

“The Role of Water Facilities in Designing Public Open and Green Space”

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ABSTRACT:

Water is one of the basic elements of resource management in cities and one of the most necessary at the same time. The paper examines the role of water facilities in the design of open and green public spaces. The research methodology is compatible with the quantitative approach, and it was through making a questionnaire and distributing it to a random sample of 121 people and analyzing the questionnaire through the APSS statistical analysis program. The research ends by emphasizing the importance of water facilities within open and green public spaces and their role in achieving well-being, a comfortable and attractive environment for users, and its social, environmental and economic benefits, and encouraging diverse groups of residents to visit these public places.

KEYWORDS: PUPLIC OPEN AND GREEN SPACE, WATER FACILITIES,

COMFORTABLE ENVIRONMENT, ENVIRONMENTAL, SOCIAL AND ECONOMIC BENEFITD.

1/ INTRODUCTION

1.1 Background of research: -

Water features are frequently used as components of landscaping in public settings. Their primary purpose is to serve as a focal point or to provide aesthetically appealing views. Numerous applications can be found for water in its many forms, such as when it is motionless, when it is moving quickly, when it is in fountains, or when it is a combination of these. The area is given a sense of motion, brightness, and energy by the presence of fountains, cascades, and other flowing water surfaces, while the presence of still water surfaces makes it more tranquil and restful. Technologies for collecting rainwater and recycling water should both be incorporated into the design in order to create an ecologically friendly and cost-effective maintenance plan. In addition to the lights, evening users may find that the water features and plants provide for an especially pleasant experience. (Murat Z. Memluk , 2013)

According to the researches that have been conducted up to this point, the presence of water features in public spaces has a favorable impact on human health, including restorative and stress-reducing effects. (Karol Langie , Kinga Rybak-Niedziółka, & V ěra Hubačiková, 2022) concluded that water is one of the fundamental components of resource management in urban areas, and at the same time, it is one of the most essential. This significance is due to the fact that steadily increasing temperatures in urban areas, particularly throughout the warmer months of the year, have an effect on how people make use of public spaces, as well as the health of humans and the environment. Taking the necessary precautions against the heat is, as a result, an essential component of contemporary urban planning. Also, they found that the level of thermal comfort can be enhanced by implementing "green and blue" infrastructure. The "blue" infrastructure that is produced by water elements is therefore an appropriate solution for the creation of spaces that provide cooling in the urban environment.

(NOHA AHMED ABD EL AZIZ, 2016) argued that one of the most important aspects of environmentally friendly architecture is water management that is both effective and mimics the natural hydrological cycle. (NOBUYA NISHIMURA, TOMOHIRO NOMURA, HIROYUKI IYOTA, & SHINYA KIMOTO, 1998) concluded that water facilities are a method that can form a comfortable urban environment. According to (Heather E. Wright Wendel, Joni A. Downs, & James R. Mihelcic, 2011) green space and water features in urban areas provide a multitude of benefits to society, the environment, and the economy.

1.2 NEED OF RESEARCH: -

The need to create a comfortable and attractive environment within the open and green public spaces, by integrating water facilities within the design due to its environmental, social and economic importance.

1.3 PROBLEM STATEMENT (GAP OF KNOWLEDG): -

The lack of studies examining the relationships between the characteristics of open and green public spaces and the availability of water facilities, and their importance as an important design element to enhance environmental and social benefits and as an attraction factor for residents to encourage them to visit open and green public spaces and their use by a diverse group of residents.

1.4 THE SIGNIFICANCE OF RESEARCH: -

1- Emphasizing the importance of providing water facilities as an important design element within open and green public squares to enhance environmental and social benefits.

2- The importance of the availability of water facilities in improving access and reconnecting the population and encouraging diverse groups of them to use open and green public squares.

3- Its importance and impact on human well-being, increasing social interaction and creating a comfortable and attractive environment.

1.5 LITERATURE REVIEW OF RESEARCH: -

(Heather E. Wright Wendel, Joni A. Downs, & James R. Mihelcic, 2011) they found that urban greenery and water features have many positive social, environmental, and economic effects, but their accessibility and distribution are sometimes uneven. A few studies have drawn attention to the need for more ecologically sound urban water infrastructures to boost wider environmental and social benefits, but these studies haven't specifically looked at the function of unconventional green space in the built environment, especially existing stormwater ponds, to improve access and reconnect residents to the urban watershed.

(J. Rockstriiml & L. Gordon' , 2001) they studied both a lack of available water and poor water quality. They concluded that are having a negative impact on human welfare on a global scale. Finding novel methods of measuring water consumption, availability, and flows that take into account the necessity for water flows to support the products and services that promote human wellbeing and are produced by both natural and human-dominated ecosystems is a challenge. However, this challenge can be overcome by devising novel methods of measuring water consumption, availability, and flows that take into account the necessity for water flows to support these products and services. The researchers recommended to recognition of people as an integral part of the natural world, rather than as something distinct from it, and water's role as the vital component of the biosphere are both necessary preconditions.

