Linking Urban Regeneration to Sustainable Urban Development of Smart Cities

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1 ABSTRACT

Urban regeneration involves the revitalisation of distressed urban areas, through actions such as rehabilitation of historic areas, improvement of living conditions in residential districts, redevelopment of public spaces, and modernisation of urban infrastructure (Alpopi & Manole, 2013). The label 'smart city' has an impact on urban strategies in both large and small towns. It helps to face the increasing problems of urban areas, local public government, companies, non-profit organisations, and the citizens themselves. They all embraced the idea of a smarter city, using more technologies, creating better life conditions and safeguarding the environment for a better quality of life (Dameri & Rosenthal-Sabroux, 2014).

This research focuses on adopting an inductive methodology of sustainable urban development in smart cities through a specific framework to be applied on the urban regeneration of city centres in cities with historical background. This will be carried out through the analysis of the interrelationship between the key principles of both urban regeneration and smart cities with the aim to compile a comprehensive list of principles. This inductive methodology will be validated through a comparative study of selected relevant examples. After that the development framework will be used to apply the compiled ideas and principles, and to verify its potential to formulate multiple scenarios of urban regeneration of city centres.

After that, the scenarios of development will be tested on a case study of the city of Alexandria in Egypt, by using multiple research methods such as focused interviews, structured questionnaires, personal observation and assessment. This study aims to conclude with a set of guidelines for intervention in similar urban contexts in general, as well as in the specific case of Alexandria with its particular conditions.

Keywords: sustainable urban development, smart cities, public spaces, case study, urban regeneration

2 INTRODUCTION

The term "urban regeneration" was evolved after the Second World War in Europe and Britain, mainly due to the decline of industries after the war. Since that time, government policies have been focusing on urban regeneration to achieve a better society (SAĞ, 2010). Today, urban regeneration aims to address issues that are associated with the improvement of the economy and employment, economic competitiveness, social exclusion, community issues, vacant and deteriorated sites in cities, new land and property requirements, environmental quality, and sustainable development. Also, governments and researchers since the 1990s have been using the term "smart cities", which has been spreading all over the world (Ramaprasad, Sánchez-Ortiz, & Syn, 2017). The majority of its definitions highlight common characteristics and components that may specify the perspectives of smart cities. It includes the enhancement of the quality of life for citizens through utilising information technology hardware, software, networks, and data for different city areas and services (Al Nuaimi, Al Neyadi, Mohamed, & Al-Jaroodi, 2015).

This research will focus on "smart urban regeneration sustainable development", which will conclude by combining the principles of urban regeneration with those of "smart cities" to create integrated urban trails in cities. Also, it will attempt to test various intervention scenarios in the city of Alexandria as a case study in order to revitalise the historical city centre, strengthen the cultural heritage tourism, enhance the economic status of the city, and improve the overall quality of life.

The main objective of this research is to perform a development framework resulting from the inductive methodology due to linking smart cities strategies with those of urban regeneration applied to cities with historical background. In particular, this applies to the conservation of city centres, cultural heritage buildings and districts, in order to enhance the city's economic conditions and quality of life for all its

residents. Also, this framework helps overcome the city's challenges, through increasing the public awareness, putting scheduled maintenance schemes in place, solving the problems of pollution and optimising the process of future urbanisation. This approach is intended in such a way that it will preserve all the city's cultural heritage and its remarkable values.

This study would have two-fold contributions:

- A new inductive methodology of urban upgrading and conservation based on reviewing the local conditions and context. Attempting and integrating smart urban regeneration principles as an approach to enhancing the prospect of urban interpretation in cities.

- Generating a development framework and a set of recommendations to apply smart urban regeneration to valuable historic city centres and design integrated urban trails in cities with historical backgrounds.

