SIGNIFICANCE OF KULAM[1] AS A COMPONENT OF URBAN PUBLIC SPACE WITH SPECIAL REFERENCE TO JAFFNA CITY

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Abstract

This paper studies the criticality of 'Kulangal' in the context of war-stricken Jaffna in an environmental perspective, looking at these drainage ponds as having potential to be incorporated as a component of public spaces that are usable by the people of the city. They are artificially created or created in existing natural depression the 'Kulangal' act as a catchment for rain water, serving to recharge water to underground aquifers.
Cites can be described as complex human settlements with highly dense populations, complex infrastructure and built environment. Green space and Blue space are the new terminology that is used in urban design of open spaces of a city. Urban green spaces are salient to the composition of great cities, where these public semi- natural spaces entwine with the built fabric of the city. The necessity for green space results in the conversion of existing natural spaces or built environments into open green spaces that are usable, an essential aspect that reflects a constant need for connection between the human and the natural environment, in order to establish calm, wellbeing and good mental and physical health.

As Kulangal serve the dual purpose of serving as a characteristic feature of the Jaffna landscape while also being a sensitive element of the environment, it is essential to rehabilitate these Kulangal and convert it into usable public open space that can enrich the lives of the urban population of Jaffna.
As a result of the civil war that lasted more than two decades, the social integration within the community and the importance of sensitive components of environment were neglected. As a result of the neglection these rainwater catchment ponds that collect, store and discharge gradually, excess runoff to the sea or lagoon are in a state of dilapidation. In addition to this foremost purpose of stormwater catchment that result in lesser occurrence of floods during seasons of high rainfall, the Kulangal also act as cooling agents that help with drought mitigation.
The primary objective is to establish the importance of Kulangal as an element of the urban context of Jaffna City and the aim of this paper is to rationalize Kulangal, based on urban design theories, as potentially

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restorable water bodies that can be converted into public open green spaces as an integrated component of Jaffna's built environment.
The study was conducted in 3 different ways to study Kulam in Jaffna Municipal Council area. It is initially evaluated as the network of Kulangal and then focus on two Kulangal as individual case studies. At last a public survey was conducted to gauge their awareness of the historical significance of the Kulangal as well as their perceptions and opinions of the redevelopment of Kulangal as a significant part of public realm of Jaffna City.

Keywords: Kulam, public open green spaces, Blue space.

Introduction

People are one of the most powerful driving forces in an urban environment. A significant contributor to rapid urbanization is population increase in cities which in turn leads to land scarcity. As per the United Nations, 55% of the world's population live in the urban areas, and this figure is expected to reach 68% by 2050 (UN, 2018). Dramatic growth of the urban populations along with an expanding built environment has had a significant impact on the physical environment of city. Vibrant public open spaces are increasingly important in order to overcome the problems associated with increasing urban density and overcrowding.

Open spaces are an important element in the architecture and aesthetic of an urban city form. The demand for the urban open spaces have increased dramatically owing to the current condition of developing cities in terms of their typical characteristic features such as rapid urbanization, higher income levels, lifestyle changes and concerns regarding healthy living (Berg, et al., 2015, pp. 806-816) . The two main functions of open space are providing recreation and other services to society and the conservation of natural values.

In an urban context, the built environment has a major impact on the natural process of the ecosystem. Open spaces allow for the continuous functioning of the ecosystems' natural processes and preserve the value of the landscape. Hence it is essential to maintain the openness or open spaces of a city and to protect or conserve them from major impacts caused by development of the built environment (Maruani & Amit-Cohen, 2007, pp. 1-13).

Urban public spaces is an important element of the urban built environment; urban public space provides a positive contribution to the quality of life (Madanipour, 1999, pp. 879-891). It plays a significant role in cities by connecting people and places by acting as thoroughfares and spaces for gathering and enhancing social life. Urban theorists such as William H Whyte (1980) and Jan Gehl (1987), have, through their research and projects, established the value of public gathering spaces in urban contexts. Jan Gehl defined a public space as "a place for everyone. It is a place in which you do not have to know anyone, or do anything in particular, except be there" (Gehl, 1989, pp. 8-17).

Tridib Banerjee states that 'Public spaces are an essential ingredient to the sustainability of cities for political, social, economic, public health and biodiversity reasons' (The Future of Public Space: Beyond Invented Streets and Reinvented Places 9). These 'ingredients' play a vital role in cities, creating place identity by adding character to the city and providing people with spaces to reflect

on life, gain inspiration, exercise the body and mind, have gatherings and simply to satisfy basic requirements of comfort and relaxation.

Urban design can be described as a process of creating connections between people and places, movement and urban form, nature and the built fabric. Urban design theories are usually a set of guidelines that have been established by a number of urban designers in order to make an urban area successful by fulfilling the needs of the general public.

Contextual Background

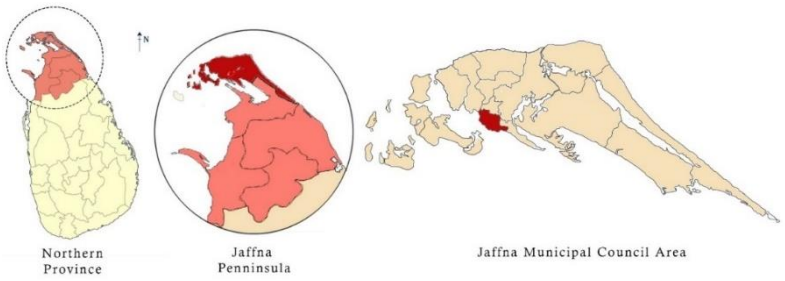


Figure 1: Location of Jaffna [Map traced] (Source : Author,2019)

Figure 2 : Jaffna Municipal Council limit [Map traced]

Located in Northern Province, Jaffna, is the second largest metropolitan area of Sri Lanka, it is also home to number of educational institutions established during the colonial and post-colonial period. The Jaffna Peninsula is located in the dry zone of Sri Lanka and is benefitted with showers of rain mainly during the wet season from October to January.

Since rainfall in the Jaffna peninsula is limited to three to four months of the year, water of good quality is a scarce resource, it is essential to utilize and support overland rainwater harvesting and conservation of rainwater in watershed by minimizing the run off to the sea. There are no natural rivers in the Jaffna Peninsula, instead there are several seasonal streams, natural ponds and man-made storage “tanks” or *Kulam*, that act as a catchment for rain water and serves to recharge water to the aquifers (Lucius Mendis, et al., 2013).

Kulangal are a unique characteristic of the Jaffna landscape. They are artificially created or created in existing natural depression and known as an important part of the Tamil culture and heritage and in addition to the role they play in the collection of rain water and recharging of aquifers, they were historically places where community gatherings took place. Kulangal are generally used by the inhabitants in the past for religious purpose, irrigation and washing of clothes (Dr.S.T.B.Rajeswaran, 2006, p. 23). Unlike in rural areas, Kulangal in urban context do not serve the function of irrigation.

Figure 3 - Pillayar Kovil Kulam [Image]
(Source : Author,2019)

Figure 4 - Marawa Kulam [Image]
(Source : Author,2019)

During the three decades of the civil war, (1983 – 2009). No development occurred in the Jaffna peninsula. *Kulangal* which were an essential component of the urban fabric of the city were completely neglected. Consequentially, the *Kulangal* are at best in a state of disrepair and at worst partially destroyed. The lack of maintenance and neglect has resulted in the *Kulangal* becoming dumping areas for solid waste and breeding ground for mosquitoes and vermin. As such in their current state, they are a significant public health hazard, and the urgency of their rehabilitation cannot be understated. (SCDP, 2016, p. 6).

