

Types and Tools of Land Use Zoning Towards Dealing with Private Properties in Re-planning Inner Informal Areas (Case Study: Maspero Triangle – Cairo Governorate)

Abeer Ahmed Mohamed Abd-Elkawy*

Department of urban planning, Faculty of Urban and Regional Planning

Cairo University, Giza, Egypt, Tel: 002-010-0697883

Email: abeerkawy@furp.cu.edu.eg

Abstract

Land use zoning policy has been applied in many countries such as the United States, England and Germany, since the second half of the nineteenth century, as one of legal systems for managing and regulating land uses in cities through many types and tools that are developed over the time. The primary type focused on identifying specific kind of land use in each area, without any mixing to improve the environmental conditions. Then, the following types used the population density index to reduce congestion in large cities, in addition to some physical and urban characteristics such as building heights, building size, floor area ratio, the percentage of roads, services and open spaces to cover environment, social, economic and urban dimensions and measure the degree of achievement the development goals for creating livable communities. Although these types are diverse, there are a number of challenges in implementation them such as the refusal of some owners towards applying planning recommendations on their private properties. In addition to the lack of justice and freedom among some owners in choosing appropriate land use for their own revenues. For these reasons, there is emergence of new types called *land use plot, spot and rezoning policy*, which deal with each land plot in a more flexible way to achieve a balance between the public interest and private benefits. At the local level, it is clear that zoning policy has appeared in Egypt since 1905 for planning the new residential suburban areas by using specific building requirements for each area to create compatible urban environments and a distinct urban personality. Then it was used in re-planning process for existing areas and informal communities through various planning and building laws, which need to be developed for dealing with the private properties without any dispute between the stakeholders and without government spending towards the compensation values.

* Corresponding author.

Therefore, this paper is important in determining the suitable types and tools of zoning policy for re-planning informal areas with private properties, by reviewing the results of some studies and international experiences in this field. As well as evaluating the current applied types of land use zoning policy in developing Egyptian informal areas through selecting one case study (*Maspero triangle area*), to benefit from the results of theoretical and practical framework in implementation the future projects with the acceptance of all parties and owners.

Keywords: Zoning Ordinance; land use zoning and rezoning policy; re-planning process; inner informal areas; Mosapero Triangle; Greater Cairo.

1. Introduction

Zoning policy is one of the oldest land use planning policies, which appeared in many countries in the late eighteenth century to organize the location of buildings and their relationship with road network, and avoid insufficient ventilation of homes and protect them from fire hazards, by using general requirements that are not codified or obligated in development process during this period. Therefore, it was presented legally at the international level through zoning codes, which applied in the American cities at the end of the nineteenth century as a result of many problems in these cities faced like high density, intense mixing in land uses, increasing of industrial expansions, depriving of public health standards and set of negative changes in urban characteristics [1]. In 1908, the city of Los Angeles used the first zoning code that focused on separating residential use from polluted uses, improving health and living conditions and ensuring good ventilation, especially after the rise of tall towers. The actual application of zoning law was in Newyork city through a comprehensive zoning law that organized the sites of economic activities such as industrial and commercial uses, to achieve profitability and support the idea of separating that are not environmentally compatible [2]. This law was developed in 1926 on large scale in most American cities such as Chicago city to regulate land uses types and the densities of development and achieve public health, safety and low overcrowding for more efficient and effective land uses. During this period, zoning map showed only the main kind of land uses such as (Single family homes- housing for two families- apartments and hotels- service areas like shops, banks and offices - warehouse and commercial activities areas- industrial areas- sewage stations) [2]. In 1957, land use density was included in zoning law like the height of building, FAR (floor-area ratio) and the front, back and side bounces... etc. for more land use controlling in cities. And then, the zoning policy spread widely in the world to achieve development goals in each country through conditions and requirements of local authorities and planning organizations which called the legal scheme. For example, England and Germany used this policy in rebuilding cities, providing housing areas for different social groups and organizing land uses around city centers, by application some architectural and planning standards such as density, buildings heights and building designs, to avoid high rates of crowding and preserve the identity of each area [3] Whereas the role of zoning in New Zealand was managing the resources and evaluating the performance of each area according to the degree of applying the development requirements. In the other countries like San Francisco, Japan and France, zoning policy targeted management of land uses and identification the allowed uses in each area to avoid any problems that impedes development processes and its sustainability [2]. Consequently, zoning policy is important for managing land uses and developing the existing or new areas, and has taken multiple types that differ from one spatial domain to another, according to the characteristics of each place and the requirements of spatial

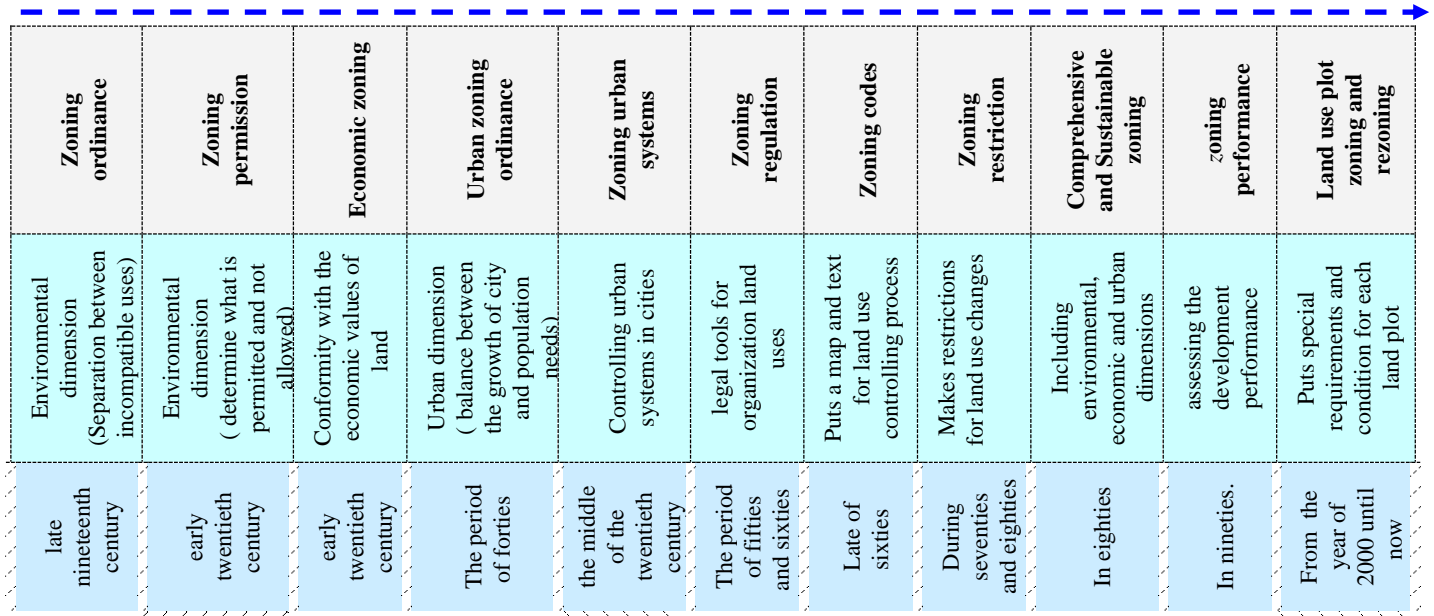
development. These types are represented in (separation between incompatible land uses- proposing new land uses that do not conflict with existing uses- organizing the spatial distribution of some activates and uses such as commercial and industrial uses- controlling the residential density by defining its types like single- family buildings and multiple families or the buildings heights- determining the ratio of construction on land plots- identification the green areas, services and parking...) [4]. However, the previous types of zoning policy did not achieve the desired objectives, especially in the areas with private properties, as a result of refusal of some owners towards the proposed use that not compatible with their desire and requirements. This led to reformulate the zoning policy by introducing new types such as land use plot, land use spot and rezoning policy, which take into account (the importance of the place and its economic value- the fair use of land and available resources- the social and economic demands of population- the freedom for landowners to use their properties within a balanced framework between their private benefits and the interests of societies). This is what the World Bank explained in 2019 about how to use these new types of land use zoning in urban renewal and development, which deal with each land plot instead of generalizing the requirement to whole area and give more flexibility in using land plots in compatible ways with the property characteristics [5]. In reviewing the Egyptian cases, it is clear that the urban development for all areas depended on a set of building and planning laws from the year of 1878 to the year of 2008, which were used in land use zoning to control their urban characteristics and achievement their social, environmental and economic returns within the framework of developmental vision. However, most development projects faced many obstacles, such as the unwillingness of land and real estate owners to apply the recommendations of zoning in their properties, that obliged them to use specific type and characteristics of land use, which did not meet their needs. In addition to the non-comprehensiveness of these requirements to deal with which the illegal changes in urbanism. Therefore, this paper aims to determine the different types of land use zoning and their tools for dealing with private properties in re-planning informal areas without any challenges. This comes through following an analytical approach that focused on reviewing the previous studies, international reports and experiences in this field. In addition to using a case study method by selection and evaluation one of development projects of informal area to spotlight the positive and negative aspects of followed zoning types and tools in its development process.

2. Definition of land use zoning policy

Cities councils and governments use zoning policy to organize and manage the spatial distribution of land use types such as residential, commercial, industrial areas, parking and recreational areas. In addition to controlling their characteristics such as (land plot area- land plot dimensions- side, front and back bounces- building ratio- building heights- building shapes and their architectural character). It also extends to determining social groups and their densities within the residential areas, whether on the areas of public or private properties [6]. There are many terms of zoning policy, which differ according to their appearance time, spatial level of application and their goals and conditions for organizing urban environments. The first term appeared in the late nineteenth century which called *Zoning Ordinance* and known as a set of regulations that were established by local governments. This term aimed at making a separation between incompatible uses and support integration between compatible ones in interior parts of cities that suffer from environmental problems and high pollution rates [7] Then, this term evolved in the early twentieth century to *zoning permission* for clarification the role of zoning in determining the permissible uses in each area, that land and real estate owners must adhere them, in

new building permits or when they want to change their activities [7]. Moreover, Zoning Ordinance referred to the management of available resources through the best exploitation for them, offering non-depleted uses of resources and preventing activities that cause negative effects on residential areas. With the increasing interest in economic dimensions in parallel with the environmental ones, the term of zoning policy became *economic zoning policy*. This term concerned with putting suitable land uses in line with the economic values of the properties to increase their returns and reduces environmental impacts at the same time. On the other side, there are some definitions dealt with the urban dimensions of zoning in the period of forties that showed the importance of *urban zoning ordinance* in achieving a balance between the growth of cities and the requirement of population and avoiding the negative effects of high concentration of overrated population, through some conditions such as (population density- building density..) [7]. In middle of the twentieth century The new term of zoning appeared with the developing of urban planning systems and their laws to introduce new uses or regulate the existing ones or change them in the cities. This term was *Zoning urban systems* as one of the most important planning systems to regulate development operations through a set of controls for the type of land uses, their location, flatness, size, shape, and function of the buildings within urban areas. The urban laws have evolved during the fifties and sixties for using them in planning systems. Therefore, the term of zoning was called *zoning regulation* or zoning law in this period, which was a branch of local law and legal tool for controlling land uses and improving urban environments [7]. Then the term developed to *zoning codes* in the late sixties to express its main components, which included a text and a map of all the detailed requirements for each land plot in selected area. This map is a binding legal document that is used in planning the new areas or developing the existing ones, and it differs from planning permission in its land use regulations and controls which were more obligatory in the implementation process to reduce the opportunities for transgressions and violations and achieve the justice in land use decision. Besides, zoning codes were used also at the detailed level such as small residential areas to support the success of land use plan at the large level such as residential neighborhood [8]. During seventies and eighties, Some studies have considered zoning as a tool to restrict land uses (*zoning restriction*) in the areas that suffer from unwanted land use changes, as a result of private stakeholders' practices at the expense of the general goals. After that, sustainability concept appeared in eighties and zoning policy became known as *comprehensive and Sustainable zoning* that covered the environmental, social and economic dimensions of sustainability. With the implementation of many development projects, there was a desire to measure the success of land use development and management, therefore the concept of zoning evolved in the period of nineties to (*zoning performance*) as criteria for assessing the development performance in different urban areas [8]. Based on the above, the term of zoning concerned with protection the environmental and health aspects, Maximizing of the economic values of private and public properties, avoiding negative influences of incompatible uses, and taking into account the social and legal dimensions of different spatial levels. Nevertheless, the implementation of zoning policy in many cities was not accepting from the majority of civil societies and owners and the planners find zoning requires a long time to implement it. All these reasons pushed a new terms since the year of 2000 which called *land use plot zoning*, land use spot zoning and rezoning policies, these terms provided special requirements for each land plot according to the its spatial convenience for more flexible in dealing with private properties [4]. Recently, zoning policy has been used in the development of informal areas (which appeared without any adherence to planning and building requirements) and need to select specific zoning types and requirements for dealing with private properties and achieving the goals of

balanced development without any conflict over land use (a balance between private properties rights and the requirements of societies to create a better environments [5]. The following figure 1 illustrates the evolution of zoning policy and their dimensions during the different time stages.



