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Considerations of Sustainable Urban Renewal for Waterfronts: Analytical case Study of Han Waterfront in Seoul

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ABSTRACT: Waterfronts are considered asset with a special nature and double value, which represents a heritage not only on the natural level, but on the urban level as well, which combines the genius of the place and the site on one level, and the architectural product on another level. These waterfronts pose a difficult challenge in the process of sustainable development, as dealing with them requires a double awareness and sensitivity. The protection of these asset and the preservation of the sustainability of their ecological, cultural and environmental potential is a central objective in these operations. This research deals with urban renewal considerations for sustainable water front development, and its criteria and procedures for implementing those criteria, which differ according to the purpose to be achieved from the renewal process. An example casestudy of a sustainable renewal project, the Han River waterfront renewal project in Seoul, South Korea, was analysed, and what was drawn from literature reviews and global assessment systems were applied in the analysis of this example; In order to achieve the objectives of the paper; This research relied on the descriptive inductive approach, which is based on collecting information and shedding light on theoretical backgrounds, followed by the deductive analytical approach, which is an analysis of the information deduced from the theoretical and analytical study, After adding the practical part to the theoretical part, the research will reach key considerations to be followed when initiating any sustainable urban renewal project for waterfronts.

KEYWORDS: urban, renewal, sustainable , project, Waterfront ,Considerations ,development,assessment systems.

I. INTRODUCTION

Urban renewal is a broad topic for what it offers of handling various issues such as social, economic, political, cultural, health and environmental issues, and the problems that these issues include, including urban problems. In the early 1990s environmental awareness increased, and environmental and social concerns increased, especially regarding the waterfront environment; Because of its direct connection with the surrounding urbanization and its impact on the ecosystem. In 1992 Metselaar paved the way for the definition of modern urban renewal and in 2000 Arteaga formulated it with its current concept as "a systematic effort in the field of planning and construction as well as in different social, economic, cultural and environmental standards of living", in order to preserve, repair, improve or restructure entire built-up areas, this concept is considered the most comprehensive, as it added to the social and economic forces, other levels such as culture, environment and sustainability.

Reasons for the importance of waterfront renewal: Sairinen and Kumpulaine¹ listed some of the reasons why developers are seeking to renovate waterfronts in general: 1) It is no longer mandatory to have industrial land in front of water due to technological progress. 2) The Historic Preservation Movement encouraged governments to restore and preserve historical heritage². 3) Increasing environmental awareness, and increasing environmental and social concerns, especially with regard to the environment of waterfronts because of its direct connection with the surrounding urbanization and its impact on the ecosystem. 4) Continuous international pressures to restore the city centers³. 5) General urban renewal and the reclamation of public and open spaces. 6) Increasing the availability of free time, which increased the need for open recreational space and various activities. 7) Government grants designated for urban renewal and tax incentives related to development projects⁴.



II. RELATED WORK

Considerations and criteria for Urban Renewal of Waterfronts: The urban social and economic factors have been given the most attention as considerations that must be taken into account when arranging the urban renewal process. For example, when discussing data on slum upgrading, "Abbott" said, "Combining slum data with physical location data, and socioeconomic data related to community members, enables us to perform a detailed analysis of what needs to be done."⁵ As for "Arteja", he developed a list of variables grouped into four categories: urban variables, social variables, economic variables, and environmental variables⁶. Some researchers did not adhere to the previous considerations, but rather identified more than that. For example, when "Britannica" explained the nature of urban renewal, he mentioned the urban, economic, environmental and organizational aspects as basic aspects, and mentioned the cultural, health and political aspects as secondary aspects⁷. And when analyzing Figure (1), it's been noticed that Some considerations have been repeated, and therefore they are considered basic foundations in the renewal process, which are: urban, social and economic considerations. Others are recent additions To keep up with evolution and are also considered a reflection of what the developers aspire to from the renewal process: environmental and regulatory considerations.