According to the Jaffna Municipal Council, there are 630 *Kulangal* in the Jaffna Peninsula, along with about 2,400 minor channels with interconnecting drainage channels. The Jaffna Municipal Council area contains 47 *Kulangal* and 26 channels. The *Kulam* is part of a network of catchment connected with drainage channels & sub channels. (SCDP, 2016, p. 6)

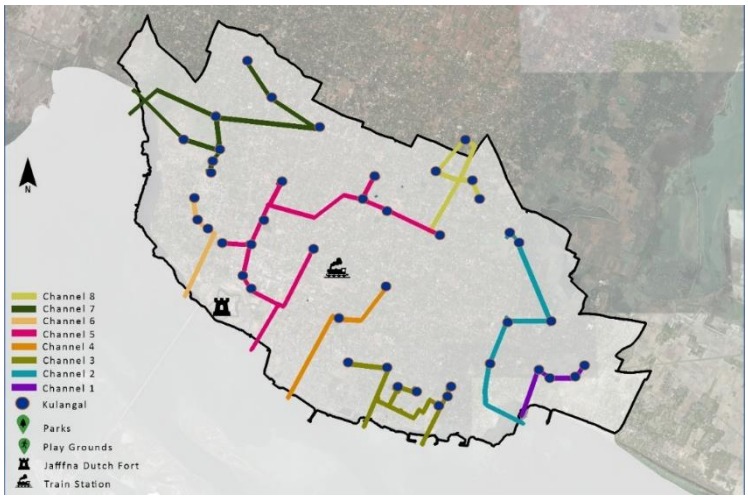


Figure 5 - Location of Kulangal in Jaffna Municipal Council Area and Channels.

Jaffna is a resourceful land which is currently undergoing urbanization with a built environment that is constantly growing; the growth of the built environment must be balanced by the creation of a vibrant public realm if the city as whole is to thrive. The *Kulangal* have the potential to become a significant component of the public realm of Jaffna. They would ideally form a network that can act as the 'lung of the city' playing a vital role of detoxifying the air, providing for both the blue and green layers of the city and celebrating the culture and heritage of the Tamil people of Sri Lanka.

As *Kulangal* serve the dual purpose of serving as a characteristic feature of the Jaffna landscape while also being a sensitive element of the environment, it is essential to rehabilitate these *Kulangal* and convert it into usable public open space that can enrich the lives of the urban population of Jaffna. (SCDP, 2016, p. 6)

Kulangal are identified as environmentally sensitive zones in the Jaffna Municipal area, therefore development projects for *Kulangal* have been taken into account by the government as they are neglected by the public and not maintained due to lack of funds and means (UDA, 2010, p. 33).

Theoretical Framework

Urban design theories are usually set of guide lines that have been established by a number of urban designers in order to make an urban area successful by fulfilling the needs of the general public. Theories of Urban design primarily deals with the design and management of the public spaces. The following are urban design theories on the role of open spaces and public spaces that have been established by important urban designers.

Capita Green Space

Solid (built space) and void (open space) are two components of the urban city. Open green space is considered a significant element of the urban context which plays major role in improving the quality of life of the increasing population of the city along with social, economic and environmental benefits. The percentage of the green spaces from the total extent of the urban area can be used to assess the environmental sustainability of the city (Chiesura, 2002) (Maryanti, et al., 2016).

'Per capita green space' is one of the standards that is used to assess the environmental sustainability of the city. This quantitative measurement value represents the extent of green open area in square meters (m2) for an individual person in a city. (Pussella, 2017, pp. 1789-1799).

Table 2 : Minimum standard value of per capita

Organization / Country	Min value of per capita
World Health Organization (WHO)	9 m^2
European Union (EU)	26 m^2
United Nations (UN)	30 m^2
London	27 m^2
Germany	30 - 60 m^2
Singapore	66 m^2
Vianna	120 m^2
Amsterdam	45 m^2

The minimum value for the Per Capita Green Space varies from city to city and country to country. The above table (Table: 1) shows the minimum values stated by different organizations and countries. (Maryanti, et al., 2016), (Pussella, 2017), (Khalil, 2014), (Bagherian, 2015).

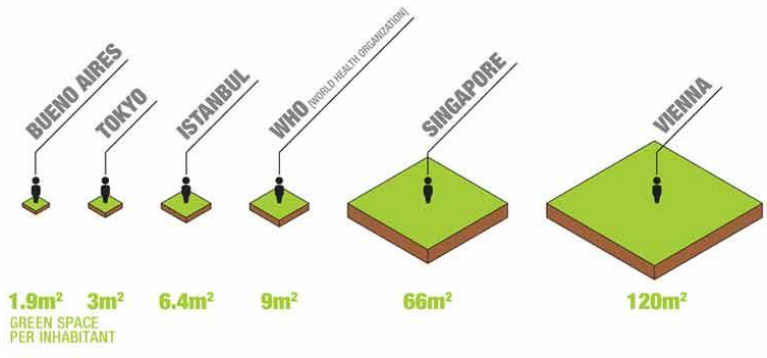


Figure 6: Comparison of green space per person [Diagram] (https://www.baharash.com)

Continuity of the Edges.

An edge is a boundary between two different spaces. Lynch (Lynch, 1960, p. 62) describes an edge as an important element of the city image. Similar to the edge of the city image, the edge of a public open space also an important element of the image of a public space that attracts the people from the surrounding context into the public space. Christopher Alexander in his 'Pattern Language' summarized the edge effect in public spaces as "If the edge fails, then the space never becomes lively." (Alexander, et al., 1977, p. 753)

According to Jan Gehl (Gehl, 1987, p. 147), the border and the edges of the public spaces are the area people occupy first when they enter. As per his observations the reason people prefer to sit or stand at edges is to watch other people and activities taking place in the surrounding.

A well-designed public space attracts people naturally through the edge of it. They do not spend a long time out in the open. If the edges of the public spaces do not let the public pause, it will only become place that they pass through. Therefore, it is essential to make sure that public spaces promote activities such as walking, Cycling etc.

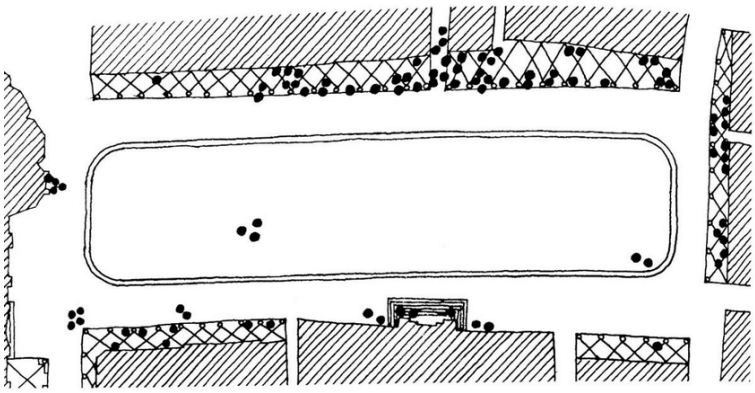


Figure 7 : Edge Effect - Survey of the city square, Ascoli Piceno, Italy: Standing people tend to congregate around the edges of the square. Survey of the city square. [Sketch] (Gehl, 1987)

Permeability

Permeability can be identified as an important quality of an urban public environment. A desirable attribute of an open public space is to allow a person to move through it from one location to another. Many urban design theorists such as Ian Bentley, Jane Jacobs, Graham Haughton and Colin Hunter have recognized permeability as one of the attribute that focus in making places responsive "The extent to which an environment allows people a choice of access through it from place to place is therefore a key measure of its responsiveness." (Bently, et al., 1985, p. 12). Permeability of a public open space can be divided into physical and visual permeability.