Zoning ordinance	Zoning permission	Economic zoning	Urban zoning ordinance	Zoning urban systems	Zoning regulation	Zoning codes	Zoning restriction	Comprehensive and Sustainable zoning	zoning performance	Land use plot zoning and rezoning
Environmental dimension (Separation between incompatible uses)	Environmental dimension (determine what is permitted and not allowed)	Conformity with the economic values of land	Urban dimension (balance between the growth of city and population needs)	Controlling urban systems in cities	legal tools for organization land uses	Puts a map and text for land use controlling process	Makes restrictions for land use changes	Including environmental, economic and urban dimensions	assessing the development performance	Puts special requirements and condition for each land plot
late nineteenth century	early twentieth century	early twentieth century	The period of forties	the middle of the twentieth century	The period of fifties and sixties	Late of sixties	During seventies and eighties	In eighties	In nineties.	From the year of 2000 until now

Figure 1: Different terms of zoning policy and their dimensions (source: Author)

3. The advantages and the challenges of zoning policy vs. other planning permission

Zoning policy is one of the policies, which used in land use management and organization for existing and new cities. This policy differs from other policies of urban planning in its achievement for the dimensions of environmental, social and economic sustainability, its possibility for dealing with public and private properties in a flexible ways and the necessity to adhere it by the development parties. The following points clarify the most important advantages and disadvantages of this policy in the field of land use management, and the figure 2 shows the differences of this policy with other planning policies such as planning permissions [8,9,10,11,12].

3.1 The main advantages of zoning policy

- Separating incompatible uses and minimizing their negative effects.
- Better use for land values and available resources in the site.
- Providing basic facilities, roads, and infrastructure in residential areas.
- Allocating new uses in the site according to the population demands.
- Achieving diversity in housing types and densities according to the levels of population incomes.
- Achieving security, safety and welfare for the community.
- Providing necessary uses for residents within the same area such as services and working areas.

- Controlling the densities in areas and achieving better city growth.
- Application the goals and standards of desirable urban development.
- Promoting the development of community in the existing areas.
- Developing mixed housing concept in a way that supports its positives and reduces any negatives.
- Motivating and encouraging the investors to participate in development process in order to achieve suitable profitability for them.
- Linking the development of the area with the comprehensive development of surrounding areas.
- Improving the functional relationships between different land uses.
- Assessing the development performance by measuring the application of the requirements in each detailed area.

3.2 *The main disadvantages of zoning policy*

- The difficulty of implementing some zoning types in the areas with private properties; because it does not give the landowners enough freedom in choose the most appropriate land use for them.
- The social and economic isolation for some areas, as a result of applying some types of zoning.
- The exclusion of some social groups after applying the requirements of the maximum population and housing densities.
- The increasing distance between housing, work and services after land use separation.
- Not achieving the justice between owners, which made only some owners benefit from zoning.
- It is one of the costly policies of land use controlling decisions.
- Changing the decisions of land use allocation in some areas.
- Putting taxation for some properties only (unfair treatment).
- Reducing the land use diversity in same area because of land use separation.

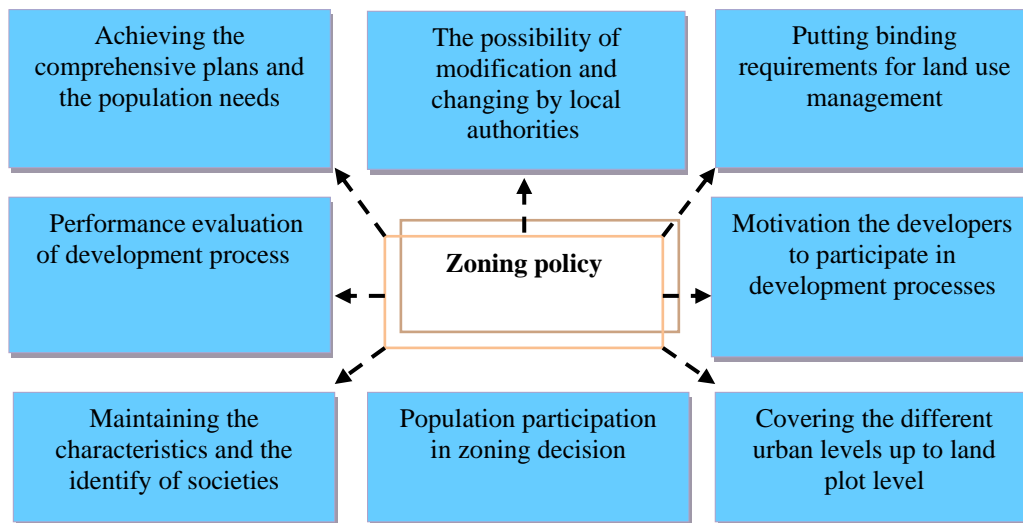


Figure 2: The differences between zoning policy and planning permission (source: Author)

4. Types of land use zoning regulations for land uses management

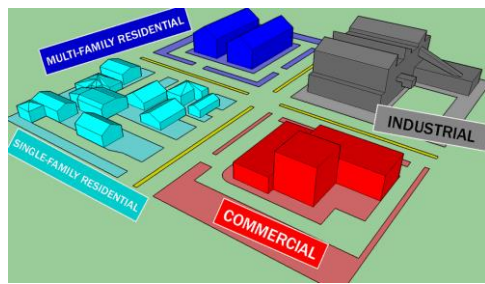
Zoning policy has many types according to the aim of them, the types of their requirements and the time in which they appeared. The following points shows these types and the table no 1 summarizes the most important advantages and disadvantages for each type in the development the areas with private properties.

4.1 Traditional zoning or Single-use zoning or Euclidean zoning

It is one of the first and most widely used types of zoning, which appeared in the United States of America in 1925 to express the division of any area into individual uses (residential, commercial, or industrial ...) as shown in figure 3. This type aims to separate incompatible uses and achieve health, safety and welfare standards without losing the economic value of the place [4].

4.2 Functional zoning

This type is a development of traditional zoning, as it emphasizes the issue of land use separating more than mixing and adds detailed land use division such as commercial, residential, and industrial use as shown in figure 4. In addition, it sets requirements for each use separately such as (density- area- building percentage- the detailed uses in it...) to increase the functional performance for each use, which differs from area to another according to the characteristics of area, its location and role towards surrounding areas [4].



Separate the incompatible uses only



Commercial
Administrative
Residential
Industrial
Green space

Requirement for each use separately

Figure 3: Traditional zoning or Euclidean zoning [13]

Figure 4: Functional zoning type [4]

4.3 Modified conventional zoning

It concerned with mixed land use approach to address the negative aspects of separating process and the excessive restriction in determining only one land use in each location .In addition to putting some conditions for land uses densities and roads networks to avoid any problems from mixing [4,13], as shown in figure 5.

4.4 Form- based codes or Transect-based codes

It is one of modern types, which appeared in the early eighties and was associated with sustainability concept. It does not specify the kind of land uses but rather the development patterns for creation more sustainable societies. This comes through some rules of urban design for each area that control the functional relationships between buildings and their characteristics such as (design- size- form- location- dimensions of building lines..) [4] as shown in figure 6.



Mixed R and C
Mixed R and A
Residential
Services
Commercial
Industrial

Mixed between compatible uses



Downtown
Uptown
East Side
Historical district
Manufacturing district

determination only the development pattern and urban design without the kind of land use

Figure 5: Modified conventional zoning (source: Author)

Figure 6: Form- based codes or Transect-based codes (source: Author)

4.5 Physical zoning

This type depends on determining all physical characteristics of each zoning area, such as (building ratio- building heights- building shape- dimensions of side bounces- ratio of open spaces- building density..) as shown in figure 7, besides the kind of land use. This type aims to create an identity for each place, especially for downtown and historical areas [4,14].

4.6 Overlay zoning

It gives additional conditions, which related to the comprehensive development plan for dealing with areas that have special characteristics and need more protection and preservation such as heritage and coastal areas. These additional conditions differ from area to another according to their needs, some of which are represented in (permitted uses- protection zones- dimensions of land plots- suitable land use kind- building type- building shape- building density..) as shown in figure 8 [4].

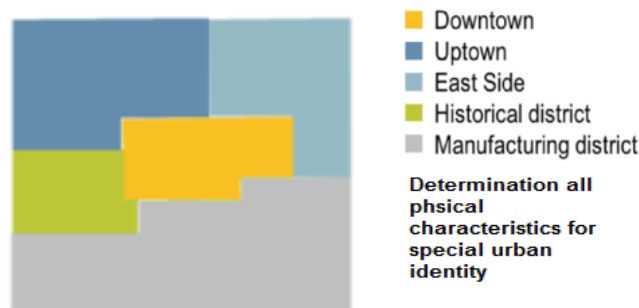


Figure 7: Physical zoning type [4]

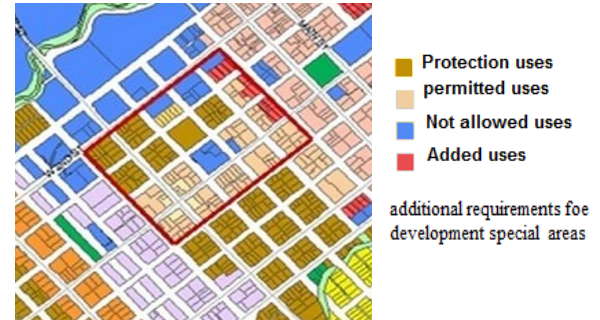


Figure 8: Overlay zoning type [6]

4.7 Guidelines zoning

This type is guidelines for developing some uses such as open areas, services, commercial centers, utilities and service centers. Therefore, they are not applied to the whole area but rather to specific uses that need additional conditions to develop them as shown in figure 9 [15].

4.8 Incentive zoning

This type appeared with the activation of the private sector role in development process, as it aims to revitalize some areas through a group of residential, service or commercial projects. Where local authorities put set of incentives for investors such as (providing roads and infrastructure- reducing taxes- increase building ratio and its density) as shown in figure 10, to build investment uses in exchange for providing the population needs from services, housing and entertainment [4,15].

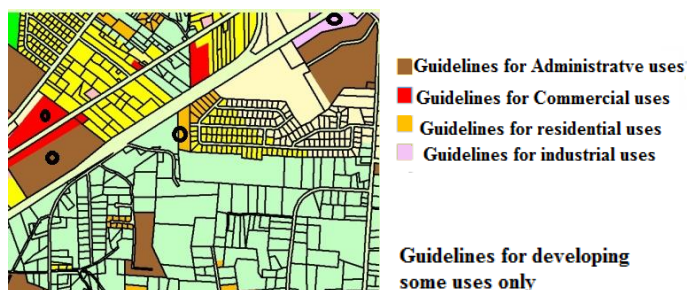


Figure 9. Guidelines zoning [15]

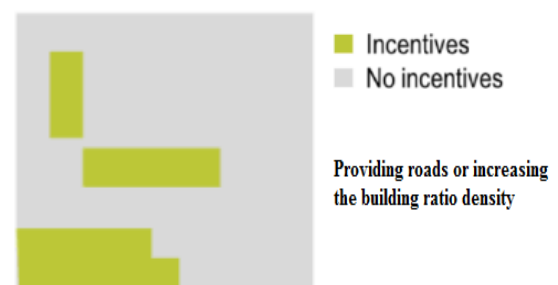


Figure 10. Incentive zoning [4]

4.9 Performance- impact zoning

Performance- impact zoning is used by local authorities to direct the compatible uses only in addition to monitoring and evaluating the negative effects of different uses and determining the degree of achievement their objectives. This type uses a variety of performance indicators to regulate land uses, including (buildings size- buildings ratio- open areas and services ratio - working hours of non-residential uses- ratio of air pollution– the compatibility with nearby uses) as shown in figure 11 [16]

4.10 Exclusionary zoning

The exclusionary zoning was introduced in the early twentieth century to exclude specific social groups from being in some areas. Then it was recently used in the field of land use planning to exclude some uses (uses that are not allowed to exist in area), by controlling (the area of land plot- building ratio-building heights- building density- taxes and fees...) as shown in figure 12 . Therefore, this type is used to maintain the economic value of the properties, reduce congestion rates and improve the quality of life [2].

