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Barriers to Applying the Eco-System Resilience Approach as a Tool to Achieve a Sustainable Built Environment in Amman, Jordan

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ABSTRACT

The eco-system approach is key to achieving a sustainable built environment. This approach Focuses on Making Cities Resilient with adapting (UR). Urban Resilience approach can play a role to achieve a sustainable built environment. The purpose of this article is examining barriers to implementing the UR concept towards sustainable development at the local level in Jordan. The focus group were studied; the Jordanian planners, architectural offices and stakeholders through a methodology based on semi-structured interviews and online questioner developed based on literature reviews data. The data analysis following a combined quantitative and qualitative approach. This research proposes that a viable sustainable ecosystem regulated with the resilience concept should be the framework adopted by environmentalists, decision-makers, and planners to facilitate and improve their sustainable future directions. From the results obtained were two types of challenges facing urban resilience, theoretically and practically with 12 challenge categories and 29 main barriers facing UR in Jordan were extracted. In addition to clarifying 7 principles that increase the effectiveness of UR.

1. INTRODUCTION

Sustainability in its major concept is "preserving something over time" [1]. Implicitly, it means that cities and societies will stop working in a certain period if they are not sustainable [1, 2]. Subsequent research in this era has used the term sustainability to refer to remarkable environmentally sound practices. This, unfortunately, does not include the concept of sustainability, the characteristics of its application and indicates the indifference of researchers in expressing it. Although it should be the cornerstone of planning studies and long-term city planning [2].

The relativity of sustainability is a scientific fact. Environmentalists and astronomers have pointed out that after billions of years the sun will have the ability to melt the oceans. Also, historical civilizations throughout the ages were able to preserve their period with its history and content of civilization, its immortal architectural and historical legacy [1]. In one form or another, the sustainability of society can be summed up in "relative multi-centuries preservation" [2, 3].

Historically, the first use of sustainability was in 1713 with a European origin by the scientist Hans Karl, sustainability in Germany is known as Nachhaltigkeit [1]. Later, afforestation used in the forests of France gained the term widespread in 1987. According to the report of the World Environment Committee and the second Brundtland of the United Nations, sustainability was defined as meeting the needs of the current generation without the ability to continue to meet the needs of the next generation [1, 4]. However, the previous definition has been criticized for failing to cover the sustainability of non-renewable resources from the environment.

1.1 Sustainable development goals in the built environments

Due to the importance of sustainable development, the United Nations General assembly developed 17 goals for global sustainable development (SDGs), intending to establish a conceptual link for countries and users to integrate effective environmental protection and sustainable city development [4, 5]. The concept of sustainability is concerned with several areas and levels such as the village, region and nation [6]. According to scientific literature, sustainable development is a combination of three systems including the economic, social and biological system that can achieve sustainability through resilience, dynamic processes, and adaptation to trade-offs [4, 7].

The framework for sustainable development strategy (FSSD), as mentioned by Broman and Robèrt [8], advocated sustainability for 25 years, highlighting the importance for scientists and practitioners to reduce risks and move positively towards sustainability in societies. Among the reasons discussed were the low quality of ecosystems, increasing population growth, and biosphere hazards. Therefore, procedures must be in place to support the implementation of the strategy to reduce the negative causes at the level of work and organization [4].

1.2 Eco-system approach in the built environment

One aspect of sustainability important to societies is the ecosystem of the built environment. The first use of the term "ecosystem" was in 1935 by British environmental scientist Arthur Tansley, who drew attention to the fact that "the

environment is a complex of living things and some physical factors shared and influence the type of interaction" [9]. The ecosystem must return to its natural state after ding subjected to certain disturbance, which was defined by Canadian ecologist (Holling) as “Ecosystem Resilience”. Holling emphasized the importance of having stable, balanced systems despite their built conditions, so that can return their structure through form, function and identity while changing or facing distributions. Notes that the ecosystem differs from the ecosystem approach, the ecosystem is the environmental system with living and non-living things. while the ecosystem approach defines how to deal with a sustainable way to adapt strategies in the system [10]. Figure 1 illustrates the continuous increase of interest in the issue of resilience between 2016 and 2000, with a focus on the field of the built environment and its reflection on sustainability. Based on this scientific development came the need to assume this research.

1.3 Urban resilience concept

The current focus of shifts in the literature review tends to a new era aimed at linking the built environment with the sustainability model through the concept of "Resilience" which is a paradigm shift in planners' thinking towards a better-built environment. The application of the resilience concept in the built environment to achieve sustainability is a relatively new field of knowledge [4].