According to the findings of a great number of studies, one of the most significant obstacles to progress in rural areas of developing nations is the maintenance and upkeep of water delivery facilities. As a result, it is necessary to conduct an assessment and put into action appropriate measures for attaining sustainability of the provision of water supply facilities in order to realize the long-term advantages that are associated with the investments. The economic and financial aspects, social elements, institutional factors, technological factors, and environmental variables that influence water supply systems have been categorized as sustainability factors. (T. Kativhu, D. Mazvimavi, D. Tevera, & I. Nhapi, 2017) they underlined that in order to create water facilities that are sustainable, they need to be carefully studied in connection to one another using an approach that is more holistic. This demonstrates how important it is to incorporate all aspects of sustainability into a multi-pronged strategy that takes into account the interconnected nature of these issues in order to ensure that the advantages derived from water supply facilities are maintained throughout time.

According to (NOBUYA NISHIMURA, TOMOHIRO NOMURA, HIROYUKI IYOTA, & SHINYA KIMOTO, 1998), size, types and layout of the water facilities can be determined based on the area of urban space to be controlled. while urban designers consider public open space to be broadly defined and include such elements as beaches and shared public areas. The design of public open space covers a variety of features and amenities that are internal characteristics of the space. (Mohammad Javad Koohsari, et al., 2015). Several authors used different combinations of factors and sub-factors (financial, institutional, technical, social and environmental) to assess sustainability of water facilities. (Tendai Kativhu, Trevor T. Madzivanyika, Wilfred N. Nunu, Margaret Macherera, & Annatoria Chinyama, 2021).

It is generally accepted that water features in public areas are connected to values that are significant for users, which in turn makes a certain location more appealing and more easily identified within the structure of the city. Water features that are designed to be installed in public spaces can take several forms, each of which can be categorized. When the temperatures are high, having access to components of water in public spaces that contribute to well-being and are good for the overall well-being of people is very beneficial. The distinction of the value of public spaces developed by Matthew Carmona (2019) was adopted, extending the classification developed by the Commission for Architecture and Built Environment with the health aspect. This was done in consideration of the multidimensional effect that water elements have. Therefore, the following values are differentiated: the exchangeable (of what is traded), the usable (of direct use, in the case of public spaces, observed user activities), the image (the identity and meaning of built environment projects, for better or worse), the social (supporting or impeding of the desired social relations), the environmental (impact on the environment, including consumption of natural resources), and the cultural (cultural significance, including artistic value and symbolic meanings) (impact on health and wellbeing)

(Karol Langie , Kinga Rybak-Niedziółka, & V ěra Hubaĉiková, 2022) They discovered that new values can be derived from empirically determinable qualities of water objects in an indirect manner through feelings determining places recognized by environmental psychology and morphological/topological qualities including, in particular, accessibility. These values can be derived from empirically determinable characteristics of water objects. Then, we determined the influence of these fundamental characteristics (and their combination) on the quality of places acknowledged by urban planning, which led to the formation of place values. The following are important categories of place quality: acoustic comfort, thermal comfort, psychological comfort (a sense of security), affordances possible activities, activities observed activities, imageability, sociability, privacy, sense of interest, sense of pleasure, robustness / responsiveness immersion. To be sociable is to have a high level of social interaction in an environment that is open to the public. The matrix of relationships between the actual characteristics of water components and the qualities and values of their surrounds and the urban environment is shown here. In the next stage, the characteristics that distinguish the various types of fountains (morphological types) based on how the physical characteristics of water are used were established. These characteristics are based on how the water is used to create different effects. After that, the repercussions of each type were determined for the various topological (needed housing) and perceptual qualities. Because water devices have such a dominant effect, different groups of water devices have been classified on the basis of this factor:

1. Relaxing: a dominant influence on the experience of pleasure, associated to activities that stimulate thought and peace, individual activities, and activities that need a high degree of privacy.
2. Spectacular: having a predominating impact on the level of curiosity, which is related with the potential of conducting in-depth observations of the water system.
3. Entertainment: preponderant impact on dedication (resilience/responsiveness);
4. Environmental: the major environmental function.

the influence of water elements of individual morphological kinds on the values of public space were determined using the Carmona 2019 categorization, which was designed for the purpose of cross examination with sector policies: Worth on the exchange market; a moderate impact on the increase of the commercial value of properties that are near to it, in instances where there is an internal economic impact (return on investment). Value Utilization; the capacity to deliver activities that are only somewhat engaging (observing, a short game, etc.). The Significant; the potential to deliver activities that are engaging (fun for extended periods of time, consumers of varying ages); Image value; the strong potential for producing a defining point that crystallizes the mental map, - Social value is the potential of so-called integration that enables the establishment of permanent or temporary social relationships (neighborly, intercultural, etc.), typically through the participation of a significant number of users (>15) in engaging and enjoyable activities. Social value can be defined as the potential for integration to enable the establishment of permanent or temporary social relationships.