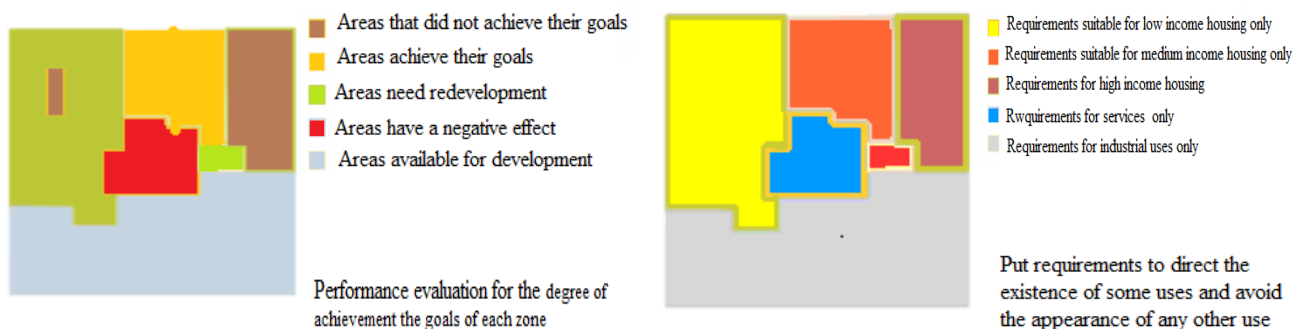


Figure 11: Performance- impact zoning (source: Author)

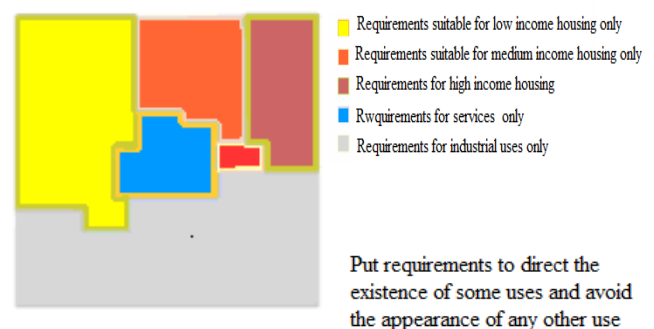


Figure 12: Exclusionary zoning (source: Author)

4.11 Inclusionary zoning

This type solves the issue of social separation in the previous type, especially when planning the new areas, by specifying building ratio for low-income housing (about 30% from the total site area) as shown in figure 13. Moreover binding the real estate developers to provide these units in exchange for a set of incentives such as sell land for them at low prices or give them a tax exemption [2].

4.12 Conditional zone

This type gives the flexibility in providing some uses or changing the others in land plots with private ownerships to maintain the economic value of those lands and meet the population's demand from shops and services as shown in figure 14. As long as there is no conflict with zoning vision and its general requirements to create a balance between development goals and the needs of residents and owners [2].



Figure 13: Inclusionary zoning (source: Author)

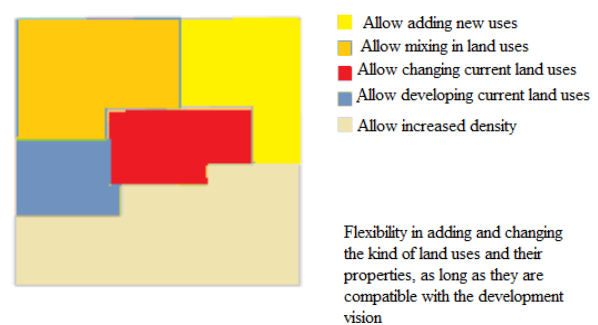


Figure 14: Conditional zone (source: Author)

4.13 Intensity zoning

This type makes the sufficient flexibility in choosing the appropriate kind of development for the owners of private properties, as long as they adhere with the permissible limits of density or number of housing units. Therefore, It is flexible not only in determining or changing the kind of land use, but also extends to the physical characteristics of buildings and their densities as shown in figure 15 [2].

4.14 Comprehensive zoning or hybrid zoning

It is a modern type that combines the requirements and conditions of the previous types. It defines the kind of land uses and works to separate the uses in some areas, as well as measuring the performance of developed areas. In addition to granting suitable incentives to provide housing units, especially for low-income people. This type also seeks to preserve the shape of buildings, their size, design and heights in areas with the distinct personality such as downtown areas. Besides the flexibility in using land plots in some areas and providing more capabilities to integrate land uses and achieve future development as shown in figure 16 [2].

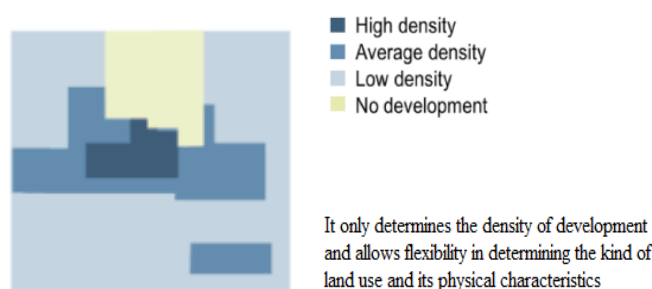


Figure 15: Intensity zoning (source: Author)

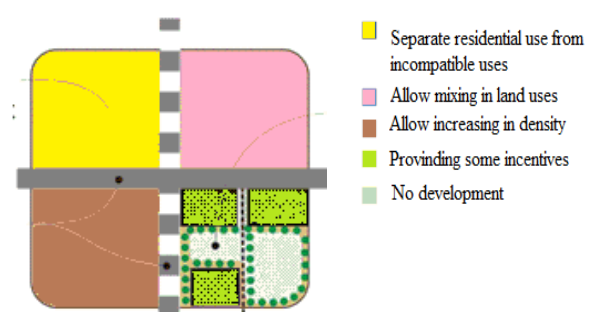


Figure 16: Comprehensive zoning or hybrid zoning (source: Author)

4.15 Land use spot zoning

It is applied to one land plot or some land plots, but not to all land plots in the area. This is used when a difference occurs between the requirements of rezoning and the recommendations of development zoning in this area. This type gives an exceptions to lift any restrictions for some real estate owners especially, who own land with large areas or have an important activities as shown in figure 17 [4,5].

4.16 Land use plot zoning

This type deals with each land plot separately, through the application of some requirements that are flexible in determining the kind of land uses and their characteristics, which is no conflict with the development vision of surrounding area as shown in figure in figure 18 [4,5].

4.17 Land use plot rezoning

Rezoning allows changing in land use for some land plots, when the proposed use by local authorities is incompatible with the desire of owners. This is done by submitting the owner a request to concerned government agencies for changing this proposed use to other use as shown in figure 19. [5,17].

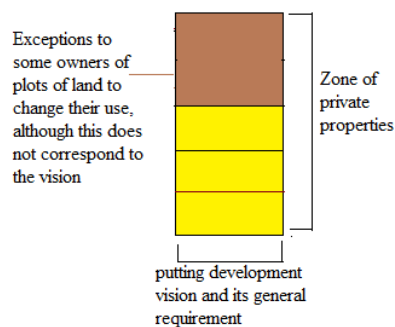


Figure 17: Land use spot zoning
(source: Author)

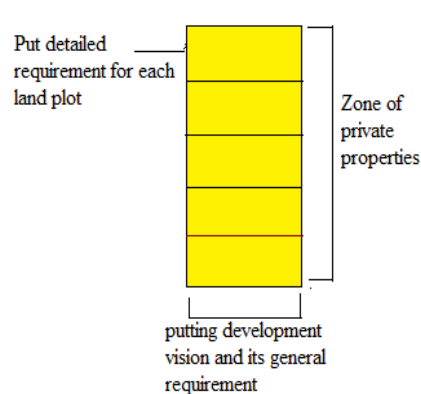


Figure 18: Land use plot zoning
(source: Author)

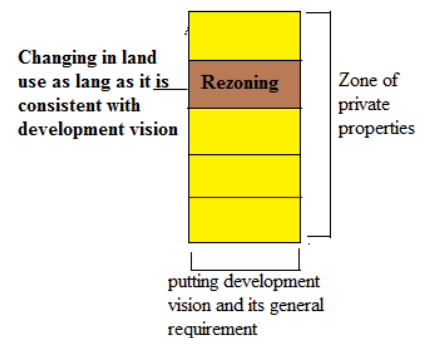


Figure 19: Land use plot rezoning
(source: Author)

Table 1: The advantages and disadvantages of each land use zoning in developing informal areas

Type	Advantages	Disadvantages
<i>Euclidean zoning</i>	<ul style="list-style-type: none"> - It is used in areas that suffer from negative mixing in land use. - More common use by governments and planners. - It supports the distancing between incompatible uses and encourages the existence of the compatible uses in the same site. - Enhances the land value by choosing the appropriate use for it. -It improves the built environment and reduces the pollution rates. 	<ul style="list-style-type: none"> - Incompatibility between the proposed uses and the desire of landowners. - Lack of the flexibility in organizing and managing land uses to keep up the dynamics of city structures. - Large distance between housing and work areas. - Restrict the possibility of any change or amendment in land use kind. -Social, economic and urban separation within residential areas. - Omission of other conditions such as density and building characteristics..
<i>Functional zoning</i>	<ul style="list-style-type: none"> - Its application is suitable for some areas that have a functional role for the surrounding areas - Improve functional performance for some land uses. -Achieve functional vision for each area and its integration with the surrounding areas. - Add other requirements besides the land use kind. 	<ul style="list-style-type: none"> - It needs to a clear development vision for each area. -Its requirements may conflict with general requirements. -This type causes some problems due to the developing of some uses at the expense of others - It focuses on some required requirements only for development process.

Modified zoning	<ul style="list-style-type: none"> - It is suitable for residential area that needs to provide services and job within it to reduce the distance between them. - It solves the negatives of land use separation. - Achieving some requirements of recent development. - Diversity of land uses in the same unit of development. 	<ul style="list-style-type: none"> -Causing environmental problems from the incorporation of some land uses. -Difficulty in future modification in land uses characteristics. - It does not cover all development requirements. - Difficult in implementation this type in areas with private properties.
Form- based codes	<ul style="list-style-type: none"> -It is suitable for new areas due to the ease of applying the requirements of urban design in them compared to the existing areas. - It gives flexibility in using land plots. - It achieves good design for buildings. - Meet the needs and requirements of societies and create a distinct identity for them. 	<ul style="list-style-type: none"> - It does not specify the kind of land use, which may adversely affect the development of the area. - There is a need for clear urban design standards. - It is difficult to apply this type in the existing areas, which differ in their characteristics from urban design standards. -It needs detailed requirements about land use characteristics.
Physical zoning	<ul style="list-style-type: none"> - It is suitable for developing areas with distinctive characteristics. - Control the kind of land use and the physical properties of buildings - Achieves good design, form and function for buildings. -Preserves the identity of each area. 	<ul style="list-style-type: none"> - The difficulty of future change in land use kind. - There is sometimes an incompatibility between the physical properties of buildings and their land use kind. - It does not cover all development requirements.. - Difficult to implement this type in areas with private ownerships.
Overlay zoning	<ul style="list-style-type: none"> - Suitable for areas with special characteristics that need additional requirements to protect and preserve them. - Achieving future requirements of development. - Merging between the comprehensive plan and the zoning plan. 	<ul style="list-style-type: none"> - This type needs detailed planning and design criteria for dealing with special nature areas. - Needs good management from the stage of information collection until implementation and follow-up stage. - There is a conflict sometimes between the added and current requirements which led to the disagree of some owners.
Guidelines zoning	<ul style="list-style-type: none"> - Contributing in developing some vital land uses such as commercial, service, and industrial uses. - Helps planners, owners, and investors to deal with these uses efficiently. -They are flexible and vary from use to another and from place to place. 	<ul style="list-style-type: none"> -These guidelines may conflict with some general requirements. -There is sometimes an effect of developing some uses on the surrounding uses. -It does not take into account a vision of the area with multiple uses, but focuses on specific uses only.
Incentive zoning	<ul style="list-style-type: none"> - It is suitable for application in areas with investment opportunities. - It proposes suitable land uses for the economic value of the place. - Achieves the variety of land uses, including housing, work and services, besides flexibility in development. - Brings some returns to the state, the private sector, and civil society. 	<ul style="list-style-type: none"> -There is a conflict sometimes between the stakeholders, besides the imbalance between their goals. - High cost of provided incentives by local authorities in some cases. -The private sector changes in some requirements to achieve his profitability. -It needs good management by local authorities.
Performance- impact zoning	<ul style="list-style-type: none"> -Ensures the achievement of development goals through performance evaluation indicators. - Supports the existence of compatible uses in different zones. -Monitors land uses and work to reduce their negative effects. - Avoids not complying with planning and design controls and requirements. 	<ul style="list-style-type: none"> -There are some non-measurable requirements and standards. -The Flexibility in application may lead to random implementation through some owners -It needs good management for monitoring, follow-up and evaluation -There is a need for comprehensive performance evaluation criteria.

