Journal of Synergy Landscape
ISSN 2807-1077(ONLINE)

SUSTAINABLE URBAN PUBLIC PARK LANDSCAPE DESIGN CRITERIA BASED ON COMMUNITY PERCEPTION AND ASPIRATIONS

Ida Bagus Rabindra[1], Titiek P. Debora[1], Ina Krisantia[1]

[1]Department of Landscape Architecture, Faculty of Landscape Architecture and Environmental Technology, Trisakti University, Jakarta, Indonesia, 11440

Corresponding Author: Ida Bagus Rabindra

Email : ib_rabindra@yahoo.com

Received : Apri 2021
Revised : Mei 2021
Accepted : August 2021

DOI: 10.25105/tjsl.v1i1.9940

ABSTRAK

This article interprets the perception and aspirations of the city community, as a cornerstone of drafting the design criteria of a community-based city park landscape, which is effective and sustainable. Flooding and drought problems in Jakarta and surrounding areas should be resolved in a comprehensive, integrated and sustainable manner. Referring to the Water Sensitive Urban Design (WSUD) which is an innovation in integrated water management, it is recommended to develop the function of detention and retention ponds as part of storm drainage system, replacing conventional system. Development of the city park landscape criteria as the synergies of the RTH function and the detention/retention ponds should be approached in a very careful, avoiding fatal malfunction and harsh rejection of the user community. The best approach should be done through tracing the needs, desires and expectations of the city community as the ‘end user' as well as 'super client' of the city park. Research on the perception and aspirations of the city community on the idea of the development of City Park with the role of retention/retention ponds has been conducted between February to May 2020 in Jabodetabek.

K**eywords**: *community perception, public park, retention ponds, urban*

ISSN 2807-1077 (ONLINE)
10.25105/tjsl.v1i1.9940
JOURNAL OF SYNERGY LANDSCAPE Vol 1 No 1 August 2021

INTRODUCTION

Floods in the rainy season and drought in the dry season has always been repeated in the Jakarta and surrounding areas, urban land use in Jakarta and the surrounding areas are assessed to be reorganized to solve the problem. Conventional storm drainage systems are no longer able to cope with the problem so that innovation is needed to overcome it, Water Sensitive Urban Design (WSUD) (Morgan et al, 2013) as a new innovation integrated water management in urban graded can contribute effectively as part of the overall urban strategy. Many studies and research conducted to test the effectiveness of the WSUD, the main findings produced is that the development and utilization of ponds detention also retention ponds on the network of urban storm drainage system very effective, therefore highly recommended to be applied. Detention Ponds is also called dry ponds is a temporary water shelter at least to control water due to daily rain, Retention Ponds is also called 'wet ponds' is a water shelter that is 'long term' at least the control of rainwater for one rainy season (Jones et al 2007). The implementation of detention and retention ponds in public parks is long done in the Americas and Europe. Initially, its implementation in public parks is given the rejection of citizens, due to concerns about the threat of safety and security, hygiene conditions and environmental health threats. Other's people think that the existence of detention and retention ponds will reduce the proportion of green open space for active recreational functions.

The application of dry ponds and wet ponds as elements of city parks in Jakarta and surrounding areas have started to be done about two decades of running. So far it seems that all went smoothly, garden function impressed alive and passionate, neither heard of complaints nor loud protests from the user community. The problem is, does it all sign all the needs, desires and expectation the city community will of the city park already fulfilled? And whether the typical design of a city park that already exist can be a role model and general criteria of the design of the city park? Of course, it will never happen that way, therefore research is done to be the study material of this writing. The research conducted by the authors (February-May 2020) gives an overview of the perception and aspirations of the community in the Jabodetabek region relating to the existence of detention and retention ponds in the city's public parks. The results of the research became the foundation of researchers in the development of landscape design criteria and the standard operational procedure (SOP) of management in urban public parks. The criteria of landscape design and SOP management of public park formulated through the interpretation of various fundamental needs of respondents as 'super client', as well as various wants and expectations of respondents as 'end-user' of public parks.