Physical and visual permeability are a fundamental characteristic that every public open space should have to enable everyone to utilize the space. According to Jane Jacobs permeability is one of the most important criteria for a good urban design. She argued that the main spaces where social interaction take place are highly permeable urban streets (Jacob, 1961, p. 125).

Criteria to Achieve Social Integration in Public Open Space

One of the main objectives of designing public open spaces is creating opportunity for social interaction. The following key attributes of place making; identified by Project for Public Space (2000), are the four determinant factors that make a public space successful. The attributes set out by PPP are supplemented by Salih and Ismail's (2017, pp. 1-9) Criteria for Public Open Space Enhancement to Achieve Social Interaction, which are presented below:

The access and linkage:

A public open space can be judged by its visual and physical connections to its surrounding and unhindered accessibility by anyone at any time (Madanipour, 1996, p. 102). A factor that affects the access and the linkage is the location of the public open space in the city. It is important that the place it is located can be accessed via different modes of transport, to strengthen the continuity of movement from the neighborhood.

According to many research studies the distance to a public open space is a very important aspect of its attractiveness. As per the literature review of 'assessing pedestrian accessibility to green space using GIS' by Tudor Morar et al. (2014, pp. 116-139) people who live more than one kilometre from an open green space are more stressed than those who live less than 300 m from the nearest green space.

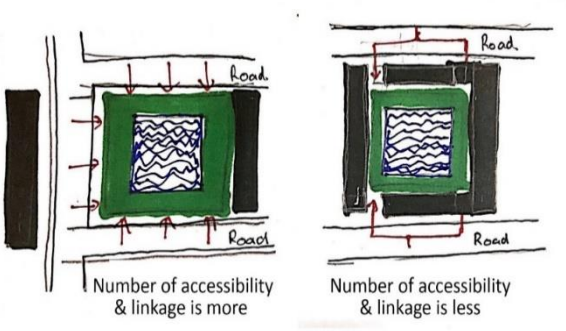


Figure 8: Interpretation of accessibility & Linkage
[Sketch]

Image & Comfort :

The quality of a public space can be judged based on its appearance and the how long one can stay with a degree of comfort. Comfort refers to the quality of the physical element and mental comfort of the public space. According to Project for Pubic Space (Place, 2000), Comfort includes perceptions about safety, cleanliness, and the availability of physical features.

Safety and comfort have influence on public space's usage and satisfaction. According to Jane Jacob's book, "Eyes on the street" (2016) when a public space attracts more people it creates a natural surveillance system and the chances of a crime occurring is reduced when large numbers of people are present in a public space.

According to 'The Social Life of Small Urban Spaces', William .H. Whyte (1980) sun, shade, trees, wind, and water as well as seating and food should be present if a public space is to be comfortable for public . Whyte indicates that "people tend to sit in the sun if the temperature is comfortable; but, people like the option of sitting in the shade when there is sun." (1980, pp. 40-44)

Sociability :

Many scholars have developed several theories on sociability of public space. Sociability is the most difficult quality for a place to achieve. Facilitating social interaction among people is the main function of a successful public space. According to Vahid. B.Rad and Ibrahim.B.Ngah (2013, pp. 184-188) people feel the strong bond with the society and space when they interact with each other. The presence of different social groups in a public space can be argued to be evidence of the sociability of a public space.

Activity and usages :

The social Interaction in public open space is affected by various factors such as the design, components, distance, location and facilities of open space along with types and nature of recreational and physical activities allowed for within the space (Salih & Ismail, 2017, pp. 1-9).

High quality public open space, by attracting people, can enhance social interaction but to extend the length of their stay in space is a function of the activities they are engaged with (Pussella, 2017, pp. 1789-1799)). The activities that a possible to be accommodated in a public open space is one of the factors that will have a significant effect on the quality of the space (Gehl & Gemzoe , 1996, p. 75).

Methodology

The theoretical framework encompassed several theories formulated by different urban designers that focus on public open spaces in urban contexts. The qualitative parameters of the theories related to public open space that are established by well-known theorists in the field of urban design is used to formulate a scheme of analysis to evaluate the potential of the network of Kulangal, to be converted to a unique and significant component of the urban fabric of Jaffna City, through the application of the identified theories of urban open spaces.

The selection of case studies will primarily be guided by their potential to be rehabilitated or their proximity to developments taking place at present. Data collection methods include direct observation, mapping of activity patterns and a photographic survey of the area, while structured interviews will be conducted with key informants to ascertain the cultural and significance of the Kulam as well as their significance as a potential component of the public realm. Final a public survey will be conducted to gauge their awareness of the historical significance of the Kulangal as well as their perceptions and opinions of the redevelopment of Kulangal as a significant part of public realm of Jaffna City. The analysis is divided into 3 parts.

The first part of the analysis will focus on the entire Jaffna Municipal Council area and the network of Kulangal found within this extent through a mapping study parameters such public open space per capita, open space coverage of the Jaffna Municipal Council Area as well as the accessibility of Kulam will be measured (distance from dwellings to nearest Kulam or waterway).

The second part of the analysis will focus on the selected case studies. These Kulangal will be evaluated against the key attributes important for the success of a public space.

The third part analyses place identity and sociability of the Kulangal. This analysis will be based on the information gathered through the public survey and structured interviews conducted with key informants.

The scope of the study is constructed based on the urban design theories related to public open spaces. The area of green spaces allocated per person, accessibility and coverage of the public open spaces were studied by comparing to standards adopted in other cities and standards, established by organizations such as World Health Organisation. From this, the availability of the key attributes and criteria to achieve social integration in public open spaces are identified.

The study is limited to the Kulangal that are located within the Municipal Council Area of Jaffna. The selected case studies were identified within specific context to limit the study area for ease of data collection and analysis and these two Kulangal are also identified by Government organizations as ponds that need to be rehabilitated as a matter of urgency.

Analytical Study on Kulangal

Analytical Study on Network of *Kulangal*

Per Capita of Usable Public Open Green Space :

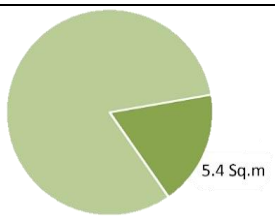
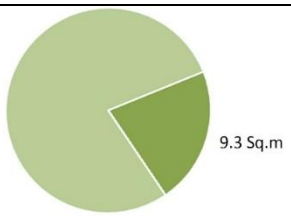
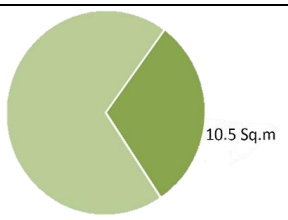
The *Kulangal* are placed within a network of rain water drains that consist of 4 major and 8 minor drainage channels. As per the report on Assessment of Social and Environmental Baseline of Jaffna Ponds by MG Consultants, the total length of the channels / canal is 18,625m and an average of 3m reservation to be kept by either side of the channel / canal.