Exclusionary zoning	<ul style="list-style-type: none"> - Avoid unwanted or incompatible uses from being in the area and improve the quality of life. - Maintain the economic value of the place and the social privacy. - Reduce the congestion rates and solving some environmental problems. 	<ul style="list-style-type: none"> - There is social isolation for some areas. - The lack of diversity in land uses in the same area. - This type is suitable only for some levels of housing (such as high-income housing areas). - Large distances between uses such as housing and work areas
Inclusionary zoning	<ul style="list-style-type: none"> - It reduces social separation and helps to mix different social groups in the same area. - It provides low-income housing units at low cost. - It works to activate the participation of the private sector in development process. - It helps to diversify land uses in each area. 	<ul style="list-style-type: none"> - It is more suitable for controlling land uses in the new areas than the existing ones. - Needs a good management from local authorities to follow up the implementation process. - It needs mechanisms for effective partnership with the private sector.
Conditional zoning	<ul style="list-style-type: none"> - Providing the residents' needs from services, jobs and activities. - Achieves satisfaction for the owners of land plots. - Flexibility in changing land uses. - Maintaining the economic values of land plots. 	<ul style="list-style-type: none"> - It needs a good management to determine the limits of permissible change in land use to avoid randomness. - Some owners only have the flexibility in changing their uses. - There is sometimes a negative impact on the other uses and the developing vision.
Intensity zoning	<ul style="list-style-type: none"> - Achieves satisfaction for the owners in determining the exploitation type of their properties. - It gives flexibility to the developers and the investors to make better use for their investments. - Flexibility in changing land uses and buildings characteristics. - Maintaining the economic values for land plots. 	<ul style="list-style-type: none"> - It needs good management to determine the limits of permissible change in land uses to avoid randomness - Only some owners have a flexibility in changing their uses. - There is sometimes a negative impact on the other uses or conflict with the development vision, as a result of the lack of precise definition of requirements.
Comprehensive zoning or hybrid zoning	<ul style="list-style-type: none"> - It is suitable for applying in different areas. - Achieves comprehensive development for zones. - Achieves good management for land uses. - It combines many requirements and conditions for land use management. - Create a relative compatibility between the objectives of different development parties. 	<ul style="list-style-type: none"> - The complexity and multiplicity of its requirements. - Conflict between the types of conditions and requirements that may lead to the random application. - There is a need to define the appropriate conditions for each area to achieve its development goals. - The Increasing in its flexibility beyond the limits of land use controlling.
Spot zoning	<ul style="list-style-type: none"> - This type is satisfactory to some landowners. - Achieves flexibility in suggestion the kind of land uses and their characteristics. - The possibility of modification the development plan for the public interest. 	<ul style="list-style-type: none"> - The lack of clarity in the development vision and its requirements. - Exceptions in changing some land uses may have a negative impact on urban environments. - It achieves the goals of some owners only. - There is no clear criteria for changing land uses.
Land use plot zoning	<ul style="list-style-type: none"> - Achieve an acceptance from the owners of buildings and land plots. - It is flexible in determining the kind of land uses in each land plot. - It links between the use of each land plot of and the total development vision for the area. 	<ul style="list-style-type: none"> - Failure in specifying the suitable requirements for each land plot may lead to randomness. - Only Some landowners benefit form this type. - There is a need to control the kind of land uses and their characteristics in order to achieve development goals. - needs good procedures for implementation this type.
Land use plot rezoning	<ul style="list-style-type: none"> - The possibility of a change in the kind of land uses and their characteristics. - Achieves a balance between the goals of the different parties. - The possibility of modification in the development plan for the public interest. 	<ul style="list-style-type: none"> - A conflict may arise between a landlord's desire and a development plan. - The lack of a clear development plan because of these amendments in land uses -- needs good procedures for implementation this type.

Source: Author according to the references of [4,5,8,9,10,11,12].

5. The main procedures and requirements for application zoning and rezoning in development informal areas

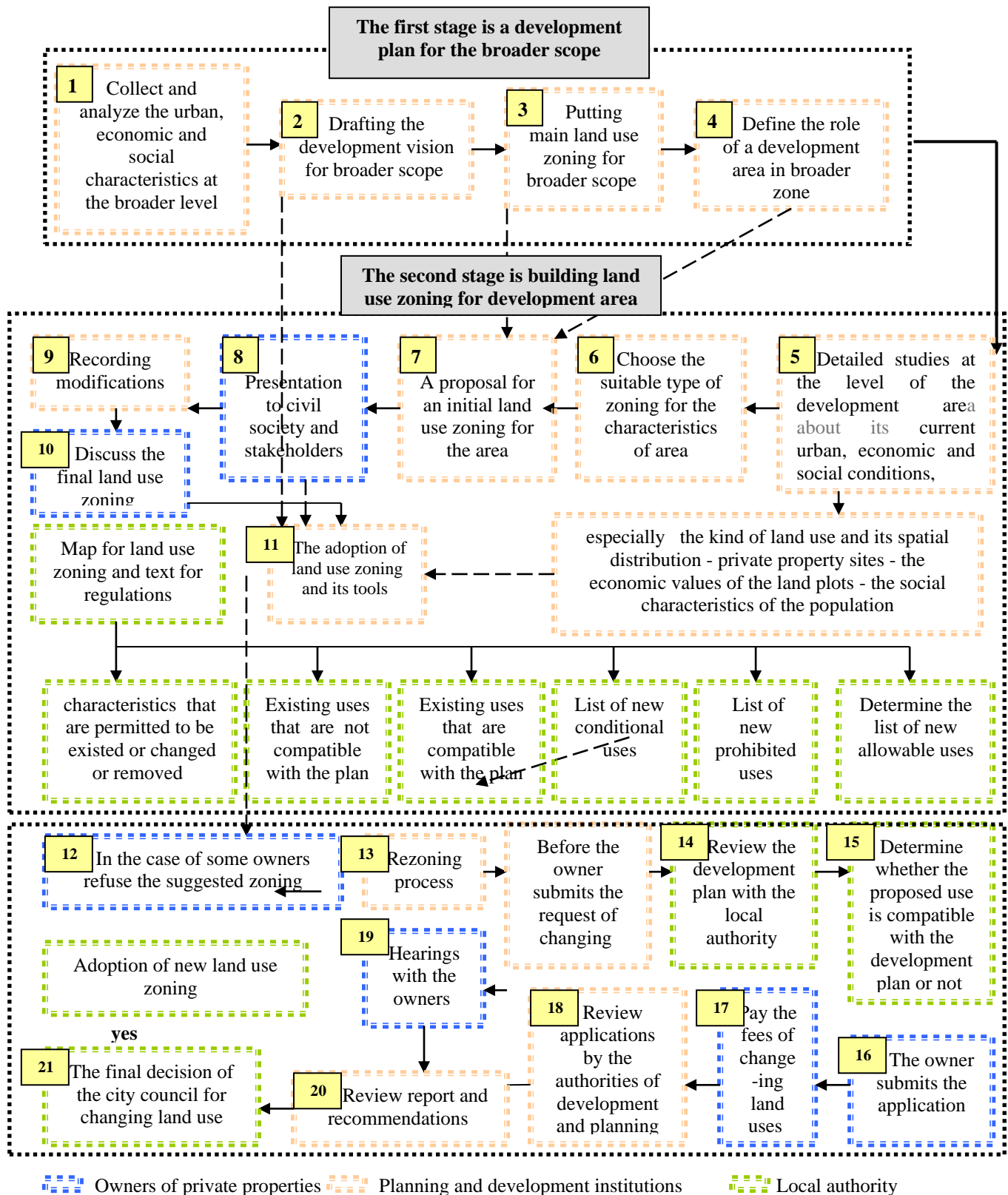


Figure 20: The process of land use zoning and rezoning in development informal areas (Source: Author)

6. Tools of application land use zoning in developing privately ownership areas

International experiences in this field have indicated that the choice of land use zoning types depends on a number of factors, which are the functional role of the area in the broader scope, as well as its main internal characteristics and the ownership patterns within it. In addition the interests of each landowner without wasting the economic values of the place or causing any increase in government spending towards paying the necessary compensation for implementation the zoning plan. All the types of land use zoning use some tools for dealing with private properties, which differ according to the type of owner and the degree of compatibility between zoning plan and the owners' needs as shown in the following figure 21.

Land owners	Real estate owners	Companies and investors	Residents	Unknown
<ul style="list-style-type: none"> -Buying land from owners at market price.. -land expropriation and paying the compensation for owners. -Providing alternative land within the site with the same value. -Providing alternative land outside the site with the same value. -Giving them residential or non-residential units with the same value. -Collecting their land plots with other owners. -Deduction part of land plot in exchange for compensation or incentives. -Providing incentives for changing the use of their land. -Establishing flexible requirements that achieve the goals of these owners. -The possibility of changing the suggested land use for the benefit of owners. 	<ul style="list-style-type: none"> - Removing buildings and rebuilding them in case of their deterioration. - Putting facilities in building permits. -Purchasing of buildings and land for development - Expropriation and paying an appropriate compensation. -Permission to build in another area within the site that has the same use. - Allowing to build in other sites. -Providing incentives such as (building heights- land use type –building side setbacks...) in return for commitment to the proposed land use. -Flexibility in changing land use that does not conflict with the objectives of zoning. 	<ul style="list-style-type: none"> -Facilities for investment and tax exemptions. -Negotiating to purchase the land for the state. -Offering suitable alternative land for investment within the site at the same price. -Offering suitable alternative lands for investment off-site at the same price. -Incentives for increasing the intensity of development in some areas in exchange for reducing them in others. -Building housing units for low-income people in return for granting land for investment. -Allowing additional land uses that do not conflict with the zoning proposals. 	<ul style="list-style-type: none"> -Alternative housing units during the development period. -Providing residential units for rent or ownership in the site. -Providing new off-site housing units for rent or ownership. -Compensation according to the types of tenure. -Financial support and facilities to pay the price of new housing units. -Integrating residential use with service and non-polluting activities. - Participation of residents in determining the characteristics of residential area and its housing units. 	<ul style="list-style-type: none"> - Recovering lands for state ownership. - Exploitation the properties that are not registered or without known owner according to the recommendations of zoning. -The state sells or leases out these properties and benefits from their returns. There are no financial or in-kind compensation for these properties.

The saving in Government spending

Figure 21: Tools of land use zoning for developing privately ownership areas (Source Author according to the references of [12,15,19,20,21])

7. Development informal areas with private properties in Egypt

7.1 Problems of developing informal areas with private properties

Land use zoning in Egypt is used for managing land uses in different areas, especially the informal ones by selection the suitable type of zoning and putting some conditions and recommendations for detailed areas, according to their environmental, social and economic characteristics. Most of these types are not taken into consideration the level of land plots and their ownership patterns. This led to some obstacles related to private properties in more than 60% of development projects as shown in the following points [22,23,24]:

- The refusal of citizens and owners to implement state' plans that focus on evacuating the area and changing its land use.
- The inadequacy of government compensation, whether financial or in kind.
- Not taking all the requirements of owners and residents when preparing land use zoning.
- Multiple and intertwined properties for the same land plot and there is no clear database of ownership patterns in many projects.
- Not using the policy of tenure rights security in the most of projects, although the proposed uses are similar with the current uses.
- State disruption towards the provision of drawings. demolition issuance and building licenses when applying the policy of empowerment (Self-development for homes).
- Incompatibility between the area of private properties and development proposals.

Therefore, there is a needs to formulate a new vision for dealing with private properties through choosing the appropriate types of land use zoning and offering alternatives tools to implement these with the least possible government funding and without any disagree from owners and population.

7.2 Land use zoning tools for developing informal areas with private properties in Egypt

Egypt has adopted many policies to develop slums during the previous periods, which used many tools for dealing with private properties as shown in figure 22. The first policy was *ignoring and neglecting* for informal areas in the late of 1970s, therefore there were no tools for dealing with properties during this period. After that, the first development attempt for informal areas appeared in early 1980s through the recognition of the existence of informal areas and direction to apply the policy of *removal* to limit their spread and get rid of any encroachments on state-owned lands and protect the public properties [23,24]. During this policy, there were neglecting for social dimensions and the stability of the population and owners whose their properties were dispossessed in exchange for low financial compensation. With the increasing of informal areas and the expansion of their area, the state tended to implement the second policy in the late eighties, which called *slum packing* to limit their growth through putting urban boundaries for them. However, this policy was not successful and there was a greater spread of informal areas on private agricultural lands in addition to the

expansion of construction on State-owned desert lands that characterized by their low price. These areas have emerged as a result of the absence of monitoring and follow-up from the state, besides the unclear housing policy for low-income social groups during this period [23,25]. Therefore, the housing policies in the new cities were developed from 1990s to meet the needs of low-income people, in addition to using new policies of development the informal areas through the application of a more participatory policy because of high costs of removal policy and the civil society's rejection for the removal decisions. This participatory policy focused on developing informal areas without any clearance except the degraded ones and used the suitable land use zoning types for each area according to its role, characteristics and needs. These types dealt with private properties through expropriation, financial compensation, providing alternative units in new cities or in same site after its development and the participation of different owners in the development process to implement health and safety standards [26]. Although the participatory policy has achieved some of the development requirements, the integrated organization and management for land uses in informal areas were not been completed. This led to formulate some laws of building and planning such as the Unified Building Law in 2008 for controlling the characteristics of different urban environments in a sustainable way and implementing development plans that aim to improve the living conditions in those informal areas [27]. In 2008, the Informal Settlements Development Fund (ISDF) was established, which classified the informal areas into two groups (unsafe areas with four degrees of risk and unplanned areas). Each type had suitable program and tools for dealing with properties and achieving development goals as shown in the following points: In the case of unsafe areas with the first degree of risk, the inhabitants are transferred to nearby areas in alternative units or compensated them financially. While population in the areas with second degree of risk were dealt with them through relocating or resettling or developing their urban environments without any transferring according to the characteristics of each area. Besides, the areas with third degree of risk need only some improvements in the infrastructure and services without removal or transferring the residents. Moreover, in the fourth degree of risk, there is a negotiation with the population to legalize their possession and on the other side; the unplanned areas are developed without transferring of their population and with the least of financial or in-kind negotiations [28]. The tools of dealing with private properties during the period from 2008 to 2011 were characterized by high government spending towards building permanent or temporary alternative units or paying the financial compensation or direct financing for development process. In addition to the lack of suitable alternatives for residents to choose from, therefore, there was a need to new tools and attempts for reducing that spending and achieve the desired development goals [29]. However, these attempts stopped during the revolution period due to the instability of the political situation until the year of 2016, in which ISDF set up programs to develop slums. Each program used some tools to deal with the properties to implement development plans and visions, as shown in the following points [29]:

- *The first program for developing life-threatening areas*, which located within natural hazards or near the high pressure or railways, whether on state or private properties. In this, case the dealing with properties was through immediate removal and some alternatives are provided to owners and population such as (financial compensation- transferring to alternative housing units in the new cities or to temporary units- paying rental values for a specific period until the appropriate housing units are available- providing lands in other sites for self-construction). This has been applied in the projects of Ezbet Khairallah- Al-Duweqa - Istbal Antar.