The relationship between resilience and sustainability was discussed. There is a relative agreement, but this does not mean that the two concepts are identical, as one does not replace another [11]. This raises a misunderstanding on how we can identify the major aspect of resilience to achieve a sustainable built environment.

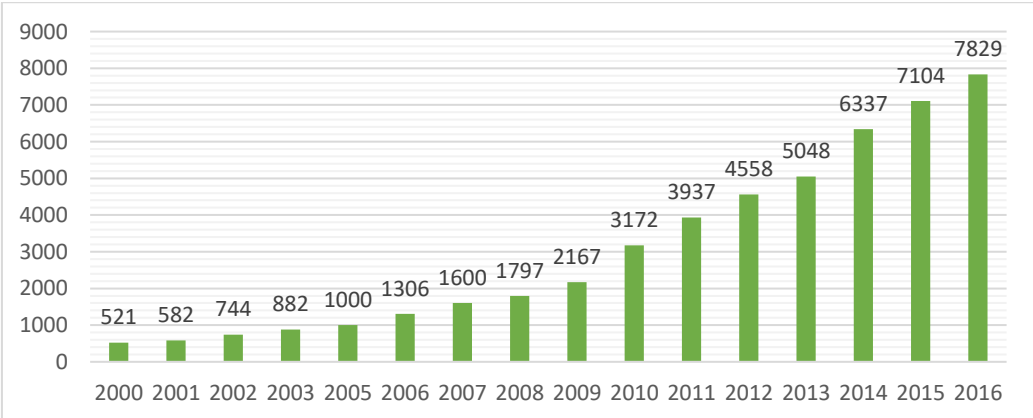
1.4 Opportunities and challenges through implementing resilience

The implementation of resilience in urban areas deals with special challenges: the ability to adapt and maintain it, varying time horizons, results vary from study to study according to factors attended, maintaining adaptability and lack of planner’s awareness. Also, the challenges can be defined in eight themes: Law, lack of tools, principles and techniques, finance, human resources, systems and processes, in addition to external systems and community participation [12]. One of the main challenges is resisting resilience to the barriers that the government has set for change and how to adapt to it during implementation. The resistance process has a positive impact so that cities are more prepared to respond to shocks [13]. Trying to adapt to these challenges helps in applying the concept of resilience more clearly within the built environment [12].

The review of the UR literature found that there is currently not much work/research translating the development of tools for the quantitative assessment of urban resilience. Most of the existing instruments are summarized in particular in conceptual structures. Most published studies on problems related to urban problems focus on the concept of sustainability and its assessment at different levels rather than on defining the resilience of cities and their urban systems [12]. Researchers presented two main problems about the current theory and application of resilience in the context of urban development, many resilience-building activities in and for cities are initially based on assumptions about the social world, which effectively impose a fundamental framework of that of more complex and interconnected domains supported by measures, values and meanings Second, the current approach to a quantitative resilience city index is over-generalized and does not fully reveal the specifics of each city. Few tools integrate functions in an integrated way.

1.5 Research problem according to the study area and related objectives

By 2035, Jordan is expected to witness a systematic development towards sustainability within the built environment. Here comes the importance of studying the reality of the built environment, the extent of social thinking awareness, and the awareness of planners in applying scientific concepts like UR in the theoretical and practical levels in Jordan.



Source:(Cerè, Rezgui and Zhao, 2017). Edited by the authors.

Figure 1. Resilience publications over the period from 2000 to 2016

Jordan is a country with limited natural resources, medium internal and external investments. It seeks in the following decades to improve the living situation of the individual and society through sustainable development of the built environmental society. Amman 2050 vision seeks to consolidate the strengths of a sustainable and resilient city. Amman enjoys opportunities that increase its sustainability, such as the abundance of renewable energy resources, political stability, ancient history and high level of education, commitment to enriching work on climate change at the

national and local levels, environmental and social development equity, and improving the quality of life for the community. Jordan and Amman in particular face a number of challenges as a result of the exponential increase in population and environmental change. This requires establishing and expanding services in an equitable manner, improving infrastructure and developing planning strategies to make them a mutable resilience to natural and human emergencies. Amman joined the 100 Resilient cities in the second group in 2014, but so far, the number of studies related to UR is limited and still in the theoretical aspect.

Ardingly, the problem allocated in the lack of procedures and operational tools to assess the potential resilience of an urban system thus represents a gap in this research area and creates a challenge and an opportunity for future work in this area [14, 15]. While this research focuses on clarifying one of these barriers, which is the awareness of planners in the study area Amman, Jordan, is it sufficient to achieve the resilience of the built environment or not.