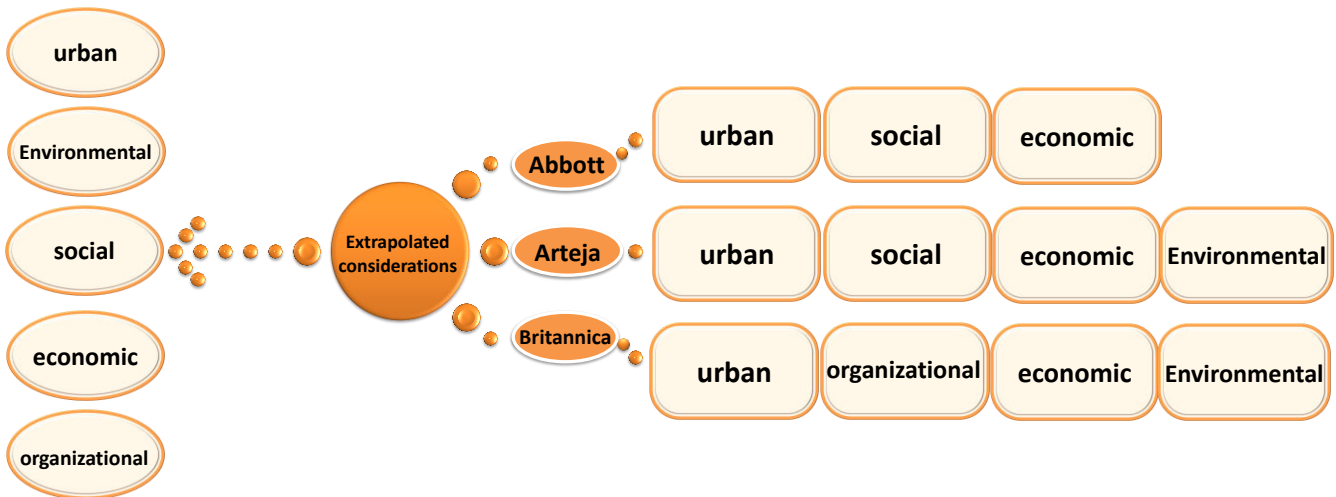


Figure (1): Basics of Urban renewal Considerations for Waterfronts Deduced from Literary Reviews

Modern sustainability approaches and their relationship to urbanism: The idea of sustainability in architecture was not a product of the moment. Since the seventies, the idea of green architecture has emerged as an intellectual predilection, concurrent with the green political movements in European and American governments. It includes a clear vision of the existence of sustainable development at the intersection of the economy, environment and society⁸. The development goals must be detailed in the three areas they cover before proposing any specific actions in the local environment in a clear and measurable way. As an example of some of the basic objectives that can guide sustainable development⁹.

III. METHODOLOGY

Research methodology sequence: Considerations and criteria Extrapolated from literature reviews will be combined with those drawn from global sustainability assessment systems. The considerations and criteria resulting from the compile will be used in the evaluation of waterfront development projects in both Seoul and Ahmedabad. The final outcome of the evaluation will be the considerations and criteria of sustainable urban renewal for waterfronts, which we concluded by adding the theoretical aspect to the practical aspect.

Considerations and criteria for sustainable urban renewal of waterfronts extracted from literature reviews: Several research centres have studied many waterfront renewal projects in an attempt to reach standards for urban renewal for waterfronts to meet the challenges these projects face. Some researchers have also studied in-depth projects for the renovation of waterfronts and reached criteria and considerations aimed at ensuring the success and sustainability of these projects. In this part, The paper will review a variety of criteria developed by researchers and research centres :