Table 2 : Calculation of Area (Source : Author, 2019)

Per Capita of existing	2010 ha
Population as per JMC on July 2018	91,361
Area of accessible public open green space	49.1 ha or 491,000 Sq. m
Area of *Kulangal*	36 ha or 360,000 Sq. m
Area of the reservation of the channel / canal. Total length of the channels : 18,625m Width of the reservation on both side : 6m	18,625m x 6m = 11.1 ha or 111,750 sq.m
Total area of usable public open green spaces with *Kulangal* : Area of existing open green space + Area of *Kulangal*	491,000 Sq. m + 360,000 Sq. m = 851,000 Sq. m
Total area of accessible public spaces : Area of existing open green space + Area of *Kulangal* + Channel reservation :	491,000 Sq. m + 360,000 Sq. m + 111750 sq.m = 962,750 Sq. m

The per capita of the usable public open green space of the city is calculated as per the land use distribution information of Jaffna Municipal Council issued in 2010 by Urban Development Authority. (UDA, 2010, p. 12)

Table 3 : Comparison of Calculation of Per Capita usable public open green space
(Source : Author, 2019)

Calculation of Per Capita of Existing Usable Public Open Green Spaces in JMC (Excluding *Kulangal*) 491000 sq. m / 91,361 = 5.4 Sq.m	
Calculation of Per Capita of Usable Public Open Green Spaces with *Kulangal* in JMC 851000 sq. m /91,361 = 9.3 Sq.m	
Calculation of Per Capita of Usable Public Open Green Spaces with *Kulangal* and Channel Reservation in JMC 962,750 Sq. m /91,361 = 10.5 Sq. m	

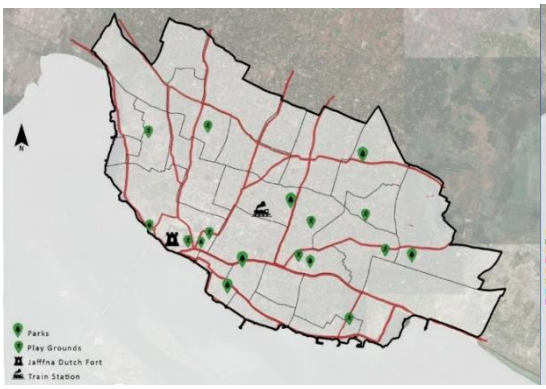


Figure 9 : Existing Usable Public Open Green Space [Traced Map]
(Source : Author, 2019)

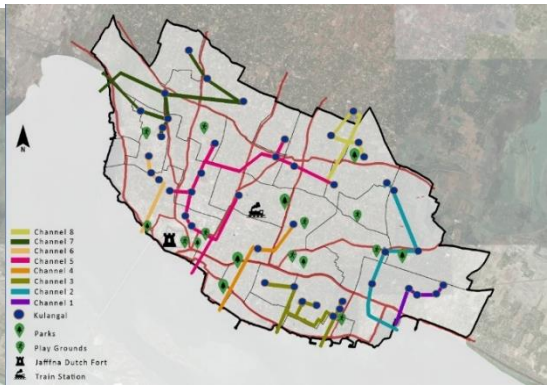


Figure 10 : Usable Public Open Green Space with Kulangal & Channel Reservation [Traced Map]

At present the network of *Kulangal*, are in a state of disrepair and cannot be considered part of the usable public open space of the Jaffna City. However, as shown in Figures 9, and 10 and Table 3, Rehabilitation of the *Kulangal*, and the associated drainage channels would effectively double the per capita open space from 5.4 sq.m to 10.5 sq.m. This illustrates the importance of this unique storm water retention and drainage system and its potential to significantly improve the quality of the urban fabric of Jaffna City.

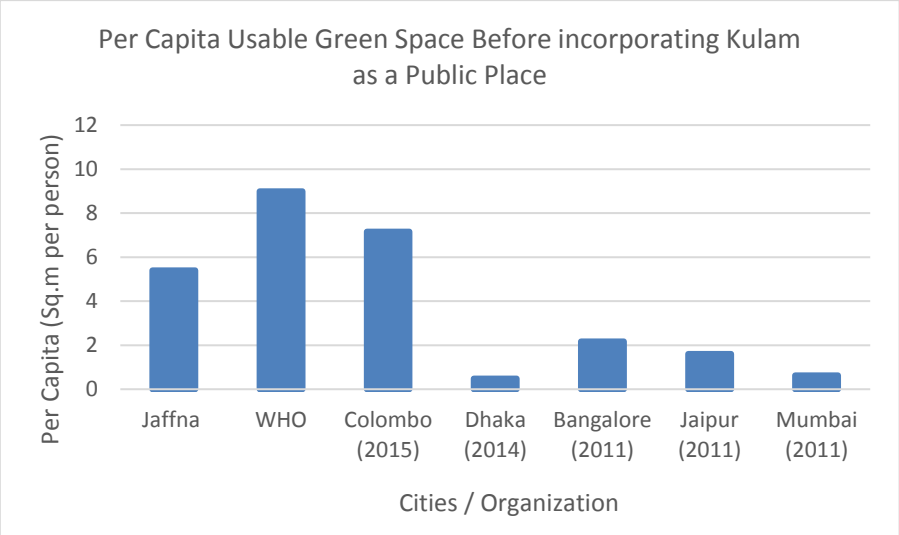


Figure 11 : Comparison of Per Capita Usable Green Space before incorporating Kulam as a component of Public Place. (Source : Author, 2019)

Per capita of existing accessible green spaces in Jaffna municipal council area is 5.4Sq.m which indicates that the current condition of the accessible public green spaces is at risk since the city does not fulfil any standards defined by UN, WHO or EU.

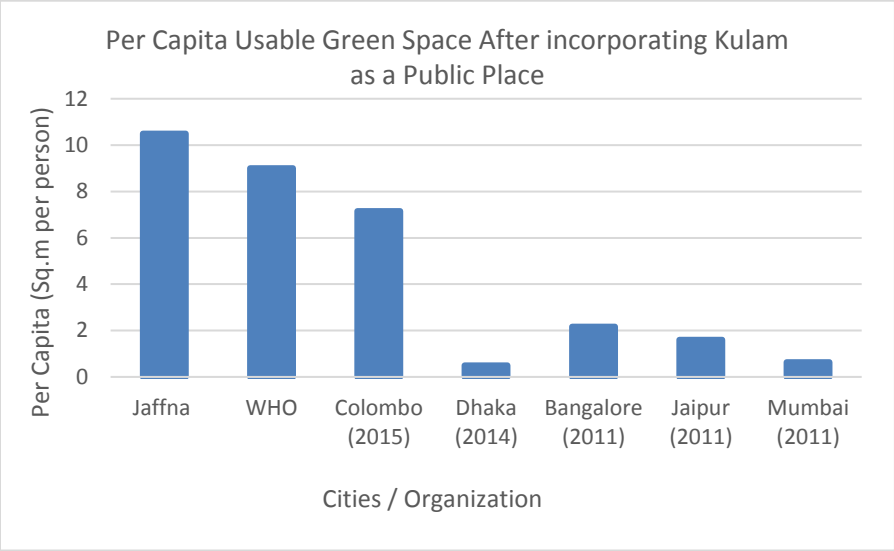


Figure 12 : Comparison of Per Capita Green Space after incorporating Kulam as a component of Public Place. (Source : Author, 2019)

In the event *Kulangal* and the Channel reservations are rehabilitated as a component of Public Open Space, the Per Capita accessible green spaces will be increased to 10.5 Sq.m, which will exceed the Per Capita standard minimum value of 9 Sq.m defined by WHO and in comparison to other cities such as Colombo, Dhaka (Bangladesh), Bangalore, Mumbai & Jaipur (India) in the south Asian region, Jaffna will become more sustainable than the cities mentioned above.