So, this research aims to explore the awareness of Jordanian planners and stakeholders among different levels about resilience. To identify the level of awareness and to investigate their challenges and barriers toward urban resilience. Also, Clarify the contribution of resilience within sustainability in Jordan to identify and summation the barrier to implementing UR and sustainability in Jordan.

1.6 Research question

Although Jordanian planners are aware of sustainability, literature reviews and implemented projects did not indicate a clear application of resilience concepts in the built environment within the projects implemented in Jordan. This requires an investigation and evaluation for the planning thinking and awareness, the extent to which planners know about the concept of sustainability, the concept of resilience and their related specifications to achieve resilience within a built environment. Also, to explore the main barriers faced to not apply resilience. Here comes the particular importance of this research because it will try to answer this question:

* What are the barriers to applying Urban Resilience towards achieving a sustainable built environment in Amman, Jordan?

1.7 Challenges and barriers to implementing UR

The challenges facing UR come into several aspects, including:

1.7.1 Practical framework challenge

The policy of implementing UR a point of controversy that raises the literature. It depends on defining the concept of implementation and transfers from the theoretical to the practical side, setting the limits of the beginning and end of implementation, in addition to crystallizing what is included and excluded from standards according to the study case conducted [13, 16]. The implementation process is often concerned with the owners of institutions and is characterized by being "Urban Silence", which reduces the levels of implementation and negatively affects the urban environment [16, 17]. The implementation process results in the presence of challenges between governmental and non-governmental organizations, social adaptation and environmental conditions, varying time horizons, and multiplicity of results [14, 17]. In addition to the challenges of the available resources, and the policies followed [12, 14].

1.7.2 Theoretical framework challenges

From a literary point of view, one of the most prominent challenges is the multiplicity of the concept of resilience and the issues raised to discuss the dimensions, the different methods of measurement and results depending on the study case, which results in the diversity of the theoretical and practical conceptual framework [12, 14, 18].

1.7.3 Environmental framework challenges

Among the challenges that were explained in the previous section 2.3.5, some countries are facing random urbanization and increasing pressure on previously dilapidated cities that suffer from outdated infrastructure, lack of service resources, and environmental degradation [13, 14, 18]. Natural disasters such as floods and earthquakes are considered one of the most important challenges that require thoughtful crisis management, because of their threats to the environment and society as a whole [8, 19-21]. Developing countries often suffer from challenges within the environmental framework [17, 22].

1.7.4 Economic framework challenges

Moving from a practical and theoretical point of view to the economic aspect. Literary discussed many argument points such: the implementation of projects that achieve the sustainable building codes by enhancing the criteria of UR requires sufficient financial support [8, 23, 24]. Countries or cities often face a lack of financial support to meet the need for sustainable investment projects at all levels, residential, recreational, commercial and others [23, 25]. The difference in the project budget in the case of pricing from the reality of implementation constitutes a challenge that prevents the completion of the project. The fluctuation of the prices for the materials used in the construction of sustainable projects and their high cost is also one of the challenges [12, 17].

1.7.5 Social challenges

At the level of individuals: especially within the scope of work and companies of stakeholders; The lack of qualified experts to manage UR issues is a major factor preventing an effective approach to them [16, 26]. Experiences include planners, architects, ecologists, soil and site engineers, or civil engineers with experience in urban resilience. The lack of scientific experience and the lack of knowledge about the advantages of enhancing the UR system is one of the challenges which steadfastness in the theoretical framework only [12-14]. There are many barriers to implementing UR in various fields [13, 27]. Similar to the previously mentioned frameworks, literary studies indicated that the barriers include lack of planning awareness about UR, difficulty in accessing the desired data that needed to complete scientific and literary studies to use the results in practice, dispersion of policies and lack of coherence between governments and municipalities responsible for organizing and managing urban construction restrictions in cities [8, 13, 25, 28].

The diversity of challenges and barriers varies according to the study scoop [13, 21]. This research aims to explore the barriers on the local level of Jordan, that prevent the application of the urban resilience approach in Jordan, after identifying the determinants of the concept used in defining the term resilience and its related specifications and standards

used.

2. RESEARCH METHODOLOGY

Many researchers have used different approaches in clarifying the barriers to urban resilience in cities [12, 14]. The methods varied between literature review and documents, observations, interviews, and electronic questionnaires. These methods were the acceptable methods can be used to clarify the UR barriers in Amman [14, 15, 29, 30].

Specifically, the researchers relied on a combination of quantitative and qualitative approaches in the process of data collection and analysis to reach results that improve understanding of the issue [31, 32]. For example, an article on creating the city's resilience and addressing the challenges of local governments was based on a qualitative approach, semi-structured interviews were conducted with 15 people from specialists, environmental experts and local government workers to identify challenges and propose solutions related to the topic of the article [12]. While writers Jon Caoffee and Wendy Millar took a comprehensive approach and literary discussion in general to achieve the requirements of the study [17, 33].