- the United Nations World Conference on the Future of Urbanism: These criteria were developed in July of the year 2000 as part of the initiative of the World Urban Future Conference (URBAN 21), which was held in Berlin¹⁰. The conference summarized that ten Criteria were adopted, in conjunction with the Criteria previously approved by The development of trust Agency “GMBH” in the state of Berlin¹¹, And most important of which are: Securing water quality and the future of the environment, one of the most important priorities is mixed uses¹², partnerships planning between the public and private sectors accelerates the development process, public participation is the key to the sustainability¹³.
- Project for Public Spaces organization (PPS): The PPS organization extracted some basic Criteria for successful waterfront development projects, in order to improve the city's public spaces and ensure that they obtain the title of sustainable projects. The non-profit organization evaluated thousands of public places around the world¹⁴, and some of the most important Criteria mentioned are the following :an open and connected community, Increasing the public's access to the waterfront, following the approach of communicating with the past without reproducing it with historical buildings, look towards the future¹⁵.
- Group of architectural researchers specialized in the field of sustainable urban renewal of waterfronts: Breen, Rigby¹⁶, Costanza¹⁷, Bruttomesso¹⁸, Good & Goodwin^{19,20}, and the most important criteria mentioned by them are: site type, accessibility For public spaces, the future consequences on ecosystems, preserving the special character of the waterfront by reusing historical resources, waterfronts are part of the existing urban fabric that needs to be connected and integrated, preserving the historical identity, reducing the footprint of parking lots, and preserve at least 50% of the existing structural elements.
- US Coastal Management Programs: The progress US coastal states have made in helping communities sustainably redevelop their degraded waterfronts since the declaration of amendments to the Federal Coastal Zone Management Act (CZMA) of 1980²¹. As a result, more than 300 areas on the American waterfront have benefited from the 25 coastal management programs, and among those criteria are the following: production of renewable energy, Non-encroachment on social needs²², supporting the renewal process even after its completion, until it reaches the stages of preservation and continuity²³.

Global assessment systems for sustainable renewal projects: Sustainability assessment (SA) is a complex assessment technique, conducted to support decision making in an environmental, economic and social context, that can help decision makers and policy makers identify actions they must take for a more sustainable society. The assessment systems in most countries based on only green building assessment systems such as BREEAM (Netherlands) and ESTIDAMA (UAE)²⁴. The sustainable building assessment tools began to evolve to the urban level in 2004 with the introduction of CEEQUAL (UK), and China (EcoGarden), the Green Neighbourhood rating tool. And then, in separate stages, the global assessment systems were developed to cover the entire neighbourhood, such as BREEAM, CASBEE-UD, DGNB-NUD and LEED-ND. Neighbourhood or city sustainability assessment systems provide a more balanced assessment between environment, community and economy than building level assessment systems alone. The need for sustainability assessment tools has increased and it is not enough anymore to evaluate only the buildings, but we need to evaluate the built environment, surrounding neighbourhoods, parks, transport and infrastructure, and special purposes such as waterfronts, in order to achieve comprehensive sustainability for future generations²⁵.

Selected assessment systems: The following systems were selected according to their novelty and comprehensiveness for the context concerned in this proposition. The selected systems are four global assessment systems from America, England, Germany and Singapore, and the following is a brief summary of those systems:

- LEED Neighbourhood Development (LEED-ND): is the first LEED assessment system that focuses on beyond the building level and rates multiple building projects or entire neighbourhoods. These criteria are the product of a collaboration between the US Green Building Council (USGBC), Congress, and the Natural Resources Defence Council, they launched it in 2009 and its last update was in 2018²⁶.
- BREEAM-Communities Assessment System: BREEAM is known as the first building certification program that was developed in England in 1990 for buildings only, initially by UK Building Research Foundation. But then a specific scheme for neighbourhoods, open areas and urban communities was developed called BREEAM Communities, which was launched in 2012. It provides an opportunity for planners and developers to refer to the environmental, social and economic benefits of the project in the planning and design phases of the development process and focuses on mitigating the impact of development within the physical and urban environment²⁷.
- Sustainable district Assessment System (DGNB-NUD): DGNB was introduced by the German Sustainable Building Council, which was established in 2007, in order to drive economically efficient green building towards a

sustainable future. The system was developed to include entire districts, and in 2012 the DGNB-NUD sustainability assessment system was launched for open and urban areas.