- *The second program for developing unfavorable housing on state property*, which characterized by cracked or dilapidated housing. In this program, the state followed some alternatives to deal with properties such as (gradual replacement with the existence of population and raising the current building density- transferring the residents to other state properties- rehabilitation of housing by the state or through the population by providing them easy loans- providing low financial compensation- negotiating with population to legalize their conditions and financing them to build new housing units), This has been applied in the projects of the Arsha area in Al-Marj district, Ramlet Bulaq area, Ash Bakri in Shubra Al-Khaimah And the nest of Sudan Street in the Dokki district).
- *The third program for development the inadequate housing areas on the lands under the jurisdiction of the central authorities* such as Agriculture ministry, Endowments and the national authorities. These areas are dealt with them through some tools (gradual replacement and raising the building density-transferring the population to other areas- providing appropriate financial compensation- negotiating with population to legalize their conditions and financing them to build new housing units). These tools were applied in the projects of railway nest in Badrasheen, Al Samakin district in Sohag, and Al Ashraf area in Minya.
- *The Fourth program for developing inadequate housing areas on private properties lands*, this program deals with private properties through some tools such as (granting permits for demolition, rebuilding and maintenance works- allow to self-development without interference from the government- removal by the state and paying compensation in the form of expropriation and financial compensation- alternative lands inside or outside the site- alternative housing units inside or outside the site- the amendment in land holdings by merging or dividing). These tools were applied in the projects of the Nile area in Al-Ayyat, the areas of the bath, the pilgrims, and Abu Murad in the Luxor governorate.
- *The Fifth program for developing inadequate housing areas on unstable tenure areas and unknown properties*. These areas have not information about the types ownership, and in this case the available tools to residents are represented in (transferring the population to new housing units outside the site at low prices- legalizing their possession and developing their housing).

Despite the multiplicity of used tools in the previous programs, the owners' adherence to the place and their properties remains the constant challenges, which face the development process of informal areas. Therefore, the state is looking nowadays for other appropriate tools for all owner-parties to implement development plans with the lowest government spending. These tools can be achieved by choosing suitable land use zoning which is compatible with the boundaries of private holdings.

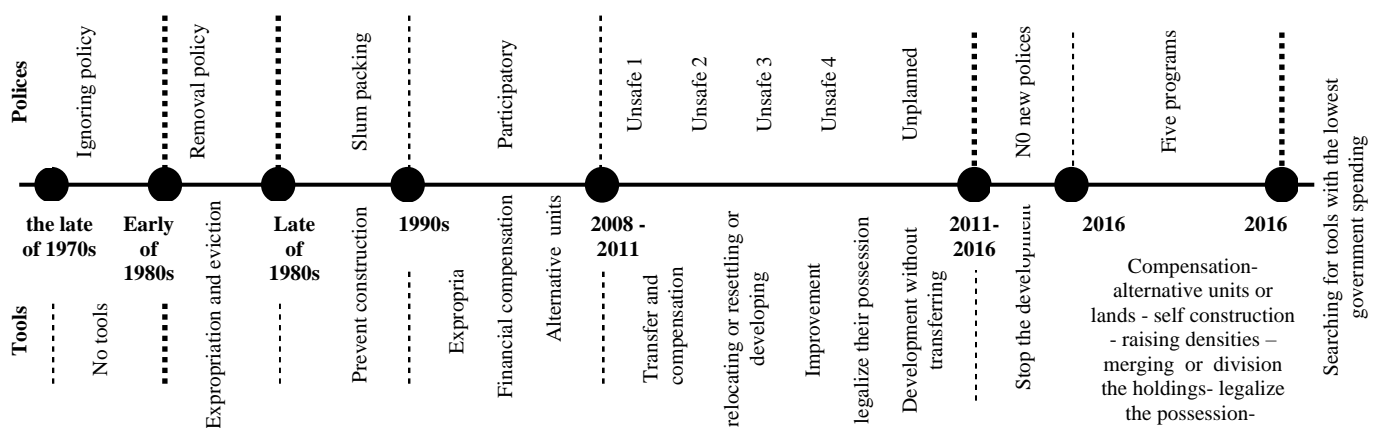


Figure 22: The main tools for dealing with private properties in the polices of developing informal areas
(Source Author)

7.3 Distribution of the informal areas with private properties in Egypt

The development and re-planning projects in Egypt were represented in the removal projects for unsafe areas (there are 22 areas in six governorates) and the development projects for 25 informal areas which were built on state properties in 13 governorates, in addition to development projects for eight areas which were built on the properties of central authorities in 6 governorates and the development projects for three areas which built on private properties.

Most of these projects were concentrated in the governorates of Cairo and Giza, as Cairo governorate included 36% of the total informal areas' population in Egypt. Moreover, the statistics of the Informal Settlements Development Fund shows that the number of unsafe areas in Cairo governorate reaches about 50 areas, of which distributed into four degrees of severity (14, 25, 10 and one area in order). These areas are existed in 15 districts that differ in their ownerships types as shown in the following table 2 .

This table also shows that Maspero Triangle area is one of the largest unsafe areas and has many types of properties. Therefore, this paper selects it as a case study to determine its land use zoning types and tools for dealing with private ownerships. In addition to clarification the most important challenges of zoning process to solve it and achieve the balance between the goals of private owners and development goals in this project and the future re-planning projects [30,31],

Table 2: Distribution of unsafe areas in the districts of Cairo governorate and their ownership types [31,32,33]

Division	Unsafe area	Area Feddan	No of housing units	Ownership types	Division	Unsafe area	Area Feddan	No of housing units	Ownership types
<i>Masr elgadema</i>	Schools complex	0.5	20	Private	<i>Nasr City 1</i>	Ezbet Al Arab 1	5.52	600	State
	Batn elbagar 1	3.5	120	private		Ezbet Al Arab 2	15.7	1421	State
	Ezbet Khairallah 1	7.8	407	State		Ezbat Nassar	1.12	290	State
	Ezbet Khairallah 2	1.3	42	State	<i>Mansheyet Nasser</i>	Youth Center area	11	578	State
	Ezbet Khairallah 3	5.9	364	State		Pharaoh's Valley	21.1	2177	State
	Istabl Antar	10.6	676	State		Mokattam Mountain	62.6	1273	State
	Ain Alsira	1.9	174	State		Compost land	4	676	State
	Abu Al Saud	5.1	480	State		Elnarsh	3.1	661	State
	Ezbet Abu Qarn	28.3	2525	State		Small areas	1.6	113	State
	Batn elbagar 2	25.1	1670	Private		Hadbat alharfayn	51.5	3685	State
	Ezbet Khairallah 4	5	258	State		Pharaoh's Valley 2	89.7	5023	State
	Istabl Antar 2	64.3	4237	State	<i>Alkhalifa</i>	Alabahya	0.5	134	State
	Elmadabg	7.8	595	Private		Friday market	7.1	180	State
	Ezbet Khairallah 5	18.3	1081	State		Masjid alrifaei	3	165	Private
<i>Elsalam</i>	Elsad Elalie 1	0.7	15	Private	<i>alsayidat zaynab</i>	Qalaeah alkbash	1.7	267	State
	Elsad Elalie 1	24.5	4918	Private		Tal aleaqarib	5.9	445	State
	Izbat Abu Rajila	52.9	900	Private		Almuaridui	3.3	271	State
	Elarsha	8.4	316	State	<i>hilwan</i>	Azab salam and Izbat Khalil	134	3860	State
	Nest of Elnahda	9.1	245	State		Ezbat alwalida	17.5	576	State
<i>Elmarg</i>	Al Zaraeeb	6.6	248	State		Mansheyet Gamal Abdel Nasser	20.3	395	State
<i>Bulaq</i>	Mosapero triangle	74	10.000	State +private + companies +authorities		Arab Abu Dahroug	7.2	244	State
<i>Matrea</i>	Izbat Alhasn	6.4	513	State		Arab kafar aleului	7.4	260	State
<i>Nasr City 1</i>	Ezbet El Haganah 1	10.9	690	State		kafar aleului	18.1	344	State
	Ezbet El Haganah 2	0.91	58	State	<i>altabayun</i>	tubayin albidu	20	1000	State

8. Land use zoning types and tools in the project of Mosapero triangle –Cairo governorate

Maspero Triangle area is one of the degraded slums located in the central area of Cairo Governorate. It is classified as *an unsafe area* with the second degree of risk (ISDF classification). Some agencies also deal with it as a *historical area* not as informal area, which needs to be developed to preserve its heritage value (classification of National Organization for Urban Harmony). On the other side, according to its urban structure characteristics, it can be classified as *a re-planning area* or an unplanned, which does not adhere to planning and design standards [34].

8.1 Location and area of Mosapero triangle project

Maspero project is located in one of the oldest district in Cairo governorate (Bulaq Abu El Ela district - West Cairo City) on an area of 74 feddan with total population size of 18 thousand person . It is characterized by high economic value as a result of its location between some vital areas such as Zamalek in the west, downtown in the south and Shubra in the north, as shown in Figure 23. it is surrounded also by the Nile Corniche in the north, the 26th of July Street in the eastern and northern side, while in the southern side, there are Al-Galaa Street and Abdel-Moneim Riad Square as shown in the following figure 24 [35].



Figure 23: Surrounding districts in Mosapero project (Source: Author)



Figure 24: The boundaries of Maspero Triangle project (Source: Author)

8.2 Land ownership types in Mosapero area

The ownership types in the Maspero Triangle area vary between public and private ownerships, the first one is the private ownerships which appear in 13.5% of the total area for the owners of the real estates and lands with small land plots, in addition to the residents who rent those real estates. The second type is the ownership of investment companies that represent 21.5% of the total area for the Kuwaiti company and 3.7% for a Saudi company. While the public ownership is the state's ownership, which is about 14.5% for the Ministry of Information, 13.5% for the Ministry of Foreign Affairs, and 11.5% for the Maspero Company. The rest percentages are distributed between other investment companies and the ownership of Cairo Governorate, in addition to some properties that are unknown as shown in figure 25 [36].

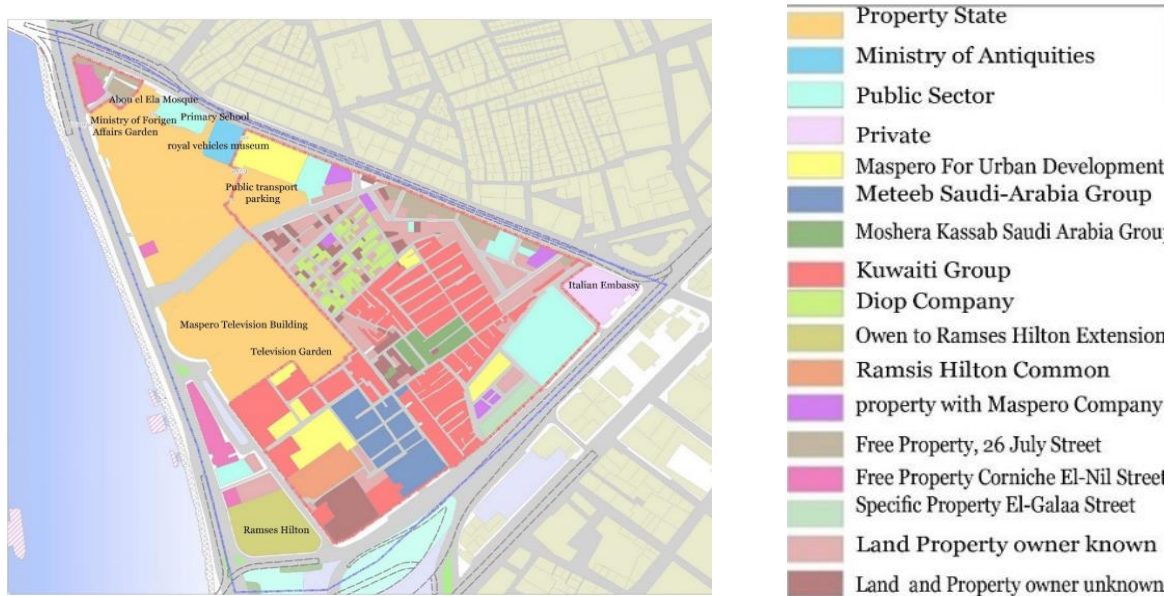


Figure 25: Land ownership types in Mosapero triangle area [36,37]

8.3 Main characteristics of Mosapero area before the development process

Maspero Triangle area is characterized by a set of urban, social and economic characteristics that have an effect on putting the zoning plans and their requirements. In addition to choosing the suitable tools for dealing with private properties to implement these plans. The following points show these characteristics [36,37].