Accessibility to Usable Public Open Green Spaces :

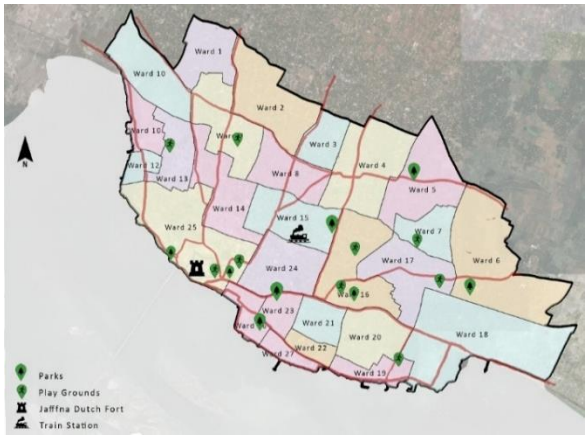


Figure 13 : Location of Existing Accessible Public Open Green Space in Jaffna Municipal Council; [Traced Map] (Source : Author, 2019)

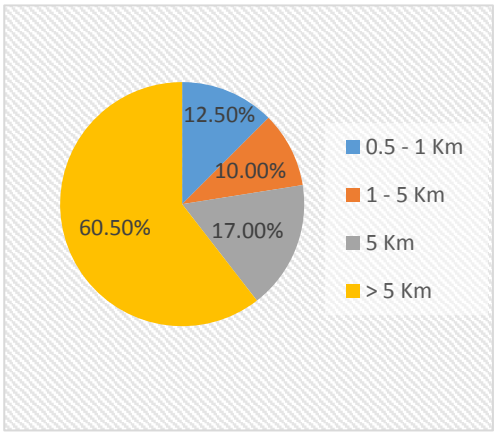


Figure 14 : Public's response to distance to Public Open Green Spaces from home in JMC

Out of the 27 wards in Jaffna Municipal Council area, the existing accessible public open green space of Jaffna Municipal Council area is just (49.1/2010 Sq.m)*100 : 2.4%. The distribution of these green spaces, among the wards, are shown in Figure 14.

To assess the level of accessibility to existing public open green space in Jaffna municipal council area, a survey was conducted with the randomly selected members of the general public. As per

the results 60.5% of the residents of Jaffna live more than 5Km from the existing public place and only 22.5% of these public open spaces are accessible within a 1Km radius. Hence, the urban planning process should take action to incorporate more public open green places in Jaffna Municipal Council area which will increase the level of social integration of the city and a positive impact on the quality of the life.

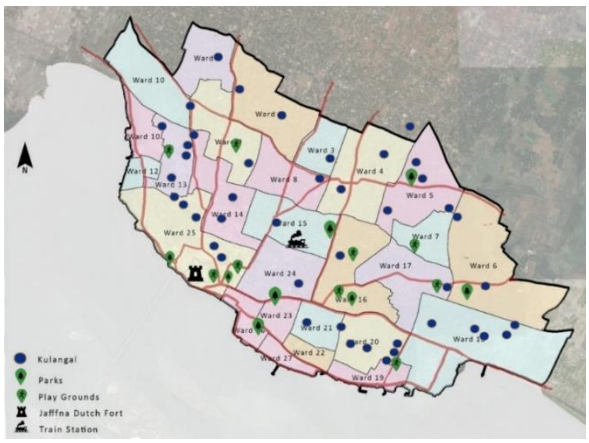


Figure 15: Location of Existing Accessible Public Open Green Space and Kulangal in Jaffna Municipal Council [Traced Map] (Source : Author, 2019)

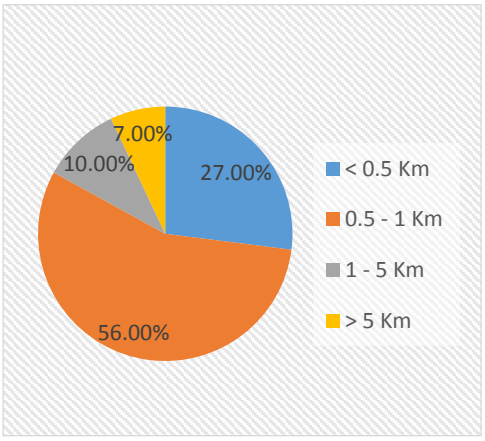


Figure 16 : Public's response to distance from house to the nearest Kulam

The rehabilitation of the existing *Kulangal* would be the most effective strategy to increase the number and extent of accessible public open green spaces. The inclusion of the *Kulangal* as a component of a public place would be the most efficient means of meeting accessibility requirements, as the 47 *Kulangal* are evenly distributed throughout the Jaffna municipal council area as shown in the Figure 15. Most wards contain at least one *Kulam*, the only wards that do not contain a *Kulam* are those that adjoin the Jaffna Lagoon.

In order to analyse accessibility of *Kulangal* a survey was conducted to ask the public the distance from their home to the closest *Kulam*. (See Figure 17). As per the results 83% of the people live within 1Km of a *Kulam*.

Walkability to Usable Public Open Green Spaces

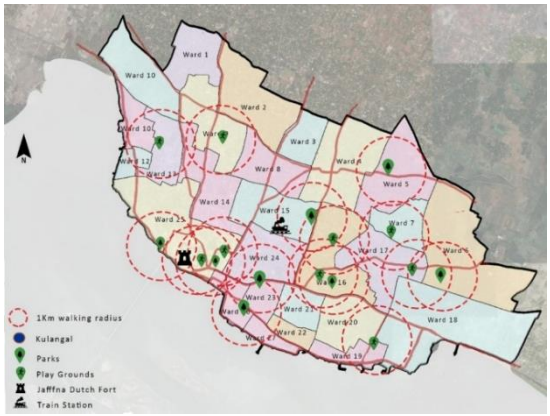


Figure 17: 1 KM walking distance coverage of existing usable open green space in Jaffna Municipal Council [Traced Map] (Source : Author, 2019)

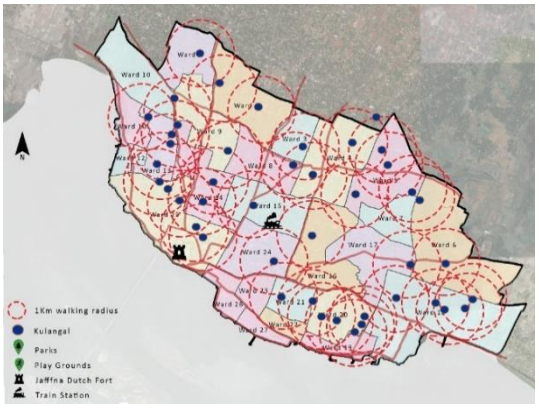


Figure 18 : 1 KM walking distance coverage of Kulangal in Jaffna Municipal Council [Traced Map] (Source : Author, 2019)

As per the survey conducted it is noticeable that the existing public open green spaces in the context of Jaffna municipal council area are located more than 1Km from residences (Figure 16). The Map below indicates the 1 KM walking distance coverage of existing open green space. Area of Walkable distance coverage of the existing usable green space is 926.4 ha, which is 46% of the total area of Jaffna Municipal Council Area.