3 URBAN REGENERATION

Urban regeneration is an action of improvement that aims to solve urban problems and design a long-term development plan to revitalise an area through the enhancement of its economic, physical, social, environmental, industrial, and cultural aspects, besides the improvement of the quality of life, and investing in the future ((Alpopi & Manole, 2013), (Roberts and Sykes, 2000), (Cin & Egercioğlu, 2016), and (SAĞ, 2010)).

Urban regeneration means creative/intelligent interventions in the existing built environment, akin to a premise of sustainable development and preservation of community values. It also means the diversification of commercial, industrial or public service areas to be used as "nonconventional spaces" for cultural creation and production (Moldoveanu & Franc, 2014).

Last but not the least, (Couch, Fraser, & Percy, 2008) defined it as, "Regeneration is concerned with the regrowth of economic activity where it has been lost, the restoration of social function where there has been dysfunction, or social inclusion where there has been exclusion, and the restoration of environmental quality or ecological balance where it has been lost".

3.1 Urban regeneration, different scales and principles

Regeneration is a broad term that, in an urban context, covers large-scale works intended to promote economic growth, as well as smaller-scale works that improve the quality of life. Urban regeneration is sometimes referred to as 'urban renewal'. It can involve the investment of public money to encourage and direct private finance into a particular area. Governments often define regeneration as being a supportive measure in areas of economic and social decline where market forces have failed. In this research urban regeneration is applied to the smaller scale of city centre and historical districts regeneration.

The urban regeneration term is synonymous with urban rehabilitation or urban renovation. This term is based on a set of action principles, aiming at sustainable development of the cities. Sustainable urban regeneration can be achieved only through the cooperation between institutions, universities, urbanists, environmental associations and builders. Urban rehabilitation actions are based on social, economic and technical aspects. The integrated urban regeneration "aims to optimize, preserve and revitalise the whole existing urban capital (environment built, heritage, social capital), compared to other forms of intervention, in which from all this human capital only the land value is prioritised and preserved by traumatic demolition and by replacing the rest of the urban and most lamentably - social capital." (Alpopi & Manole, 2013).

3.2 Tools of an urban regeneration project

Compared to other areas, old urban areas lag behind in development due to the following:

(1) changes in social and industrial structure,

(2) canges in lifestyle, and

(3) New town-centred urban expansion.

An urban regeneration project is a systematic programme developed to reconstruct the urban spatial structure, improve its infrastructure, and foster its natural functions. Figure 1 shows the four tools/phases of an urban regeneration project (Yu & Kwon, 2011).

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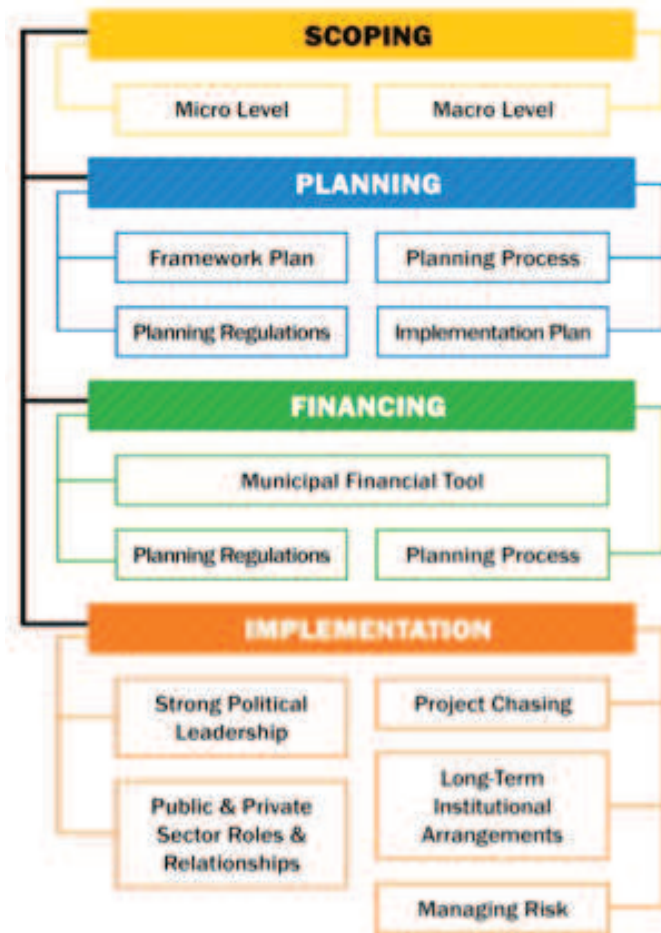
Figure 1: The four tools/phases of urban regeneration