The landscape design criteria and landscape management SOP of the public park as a result of this research is expected to contribute to the development of science, technology and the arts, as well as development solutions. Contributions to the development of science/technology and art are expected to give important significance to the planning and designing process through a comprehensive community-based research approach and sustainability. To contribute a thought to the city government to be able properly manage the city infrastructures, truly beneficial to community and avoid the mistakes of management. Give them a more comfortable, livable and sustainable city to stay. There are several stormwater functions studies that need to be considered in the design. Considerations of such designs can be made creteria sustainable urban park design. to strengthen creteria design can be seen from the opinion of the community as a user who will strengthen the kreteria sustainable park design. Based on this paper will look at the perception and aspirations of a sustainable urban park aspects of the existence of ponds in urban parks.

To see the public perception based on literature studies have been made as below as the basis for determining variables and indicators about the existence of ponds in urban parks (France, 2002) a stormwater pond may provide three basic functions: (1) flood control, a stormwater pond shall be able to collect as much runoff as possible and as effectively as possible, (2) The water quality function of stormwater ponds is commonly evaluated by removal efficiencies of pollutants. Some important considerations to enhance the pollutant removal rate include the following: (a) Detention time would be better between 24 h and 40 h. When in permeable soil, the time can be shorter depending on the infiltration rate. The larger the infiltrate rate, the smaller the detention time will be.

Therefore, reliable infiltration rate calculation methods using accurate in-site permeability test data are necessary to achieve practically accurate groundwater recharge and water quality benefit due to infiltration in stormwater ponds or basins (Wang, 1999), (b) Flow distribution shall be made as uniform as possible across the pond section, which is perpendicular to the flow direction. This can be facilitated by shaping the pond as an ellipsis, and installing flow distribution berms at the inlet and outlet, a sediment forebay at the inlet, and a high marsh between the inlet and outlet. (c), Flow depth shall be no less than 1 ft for an annual mean storm event, (d) Maximize the distance between inlet(s) and outlet(s), (e) Minimize “clean water” through pond, such as roof runoff to maximize treatment for “dirty water,” such as roadway runoff. *(3) Ecological and safety impacts* as observed in the field, a stormwater pond will likely become some kind of habitat for

wildlife and waterfowl. The water quality in the pond itself can be important to wildlife coming to use the pond, which somehow is contradictory to the stormwater quality treatment function of the pond design. Ecological and aesthetic functions are commonly observed: (a) Most stormwater basins with permanent pools attract wildlife and waterfowl including but not limited to wild ducks, frogs, turtles, spring peepers, and other macro-invertebrates, (b), Stormwater ponds with proper landscaping are usually attractive and may add value to commercial and industrial land, (c) The groundwater is recharged, (d) Stormwater ponds in residential subdivisions tend to trigger safety and mosquito concerns from neighbors, (e) Even stormwater ponds with temporary water provide some wildlife habitat value regardless of design purpose.

For example, embankment slopes that are too steep can be hazardous to the public and maintenance staff. Another example is high wing walls or other vertical structures. In the past few years, a serious public health concern that has emerged is related to ponds that create mosquito-breeding habitat due to shallow and stagnant standing water, thus increasing the risk of West Nile virus to the adjacent community. Based on the explanation above can be concluded that the issue of pool safety is concerning, edge, depth of the pool, animal, maintenance. Therefore, public safety should consider edge, dept of the pool, animal and maintenance so that the water condition of the pool is clean, clear (Yannopoulos et al., 2013). The hydrological cycle is a continuous process of water transport from the oceans to the atmosphere, to the land and back to the sea, Hydrologic Function, Collection, Storage. Butler and Davies (2004) Public health Relatively high concentrations of a variety of pathogens may be expected from both com-bined sewer overflow (CSO) and stormwater outfall (SWO) discharges. Aesthetics In addition to chemical and biological impacts, public perception of water quality is also important.