8.3.1 Physical and Urban characteristics

- a. The total area of Maspero Triangle is about 74 feddan, of which 42 feddan are an unsafe area with a second-class risk and 58.5 feddan are development area as shown in figure 26.
- b. The area is located near the Egyptian Museum and Tahrir Square and includes some land uses with historical, tourism and media values (30% of the total building area), which need to be preserved and developed their surrounding areas, such as the Ministry of Foreign Affairs, the Italian Consulate, the Radio and Television Building and Dar Al Maaref Building.
- c. The existing land uses within the area vary between (residential– residential mixed - residential commercial- religious- cultural and social- administrative uses- craft uses- tourist uses), where the percentage of residential use reaches to more than 40% as shown in figure 26.
- d. Most of the administrative, education and social uses appear on state-owned lands, while residential and commercial uses are found on privately owned lands, whether for small owners or companies.
- e. The percentage of deteriorated buildings in the area reached about 20% of the total buildings in 2006, and the rest is in moderate condition, while this percentage increased to more than 40%

before the development period (in 2011), according to the studies of the Informal Settlements Fund.

- f. Average building heights in the area ranges from 2 to 4 floors.
- g. The area lacks from paved internal roads with adequate widths (internal roads reaches less than 6 meters) and has less areas for open green.
- h. The average number of units in each residential building ranges from 5 to 10 units and the average area of each unit is about 50 square meters.
- i. The area of most land plots in Maspero Triangle ranges from 40 to 200 m², which owned by small owners, while the other plots exceed 1000 m², which owned by companies.

8.3.2 Socio-economic characteristics

- a. The economic activities within the area are represented in the commercial activities such as shops of selling clothes, toys and furniture, in addition to the craft activities such as workshops of car repair, aluminum, iron and carpentry.
- b. Most of the commercial activities are concentrated on the main roads, while the craft activities are located within the residential area, and intertwined with the residential use.
- c. More than 70% of the total population works within the site in commercial, crafts and service activities, while the rest works in nearby surrounding areas.
- d. Most of buildings and land are owned by the private sector (more than 80%) and Its exploitation systems vary between (Tamlek systems- rent- usufruct), and the rent system is the predominant percentage (more than 60%), in which the average rental values of residential reach about 50 pounds per month.
- e. The area is characterized by its high economic value, especially the parts that are near from the Nile Corniche, the downtown area and 26th of July Street.
- f. The population size of the Maspero Triangle area is approximately 20 thousand person which has been characterized by a decline since the 1960s due to the demolition of many buildings and the increase in the ownerships of companies and investors.
- g. The social characteristics of the Maspero Triangle area differ from the surrounding areas, as it is inhabited by low-income social groups while the other areas such as downtown, Zamalek and Shubra are inhabited by Medium and high incomes.
- h. The existence of civil society organizations such as the Maspero Youth union which represents the residents of the area to attend the meetings with officials of the (Cairo Governorate, the Slums Fund, and planning authorities), to suggest the appropriate development plan for them and preserve the residents' rights for the adequate housing.

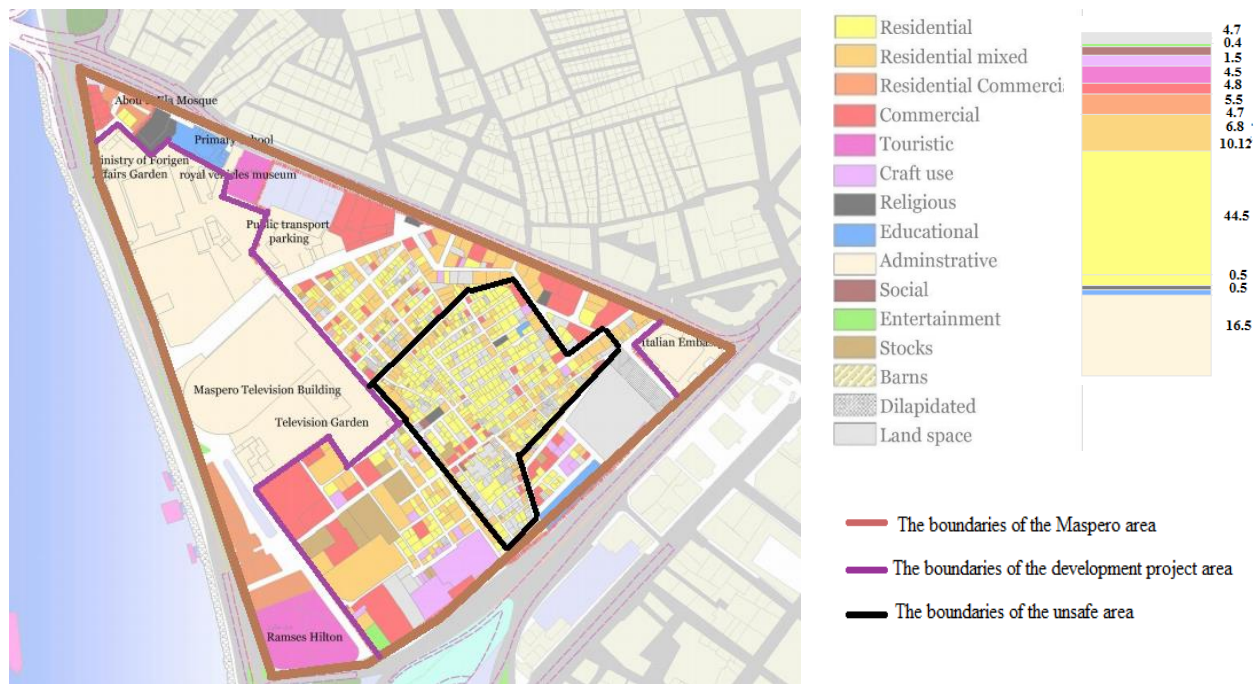


Figure 25: Distribution of land uses and their ratios in Mosapero triangle area [36,37]

8.4 Land use zoning types in Maspero Triangle project and the ways of dealing with private properties

Maspero area had many development process from the period of Ismail Pasha's rule (1830-1890), as the area was given to Circassians Pasha, who became its owner and benefited from the area by renting it for some time until the year of the revolution (1952). Then Maspero area became Waqf for old tenants and workers for a period of 20 years. During this period, many families stabilized within the area and they became the land owners over time. After the war of October 1973, some residents sold parts of the area (half of the total land plots) to companies (Kuwaiti, Saudi and Maspero companies) [37,38,39]. The dealing with private properties in Maspero Triangle area began in 1959 by confiscating some lands and buildings for construction the Ministry of Information, removal of some residential buildings in 1980 to build the Ramses Hilton Hotel and confiscating another land in 1989 for construction the Ministry of Foreign Affairs. From this date, there was a restructuring of the urban area as a result of many confiscations and demolitions of buildings for construction the administrative and tourist buildings, in addition to the demolition of many buildings after their deterioration and fall during the earthquake of 1992 [37,40]. In 2005, the Cairo 2050 plan aimed to develop Cairo governorate and Bulaq district. Through this plan there was a vision to develop Maspero Triangle area and turn it into an administrative and financial center, besides its role as historical and cultural center as shown in figure 27 [38]. Before 2008, there was no land use zoning at the level of Maspero area except the zoning and plans for Cairo governorate, which put development vision for its districts and areas. Then, there were many attempts to conceptualize and develop land uses in Maspero for achieving its development visions [37]. The first attempt was Maspero 'Triangle' plan in 2009 by (consultant Hossam Youssef) according to the proposal of the Cairo Governorate, so that its zoning division included investment areas, administrative and financial centers and did not include any residential areas for the residents, but for other social groups as shown in figure 28. [40,41] This zoning dealt with private properties by expropriation process and transferring of residents outside the site. In

addition to compensating them with housing units in new cities such as six October City and Al-Nahda City, or providing them financial compensation without any kind of other negotiations with them [37].



Figure 27: Cairo governorate plan 2005 and development of Maspero Triangle [38].



Figure 28: A proposal of developing Maspero Triangle area by the consultant Hossam Youssef [42]

However, this proposal was not accepted by the population and many demonstrations took place to express the rejection of the project due to the fact that more than 70% of the residents work within the site and the rest work in nearby sites that do not need to use public transportation. In addition to the diversity of means of transportation in Maspero that connect it with other areas in Cairo and Giza [39]. In 2010, an organized competition by the Urban Planning Authority and Cairo Governorate was held to develop the downtown area and achieve the vision of the 2050 plan. The Associated Consultants Office won this competition and putted a plan for developing downtown area, Bulaq Abu Al-Ela district and Khedivial Cairo area with the Maspero Triangle as shown in the figure 29. This plan supported the same previous idea of developing Maspero area as an administrative and financial center through replacing the poor people with higher social classes and building high towers through expropriation the current private properties and transferring the residents outside the site. Many decisions have been released to evacuate the population and implement the proposed development plan, but the residents also rejected this project and there was a disruption for the project during the revolution period due to the instability of the political situation in the state [37]. Moreover, the residents demanded in 2013 through their representatives (Maspero Youth union) to stay in the area after the development process without moving them outside the Maspero area. Therefore, Cairo Governorate proposed to build a number of residential towers inside the area on about 6 feddan for the residents and the rest of the area for investors and companies. Despite this suggestion, it was not implemented due to the inability to accommodate the population on this small allocated area [39]. With the establishment of the MURIS (Ministry of state for Urban Renewal and Informal Settlement) in 2014, the Maspero Triangle project was developed by thinking about participatory zoning through consultation and partnership with residents, investors and all parties that own land and real estate in the area. This project is assigned to MADD Group, which studied the different characteristics of the area in the

dimensions of urban, social, economic and environmental. In addition to discussion the project with the residents and their representatives ((Maspero Youth union) and all related parties to get the consensus between the different the goals of the stakeholders [36].The project of MADD relied on redistributing the land properties in a way that divided Maspero area into investment areas to achieve returns for the investors, residential areas for residents who want to reside in the area after the development process, areas that have Historical and cultural values and areas for services and recreational activities to serve residents and investors as shown in figure 30 (strategic concept for Maspero area) [36].



Figure 29: The plan of developing downtown area [42]



Figure 30: Strategic concept for developing Maspero area [42]

The following figure 31 shows the main steps of formulation land use zoning and strategic concept for developing Maspero area by MADD Group:

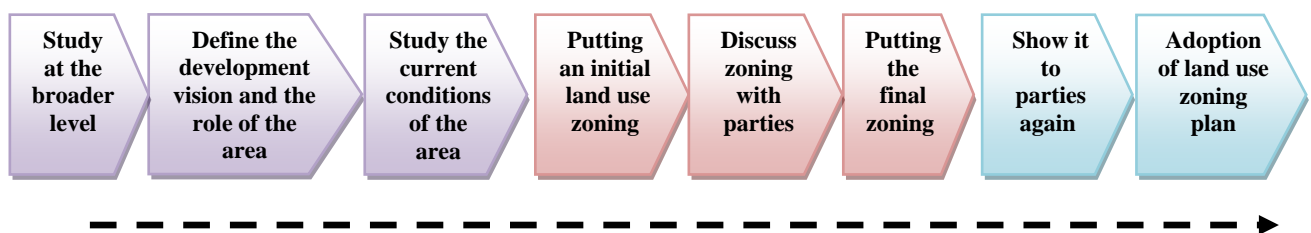


Figure 30: Steps of formulation land use zoning and strategic concept for developing Maspero area (Source: Author)

The dealing with private properties through this project varies between (financial compensation of about 50 thousand pounds for each room- alternative apartments outside the project area- new apartments in the project after collecting small private properties along 26th of July Street which have an area 12 feddan and own by the state and some companies). The residents get theses new apartments by choosing suitable method of utilization for them such as (owning the housing unit through paying monthly installments of up to 400 pounds for a period of 20 years- rent for a period of 50 years with a rental value of up to EGP 170 per month).[36,37].

According to the previous strategic concept of Maspero area, the Ministry of state for Urban Renewal announced for a competition in 2015 to prepare a detailed plan for project implementation which was won by Foster and Partners' office. This detailed plan divided Maspero into six areas as shown in figure 31 (residential use on an area of 20 thousand square meters for about 14 thousand inhabitants and includes a number of residential buildings about 27 buildings with a height of 36 meters and multi-use activities in a cultural, historical and service center center- investment uses with medium density near the residential area - investment uses with High density on the Corniche - recreational areas - commercial areas - heritage areas). The rest of project area is distributed to the owners according to the share of each owner before the development process and this area will be used according the recommendations of the plan. [40,41].