Critical success factors of urban regeneration:

From the perspective of management functions, the following ten factors were elaborated (Yu & Kwon, 2011).

(1) Reasonability of project master and implementation plan;

(2) Establishment of appropriate organisational structure;

(3) Good communication and information sharing;

(4) Performance management at each phase;

(5) Suitability of project management system;

(6) Balanced adjustment between the public and the private interests.

(7) Cooperativeness of stakeholders on project.

(8) Standardisation of decision making process.

(9) Optimisation of legal and administrative services.

(10) Minimisation of conflict between stakeholders.

3.3 Urban regeneration summary

The research is adopting the general definition resulting from the definitions and explanations of urban regeneration that are discussed in the previous parts:

Urban Regeneration is an action of development which aims to improve the quality of life, solve urban problems, and invest in the future. The main aspects/factors of urban regeneration are economical, physical,

social, environmental, industrial and cultural. It preserves the community values and restores social inclusion, ecological balance and environmental quality.

After analysing the definitions, principles, goals and success factors of urban regeneration, it follows that urban regeneration has a great effect on the revitalisation of cities' historical districts and city centres. It is a process of improvement actions at both the city/town scale and the smaller scale of city centres and historical districts. It has six main factors of regeneration which are explained in figure 2.

Main Factors of Urban Regeneration

- 1. Economical regeneration
- 2. Physical/spatial regeneration
- 3. Social regeneration
- 4. Environmental regeneration
- 5. Industrial regeneration
- 6. Cultural regeneration
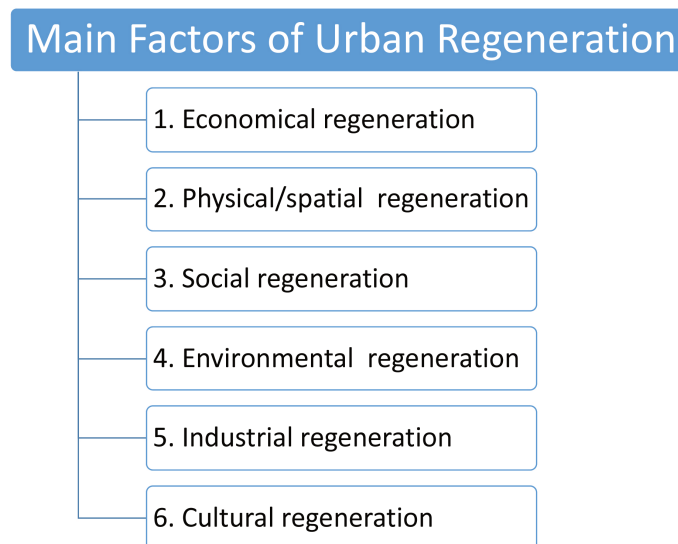
Figure 2: The six main factors of urban regeneration (Researcher)

In this research, urban regeneration is applied at the scale of urban areas and city centres. As the city's historic centre is the heart of urban identity, so the urban preservation of historical city centres gains crucial importance to save identity. That is why historical significance and cultural heritage should be handled very delicately by conserving and regenerating at the same time, forming a bridge between the past and the future.