Research has shown that the public has a good idea of what might be considered a polluted river but is less certain as to what might be considered a clean river. (Yannopoulos et al., 2013) the hydrological cycle is a continuous process of water transport from the oceans to the atmosphere, to the land and back to the sea. Urbanization may change dramatically this water cycle by runoff increase and infiltration decrease, sometimes almost to zero. The functions of the hydrological cycle that include the occurrence, circulation, distribution, and chemical and physical properties of water on the surface ofthe land, in the soil and underlying rocks, and in the atmosphere, and water'sinteraction with the environment including its relation to living things. The increases in temperature associated with projected changes in Ontario's climateis projected to lead to more winter rainfall, less snowfall, delayed lake ice cover, thinner lake ice, and earlier snow and ice melt (Zhang, et al., 2001). In the Great Lakes region, this could result in theincreased occurrence of lake-effect precipitation with longer ice-free periods

(Mortsch, et al., 2003), affecting the timing and magnitude. Storage, the net impact of changes in climate will result in changes to the distribution of water within the landscape, primarily impacting shallow groundwater and surface water resources. Shallow aquifers that are only hydrologically connected to local recharge and discharge sources will have stronger responses to changes in climate than those that are connected to regional-scale recharge sources (Chen, et al., 2002) Discharge**, m**odels consistently project decreases in runoff over mid-latitude North America by the 2020s, expanding through the 2080s, however projections of change in runoff remain more variable than those of precipitation or evapotranspiration (Cohen & Waddell, 2009). Changes in precipitation accumulation may cause a correlated, but greater change in stream discharge and changes in temperature may result in a. Jurisdictional Use of Hydrologic Function**,** the broadly used term 'hydrologic function' has a wide range of applications and associated meanings (e.g., wetland function, drainage function, ecological function, etc.). A search for the application and use of this term throughout other jurisdictions.

RESEARCH METHODS

Previous research aims to capture the perception and aspirations of the urban community as a city park user equipped with ponds. The perception and aspirations of the results of the research are further interpretation and formulated as needs, wishes and expectations of end users who become the cornerstone of the city garden landscape design criteria with ponds as the main element. The type of research is Action Research, qualitative using the Participatory Observation method. The subject of research is urban community in the administrative area of Jakarta, Bogor, Depok, Tangerang and Bekasi. Samples are citizens of urban communities of users/visitors of environmental parks, city parks or child friendly public open spaces (RPTRA) who have at least been more five years of continuous life in urban areas. Sampling is set based on sample randomizing distraction (Stratified Random Sampling). Strata samples are based on gender, age level, education level, socio-economic level, to detect needs, wants/wishes and expectations of the specific compound citizen.

The method of data collection is done by a live interview based on a list of questions that have been designed in the research questioner, containing 53 questions divided into 5 (five) variables of research, consisting of 48 closed questions and 5 open questions. This research variable is the perception of community to the effectiveness of the function detention/retention ponds and its efficacy as a staple element of urban RTH, namely: (1) Hydrological function variables; (2) Ecological function variables; (3) Public safety and security eligibility variables; (4)

ISSN 2807-1077 (ONLINE)
10.25105/tjsl.v1i1.9940
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Hygiene and environmental health feasibility variables; (5) Beauty feasibility and environmental comfort variables. Tabulated interview data is based on five. (5) variables of the study, the tables of answers to 48 closed questions are analyzed later in-interpretation and qualitative deduced. The result of the analysis of the answer is interpreted as the perception of respondents to accept, reject or abstain over the role of detention/retention ponds as an element of urban public parks landscape. The answer to the 1 question opens in each variable (5 questions total) is grouped based on the form of the respondent's statement or suggestion, and then qualitative interpretation as the aspiration of respondents of their needs, wishes and hopes as 'end-user' will be the optimal role of detention/retention ponds as a landscape element of urban public park.

RESULTS AND DISCUSSION

The results of research revealed that the detention and retention ponds are very effective for controlling the surface water flow/run off, flood and drought. The implementation is highly recommended to be applied as a sub-system of storm drainage system on land or wider environment, such as residential/settlement environment, even at city level. Some studies have also resulted in a conclusion that the detention and retention pond have a very important hydrological function in the process of water infiltration into the soil significantly. The detention/retention ponds will be able to achieve its ecological function optimally when integrated with green open space.