According to (Karol Langie , Kinga Rybak-Niedziółka, & V ěra Hubaĉiková, 2022) several aspects that should be particularly taken into account when designing new water facilities in public spaces:

1. The value of public spaces is increased by each and every recognized morphological form of water feature that is present in these locations. It's possible for water features in public areas to serve a variety of purposes, ranging from just beautiful to fully practical, all of which contribute to an overall improvement in people's well-being.

2. The design of water features in public areas ought to be carried out in such a way as to balance the benefits to the surrounding environment with the aesthetics of the feature and its arrangement in relation to the particulars of the location.
3. When appropriately constructed, water features in public spaces have the potential to improve the physiologic well-being of those who utilize them. The high socio-functional value of water elements in public spaces, particularly in relation to the enhancement of people's well-being, is another recommendation for the design of water features in public areas.
4. The presence of water components elevates the overall design of public places. If they are planned correctly, they have the potential to enhance important aspects of public space, including visibility, liveliness, movement, and comfort.
5. The presence of water features helps to differentiate between locations inside cities. As a result of the presence of this kind of component, the areas in question become magnets for foot traffic and, depending on their visual impact and size, either function as identifying points or landmarks.
6. Water features found in public areas should be planned such that they can function as an integral part of the urban resilience system.
7. Water features seen in public spaces should have a comprehensive approach taken to their design.

1.6 METHODOLOGY OF RESEARCH: -

The research methodology is compatible with the quantitative method to ensure the comprehensiveness and accuracy of the results and the validity of the conclusions drawn from these results. A questionnaire will be made and the elements of the scale will be determined to determine the role of water utilities in the design of open and green public spaces, and then the questionnaire will be analyzed by the APSS statistical analysis program.

Items on the scale were preceded by the following directive: "Here are a group of statements. Please indicate your level of agreement or disagreement with each statement. Items on the 5-point Likert scale were presented as "5 - strongly agree, 4 - agree, 3 - I don't know (neutral), 2 - I disagree, 1 - I strongly disagree."

1.7 AIM OF THE STUDY: -

The study looks at emphasizing the importance of water utilities as an important design element within open and green public spaces. The aim of reviewing the above literature arose in order to promote social and environmental benefits and to encourage a diverse population of the population to use it. And understanding the association of the features of open and green public squares with water facilities.

1. Analysis and Discussions: -

In this part of the study, data collected using questionnaires to test the role of water facilities in the design of open and green public spaces are analyzed by means of the APSS statistical analysis program. Items were presented on a 5-point Likert scale as "5 - strongly agree, 4 - agree, 3 - don't know (neutral), 2 - disagree, 1 - strongly disagree."

2.1 Questionnaire analysis: -

2.1.1 Social characteristics of residents: -

Social characteristics of users who answered the questionnaire presented to them. The questionnaire included questions about (gender, age).

The number of respondents to the questionnaire was 121 individuals. The results showed that the percentage of males is higher than the percentage of females, according to Table 1.

Table 1. The gender.

The gender	Number	Percentage
male	64	52.893 %
female	57	47.107%
Total	121	100.00%

The number of respondents to the questionnaire was 121 individuals. The results showed that most of the groups that responded to the questionnaire ranged in two periods between 15-25 years and 26-35 years, according to Table 2.

Table 2. Age groups of respondents.

Age group	Number	Percentage
15-25	45	37.19 %
26-35	48	39.67 %
36-45	14	11.57%
over 46	14	11.57%
Total	121	100.00%

2.1.2 The questionnaire was divided into three sections (three variables) as follows: -

A. The role of water facilities in creating a comfortable and attractive environment and achieving the well-being of people in open and green public squares.

- quantitative analysis: -

Table 3: - Statistical analysis using APSS program for the first variable (A) in the questionnaire.

Question rank	Sample direction	T Test	Per	Standard deviation	M	Strongly disagree	disagree	Don't know (neutral)	agree	Strongly agree	Question number
1	Strongly agree	58.695	90.413	0.285	4.521	0	0	2	54	65	1
2	Strongly agree	34.151	88.926	0.466	4.446	0	3	4	50	64	5
3	Strongly agree	43.352	88.760	0.365	4.438	0	1	4	57	59	7
4	Strongly agree	34.649	87.438	0.436	4.372	0	2	6	58	55	2
5	Strongly agree	42.929	86.942	0.345	4.347	0	0	7	65	49	6
6	agree	19.695	82.645	0.632	4.132	0	4	19	55	43	3
7	agree	11.538	78.182	0.867	3.909	0	14	16	58	33	4

- qualitative analysis: -

1- Question No. (1) which represents (**The availability of various water facilities in open and green public spaces helps to create a comfortable and attractive environment.**): We see that a percentage of (90.413) of the sample members answered that they are (strongly agree) about (**The availability of various water facilities in open and green public spaces helps to create a comfortable and attractive environment.**).