Urban regeneration objectives are simplified in the following points (researcher):

(1) Improving the quality of life for residents

(2) Investing in the city's future and finding long-term development plan

(3) Solving urban problems

(4) Creative interventions in the existing built environment

(5) Applying sustainable urban development strategies

(6) Preservation of community values

(7) Diversification of public service areas to be used for cultural creation and production

(8) Regrowth of economic activity

(9) Restoration of social function and inclusion

(10) Restoration of environment quality and ecological balance.

4   URBAN DEVELOPMENT

"Sustainable development represents a balance between the goals of environmental protection and human economic development, and also, between the present and future needs. It implies equity in meeting the needs of people and integration of sectorial actions across space and time." (Cruz, et al., 2007).

From different definitions of global urban development and sustainable urban development, it has been clarified that sustainable urban development means:

 The long term development towards a better future in all different aspects of social, environmental and economic development. The aim of this development is to achieve better well-being for the city inhabitants

and solve the city problems in its different fields: demographic, climatic, political, social, environmental , and economic ((Chattopadhyay ,2008) (GUD, 2005)).

4.1 Factors of urban development

Urban development has eight main factors with their relevant 57 indicators. These major factors directly affect the city urban development strategy. They are explained below (Abdo, Ayad, & Taha, 2013).

Residential and planning factors
- Unkempt Buildings and slums.
- Land uses, open spaces and public services.
- Aesthetics and the culture heritage of the region.
- Reconstruction, renewal of facilities and networks.
- The efficiency and coverage of the planning.
- The percentage of residential units to the number of population in the city.
- The planning of the city extensions due to the demographic changes.
- Land uses – i.e. Employment / commercial / educational / recreational requirements.

Economic factors
- Collaboration between private and public sector.
- Respond efficiently to the residential needs.
- Quality of life and good health with fewer costs.
- Efficiency through the residential area qualities.
- Average size apartments and adequacy of space.
- Building a social context to enhances value of resources.
- Efficient use of public and private space.
- Challenge existing industries and methods of production.
- Challenge current employment structures.

Social factors
- Security at an individual level.
- Opportunities to foster intergenerational relationships.
- Strengthening the social network...
- Activating participation, increasing sense of responsibility, sharing and co-decision.
- Fighting isolation and the sense of loneliness.
- Stimulating social cohesion.
- Enhancing sense of belonging to community.
- Considering a role of civil society.
- Make use of the life experience of elderly.
- Paying attention to security conditions.
- Having ability to mitigate architectural barriers
- Increasing equity of urban space

Environmental factors
- Community / consumer awareness.
- Genuine concern for the environment.
- Attitude to environmental issues and the creation of effective design standards.
- The earth warming and the concept of sea level rise.
- Design requirements and development approvals.
- Reducing the environmental pollution.
- Increasing the quantity and quality of green spaces.
- Developing integrated city and neighbourhood.
- Creating space easily travelled on foot or by bike.
- Developing new buildings with mixed uses and integrated into the urban fabric.
- Improving the accessibility of services, public space and residence with minimizing using private transport.

Demographic factors
- The speed of population change.
- Populations' migration to the city.
- Populations' migration from the city.

Political and safety factors
- Safety of residents and visitors when developing a town or city.
- Extreme weather conditions, as flooding or hurricanes.
- Planning for emergency routes and safety features.
- Political state and percentage of crimes.

Network and infrastructure factors
- Vehicle usage and public transport.
- Extensive hard paving and effective landscaping.
- Alternate forms of transport to promote mobility.
- Traditional service infrastructure.
- Locations of interstate highways.
- Other transportation facilities of highways and light rail.

Geographical factors
- The city accessibility and connectivity
- The natural sources of water.
- The location of employment, its accessibility measures.
- The climatic characteristics.

From the above list discussing the urban development factors and their relevant indicators, it becomes much easier to find a link between these factors and those of urban regeneration and smart cities in order to be able to conclude the interrelationship between them. After studying this relation there would be some factors that should be analysed while applying the smart urban regeneration objectives to a city development strategy (researcher).