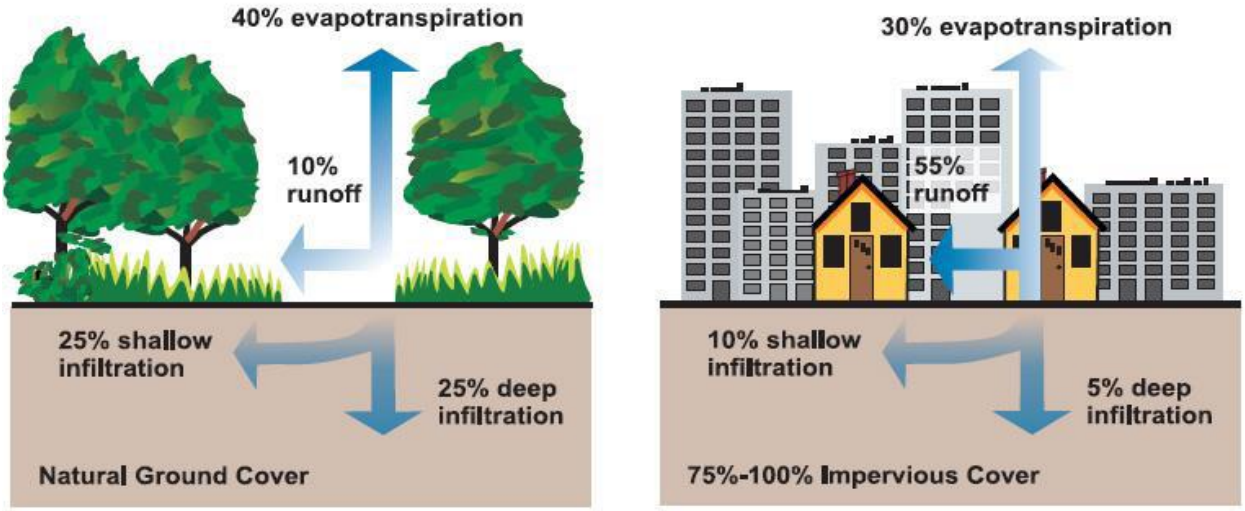

Figure1. Comparison of Water Absorbing Ability
source: ejournal.unitomo.ac.id

ISSN 2807-1077 (ONLINE)
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Freshwater ecosystems are part of the Earth's aquatic ecosystem, they include lakes and ponds, rivers, springs, swamps, and wetlands. In aquatic ecosystem more instrumental biotic components are water. A-biotic element in aquatic ecosystems is water, sunlight, air, and temperature. A-biotic environmental component plays an important role in living creatures in the waters. Based on the water condition, pond is incorporated as a *lentic* freshwater ecosystem (calm). As half of our consumptive need, we must preserve freshwater supplies. The best way to preserve fresh water is by preserving all of the freshwater storage bags, including rehabilitation of the natural ponds.