2- Question No. (5) which represents (**One of the elements of water facilities is running water, fountains and waterfalls that add movement and vitality to the space.**): We see that a percentage of (88.925) of the sample

members answered that they are (strongly agree) about (One of the elements of water facilities is running water, fountains and waterfalls that add movement and vitality to the space.).

- 3- Question No. (7) which represents (Water facilities in open and green public spaces help improve mood and relieve stress for users.): We see that a percentage of (88.960) of the sample members answered that they are (strongly agree) about (Water facilities in open and green public spaces help improve mood and relieve

Question rank	Sample direction	T Test	Per	Standard deviation	M	Strongly disagree	disagree	Don't know (neutral)	agree	Strongly agree	Question number
1	Strongly agree	47.595	88.595	0.330	4.430	0	0	5	59	57	2
2	Strongly agree	30	85.455	0.467	4.273	0	3	7	65	46	3
3	Strongly agree	27.453	84.298	0.487	4.215	0	1	16	60	44	1
4	Strongly agree	26.619	84.132	0.499	4.207	0	2	14	62	43	4
5	agree	16.644	82.479	0.743	4.124	0	6	20	48	47	5

stress for users).

- 4- Question No. (2) which represents (The availability of water facilities in open and green public spaces has a great impact on the well-being of people.): We see that a percentage of (87.438) of the sample members answered that they are (strongly agree) about (The availability of water facilities in open and green public spaces has a great impact on the well-being of people).
- 5- Question No. (6) which represents (Water facilities help to form a comfortable environment for users.): We see that a percentage of (86.942) of the sample members answered that they are (strongly agree) about (Water facilities help to form a comfortable environment for users).
- 6- Question No. (3) which represents (The water facilities within the open and green public spaces help to cool the atmosphere and reduce temperatures.): We see that a percentage of (82.644) of the sample members answered that they are (agree) about (The water facilities within the open and green public spaces help to cool the atmosphere and reduce temperatures).
- 7- Question No. (4) which represents (One of the elements of water facilities is stagnant water, which helps to create a more comfortable and calmer environment.): We see that a percentage of (78.181) of the sample members answered that they are (agree) about (One of the elements of water facilities is stagnant water, which helps to create a more comfortable and calmer environment).

B. Environmental, economic and social benefits of water facilities.

- quantitative analysis: -

Table 4: - Statistical analysis using APSS program for the second variable (B) in the questionnaire.

- qualitative analysis: -

- 1- Question No. (2) which represents (The availability of water facilities in open and green public spaces has social benefits (as a point of attraction for pedestrians, improving welfare and encouraging social relations)): We see that a percentage of (88.595) of the sample members answered that they are (strongly

- agree) about (The availability of water facilities in open and green public spaces has social benefits (as a point of attraction for pedestrians, improving welfare and encouraging social relations)).
- 2- Question No. (3) which represents (The availability of water facilities in open and green public spaces has environmental benefits (softening the atmosphere and reducing temperatures)): We see that a percentage of (85.454) of the sample members answered that they are (strongly agree) about (The availability of water facilities in open and green public spaces has environmental benefits (softening the atmosphere and reducing temperatures)).
 - 3- Question No. (1) which represents (The presence of water facilities in open and green public spaces increases the value of these places in various aspects.): We see that a percentage of (84.297) of the sample members answered that they are (strongly agree) about (The presence of water facilities in open and green public spaces increases the value of these places in various aspects).
 - 4- Question No. (4) which represents (The availability of water facilities in open and green public spaces has economic benefits (increasing the economic value of neighboring properties and encouraging investment)): We see that a percentage of (84.132) of the sample members answered that they are (strongly agree) about (The availability of various water facilities in open and green public spaces helps to create a comfortable and attractive environment).
 - 5- Question No. (5) which represents (Availability of water facilities in open and green public places also encourages tourism.): We see that a percentage of (82.479) of the sample members answered that they are (agree) about (The availability of various water facilities in open and green public spaces helps to create a comfortable and attractive environment).
- C. The role of water facilities in encouraging and attracting diverse groups of residents and increasing social interaction in open and green public squares.
- quantitative analysis: -

Table 5: - Statistical analysis using APSS program for the third variable (C) in the questionnaire.

Question rank	Sample direction	T Test	Per	Standard deviation	M	Strongly disagree	disagree	Don't know (neutral)	agree	Strongly agree	Question number
1	Strongly agree	56.842	92.727	0.317	4.636	0	1	2	37	81	6
2	Strongly agree	41.916	90.579	0.401	4.529	0	2	3	45	71	3
3	Strongly agree	57.364	89.752	0.285	4.488	0	0	2	58	61	5
4	Strongly agree	45.427	88.760	0.348	4.438	0	1	3	59	58	4
5	Strongly agree	27.114	86.612	0.540	4.331	1	2	7	57	54	8
6	Strongly	20.968	84.628	0.646	4.231	0	7	7	58	49	2