- Green Mark for Districts (BCA): As a country that does not have enough renewable energy resources, Singapore aims to improve energy efficiency by 35% by 2030. The Green Mark assessment tool was introduced to the countries towards this goal on 29 October 2009 by the Building and Construction Corporation of the Building and Construction Authority of Singapore and updated 2013²⁸.

Considerations for sustainable urban renewal of waterfronts: Through the previous narrative in the global assessment systems and through the inferences drawn from the considerations and criteria for the sustainable urban renewal of waterfronts extracted from the literary reviews, There are basic considerations that can be considered largely unified in the analysis process. Research has found that the main difference is in the procedures for applying those considerations, Figure(2) shows the considerations extrapolated after integrating considerations from the literature with those of global assessment systems.



Figure (2) shows the considerations extrapolated after integrating considerations from the literature with those of global assessment systems

Analytical Case Study: In this part, the search will analyze international project that was selected according to the criteria that best serve our purpose of this study. The overall vision in the chosen example, achieves the goals that the research aspires to from the development process. Which made it fulfill the conditions and reasons that must be in the sample of the study presented.

Reasons for choosing the case study:

- Successful and sustainable renewal project according to international recognition.
- The water is directly adjacent to the urban space, and there is no visual obstacle
- Huge project, (more than 70 km).
- A project that was dealt with as part of the urban fabric of the city and was not separated from it
- The basic considerations used in the sustainable renewal of waterfronts have been taken into account
- Priority is given to the environmental factor and the concept of sustainability
- Main vehicle traffic axes on the waterfront have been reduced

Han River urban waterfront : Seoul is the capital of South Korea. It contains more than half of the population of South Korea. The Han River or Hangang - (Han) means the wide as it reaches more than a kilometer in width, and (Jang) means the river. It is the fourth longest river in South Korea, and it flows through the city of Seoul. The idea of developing the Han River began in the reconstruction phase after the Korean War, which ended in 1953 AD, and that process was dispersed and did not bear a future outlook, followed by another more focused and comprehensive development process, and the fuse that ignited it was the preparation to receive the 1988 Olympics, in which the waterfront was transformed into Recreational area. The current development of the Han waterfront is known as the "Hangang Renaissance Project" and its main focus is to restore the ecological environment and create economic and recreational potential along the river strip²⁹.

The urban development of the Han River front has been internationally recognized through:

- International LivCon Awards 2010: Environmentally sustainable projects.
- By foreign governments: 78 times by the year 2000 in official international forums and conferences.
- International seminars and press tours: 103 times by 3,500 people³⁰.

Waterfront problems : 1)The problems of floods and droughts of human losses, and disruption of the ecosystem, and displacement of the population of the river area. 2)The river is a victim of the side effects of the city's rapid growth. 3)Pollution of river water as a result of sewage and factory waste. 4)The severe overcrowding resulting from poor planning in the post war reconstruction phase.