Figure 31: A proposal of developing Maspero Triangle area by Foster and Partners' office [43]

After the cancellation of the Ministry of state for Urban Renewal in 2015, the project was transferred to the responsibility of the Ministry of Housing, which undertook the meeting with the different owners in Maspero to negotiate with them for project implementation satisfactorily. The Ministry of Housing developed the ways of dealing with private properties by suggesting some alternatives, which differ according to the type of owner. The available alternatives for the owners of land and real estates are (participation in development process with their lands through building new housing units for residents after deducting a percentage from their land for roads and services- obtaining another land in or out the site at the same value and price- obtaining financial compensation after the dispossessing of their land) [41]. While the available alternatives for residents are obtaining new housing unit with an area that ranges between 60 to 75 m² and with old rent system in the same area. The rental value of these units varies between 2500 to 3000 pounds per month which are paid through the monthly interest of compensation amount (60 thousand pounds for each room) and what the residents pay monthly as price difference (300 to 1500 pounds). In addition to the new housing units with the ownership system (ownership rent) by paying the compensation value as a down payment and paying the rest of the amount in monthly installments over 20 or 30 years. The total price of unit with ownership system ranges between 350 thousand pounds to 750 thousand pounds, and the monthly installment ranges between 600 to 3000 pounds per month. The other alternatives are financial compensation for leaving the area, which ranges between 100 to 280 thousand pounds, or getting new housing unit in Alsmarat area with no down payment and installments for a period of 30 years. [36,37,40,41]. The owners of non-residential units are compensated with one of the following alternatives (new commercial activity unit in the area - rental or ownership housing unit in new cities - obtaining

new housing unit in the same area under the rent or ownership system - appropriate financial compensation for them). There was no vision about the dealing with the investment uses in Maspero area, and nowadays the Ministry of Housing attempts to negotiate with (Saudi and Kuwaiti companies and the Holding Company for Construction) to purchase a number of their land plots (160 land plots) at market prices to establish investment projects through a group of investors. The alternatives for companies were collecting their properties in the area to establish investment uses or buying their land at market price by the state. After putting the all alternatives for dealing with the different types of private properties, The percentage of residents who preferred to remain in the area reached about 22%, in which most of them owned commercial activities within the area,. In addition to 77% preferred to leave the area, and 1% rejected the project. The residents who left the area only 5% choosed to move to Alsmarat area and the rest decided to obtain financial compensation. The final detailed plan was adopted in 2018 as shown in figure 32 and the Ministry of Housing determined a period for implementing the project, which is about 5 years, so that the government builds units for the population and the owners of land and real estate sell or invest their lands according to the recommendations of zoning [41].

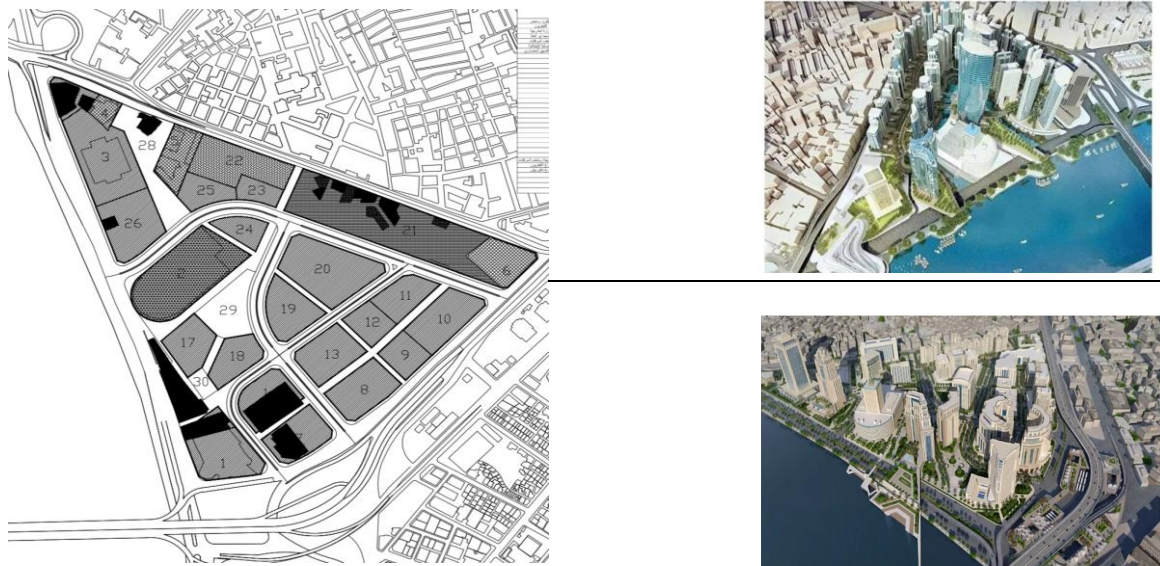


Figure 31: the final detailed plan for developing Maspero Triangle area [44]

The following figure 32 shows the development of land use zoning types in Maspero area through all development attempts, with an explanation of the most important tools, which used in every type to deal with private properties.

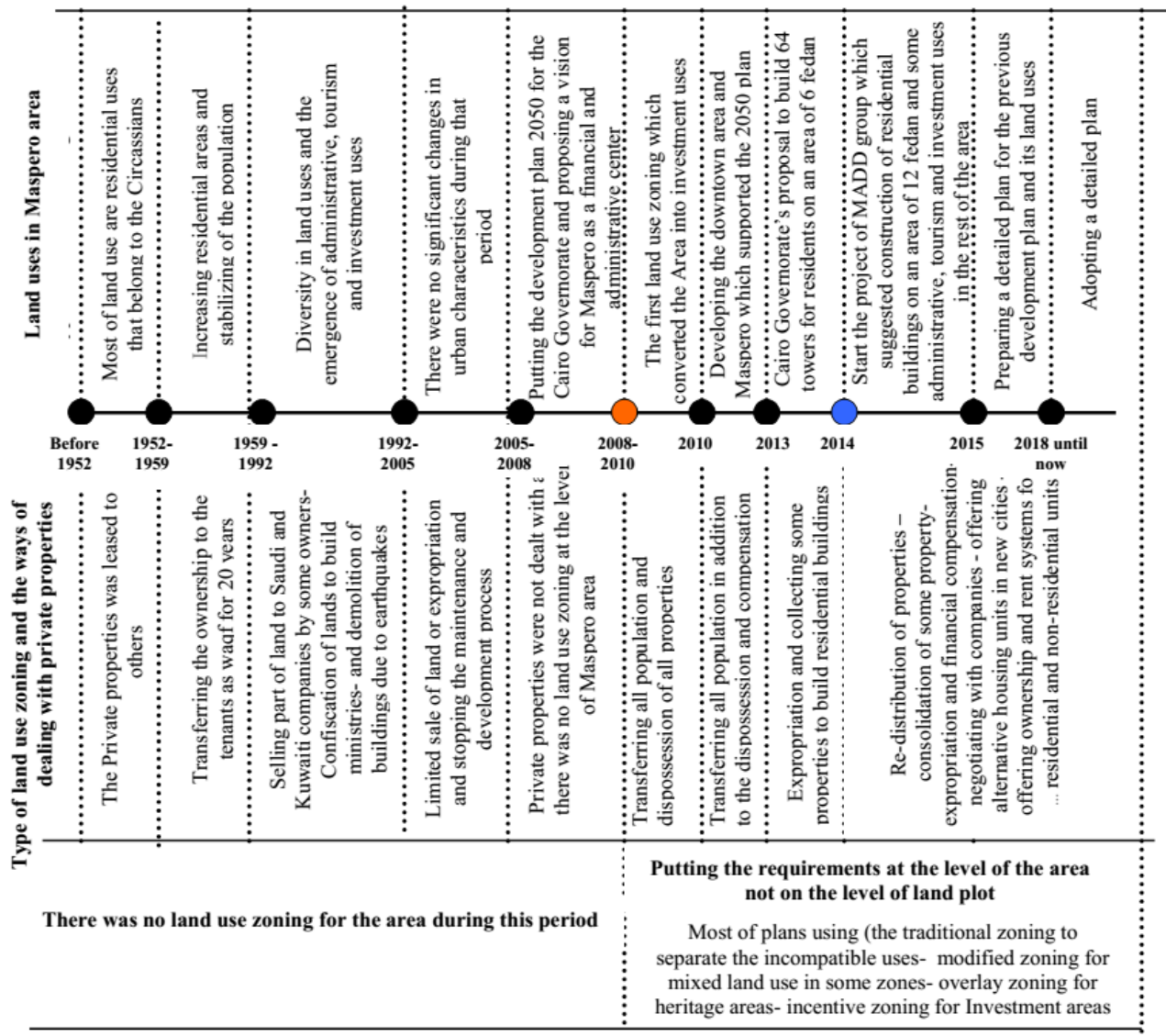


Figure 32: Land use zoning types and tools in Maspero area through all development attempts (Source: Author)

9. The main challenges of private properties when applying land use zoning for re-planning Maspero Triangle area

The final re-planning project of Maspero area used some types of land use zoning which represented in the *traditional zoning* to separate incompatible uses, *modified zoning* to introduce some mixed land use in some areas for investment and *overlay zoning* to preserve historical, administrative and tourist areas as existing uses. These types of zoning faced a set of challenges related to the existence of different types of private properties, which are represented in (real estate and landowners- residents- companies- state properties- unknown properties). The following table shows these challenges according to the ownerships patterns.

Table 3: The main challenges of private properties when applying land use zoning for re-planning Maspero area

Type of ownership	Main challenges	Type of ownership	Main challenges
Real estate and land owners	<ul style="list-style-type: none"> -Incompatibility of compensation values with the economic value of the land. -Difficulty in property consolidation in some areas. -The proposed land use in zoning differs from the desires of the owners. - Transferring craft activities that exist in their properties. - Difficulty in changing land use after putting the zoning. -Some landowners refused to leave their lands. -Owners are obligated to change the craft activities to commercial activities which are not suitable for them. - The inflexibility of the requirements in meeting the needs of owners. - Executing the decisions of property expropriation without the negotiation with some owners. -Unfair price estimation for some land plots. - Useless of their land reusing requests. - Pay extra high fees if they want to increase the building heights in their properties. -Most of land owners have land plot with an area of 50m2 which are not suitable for proposed land use. - Low prices of alternative lands in new cities in comparison to their land prices. 	Saudi and Kuwaiti companies	<ul style="list-style-type: none"> -They own land plots in different places which spread over the site. - Inappropriate price estimation for some land plots which owned by companies. -Not specifying for zoning type that offered investment uses for companies in the new land use zoning. - Requiring companies to build housing units for the population in exchange for obtaining land plots in investment areas. -Companies bought many land plots and housing buildings from landowners and residents. - The companies refused to negotiate with the state to sell some of their land plots. - These companies owned a large portion of the area. -There are no binding requirements for the investment zone within the project. -There are no encouraging investment incentives for companies.
		The state	<ul style="list-style-type: none"> -Continuing administrative uses as constants in the new division, which weakened its flexibility. - The state does not own all the allocated lands for building residential units. -Weak government funding to pay compensation, build housing units or buy land from companies. -There are no clear requirements for investment, historical and value areas that lead to a negative impact on the objectives of the zoning. - Failure to take into account the appropriate activities for population in the new zoning. - Segregation between land uses without any goal or consideration the functional complementarity between them. - Concentrating the investment uses in one area despite the multiplicity of areas with high economic values in the project. - There is no clarity for the provided incentives to investors to use their properties in a manner consistent with the plan. -Lack of flexibility in changing or modifying the proposed uses.
Residents	<ul style="list-style-type: none"> - Some residents refused to leave the area or move outside it. - Increasing the value of the monthly installments of new housing units compared to the residents' income level. - Low compensation value compared to the economic value of old residential units. -The absence of craft activities in the new zoning that some residents work in. -Transferring most of the residents' work activities outside the area. - Providing alternative housing units for the residents in Asmarat project, which are far from services and workplaces. - The new housing units have small area that do not meet the residents'needs -some residents have not ownership documents, which made it difficult to compensate them. -Unsuitable price estimation for some old residential units. - Residents bear a high price difference to obtain new housing units that exceed their average incomes level. 	Unknown properties	<ul style="list-style-type: none"> -There are no ownership documents for some land plots. -Lack of an updated database of ownership patterns. -Multiplicity of owners for the same land plot.