To investigate the barriers that stand in the way of achieving UR and the opportunities for its practical application, specialists were interviewed within target groups that include municipal and secretariat employees, the private architectural office's sector, faculty in the colleges of architecture and planning, urban planners and stakeholders. The interviewed groups were identified through relevant documents, websites and studies of urban resilience. Participants were invited through an electronic form and according to their direct and active background in sustainable planning and urban resilience (snowball technique sampling method). In total, 15 participants were interviewed. Interviews were conducted with their consent using a standard letter of invitation; Through which the objectives of the study, the target groups, the duration and method of the interview were clarified. Some interviews were conducted by telephone and online meeting platforms, and others were face-to-face in the participants' official offices or workplaces.

3. RESULTS AND DISCUSSION SUMMARY

The results highlighted the current situation towards urban sustainability and urban resilience barriers in Jordan. In general, through interviews, a questionnaire and a review of documents related to the topic of research in Jordan, a number of results were drawn on more than one direction:

The results differed in defining the terms that express urban resilience accurately, given that it is a multilateral concept and depends on the scope of application. But the results are agreed that the concept of urban resilience in Jordan contains the following terms to varying degrees. Where urban resilience can be defined as the ability of the urban built environment to adapt, respond, balance, resistance and endurance, recover and repair, transform, preserve, absorb, durable and maintain in order to enhance an efficient urban context.

Also, based on the results, the following table categorizes set of challenges facing urban resilience in Jordan which preventing its effective implementation or its transformation from theoretical to practical side. This table answered the research question mentioned previously. The challenges are mainly divided into theoretical challenges and practical challenges. In general, there are 12 subcategories that fall from 2 main challenge categories, and the number of categorized sub-barriers is (58). The most important of the theoretical challenges is with regard to laws and regulations. As for the practical challenges, it occupies the challenge of planning practices, including its bifurcation, including the absence of comprehensive planning practices, short-term planning, private poverty and land use change challenge. In addition to other categories that constitute a practical and theoretical barrier, as shown in the Table 1 in detail.

Table 1. Summary of challenges and berries to UR reported from research results

Them	Challenge category	Sub-Category (sub-challenge)	Codes (berries)	Specific challenge or barrier related to codes (sub-barriers)
Challenges and barriers to urban resilience.	Theoretical	1.Term	Background knowledge	Lack of understanding of the UR term.
			Altitude	The multiplicity of concepts concerned with UR.
		2.Law	Regulations	Regulations and laws are not concerned with sustainability and urban resilience.
				Short term strategies.
				The absence of real strategies and laws that define the risks of the urban environment.
				Legislation and laws need to have implementation plans.
				The seniority of the regulations and the difficulty of amending them.
			Internal administrative law	Experts' corporation: There is no actual cooperation between the relevant experts through authorities.
				Planning corporation: There is a problem in planning cooperation between state institutions.
		3.Vision	Strategies	The lack of a strategic vision at the level of the state, the region, and cities as a whole
			Experts	Distorted vision and Limited knowledge
	Practical	1.Awarness	Institutional	Application aspect: Lack of institutional awareness among stakeholders and decision-makers
				Economic aspect: Lack of economic awareness towards implement UR.
			Governmental	Application aspect: Lack of urban management an awareness of cities.