If the *Kulangal* are rehabilitated the walking distance from people's house to Public open green space will be reduced, as 83% (Figure 17) of the *Kulangal* are located within the 1Km of walking distance. Area of Walkable distance coverage of the *Kulangal* is 1616 ha, which is 80.3% of the total area of Jaffna Municipal Council Area.

Analytical Study on Individual *Kulam*

Case Study 1 : Pillayar *Kovil Kulam*

Location & Land Use :

Figure 19: Location of Pillayar Kovil Kulam in the Macro Context Map [Traced Map] (Source : Author, 2019)

Figure 20 : Location of Pillayar Kulam in the Micro Context Map [Traced Map] (Source : Author, 2019)

'Pillayar *Kovil Kulam*' owned by JMC is located in Maruthady (Ward No 16) which belongs to cluster No 4. It has an extent of 5600 Sq.m and has a perimeter of 330m. Land use of the immediate surrounding of the Pillayar *Kovil Kulam* is mostly residential, Institutional and religious as show in the Figure 21 below.

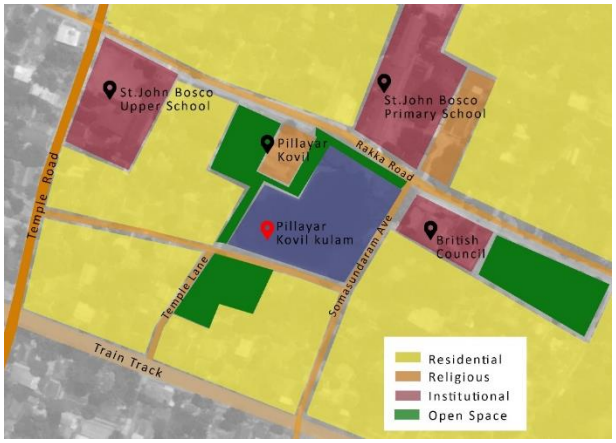


Figure 21: Land Use map of the area around the Pillayar Kovil Kulam

Figure 22 : Pillayar Kovil Kulam [Image]
(Source : Author,2019)

Edge :

Figure 23 : Zoning of the area around Pillayar Kovil Kulam [Sketch] (Source: Author, 2019)

Figure 24 : Layout Plan of the Pillayar Kovil Kulam [Sketch]
(Source: Author, 2019)

The Pillayar *Kulam* is surrounded by roads on three of its edges and the fourth edge is defined by the Pillayar *Kovil* premises boundary. There is no undeveloped land that could be converted as public place, apart from the strip of land around the *Kulam* edges which are present as the set back of the road. The above diagram shows this area that could be converted into a public place thus resulting in the *Kulam* acting as a component of the public place.

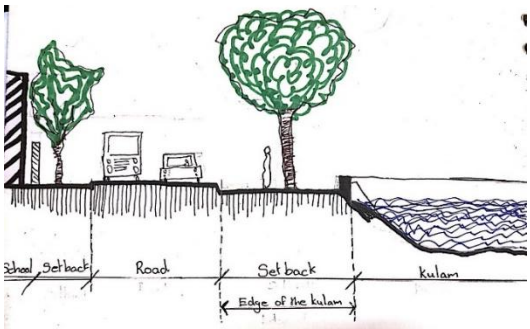


Figure 25 : Section along the Rakka road [Sketch] (Source: Author, 2019)

Figure 26: Rakka Road [Image]
(Source : Author,2019)

Accessibility :

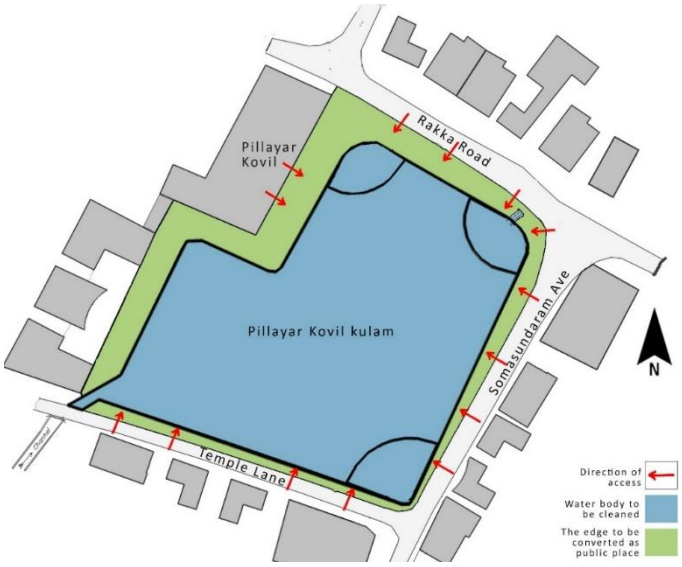


Figure 27 : Paths of Accessibility [Sketch] (Source: Author, 2019)

The *Kulam* has potential in terms of its accessibility. The above diagram shows the directions of access and pathways of access. The areas that could incorporate recreational features are on all four sides around the *Kulam* and 3 of its sides that are surrounded by access roads, namely temple lane, Somasundaram Avenue and Rakka road could be easily accessed. The fourth side is accessed through the *Kovil* garden, making the *Kovil* a fundamental part of the whole experience, as it was in the past. The essential character of a public place is physical and visual permeability and it could be achieved in this *Kulam* as it has many alternative means of access. It is not only physically connected with the road but is also is visually connected with the street. Visual connectivity is as important as physical connectivity. If the public space is not visible from the street, it people become insecure and would not patronize the space.

Image & Comfort :

Figure 28 : Natural elements available around Kulam. [Sketch] (Source: Author, 2019)

Figure 29: Physical element available around Kulam [Sketch] (Source: Author, 2019)

Sun, Wind, Trees and Water are key aspects in a successful public space. The effects of Sun/Shade and the wind are balanced well through a variety of vegetation present around the *Kulam*. There is necessary shade around the *Kulam*, where the public component will be incorporated and there is adequate sunlight that falls on to the water. This will make this public space timeless and will encourage more people to visit the *Kulam* anytime during the day- morning, noon or evening. The total 330m periphery of the *Kulam* consist of 12 trees, of varying spread of their foliage and varying heights. It was noticed that the activities around the *Kulam* almost exclusively take place around these trees as they provide adequate shade from the harsh tropical sun that is present throughout the day.

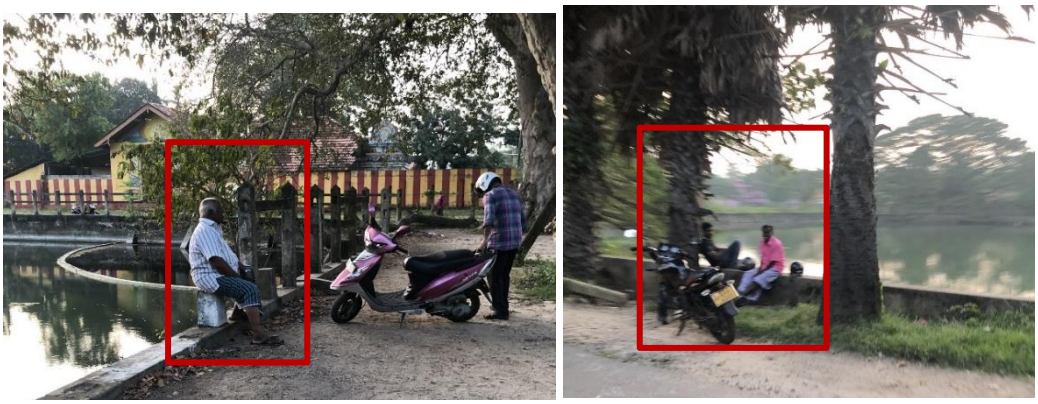


Figure 30 : Retaining wall used as the seating [Image]
(Source : Author,2019)

The above diagram shows the places where people were seated (from observational studies). It correlated with the placement of tree and the building around it. The people utilize the available retaining wall ledges as seating. However, though proper benches and seats are available, owing to the Kulam being polluted, people tend to sit facing the road instead of Kulam.