5 SMART CITIES

The smart cities concept has different explanations from the people's perspective and the technological perspective. This is clear when countries set initiatives to become smart cities, because they give different points of view around what is meant by the term smart cities. Although there is a prevalence of the smart cities phenomena worldwide, there is obscurity about its definition.

5.1 Definitions

From the literature review of Smart Cities as a general definition ((Albino, Berardi, & Dangelico, 2015; Batty et al., 2012; Cavada, Hunt, & Rogers, 2014; Dameri & Rosenthal-Sabroux, 2014)),

A smart cities is "a city which invests in ICT enhanced governance and participatory processes to define appropriate public service and transportation investments. That can ensure sustainable socio-economic development, enhanced quality-of-life, and intelligent management of natural resources". Also, Smart cities is a concept, which includes not only physical infrastructure, but also human and social factors to enhance the life quality of citizen, it mainly focuses on applying the next-generation information technology to all walks of life. In addition to the previous definitions, it is defined as a city well performing in a forward-looking way in economy, people, governance, mobility, environment, and living, built on the smart combination of endowments and activities of self-decisive, independent, and aware citizens. From the offered definitions, we can view the smart cities as an integrated living solution that links many life aspects such as power, transportation, and buildings in a smart and efficient manner to improve the quality of life for the citizens of such a city. (NUAIMI, ET AL., 2015)

5.2 Benefits and opportunities of smart cities

Currently, many cities compete to be smart cities in the hope of reaping some of their benefits economically, environmentally and socially. Some of the assumed benefits of smart cities include the following:

- Efficient resource utilisation

- Better quality of life

- Higher level of transparency and openness

5.3 Characteristics of smart cities

Many governments have started to utilise big data to support the development and sustainability of smart cities around the world. That allowed cities to maintain standards, principles, and requirements of the applications of smart cities through realising the main smart cities characteristics.

These characteristics include

- sustainability

- resilience

- governance

- enhanced quality of life

- And intelligent management of natural resources and city facilities.

There are well-defined components of the smart cities, such as mobility, governance, environment, and people as well as its applications and services such as healthcare, transportation, smart education, and energy (NUAIMI, ET AL., 2015).

Factors of smart cities as shown in figure 3:

(1) Economic factors

(2) People/social factors

(3) Governance factors

(4) Mobility/transport factors

(5) Environment factors

(6) Living/quality of life

The need of better management and control of the different smart cities aspects and applications, will drive the interoperability and openness to higher levels. Data and resource sharing will be the norm. In addition, this will increase information transparency for everyone involved. This will encourage collaboration and communication between entities and creating more services and applications that further enhance the smart cities. One example is the US government that collected and released a wide range of data, publications, and content in the name of transparency and openness. These offered the citizens and the government entities the chance to exchange and use the data effectively.

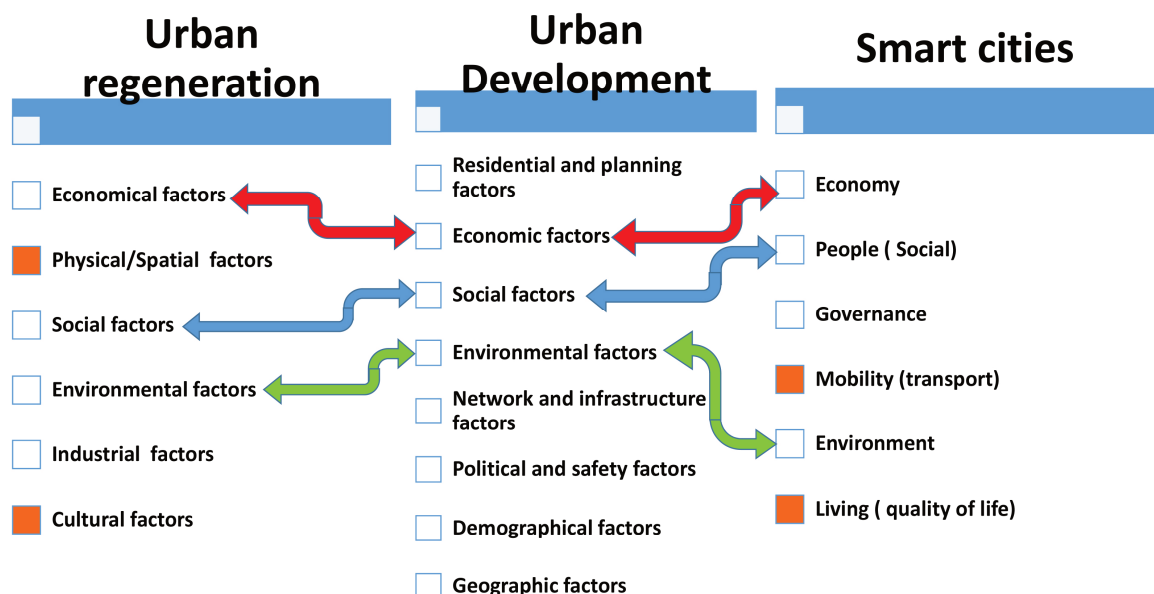Figure 3: factors and components of smart cities (Witte, de Wijs, Geertman, & de Klerk, 2017)