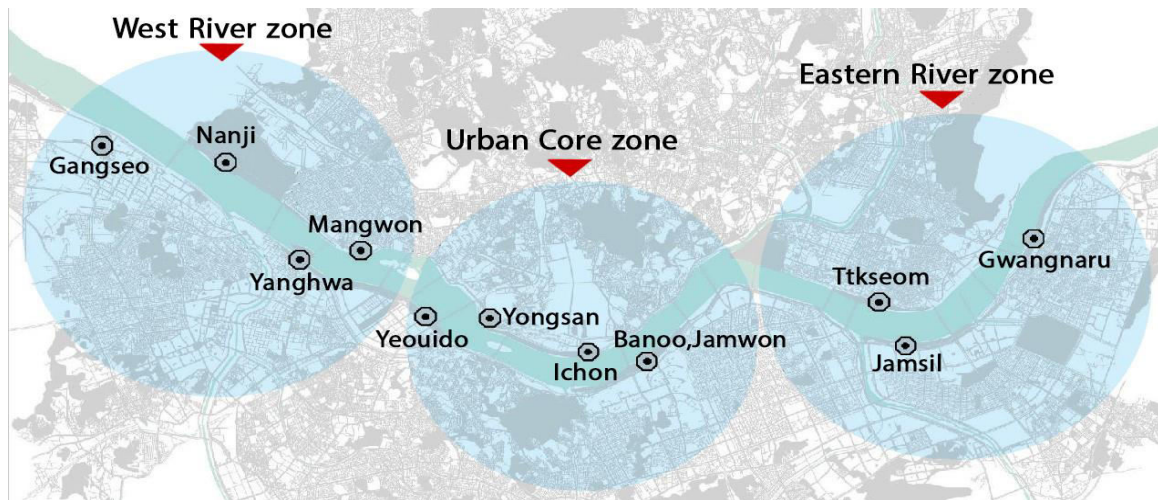
The objective of the waterfront renewal project: 1)Achieving progress towards sustainable development.



2) Restore the friendly relationship between humans and nature. 3) Create links among all city departments. 4) Marketing a brand for an attractive city on the waterfront. 5) Enhancing economic competitiveness. 6) Comprehensive flood control 7) Ecosystem restoration. 8) Curbing the expansion of the population. 9) The Summer Olympics of the 1980s³¹.

Elements of the Han River waterfront renewal project: The entire project is a group of recreational parks along the river and on both banks, and it consists 11 parks diversified between cultural, historical, economic and environmental, and the river has been divided into three areas (zones) and each area includes several parks serving the general context of the zone, Figure (3), distributed as follows:

- Eastern River zone (entertainment - sports): Ttukseom- Jamsil - Gwangnaru
- urban core zone (center of business and culture): Yongsan - Yeouido- Ichon- Jamwon- Banpo
- West River zone (Eco friendly): Gangseo - Nanji - Yinghua- Mangwon³².



Tetoxtum Family Fun Sports Park



Jamsil Park New Fish Pass



Nanji Environmental Education Park includes camping grounds



Gangseo and Mangwon parks nature reserve parks



Yeouido Park Culture and Arts Complex



Banpo Park, the cultural hub

Procedures for implementing the sustainable urban renewal considerations followed in the Han River waterfront: Several procedures have been implemented to achieve the criteria for urban renewal considerations to renovate the waterfront in a sustainable manner, and the following are the implementation procedures in this example:

- Environmental treatments: The Han River renewal project, which is part of the "New Green Deal Project", includes the following activities to achieve its environmental and ecological objectives: water storage, flood control, water quality, environmental restoration, restoration of natural life, and a new sea route for fish³³.



- Architectural treatments: The entire project is a group of parks on both sides, and there are many other urban environmental aspects that have been highlighted in the Han Renaissance project, Figure(5), including the following:



Figure (5) : shows the project Land use

- Orientation: A feature of South Korean dwelling is the emphasis on southern exposure. The reason for this is exposure to sunlight, as it is noted in Table (1) that 67% of the residential buildings have a southern orientation, and green spaces are left to slow the flow of water in the event of floods, with the adoption of different formations in the buildings facing the water to mitigate the impact of floods³⁴.