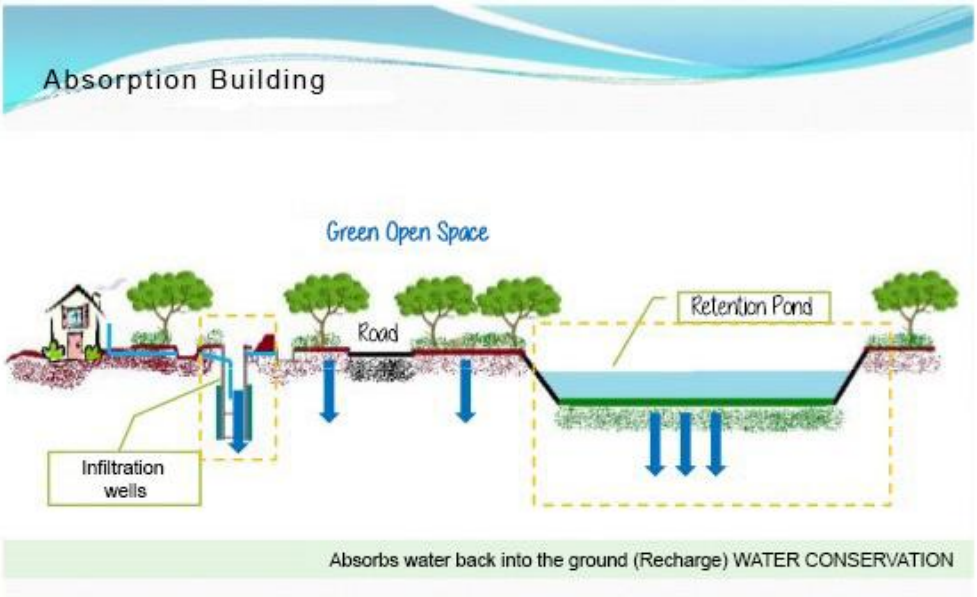

Figure2. Absorption Building for Water Conservation
Source: Kementerian PUPR, Dit-Jen Cipta Karya (Google.com)

Community rejection of the application detention-retention ponds is more due to several factors is: fear and worry about public safety, hygiene and public health, as well as comfort and beauty of the environment. Based on the opinion, the retractable Hypothesis is that if these factors can be minimized, the negative perception of the community can be changed to be more positive. The interpretation of table 1 shows that: respondents are generally aware of the hydrologic functions of ponds storing large volumes of water as reserves and reducing the chances of flooding. Generally agreed ponds need to be guarded, preserved, rehabilitated, even rebuilt until optimal function. Respondents assessed the need for an open space green as a buffer every detention and retention ponds that exist is: necessary.

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Table 1. Respondents Options Over Hydrological Function Variables of Detention/Retention Ponds.

HYDROLOGICAL FUNCTION VARIABLES				
NO.	Q U E S T I O N	YES	ENOUGH	NO
1.1.	Did you know that ponds can accommodate a lot of storm water?	41	3	1
1.2.	Did you know that ponds can reduce the possibility of flooding?	40	4	1
1.3.	Did you know that ponds can be used as water reservoir in during the dry season?	37	6	2
1.4.	If the answer (1,2,3) is 'yes', does it need to be protected and preserved?	37	6	2
1.5.	In order to be sustainable, does it need to be maintained and improved?	35	8	2
1.6.	If it has been 'lost', should it be 'replaced' or rebuilt?	35	8	2
1.7.	If it has to be 'rebuilt', is it appropriate to be built in the public park?	34	9	2
1.8.	If it is 'rebuilt', would it be OK if a public park was built around it?	34	9	2
1.9.	If it is considered good, should every public park be equipped with reservoir?	35	8	2
1.10	Do you mind that the presence of a pond in the park will reduce the functional space of a public garden? convey your opinion briefly:			

Source: Survey (February-May 2020)

Interpretation as described in table2 indicates that: Respondents are generally aware that detention and retention ponds is a ecosystem where many lives depend, its sustainability benefits a lot, so it needs to be well preserved both physically and legally. The preservation can be physically done by giving a protective buffer in the form of green open space, the detention and retention ponds will be legally protected for being in public management and supervision.

Table 2. Respondents Options Over Ecological Function Variable of Detention/Retention Ponds.

ECOLOGICAL FUNCTION VARIABLES				
NO.	Q U E S T I O N	YES	ENOUGH	NO
1.1.	Did you know that the pond is where the lives of many living things depend?	40	4	1
1.2.	Did you know that water is the main element of the pond's environment?	38	5	2
1.3.	Did you know that a sustainable ponds environment will provide many benefits?	35	7	3
1.4.	In order not to lose its benefits, do we need to preserve the ponds?	35	7	3
1.5.	In order to stay sustainable and useful, does pond need to be protected physically and legally?	32	8	5
1.6.	In order to stay protected, does around the pond need to be surrounded by green open space?	32	8	5
1.7.	In order to be useful, is it appropriate if the green open space also being functioned as a public park?	32	9	4
1.8.	In order to be useful, should pond be provided in every city public park?	32	9	4
1.9.	Do you mind that the existence of a public park will reduce the environmental sustainability around the reservoir pond? convey your opinion in brief:			

Source: Survey (February-May 2020)

Interpretation as described in Table 3 indicates: Respondents feel safe and do not worry when located in the public park with detention and retention ponds with clear water conditions. It appears quite worried if the water looks murky and knows that the water depth reaches 2.50 meters. To reduce the fear generally expect to provide information in the form of warning signs(danger hazardous), space as a distance limiting activities, safety fence, lighting public for night activityaround the pond.