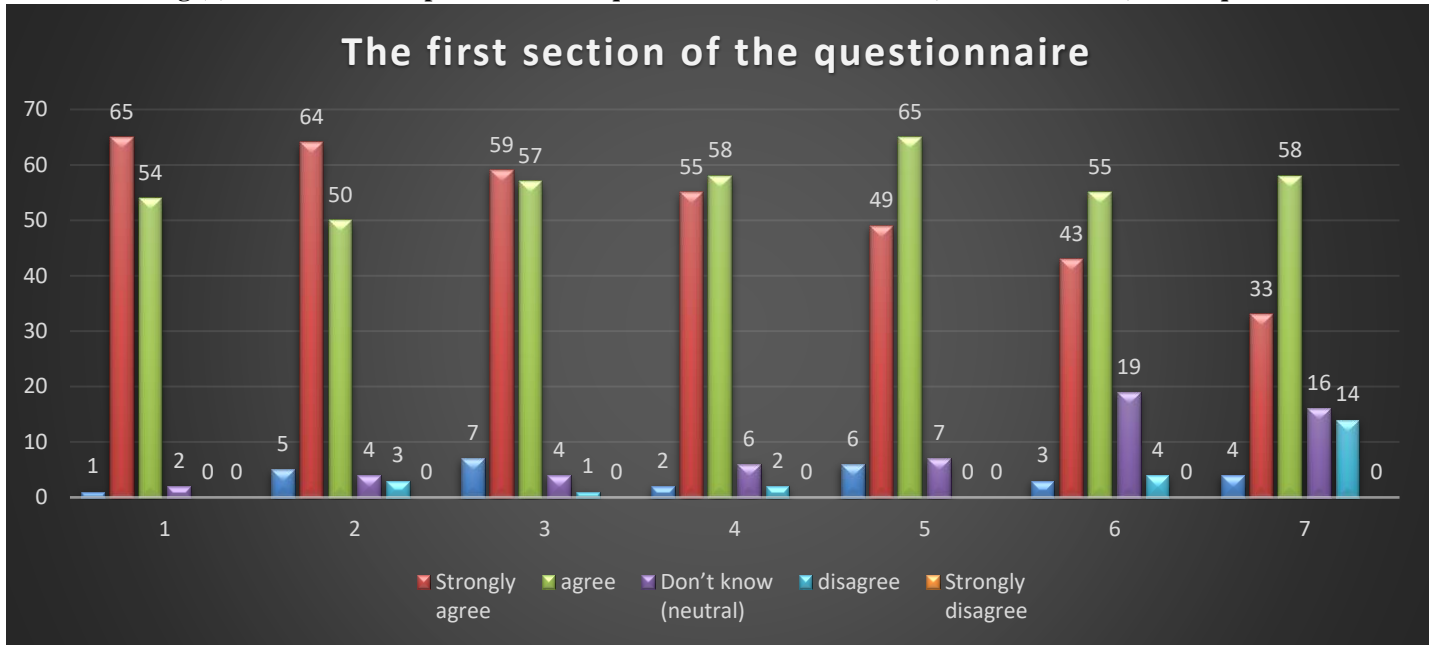
	agree											
7	agree	22.392	83.306	0.572	4.165	1	5	5	72	38	1	
8	Don't know (neutral)	1.127	63.802	1.855	3.190	10	44	8	31	28	7	

• qualitative analysis: -

- 1- Question No. (6) which represents (**Safety must be taken into consideration when designing water facilities in open and green public spaces**): We see that a percentage of (92.727) of the sample members answered that they are (**strongly agree**) about (**Safety must be taken into consideration when designing water facilities in open and green public spaces**).
- 2- Question No. (3) which represents (**Water utilities enrich the composition of public spaces as they improve the main features of public spaces such as photography, liveliness, mobility and comfort**): We see that a percentage of (90.578) of the sample members answered that they are (**strongly agree**) about (**Water utilities enrich the composition of public spaces as they improve the main features of public spaces such as photography, liveliness, mobility and comfort.**).
- 3- Question No. (5) which represents (**Availability of water facilities in open and green public spaces encourages residents to spend more time outdoors**): We see that a percentage of (89.752) of the sample members answered that they are (**strongly agree**) about (**Availability of water facilities in open and green public spaces encourages residents to spend more time outdoors**).
- 4- Question No. (4) which represents (**Having water facilities in open and green public spaces while making sure privacy is respected attracts people**): We see that a percentage of (88.760) of the sample members answered that they are (**strongly agree**) about (**Having water facilities in open and green public spaces while making sure privacy is respected attracts people**).
- 5- Question No. (8) which represents (**Open and green public spaces with water facilities are better at attracting residents than green and open spaces without water facilities**): We see that a percentage of (86.611) of the sample members answered that they are (**strongly agree**) about (**Open and green public spaces with water facilities are better at attracting residents than green and open spaces without water facilities**).
- 6- Question No. (2) which represents (**The presence of water facilities usable by visitors within the public open green spaces (swimming pools) attracts residents**): We see that a percentage of (84.628) of the sample members answered that they are (**strongly agree**) about (**The presence of water facilities usable by visitors within the public open green spaces (swimming pools) attracts residents**).
- 7- Question No. (1) which represents (**The presence of water facilities (fountains, waterfalls or water pools) within the green open public spaces. walled (unusable)**): We see that a percentage of (83.305) of the sample members answered that they are (**agree**) about (**The presence of water facilities (fountains, waterfalls or water pools) within the green open public spaces. walled (unusable)**).
- 8- Question No. (7) which represents (**Open and green public spaces without water facilities are better at attracting residents than green and open public spaces with water facilities**): We see that a percentage of (63.801) of the sample members answered that they are (**I don't know (neutral)**) about (**Open and green public spaces without water facilities are better at attracting residents than green and open public spaces with water facilities**).