10. Results and Recommendations

This paper discusses the types and tools of land use zoning for dealing with private properties in re-planning informal areas. These types and tools differ in the degree of their compatibility with the boundaries and characteristics of private properties as the previous studies and international experiences have shown that there are about 17 types of land use zoning. The appropriate type is chosen for development each informal area in order to meet the requirements of the various development parties and owners with the least government spending. These types were represented in:

The first type (*traditional zoning*) which concerned with identifying specific one kind of land use in each zone and separation between the incompatible uses - The second type (*functional zoning*) puts conditions for each kind of use to increase its functional performance but also preserves the separation between incompatible uses - The third type (*modified zoning*) allows a combination of uses or mixed land use to meet the needs of residents and owners – The fourth type (*form based code*) determines the development pattern in each zone without specifying the kind of land use to give more flexibility for owners- The fifth type (*physical zoning*) sets all required physical characteristics in each zone to distinguish it – The sixth type (*overlay zoning*) controls only land uses through what is allowed, and not allowed in addition to what can be added and what must be protected from uses- The seventh type (*guideline zoning*) which sets conditions for specific uses only for its development and not for all uses in the area- the eighth type (*incentive zoning*) creates incentives for investors to develop some zones- the ninth type (*performance-impact zoning*) identifies some standards of measuring development performance for land uses to achieve sustainability for all area in all dimensions- the tenth type (*exclusionary zoning*) does not specify the kind of land uses in the area but puts only some conditions which supports the existence of specific uses and avoids the others- the eleventh type (*inclusionary zoning*) defines a percentage for all uses to allow all levels of housing and desired uses to exist in the area- the twelfth type (*conditional zone*) gives flexibility in dealing with uses by allowing increased density, removal, addition, development or change current uses within the area- Thirteenth type (*intensity zoning*) distributes the densities only within the area without specifying the types of land uses- the fourteen type (*comprehensive zoning*) which uses all the previous types in the same area in order to achieve its development goals and prevents the rights of owners- the fifteenth type (*spot zoning*) allows flexibility in dealing with some large land plots- the sixteenth type (*land use plot zoning*) puts flexible requirements for each plot of land to achieve a balance between the owners' requirements and the development visions- the seventeenth type (*land use rezoning*) deals with each land plots and allows to change its land use within the acceptable limits. The balanced development of any informal area depends on selection the appropriate type of land use zoning from the previous types. The selected type must be compatible with the types and characteristics of private properties and has less expensive tools, which far from financial or in-kind compensation and satisfactory to all owners. Therefore the results of the previous studies indicated the importance of using new tools for dealing with private properties to implement zoning plan in a way that does not conflict with the vision of development and fulfills the requirements of the owners and residents. The most important of these tools are (collecting or dividing land plots- deducting small areas from land plots for development purposes in exchange for an acceptable compensation- flexibility in changing land use kinds, densities, dimensions, or addition the new uses- granting incentives to investors - granting loans to owners for self-development). On the other side , the results of Egyptian case study (the project of re-planning the Maspero

area) showed that the final project uses traditional land use zoning such as traditional and mixed zoning, which do not take into account the boundaries or characteristics of all private properties. These led to using a number of tools to deal with to implement the project, which was characterized by the high government spending such as the financial compensation, alternative units or lands in addition to the costly negotiations with companies. For these reasons, this paper raises a set of recommendations related to land use zoning types to be applied in the Maspero project or future projects for re-planning informal areas. Those recommendations are:

- Defining only the main types of land use to give the owners enough freedom to choose suitable use.
- Implementing the separation of land use in limited cases which have only a negative impact to minimize the change in the current properties.
- Putting requirements and conditions for all land uses, including their density and relationship with neighboring uses, to ensure their functional performance and achieve good management for land uses.
- Merging of land uses in residential areas to achieve the needs of the population from services and job opportunities.
- Determine the permissible and impermissible uses and what can be added in the area to give the owners enough flexibility to adapt with them.
- Subtracting the pattern of development and its intensity in each part of the area without specifying the type of land use to give the owners sufficient flexibility in determining the suitable exploitation of their properties.
- Establish incentives for investors such as providing a road network and infrastructure and making facilities and exemptions to implement investment uses in development projects.
- Using performance- impact zoning to monitor the performance of land uses after development and achieve their sustainability.
- Dealing at the level of land plot to reconcile it with the zoning plan, and in the case of incompatibility, the flexibility is allowed to change the use of zoning plan as long as it does not have a negative impact on the development vision.
- The possibility of combining or dividing land plots to achieve the development requirements, when the different owners' goals are consistent or there is one owner for them.
- Flexibility in putting conditions that can be implemented in more than one way, according to the vision of owners and population.
- Minimizing the changes in properties and their characteristics to achieve a balance between development goals and owners' goals.
- Granting facilities to the owners for self-development instead of their transferring, expropriation, or financial compensation.

References

- [1]. Ellickson, R. (1973), "Alternatives to Zoning: Covenants, Nuisance Rules and Fines as Land Use Controls." University of Chicago Law Review, Vol. 40 PP 681–782, available at: <https://chicagounbound.uchicago.edu/cgi/viewcontent.cgi?article=3777&context=uclrev>
- [2]. Zoning in United States, available at: https://en.wikipedia.org/wiki/Zoning_in_the_United_States
- [3]. Fischel, W. (1985), " The Economics of Zoning Laws", Baltimore: Johns Hopkins University Press, available at: <https://www.jstor.org/stable/3146477>
- [4]. Rodrigue, J.P. (2020), " Types of land use zoning" in the Geography of transport systems, fifth edition, New York, available at: https://transportgeography.org/?page_id=4956
- [5]. World Bank. (2019)," Zoning and land use planning ", available at: <https://urban-regeneration.worldbank.org/node/39>
- [6]. Acioly,C. (1999),"Institutional and Urban Management Instruments for Inner City Revitalisation: a brief review with special focus on Brazilian experiences", Brazil: s.n, available at: <https://www.semanticscholar.org/paper/Institutional-and-Urban-Management-Instruments-for-Acioly/05514c9d1e63762d00f36e74855167a818f60358>
- [7]. NYC Government. (2020),"zoning Glossary", Zoning Handbook, available at: <https://www1.nyc.gov/site/planning/zoning/glossary.page>
- [8]. McDonald, J and McMillen, D. (1996), " Zoning and Efficient Use of Urban Land" In Urban Land and Housing Reform in Socialist and Formerly Socialist Countries, ed. Tolley, G., Hao, S. and Occomy, M., pp 531–564. Mount Pleasant, MI: Blackstone Books.
- [9]. Richard, C. (2020), "The Pros and Cons of Zoning", available at: <https://www.rcsanda.com/Experience/Pros&Cons.htm>
- [10]. Ellickson, R. and Tarlock, A.D. (1982), " Land Use Controls: Cases and Materials" Boston: Little,Brown.
- [11]. Speyrer, J.F. (1989), " The Effect of Land-Use Restrictions on Market Values of Single-Family Homes in Houston", Journal of Real Estate Finance and Economics Vol. 2, pp 117–130, available at: <https://link.springer.com/article/10.1007/BF00159794>
- [12]. Peterson, G.E. (1973), "The Effect of Zoning Regulations on Suburban Property Values", Urban Institute Working Paper No. 1207-24.Washington, D.C.
- [13]. City of Billings Pattern Guide. (2020)," What is zoning", available at: <http://www.billingspattern.com/what-is-zoning.html>
- [14]. Glaeser, E. and Ward, B. (2009), " The Causes and Consequences of Land Use Regulation", Evidence

- from Greater Boston.” *Journal of Urban Economics*, Vol. 65, pp 265–278, available at: https://scholar.harvard.edu/files/glaeser/files/the_causes_and_consequences_of_land_use_regulation_evidence_from_greater_boston_2009.pdf.
- [15]. Library, City Planning and Zoning Commission of the Chicago Real Estate Board on Zoning in Chicago, Final Report, 1923. available at: <https://www.chicago.gov/city/en/depts/dcd/provdrs/admin.html>
- [16]. Performance-Based Zoning Model, 29 Sept. 1998, available at: <http://tylertopics.com/cityhallcommons/topiclist/c232.perfzoning.html>
- [17]. Fairfax country. (2020), Department of planning and development, Rezoning process, available at: <https://www.fairfaxcounty.gov/planning-development/zoning/rezoning-process>
- [18]. Rochester Development Guide, (2020), " Land use zoning process", available at: <https://www.rochestermn.gov/departments/community-development/planning-zoning/rochester-development-guide/land-use- zoning-processes>
- [19]. Office of Planning, Development and Community Infrastructure. (2019), " Basic Land use tools for resiliency", New York State Department of State, available at: https://www.dos.ny.gov/opd/programs/resilience/1_Basic%20Land%20Use%20Tools%20for%20Resiliency_All.pdf
- [20]. Ellson, R. and McDermott, J. (1987), " Zoning Uncertainty and the Urban Land Development Firm.” *Journal of Urban Economics*, Vol. 22, pp 209–222, available at: <https://www.sciencedirect.com/science/article/abs/pii/0094119087900428>
- [21]. Fischel, W.A. (1990), " Growth Controls Matter?: A Review of the Empirical Evidence on the Effectiveness and Efficiency of Local Government Land Use Regulation", Cambridge, MA: Lincoln Institute of Land Policy.
- [22]. Alfiky, M. (2014), " Community Based Security of Tenure", (Initial Framework for Squatter Areas in Cairo), Cairo: A Thesis submitted in the Partial Fulfillment for the Requirement of the Degree of Master of Science in Integrated Urbanism and Sustainable Design, available at: https://www.academia.edu/36654940/Community_Based_Security_of_Tenure_Initial_Framework_for_Squatter_Areas_in_Cairo
- [23]. Alghohary, S. and El-Faramawy, A. (2010), " Egyptian approach to informal settlements development. Cairo: presentation at the Global Risk Forum, available at: <http://www.slideshare.net/GRFDavos/egypt-for-idrc-2-june-2010-finalpptx>.
- [24]. Amnesty International, We Are Not Dirt’ Forced Evictions In Egypt’s Informal Settlements, United Kingdom: Amnesty International Ltd, 2011, available at: <https://www.refworld.org/pdfid/4e5739602.pdf>

- [25]. Fowler, J. (2015), "Egypt moves on slum resilience", available at: <http://www.unisdr.org/archive/43191>
- [26]. El-Shahat, M. and El-khateeb, S. (2013) " Empowering people in Egyptian Informal areas by Planning: towards an intelligent model of participatory planning" *The Journal of Urbanism*, Vol. 26(1), pp 1-11, available at: http://media.planum.bedita.net/6b/9d/41_CTBT2012_by_Planum_no_26-2013_El-Shahat-et-al_Section_4-1.pdf
- [27]. Egyptian Ministry of Justice "The Encyclopedia of Unified Building Law no. 119 of 2008 and Its Regulation no. 144 of 2009", Egypt: s.n.
- [28]. Khalifa, M. " Redefining slums in Egypt: Unplanned versus unsafe areas" *Habitat International*, Issue 35, pp. 40-49, available at: <https://www.sciencedirect.com/science/article/abs/pii/S019739751000024X>
- [29]. El Maabady, B. (2016), " Reviewing the ISDF strategy for dealing with Slums in Egypt" Master Thesis, School of Global Affairs and Public Policy, The American University in Cairo, available\ at: <http://schools.aucegypt.edu/Sustainability/CSD/Documents/Community/AUC%20Report%20web%20file%2020-2.pdf>
- [30]. Sims, D., Sejourne, M. and El Shorbagi, M. (2003), " "Urban Slums Reports:The Case of Cairo, Egypt, (Case Studies for the Global Report on Human Settlements), available at: https://www.ucl.ac.uk/dpu-projects/Global_Report/pdfs/Cairo.pdf
- [31]. Cairo Governorate.(2017), "Cairo Governorate's Experiences in Informal Areas Upgrading", (presentation material prepared for the JICA Data Collection Survey Mission), Cairo, Egypt, available at: http://open_jicareport.jica.go.jp/pdf/12013439.pdf
- [32]. Sejourne, M. (2009)," The History of Informal Settlements". In: GTZ. (ed), *Cairo's Informal Areas Between Urban Challenges and Hidden Potentials: Facts. Voices. Visions*, Cairo, GTZ Egypt, available at: http://cairoclimatetalks.net/sites/default/files/Cairos-Informal-Areas-Between-Urban-Challenges-and-Hidden-Potential 2009_EN.pdf
- [33]. GTZ Egypt.(2009), "Improving informal areas in Greater Cairo", Egypt, Cairo, available at: www2.gtz.de/dokumente/bib/gtz2009-0424en-cairo-informalareas.pdf.
- [34]. All Africa Global Media. (2015)," Egypt: PM Reviews Plan for Developing Maspero Triangle", available at: <http://allafrica.com/stories/201412200229.html>
- [35]. Zaazaa, A. (2015), " Update on the status of Maspero triangle project, 2015, available at: <http://cairoobserver.com/post/124935477199/update-on-thestatus-of-maspero-triangle-project#.VbObM7Oqqkr>
- [36]. MADD. (2014), "Maspero Parallel Participatory Project", (Draft Report), Cairo, available at: https://issuu.com/maddplatform/docs/maspero_parallel_participatory_proj

- [37]. Gate Way. " Pervious studies for the development of Maspero area ", Cairo, Egypt :s.n.
- [38]. Tadamun, Cairo 2050 Revisited: A Planning Logic, (2014), available at: <http://www.tadamun.info/2014/07/10/introduction-cairo-2050-planning-logic/?lang=en#.VW2tZs8iq1s>
- [39]. Maspero Youth Association triangle volunteer (Facebook Page), available at: <https://www.facebook.com/pages/Maspero-Youth-Associationtriangle-volunteer/172668542848111?ref=ts&fref=ts>
- [40]. Maspero Company. (2014), "Maspero Triangle", available at: <http://masbiro.entejsites.com/en/maspero-triangle/>
- [41]. Investgate. (2020)," The Maspero Triangle : A Zero to A Hero project?, available at: <https://investgate.me/features/the-maspero-triangle-a-zero-to-a-hero-project/>
- [42]. MennatuAllah, M.H. (2015)," Connecting Urban Policy Making and Implementation - Case of Maspero, Cairo, Egypt" , Cairo, A Thesis submitted in the Partial Fulfillment for the Requirement of the Degree of Master of Science in Integrated Urbanism and Sustainable Design, available at: https://www.researchgate.net/publication/330840639_Connecting_Urban_Policy_Making_and_Implementation_Case_of_Maspero_Cairo_Egypt
- [43]. Brooker, G. (2015), "Foster + Partners wins Maspero Triangle District Masterplan Design Competition", available at: www.fosterandpartners.com/news/archive/2015/11/foster-partners-wins-masperotriangle-district-masterplan-design-competition/
- [44]. Middle East site. " Egypt begins developing the Maspero Triangle", No 14358, available at: <https://aawsat.com>