ISSN 2807-1077 (ONLINE)
10.25105/tjsl.v1i1.9940
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Table 3. Respondents Choice of Public Safety and Security Eligibility Variables

PUBLIC SECURITY FEASIBILITY VARIABLES IN GARDEN WITH DETENTION / RETENTION PONDS				
NO	**Q U E S T I O N**	**YES**	**ENOUGH**	**NO**
3.1.	Do you feel safe when you are in a public park with ponds as its element?	39	3	3
3.2.	Are you worried about your safety when you are in a public park with ponds?	3	3	39
3.3.	If you are on the edge of / above a pond in a public park, are you worried about your safety?	6	19	20
3.4.	If the water in the pond is cloudy/muddy, and the bottom cannot be seen, are you worried?	21	21	3
3.5.	If the water in the pond is clear, and the bottom is deep, are you worried?	1	21	23
3.6.	If there is an information on the maximum depth of the pond of 2.50 meters, are you worried?	19	18	8
3.7.	Do you need a warning system for visitor safety / security?	35	10	-
3.8.	Do you need a safe distance between the pond and the visitor activity space?	36	9	-
3.9.	Do you need a safety fence at the edge of the pond in a public park?	32	9	4
3.10.	Is there any need for lighting at the edge of the ponds for night safety?	39	6	-
3.11	Are you worried about the threat of reptiles at the ponds of a public park?	-	10	35
3.12.	What are your suggestions for reducing or eliminating worries regarding to public safety and security in public parks that have ponds?			

Source: Survey (February-May 2020)

Interpretation of the respondent's reply as described in table 4. indicates that: respondents generally do not feel worried about the cleanliness and health of the environment with the existence of ponds in public parks, especially if the water condition of the pool is clear, not smell rotten, there is also a fountain in the pond. There is a slight sense of fear of respondents when there are various types of water plants and various types of fish in the pond. Worry is more significant when the water condition is murky pond, there are garbage and leaves inside, especially when smelled by the smell of pond water.

Table 4. Respondents Choice of Environment Clean and Healthy Eligibility Variables

VARIABLE OF HYGIENE AND HEALTH IN GARDEN WITH PONDS				
	Q U E S T I O N	YES	ENOUGH	NO
4.1.	If there is a pond in the public park, are you worried about its cleanliness?	5	14	26
4.2.	If there is a pond in a public park, are you worried about the health of the environment?	4	13	28
4.3.	If the water of the pond is clear, are you worried about its cleanliness and healthiness?	-	5	40
4.4.	If the water of the pond is cloudy/muddy, are you worried about its cleanliness and healthiness?	10	18	17
4.5.	If there is leaf litter in the pond, are you worried about its healthiness?	15	18	12
4.6.	If there are various types of fish and water plants in the pond, are you worried?	12	15	18
4.7.	If there is a foul smell in the pond, are you worried about its healthiness?	42	3	-
4.8.	If you don't smell the foul smell in the pond, are you worried about his healthiness?	1	21	22
4.9.	If there is a fountain at the pond, are you worried about its healthiness?	6	8	31
4.10	What do you suggest to reduce or eliminate the worries regarding the environmental cleanliness and healthiness, with the presence of pond in public parks?			

Source: Survey (February-May 2020)

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Interpretation of the respondent's reply as described in table 5 shows that: respondents generally assumed that the quality of beauty and the comfort of public parks is important. The existence of pond assessed can improve the beauty and comfort of public garden, let alone a pond filled with ornamental fish and water plants (lotus or certain type), also equipped with a fountain. To increase the degree of comfort of public park can be done by giving shade plants, decks, garden benches, garden lamps around the pond, also bridges that cross over the pond.