2.2 Discussions: -

Fig (1): - Number of respondents to the questions in the first section (the first variable) of the questionnaire.



Through the responses to the first section of the questionnaire (the first variable A), which is concerned with the role of water facilities in creating a comfortable and attractive environment in open and green public spaces and achieving well-being for users.

After analyzing the questionnaire through the APSS program, it was found that water facilities have a significant role in creating a comfortable environment, as the question ranked first, and in the second place that the elements of running water add movement and vitality to the space, and in the third place, water facilities help in improving the mood of users and relieving stress. In the fourth rank, the water facilities had a great impact on the well-being of people, the fifth rank was that the water facilities helped create a comfortable environment for users, and the sixth rank was that the water facilities helped to cool the atmosphere and reduce temperatures, which helps to achieve a comfortable and more comfortable environment for users, and finally in the seventh Standing water which is an element of water utility, helps to create a more comfortable and calm environment. Since most of the answers to the questions I agree and strongly agree.

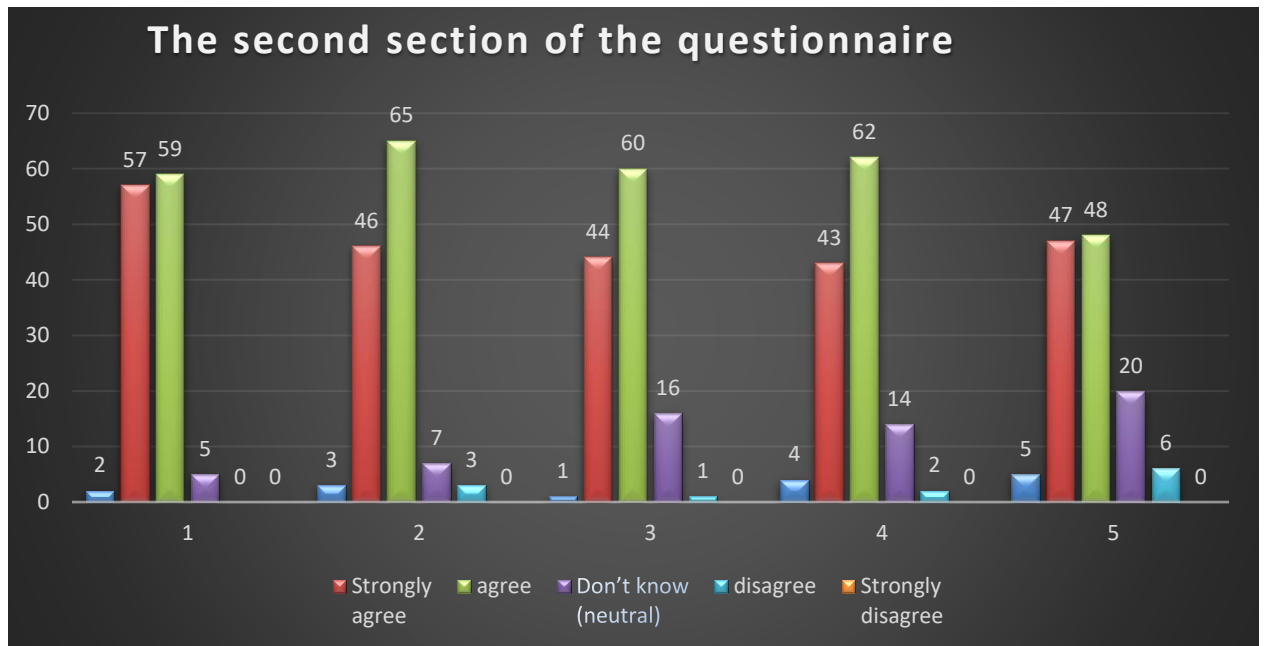


Fig (2): - Number of respondents to the questions in the second section (the second variable) of the questionnaire.

In the second part of the questionnaire (the second variable B) related to the environmental, economic and social benefits of water facilities in open and green spaces.