Activity and Usage :

The activity nodes identified during the study show that the majority of people around the *Kulam* come for activities around the *Kulam* rather than to visit the *Kulam* itself. For example, parents come to fetch their children from the school opposite the *Kulam* and they wait at the Edge of the *Kulam*. Through conversations the author had with a small focus group that consisted of people who visit the *Kulam* for rest and relaxation, it was discovered that the main reasons for the *Kulam* not being frequented by more people is the garbage that is dumped and the mosquitoes that breed in the neglected water body.

Figure 31 : Activity nodes around the Kulam at 7.30 am [Sketch] (Source: Author, 2019)

Figure 32 :Activity nodes around the Kulam at 1.30 pm [Sketch] (Source: Author, 2019)

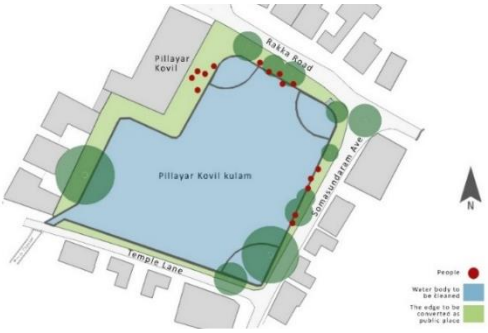


Figure 33 : Activity nodes around the Kulam at 5.30 pm [Sketch] (Source: Author, 2019)

Figure 34 : Activities around the Kulam different time of the day [Sketch] (Source: Author, 2019)

Perception of General Public's & Key Informant's on Rehabilitation of Kulangal

Perception of General Public :

Importance of *Kulangal*

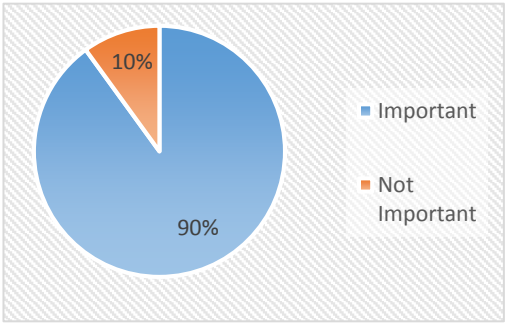


Figure 35 : Public's perception on Importance of Kulangal

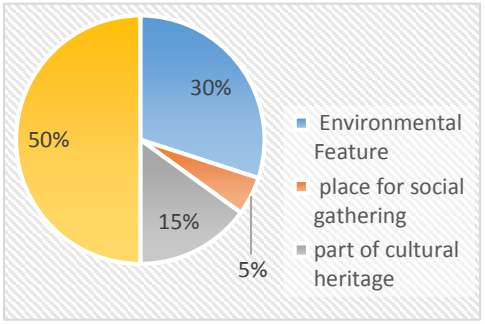
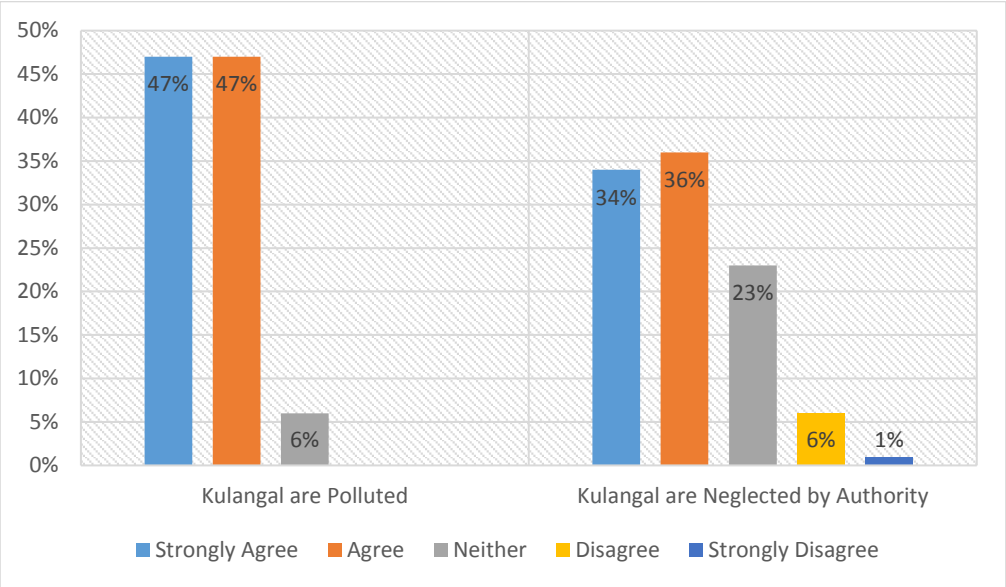


Figure 36 : Reason of importance

Based on the survey conducted, 90% agreed that the *Kulangal* are an important feature of Jaffna. A majority of the respondents are aware that the *Kulam* are the main component of the drainage network that collect rain water runoff and act as an agent to discharge water into the ground. It also plays a major role in environmental perspective in the context of Jaffna. 15% of the participant consider ponds as an important part cultural heritage.

Present Status of *Kulangal*



Kulangal being the important feature in Jaffna, It was observed that the *Kulangal* are polluted. 94 % of the respondents of the survey also agree that the *Kulangal* are polluted, and 70% are in the opinion of it's due to the negligence of government authorities.

Actions to be taken with Regard to the Condition of *Kulangal*

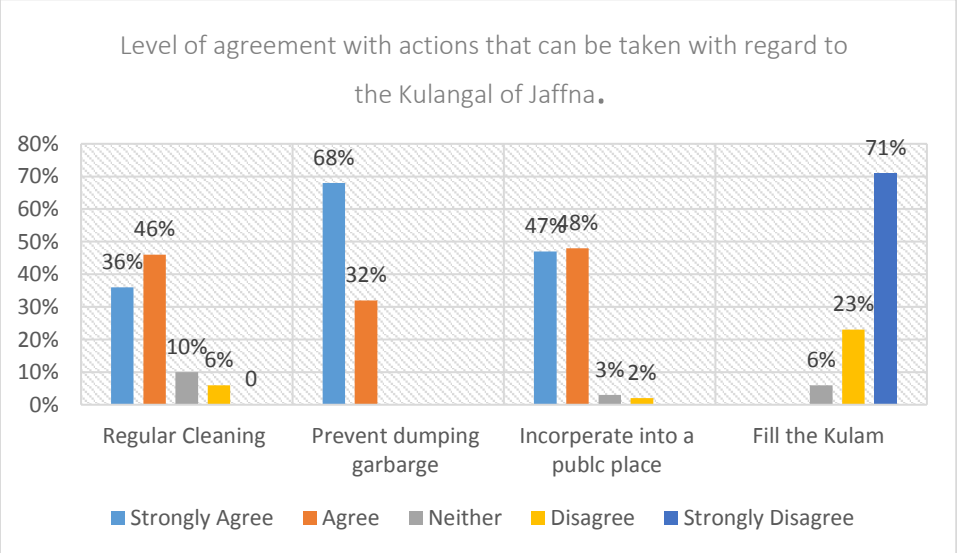


Figure 37 : Public's level of agreement with the current condition of the Kulangal

Majority of the respondents were in agreement that actions such as regular cleaning, and the prevention of garbage dumping into the *Kulangal* are urgently needed in order to protect this feature of Jaffna. A large amount of the respondents disagreed with the statement that the *Kulangal* should be filled.