Table 5. Variable of Beautyand Comfortin Garden with Ponds

VARIABLES OF BEAUTY AND COMFORT IN A GARDEN WITH A PONDS				
NO.	**Q U E S T I O N**	**YES**	**ENOUGH**	**NO**
5.1.	Is it important for you the quality of beauty of an urban public park?	42	3	-
5.2.	Is it important for you the quality of comfort in an urban public park?	42	3	-
5.3.	Do people need ponds in public park to add to the beauty of public park?	35	7	3
5.4.	Do people need ponds in public park to add to the comfort of public park?	35	7	3
5.5.	Is there a need of ornamental fish in the ponds to add to the beauty of public park?	32	8	5
5.6.	Is there a need of water plants in the ponds to add to the beauty of the park?	32	8	5
5.7.	Is it important of fountain in the ponds to add to the beauty of the park?	32	8	5
5.8.	Do people need shade plants on the edge of the ponds to add to the comfort of the park?	35	8	2
5.9.	Is there a need for a deck on the edge of the ponds to be able to enjoy the beauty of the ponds more?	35	6	4
5.10	Is there a need for a park bench on the edge of the ponds to enjoy the beauty of the ponds?	42	3	-
5.11	Is there a need of lighting on the edge of the ponds to enjoy the beauty of the park at night?	43	2	-
5.12	Is there a need of bridge across the ponds to enjoy the beauty of the ponds?	31	9	4
5.13	What do you suggest to be able to increase the beauty and the comfort of a public park which is equipped with ponds as a basic element of the park? … ……			

Source: Survey (February-May 2020)

Respondents' aspiration based on suggestions and inputs according to 5 research variables:

1. Community aspirations about the reduced recreational function space due to ponds is: 76% respondents expressed no objection, generally argues that the function of garden space can be adjusted proportionally since the goal setting and the concept of its designation, where ponds is also a space of recreational function.
2. Community aspirations about public parks will reduce the ecological function of ponds, 51% do not worry for reasons: Activities and facilities for park visitors can be limited since the preparation of the draft program; Theme of the plan and concept of garden design can be set from the beginning as a passive recreation park.
3. Community suggestion to reduce the worry about security and public safety in a public park with ponds, is: Aspects of public safety and security should be the cornerstone of the site planning, site design concept and SOP management of public parks with ponds as a dominance element.

4. Community suggestions to reduce or eliminate the worry about hygiene and health of the environment with ponds in public parks, are: Ponds should be equipped that can maintain the levels of oxigen and water quality remain fresh; Filled with types of fish or plants that can control mosquito larva; The organizer has integrated waste/garbage management SOP.
5. Community suggestion to improve the beauty and comfort of public gardens with a pond as element, are: Optimized ponds function become 'dominance'of a park; Improving the quality of beauty and comfort elements. In addition to improving the visual quality, ponds presence is also expected to improve other sensory qualities and comfort of micro-climate.

CONCLUSION

The landscape planning and designing criteria of public city park based on the perception and aspirations of a city community related variable research are as follows:

1. The hydrological functions of detention and retention ponds were rated very good should be the main criteria in the development of themes, programs and concepts plan of the effectively public city park landscape.
2. The ecological function of detention/retention ponds is rated good it can be adopted as a basic-criteria for theme development, program and concept design of a sustainable public city park landscape.
3. Public security and safety considerations are the main concern and become a fundamental necessity or needs for the city community, which must be met in drafting a detailed plan of Landscape Development Program of a public and child-friendly public city park.
4. Environmental hygiene and health considerations are also a concern and a fundamental desire or wants for the city community, which needs to be met in the detailed design of a healthy City public park landscape.
5. Consideration of the beauty and comfort of the environment is quite a hope or expectation for the city community, which is good when fulfilled in aesthetical creations of detailed parks element design of the fun city public park landscape.

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