Orientation	number of buildings	The ratio
Between East and West	47	23%
South orientation	130	67%
Further orientation	20	10%
Total	197	100%

Table (1) shows the percentage of solar orientation of buildings in different directions

- Make the waterfront accessible to the public: Through promenades, walking and cycling paths, bridges with observatories, elevators and hanging cafeterias, they all act as connection points for the waterfront.
- Urban landscape: Removing the overcrowded housing on the waterfront and creating a wide area surrounding the river. The Korean government has succeeded in creating an image that sticks in the minds. The international community called the city of Seoul a miracle on the Han River.
- Sights and attractions: Along the Han River, we find many strong attractions, the most important of which is the Moon Bridge Fountain, which is ranked as the longest fountain in the world, as well as the floating artificial island of Seoraeseom, which is three islands combined together.
- Joining the North and South of the Han River together: Across the Han River, there are 31 bridges. There are two major highways running parallel to the river, Olympic Road and Gangbok Road. There are also boat facilities, cycle paths, river tours, and river taxi service.
- Providing visitors with new cultural, recreational, sports and social means: There are many projects such as floating theaters, cultural centers, observatories, and museums, but the most important projects are those that interact with the community directly, such as swimming pools, camping areas and water parks³⁵.
- High quality transportation: Bus lines were developed and connected to metro lines to cover the widest possible area. The buses were divided into 4 types with 4 colors according to the scope of coverage and the type of service. Special routes were planned for them to avoid crowding, and all of them were linked to an information center that provides drivers and passengers with the necessary information on trip times and duration on phone applications as shown in Figure (6). All public transportation facilities, whether metro or bus facilities, have been developed³⁶.

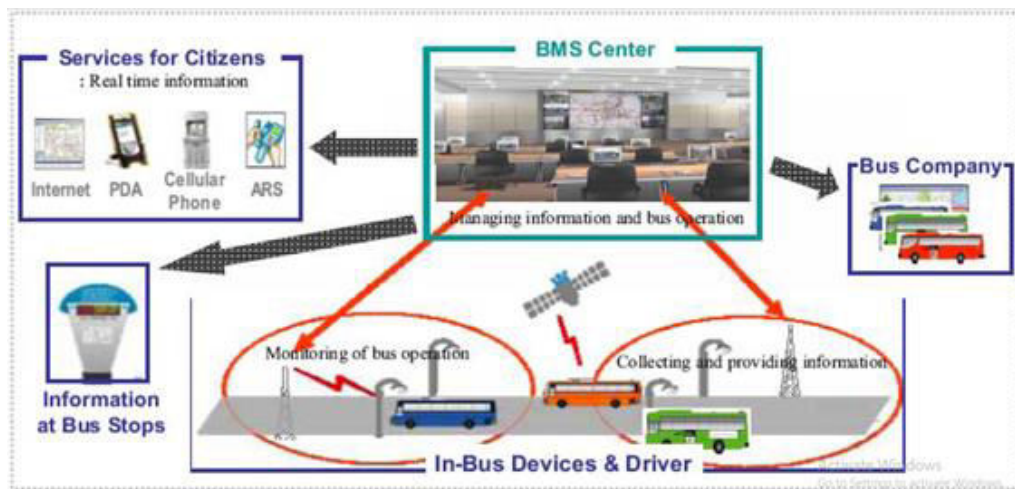


Figure (6) Illustration of the bus management system

- 8) Joining the North and South of the Han River together: Across the Han River, there are 31 bridges. There are two major highways running parallel to the river, Olympic Road and Gangbok Road. There are also boat facilities, cycle paths, river tours, and river taxi service.
- 9) Providing visitors with new cultural, recreational, sports and social means: There are many projects such as floating theaters, cultural centers, observatories, and museums, but the most important projects are those that interact with the community directly, such as swimming pools, camping areas and water parks.
 - Social treatments: None of the societal parties were involved in the renovation process. On the contrary, the Korean government imposed strict laws on everyone who objects to the acquisition of waterfront lands or anyone who resists resettlement, and those voices did not come to light except when one aspect of the project failed, such as Yongsan Park Project (Business Administration Center), where cases and compensation requests were launched in conjunction with the announcement of the project's suspension³⁷.
 - Economics and Financial Management: The Han River Regeneration Project is a comprehensive government project fully subsidized by the Korean government and its proceeds entirely at the disposal of the Korean government, and represents the planning commitment of several Korean government ministries to work together to restore the Han River³⁸.
 - Administrative Processes: The community has been integrated into the environment in a recreational and sporting way through the following: 1) By making ecological parks accessible to all and providing them with wildlife monitoring observatories and interactive tools. 2) Compulsory provisions have been made in the Korean curriculum for visiting ecological parks and reserves. 3) Direct interaction with the environment by making places for camping in the heart of the ecological Western zone³⁹.