Figure 4: linking different factors of urban regeneration, urban development and smart cities to be applied on city centre(researcher)

6   LINKING URBAN REGENERATION TO SMART CITIES SUSTAINABLE DEVELOPMENT

The integrated urban regeneration "aims to optimize, preserve and revitalize" the whole existing urban area (Alpopi & Manole, 2013). Also,Chattopadhyay (2008) declares that sustainable urban development specifically means achieving a balance between the development of the urban areas and protection of the environment with an eye on equity in employment, shelter, basic services, social infrastructure and transportation in the urban areas. Smart cities could also involve various city components like natural resources, infrastructures, power, transportation, education, healthcare, government, and public safety (NUAIMI, ET AL., 2015).

Linking the main factors of urban regeneration and appling them in the sustainable urban development of smart cities will put a certain framework of development in a smarter strategies. This research adopts an inductive methodology of applying this framework on city centres and comparing them to a set of relevant examples, in order to be able to apply the same framework on cities with historical backgrounds.

Derived from the previous definitions and analysis of the characteristics and factors of urban regeneration, sustainable urban development and smart cities, the above figure shows the cross relations between all the factors of each topic among them. Hence, it has been clarified that there collectively are three main typical factors that must be studied:

- Social factors: Strengthening the social network, stimulating social cohesion through appropriate relations between public and private space are affected by the city development.

- Economic factors: The city's economy is the most important aspect in managing multiple issues: networks and infrastructure needs, planning and residential facilities, and it affects its economic development.

- Environmental factors: The attitude towards environmental issues, reducing environmental pollution, increasing the quantity and quality of urban green spaces are important factors for city development.

Four additional factors are always taken through the application of most of relevant examples, they are:

- Physical/Spatial factors: The development of a certain space implies the detailed analysis of its physical and spatial factors to be able to regenerate it and keep its identity as it is.

- Cultural factors: The historic city centres have cultural meanings and could be developed to revitalise its cultural background through certain events.

- Mobility (transport) factors: To develop any place, the means of transport should be well analysed to improve the efficiency of this place.

- Living (Quality of life) factors: The target of all the development plans and regeneration of city centers is the improvement of quality of life of the city residents.

7   CONCLUSION

- The research objectives were to adopt a new methodology in the shape of a framework of smart development to be applied on cities with historical background for the purpose of regenerating its city centre.

- This research has reviewed the basic notions of urban regeneration, sustainable urban development and smart cities.

- The different set of factors are cross analysed and synthesised.

- Based on this, a list of combined/composite factors is suggested.

- These factors will give better insight into linking urban regeneration to sustainable urban development of smart cities.

- This is a dynamic field that will continue to develop and generate more theories, ideas and prospects of application in different context.

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