After analyzing the questionnaire through the APSS program, it was found that water facilities have social benefits as an attraction for pedestrians and encourage social relations, where the question ranked first, and in the second place that water facilities have environmental benefits such as softening the atmosphere. And reducing temperatures, and in the third place, water facilities increase the value of public places in various respects, and in the fourth place that water facilities have economic benefits such as increasing the economic value of neighboring properties and encouraging investment, and finally in the fifth place that water facilities encourage tourism, especially domestic tourism. The majority of the responses to the questions where I agree and strongly agree.

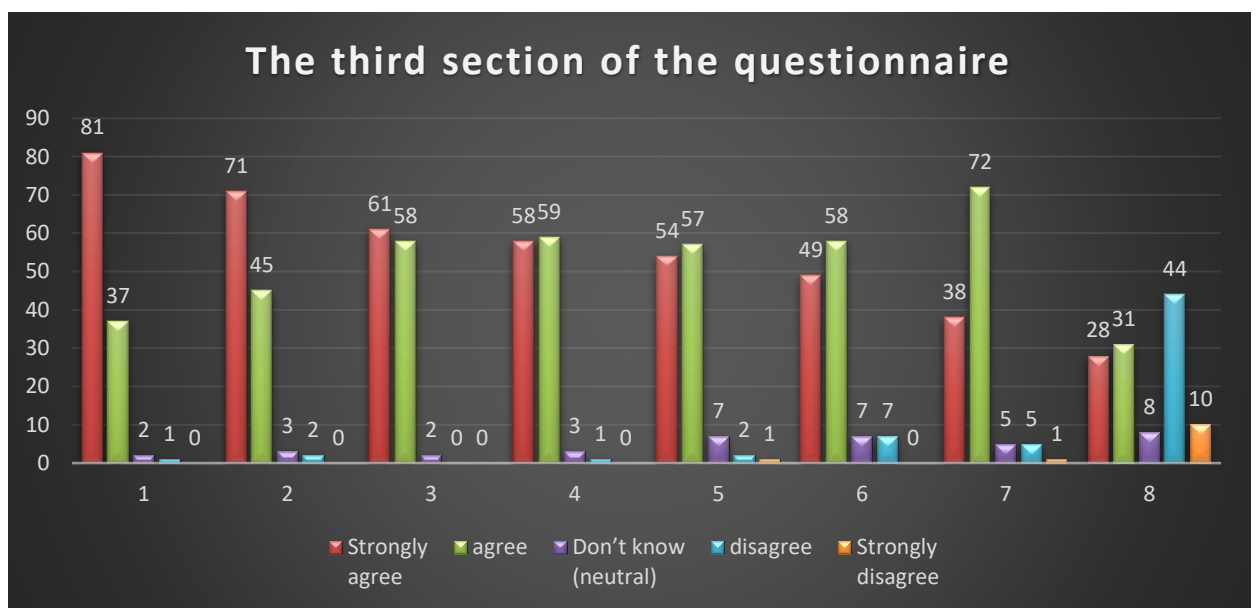


Fig (3): - Number of respondents to the questions in the third section (the third variable) of the questionnaire.

In the third part of the questionnaire (the third variable C), which is concerned with the role of water facilities in encouraging and attracting diverse groups of the population and increasing social interaction in open and green public squares.

After analyzing the questionnaire through the APSS program, it was found that public safety must be taken into account when designing water facilities, as the question ranked first, and in the second place, that water facilities enrich the composition of public places. Because it improves the main features of public spaces such as photography, liveliness and comfort, in the third place, aquatic facilities encourage residents to spend more time outdoors, and in the fourth, they emphasize respect for privacy when designing water facilities, in the fifth place, they emphasize that open public spaces And green spaces with water facilities are better at attracting residents than others, and the sixth place is that usable water facilities such as swimming pools are better in attracting residents, and the seventh place is that the presence of water facilities such as fountains, waterfalls or walled pools (not usable) within open public spaces Green and open public spaces attract residents, but in a lower proportion than open and green public spaces with usable water facilities, and finally in eighth place, open and green public spaces without water facilities are better at attracting residents, but also in a lower proportion than open public spaces And the green ones with water facilities where the highest percentage of responses to the last question was I disagree.

From the above, it turns out that open and green public spaces with water facilities for us, which took into account public safety and privacy measures when designing, are the best at attracting residents and helping them to spend more time in the fresh air.