Disadvantages of the renewal project : 1) Problems between developers, NGOs and owners of buildings and lands subject to rehabilitation. 2) The return is not up to investment. 3) At the expense of the cultural and symbolic value of the waterfront. 4) The transfer of residents to alternative places results a change in the social and urban fabric.

How developers get over the Disadvantages : 1) The developer is the Korean government, so the sentences were arbitrary against the objectors.

2) The entire project has an economic outlook. All ecological parks, reserves, and fish crossings are open to visitors in return for entrance fees owed by the Korean government

3) Unlike private development companies, the development process was carried out according to an integrated plan by the Korean government, whose main goal was to create a symbolic image of the waterfront, not just financial profit.

4) At the beginning of the 21st century, the imbalance in the ecological balance of the waterfront began to appear. In 2008, this defect was remedied before it got worse by adding the "Green New Deal Project" to the Han Renaissance Project, which is a fully sustainable environmental project that began work on it as a national project in all of Korea. And not just the waterfronts



IV. EXPERIMENTAL RESULTS

From the analysis of the operational procedures used to achieve the criteria for the considerations of sustainable urban renewal for the previous case studies of the Han Waterfront and the Sabarmati Waterfront, and this analysis was done using Table 1, From that analysis, considerations and criteria for sustainable urban renewal of waterfronts were reached, and this is what is shown in the following table (table 3) :

Consideration	Parameter	Procedure	
Urban	transportation	Access to high quality transportation	
		Developed transportation facilities	
		Promote cycling as an ecological alternative to short trips	
		A network of safe bike paths with direct links to major roads	
		Allocate indoor and outdoor bicycle storage spaces	
	Services and Activities	Priority for mixed uses	
		Access to public places	
environmental	Waterfront environment	Achieving the region's preferred solar orientation	
		Shading streets and sidewalks with trees	
		Ceiling on uncovered facilities	
		Design to enable air flow through the site	
		Reducing light pollution	
		Reducing the parking footprint	
	ecological	Reclamation of polluted lands and restoration of environmental quality	
		Restoration of habitats or wetlands and water bodies	
		Future implications for ecosystems	
Resources	water management	rainwater management	
		Raising the efficiency of water consumption over the coming years	
		Obtain certification for clean and running water design guidelines	
	Material and waste management	Achieving resource efficiency	
		Preserve at least 50% of the existing structural elements	
		Reduce site disturbance	
		solid waste management	
			Provide at least one recycling station
	Energy Efficiency	Renewable Energy Production	
		Achieve 50% of Energy Design Manual standards	
social		Providing social needs	
	Participation and community awareness	Community awareness of the importance of environment and sustainability	
		Provides visitor brochures, information portals and facilities	
		Encouraging local food production and community-supported agriculture	
economic		Partnerships in planning between public and private sectors	
	financial support	Obtaining funding from the government	
	local economies	Raising investment opportunities and the local income	
		employment provided by development	
	earnings	Profitable from the project as a whole	
		Make a profit from reusing historical resources	
		Make a profit from regulating the demand for transportation	



