to the people according to their financial level, missed the opportunity to shape the town, and it became slums.

- The buildings suffer from complex structural problems and ventilation and natural lighting that have not been studied well.
- Despite its area exceeding half the size of the old city, it did not help solve the problem of overcrowding of the old town, and most of it is still not inhabited yet.

9. Conclusions

Reflections of urbanization in environmental impacts on existing urban areas Framework: Through the previous results, we can arrive to Framework (figure 15) which explains Reflections of urbanization in environmental Impacts on Existing urban areas like El burullus city, through the large projects that enter existing urban communities and the physical changes that occur in the region because of these projects. As well as the environmental impacts and changes resulting from physical changes, and development and improvement plans that can be used to solve emerging problems by defining the role of those responsible and the role that can be intervened and performed.

10.Recommendations:

- The research recommends a set of the following points:
- When starting to establish mega projects, its direct impact on the area in which the project is located must be studied well.
 - Provide a suitable alternative environment for residents in which they can continue their lives.
 - Develop alternative plans that help mitigate the resulting effects when establishing new projects.
 - Attention to the application of standards and requirements for construction in slums and unplanned areas.
 - Develop detailed plans for unplanned areas so that they do not turn into slums over time
 - Relying on the appropriate construction methods for each region according to the nature of the region.
 - Rely on modern methods of waste disposal and sewage.
 - Addressing the competent authorities represented by the Planning Department in Kafr El-Sheikh Governorate and the Urban Communities Authority to take the necessary measures to develop the El-Gouna area in the city of Burullus.

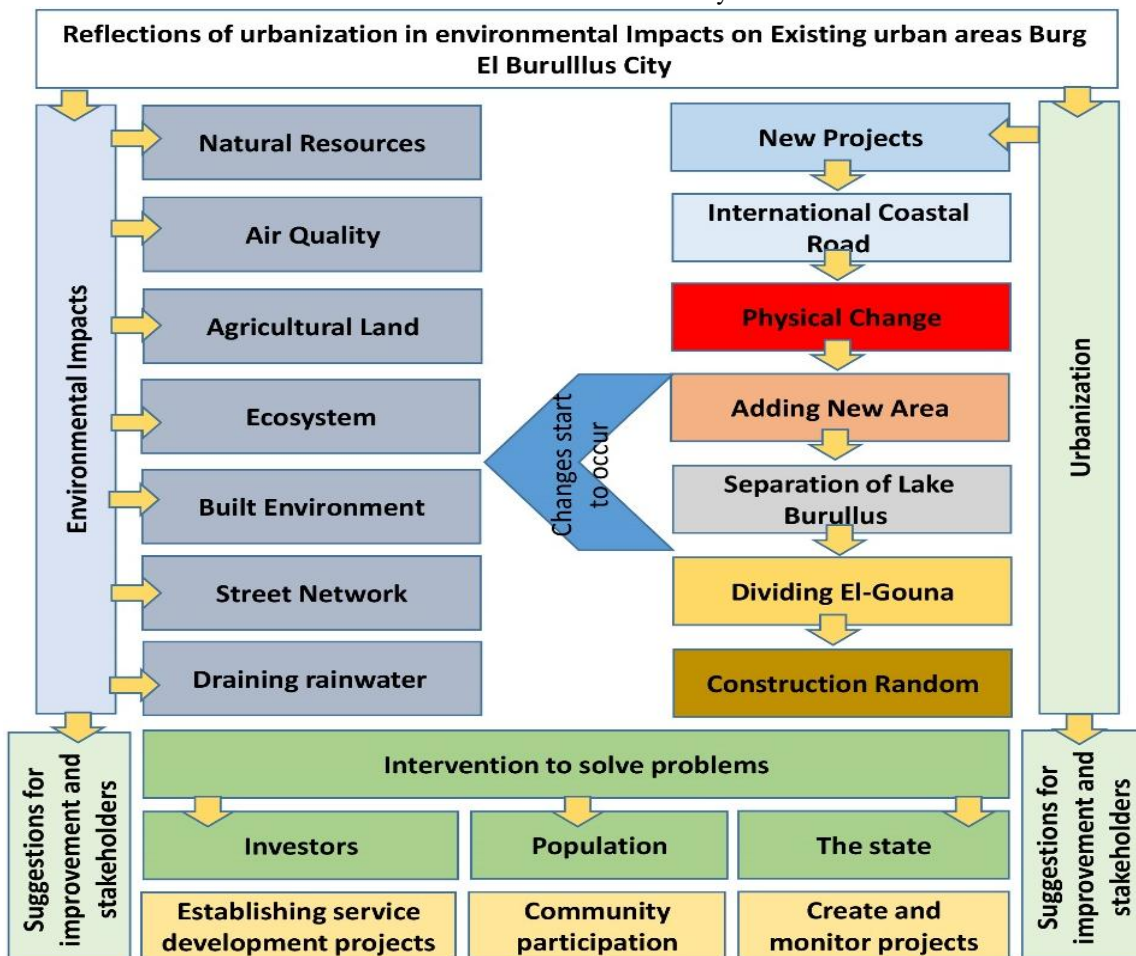


Fig.15. the Framework to the Reflections of urbanization in Environmental Impacts on Existing urban areas, (The author, 2022)

- Raising awareness among the population through educational seminars and open dialogues to know the extent of the problems that exist and are expected to occur in the future.
- Encouraging community participation in large urban projects.
- Integrating renewable energy sources into new projects.

Acknowledgments:

This paper is based upon work supported by the DAAD (deutscher akademischer austauschdienst e.v., kennedyallee, 53175 bonn), also, the work was sponsored by "urban resilience and risk management understanding egypt's delta region duration: 1 january 2021 – 31 december 2022" project of Kassel, Elmansoura and Kafrelsheikh Universities. The authors thank the kassel university members at faculty of architecture, urban planning, landscape planning for providing assistance through fellowship from 1 September 2021 to 31 December /2021.

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