2. Conclusion and Recommendations: -

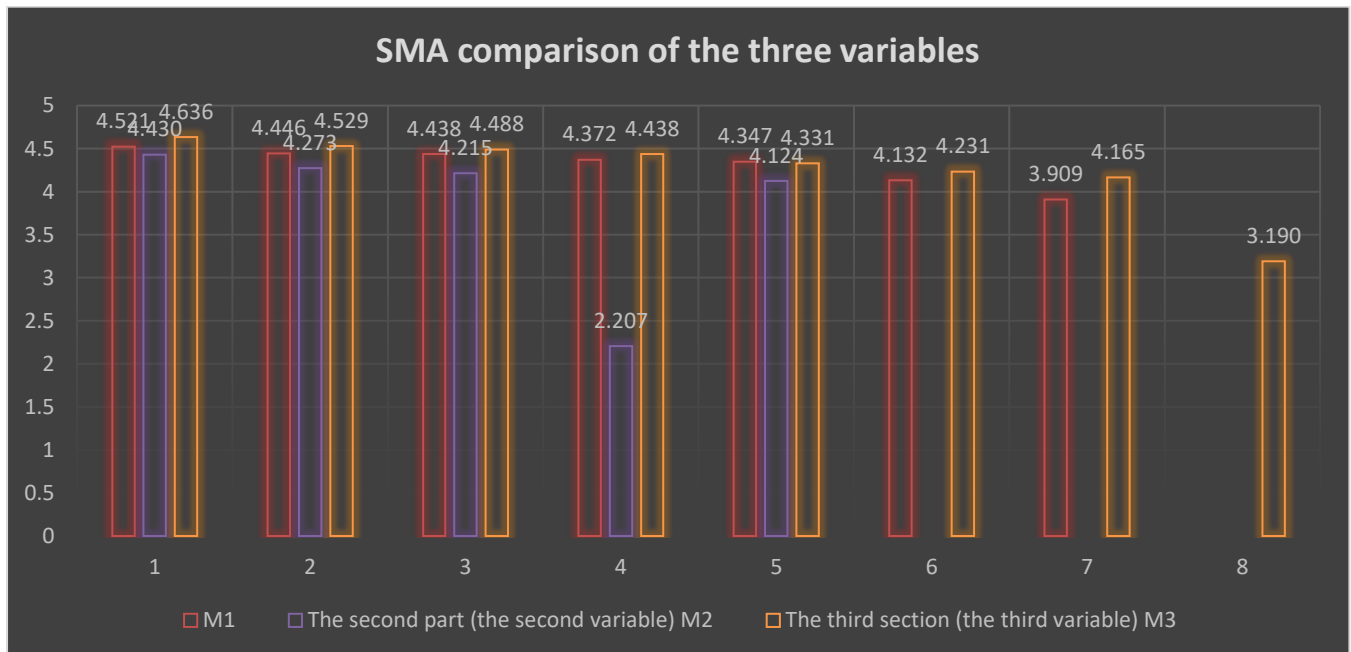


Fig (4): - Comparison of the number of respondents in the three sections.

According to the data presented in the figure (4), the first section (M1) received the highest percentage of responses to the questions that were "I agree" and "strongly agree," while the percentage of responses that were "I disagree" and "strongly disagree" was very low. Furthermore, the second section (M2) also received the highest percentage of responses to the questions that were "I agree." I wholeheartedly and completely concur. And the percentage of respondents who said they disagreed or strongly disagreed is also quite low, and the third section (M3) was the percentage of responses to the questions that said they agreed or strongly agreed with all of the questions, with the exception of the last question, which was about the fact that open and green public spaces that do not have water facilities are more effective in attracting residents than open

and green public spaces that do have water facilities. I disagree with the part of the answer that had the biggest percentage of other respondents' responses.

It was found that the three different variables had a considerable impact on the respondents' opinions and attitudes. Therefore, this demonstrates that water facilities play an essential part in the design of open and green public spaces, both in terms of achieving a comfortable and appealing environment and having an effect on the health and happiness of users, in addition to their role in achieving a wide range of social and environmental benefits. and economically, in addition to their role in encouraging and attracting diverse groups of the population and increasing social interaction.

3.1 Recommendations: -

Water is one of the basic elements of resource management in cities and one of the most necessary at the same time. Based on the foregoing, and through the responses to the questionnaire, it was found that water utilities have an important role in the design of open and green public spaces. This is recommended when designing water utilities within open and green public spaces: -

- 1- The diversity of water facilities in the open and green public spaces helps to create a comfortable and attractive environment for the residents. Among the elements of hydropneumatics facilities are running water that adds liveliness and movement to the space, and standing water that helps create a more relaxing and calming environment. Thus, creating a comfortable environment for users, improving their mood, relieving their stress, and making a significant impact on the well-being of residents.
- 2- Water facilities in open and green public places have social benefits such as (attracting pedestrians, strengthening social relations and improving welfare), environmental benefits such as (softening the general atmosphere and reducing temperatures), and economic benefits such as (encouraging investment, encouraging domestic tourism, increasing economic value). for neighboring properties). Thus, the value of these places increases in many ways.
- 3- The presence of water facilities within open and green public spaces helps improve the basic features of public spaces, and encourages people to spend more time outdoors.
- 4- When designing water facilities, public safety and respect for privacy must be taken into account, especially when designing swimming pools.
- 5- Open and green public spaces with water facilities are better at attracting residents than open and green public spaces without water facilities.
- 6- **Limitation: -**
 - 1- Not checking the correctness of the respondents' answers.
 - 2- Not sure about the accuracy of the answers.
 - 3- Lack of time to collect a sufficient number of responses.

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