		Economic aspect: Lack of economic awareness towards implement UR.
	Community (Local)	Lack of Community awareness a community participation.
		Lack of concern and interest
2.Contextual	Culture	The lack of people's culture.
	Trust	lack of institutional trust in the community participation.
		lack of community trust in state institutions
3.Planning practices	General practices	Neglect of the responsible authorities.
		Planning practices are poorly considered.
		The practical aspect of the legislation does not cover the issue of urban resilience.
		The traditional planning errors that were practiced in the past and are still taken into consideration.
	Comprehensive planning challenge	The absence of comprehensive planning standards that take the concept of UR into consideration.
	Short term planning and decisions challenge.	The shortness of the planning period constitutes.
		A problem in the implementation of projects and their periodic follow-up after the end of the maintenance period.
		The Planning catches up with and bends over reality.
		Temporary systems are put in place to solve temporary problems and not to generalize them as a policy.
		No future vision in the percentage of population increase
	Private property challenge.	It’s an obstacle in the process of regulation.
		The strategies do not fit the whims of private property owners.
		No suitable solutions that would satisfy private property owners.
	Change of land uses challenge.	Changing land uses hinder the work of government and private authorities in the process of implementing projects that achieve sustainability and urban resilience
4.Risk management	Natural disasters challenge	There are no quick systems to respond to any disaster.
	Environmental issues	Environmental degradation.
		Climate change.
		Shortage of natural resources.
	Urbanization	The concentration of the population in the cities and the lack of acceptance for the horizontal housing extension
	Refugee pressure	Inefficiency of services as a result of the increase in the number of refugees
5.Planning verses organizing	Practices	Municipalities practice the process of organizing not planning.
		The organization follows people's needs and desires.
6.Infratructure	Physical	There is no Efficient transportation system and transportation public plan.
		Underutilization of the energy sector.
7.Database	Accuracy	The lack of a real assessment for the information’s with reality
		Inconsistency of data that results in proper planning.
	Information	Information inaccessibility
		Information fragmented
		Information unavailability
8.Experince	Experts	The presence of experts to study the alternatives that related to US and UR.
		Lack of scientific experience and Lack of practical staff.
	leaderships	Absence of wise leadership and lack of continuity due to the succession of officials.
	organizations	The organizations Relatively suffer from lack of experience.
		Lack of specialized departments
9.Economic	Financial support.	Lack of local financial support
		Lack of donor funding
	Service sector	High energy prices
		Water shortage.

4. CONCLUSION

The research adds to the growing body of knowledge about urban resilience and barriers in Amman, Jordan. Although urban resilience is an increasingly important topic in the current era, it is facing ever-growing challenges. The study illustrates the theoretical and practical challenges facing urban resilience in Jordan. Perhaps the most relevant observations from this study are the importance of dealing with barriers in order to overcome and avoid them, thus emphasizing the necessity of implementation. There are two types of challenges; Theoretical and practical. Theoretical challenges relate to barriers to a plurality of term, laws and regulations as well as a theoretical future vision. As for practical challenges, they are

related to barriers that include awareness, context, planning practices, risk management, planning versus organizing, infrastructure, database, experience and economic barriers.

The two categories of challenges included 12 sub-categories, of which 29 barriers were emptied and emanating from the main categories with 58 detailed or sub-barriers that were previously presented in the Results chapter. The most important barrier in theoretical challenge is the laws and regulations that govern the application process, while the barrier of planning practices is the most critical one within the practical challenges. Thus, the diversity of barriers makes it difficult to focus on the objectives of the concept of resilience and to delegate its progress in theory to practice at the local level.

The research finds that Resilience challenges are strongly overlapping and are not subject to strict categorization and interconnected at different levels of priority and severity. These barriers are not limited to the capital, Amman, other Jordanian cities suffer from them, with varying severity. This means that the barriers identified in the study may match the barriers of other developing cities in countries with similar characteristics to Jordan, with a difference in their impact. While the awareness findings shows that the concept of urban resilience did not appear in Jordan as a result of local efforts, but rather as a result of external donors in various projects. This requires enhancing awareness and expanding knowledge about the dimensions of urban resilience. So, at the practical level the action plans towards sustainability and resilience are must be modern, not fragmented with long-term implementation plans. Also, the Planning practices have an effective role in interacting with the challenges of resilience. The planning must deal with it primarily as a series of simultaneous and interrelated barriers rather than a completely linear series of events.

For content limitations, results are context specific and cannot be completely generalizable because this is a case study that may be complemented by other cases. The other limitation was the limited data related to urban resilience in Jordan. Only one of the strategic plans was recently issued in 2017 (Amman's Resilience Strategy). The executive plans related to resilience do not exceed the 4 plans and interact with the Amman resilience strategy. The restriction of work around the Amman Resilience to one office with a limited number of scientifically qualified people is unfortunate, especially after the end of the period of the urban resilience project funded by external parties. It requires striving towards strengthening the specialized professional staff and preparing a headquarters specialized in urban resilience to obtain theoretical data and practical implementation plans in the future.

Future research directions related to planning practices barriers. It would be useful to investigate the validity of the planning policies governing urban resilience and sustainability. And examining the impact of strategies and the extent of cooperation between the responsible authorities in order to improve visibility and reduce barriers resulting from poor regulation and lack of implementation. Researchers can also investigate how planning practices over time affect the urban environment and discover whether they create other barriers and challenges. There are some titles suggested for future research studies: the effect of biodiversity and bioclimatic design on urban resilience, the impact of applying an efficient green infrastructure on the Urban Resilience context, the relationship between citizen participation and Urban Resilience, Urban Resilience indicators relation with proper planning and the economic needs toward Urban Resilience implementation.

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