Consideration	Parameter	Procedure
Administrative		Community participation in decision making
		Partnerships in planning between the public and private sectors
		Community review and approval of the design
social		Providing social needs
	Participation and community awareness	Community awareness of the importance of environment and sustainability
		Provides visitor brochures, information portals and facilities
Encouraging local food production and community-supported agriculture		
economic		Partnerships in planning between public and private sectors
	financial support	Obtaining funding from the government
	local economies	Raising investment opportunities and the local income
		employment provided by development
	earnings	Profitable from the project as a whole
Make a profit from reusing historical resources		
Administrative		Community participation in decision making
		Partnerships in planning between the public and private sectors
		Community review and approval of the design
Organizational		look towards the future
		Supporting the renewal process even after its completion to the stages of preservation and continuity
		Certified International Specialist in Sustainable Projects
		The main developer obtained the ISO 14000 . certification
Legislation		Compliance with the city's urban legislation
		Passing new legislation according to the waterfront development policy
		Develop traffic laws according to the waterfront development policy

Table (2) shows the Waterfront sustainable urban renewal considerations, standards, and implementation procedures

V. CONCLUSION

After reviewing the above, we will notice that there are new basic considerations that have been added to what was mentioned in Figure (2), the resources, the administrative and the Legislation, thus becoming 8 main considerations to be followed when initiating any sustainable urban renewal project for waterfronts.

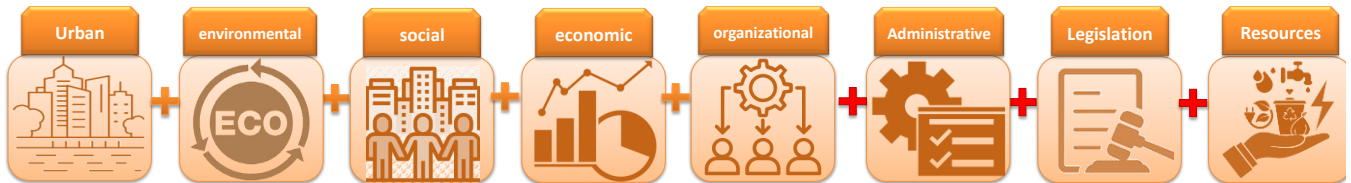


Figure (7) Final Considerations for Sustainable Urban renewal of Waterfronts

In conclusion, the research reached to put forward criteria and considerations for sustainable urban renewal of waterfronts, and it includes eight main considerations that include secondary criteria that were drawn from the theoretical study and formulated and crystallized in the analytical study, so that it can be followed to achieve sustainable urban renewal for waterfronts, which can be clarified as follows:

1. **Urban considerations:** That it be a site of environmental and urban priority with creating a distinct identity, linking and integrating water fronts and the urban fabric, increasing public access to the waterfront, and that the streets



are safe, attractive, and walkable with access to high-quality transportation, and also priority for Mixed uses and for access to public places.

2. **Environmental considerations:** reclamation of polluted lands, restoration of environmental quality, habitats and bodies of water, and precaution against the impact of future consequences on ecosystems.

3. **Resource considerations:** Rationalization in the consumption of water and energy and the pursuit of renewable energy production in addition to waste management and the provision of at least one recycling plant near the project.

4. **Social considerations:** Providing social needs with societal awareness of the importance of the environment and sustainability, taking into account people with special needs, providing guidebooks and websites, in addition to organizing gatherings (celebrations, feasts, etc.) at the waterfront as attractions for visitors.

5. **Economic considerations:** Financial support, obtaining government funding, and supporting the local economy by creating job opportunities and raising investment opportunities, in addition to achieving profitable returns from the project, in a way that does not harm the principle of sustainability and provides self-sufficiency in operating expenses and maintenance.

6. **Organizational considerations:** Public-private planning partnership, community participation in decision-making, community review and approval of the design, ensuring that there is accredited specialist in sustainable projects in the design and implementation team, and the developer obtaining ISO 14000 certification .

7. **Administrative considerations:** looking to the future and supporting the activation process even after its completion, reaching the stages of preservation and continuity, in addition to managing workers, operation and maintenance, emergency plans, and monitoring activities and users to prevent infringements within the project.

8. **Legislative considerations:** Commitment to the urban legislation of the city, but when needed, legislation that serves the public interest in the use of land within the scope of development and preserves the citizen's right to compensation for damage.

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