Opinion on Incorporating *Kulangal as* a Component of a Public Place

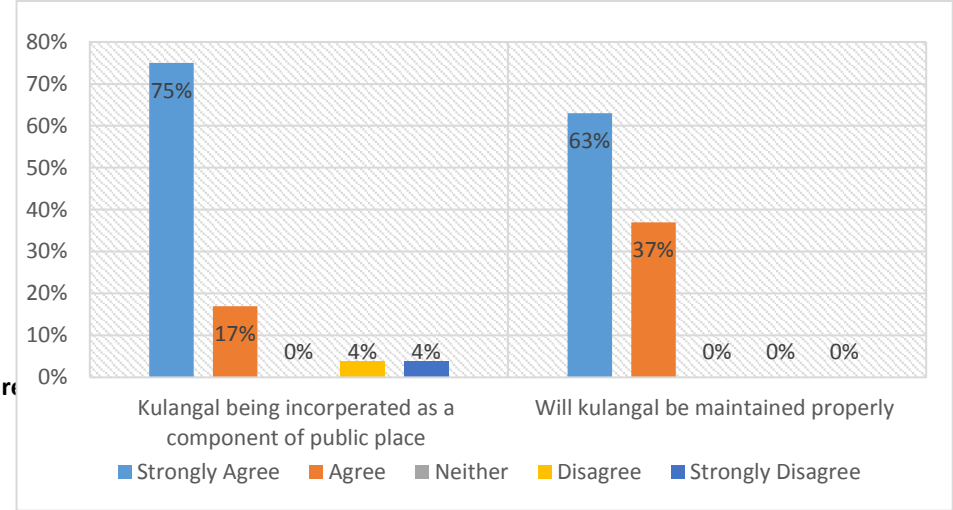


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Figure 39 : Public's Level of agreement with improvement of Kulangal

A majority of the respondents are in favour of incorporating *Kulangal* as a component of public place as 83% of them picked water as the feature that attracts the public to a public space. 63% strongly agree that the *Kulangal* will be maintained properly if they are rehabilitated.

Perception of Key Informant's / Experts:

Key informants such as government officials and private sector architects, designers and planners who were involved and interested in the rehabilitation of *Kulangal* in the context of Jaffna Municipal Council, were interviewed to gain insight into their expert knowledge on the current condition of the *Kulangal,* their learned opinion on the rehabilitation of the *Kulangal* and their potential contribution as a component of urban public place.

In addition to interviews with domain experts, the report titled 'Assessment of Social and Environmental Baseline of Jaffna Ponds' by MG Consultants was also utilized in this study to gain further domain information. Based on the data gathered from the Key informants/ experts, the information gathered is categorized under the following five subjects:

Relationship of People and Usage of Public Places Existing in Jaffna :

All the experts were of the opinion that the people of Jaffna who endured thirty years of war were not accustomed to public life in public spaces and social gathering in public was largely forgotten. They stated that it would take more time for them to adapt to the social life of going out for leisure

activities in public spaces such as parks. At present the availability of public spaces for social life are limited and the rehabilitation of the *Kulangal* would contribute significantly to this area.

Importance and the function of *Kulangal :*

Kulangal are considered as an important element of the Jaffna physical environment. Cluster of *Kulangal* are connected through a cascade system. The *Kulangal* act as an agent to discharge the water to the ground and act as a cooling agent during the dry season. They are also useful in prevention of floods as well as drought mitigation.

In addition to their the environmental benefits, in the past the community benefited from the *Kulangal* in many ways such as for agricultural, drinking water for cattle, washing clothes on commercial scale etc.

Urban Planner the S. Raveendran stated that 'Initially the existence of *Kulangal* are important from an environmental perspective. The *Kulangal* are in dire need of rehabilitation and their cultural value should play a major role in the justification of the continued maintenance of the *Kulangal.*

The Current Condition of the *Kulangal :*

At present the *Kulangal* are polluted in various ways such as solid waste disposal and waste water discharge etc. According to the Deputy Director of UDA, private property development has resulted in the reduction of the area of many of the *Kulam* through illegal filling and encroachment. People's lack of awareness regarding the importance of *Kulangal* to the environment of Jaffna is the main reason for the pollution of the *Kulangal.* Negligence on the part of governmental organizations and the lack of action against illegal dumping of garbage is another significant reason for the decline of the *Kulangal*.

The Urban planner S. Raveendran stated that in the past, the public consumption of many products was restricted due to the war. At present, with the urbanization, the people's consumption of polythene and plastic has increased which in turn has resulted in an increase solid waste generated.

The Relationship between *Kulangal* and Culture of Jaffna :

Planner S. Raveendran stated in the culture of Jaffna there are rituals such as *Kovil* festivals, death rituals etc. that had connections with water and the *Kulangal* played a major role in these ritual in the past. Many *Kovil* are located adjacent to *Kulam*, and in these cases the *Kulam* was owned and maintained by the *Kovil* Trust. According to the report titled 'Assessment of Social and Environmental Baseline of Jaffna Ponds' by MG Consultant states that the water of the *Kulangal* that are managed by *Kovil* are indirectly used for 'water cutting ceremonies' associated with the Hindu temples. They usually use a well dug within the pond or in the vicinity of the pond for the ceremony.

In the past the formation of a temple beside the *Kulam* began from placing a statue under a tree next to a *Kulam*. Later a *Kovil* was built adjoining the *Kulam*. When the water in the *Kulangal was*

usable and clean, all the *Kovil* adjoining the *Kulangal* used it for water cutting ceremonies. Later the source of water changed from *Kulangal* to dug wells within the premises of *Kovil* for the ritual as the water in the *Kulangal* was not considered clean.

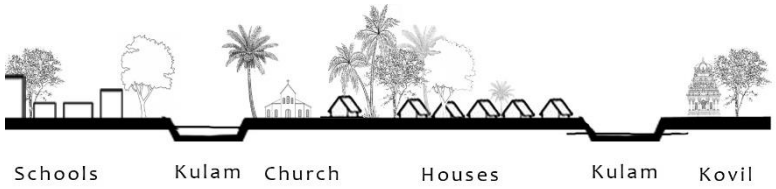

Figure 40: components of Urban Jaffna

Conclusion

The *Kulangal* are a collection of storm water retention ponds connected by a network of drainage channels. Once a vibrant component of the public open space of Jaffna City they are now in a state of neglect and disrepair, caused by the Sri Lankan civil war. This study was conducted to explore the potential of rehabilitating the *Kulangal* and converting them to a valuable component of the public open space of the urban fabric of Jaffna.

This study analysed the *Kulangal* from three distinct perspectives to get a balanced understanding of their importance. Initially, the entire network of *Kulangal* within the Jaffna municipal council area were evaluated for their potential to improve the quality and extent of the public space component of the urban fabric of Jaffna.

The second, part of the study focused on two selected case studies (individual *Kulangal*) in order to evaluate them against the key attributes that were identified in the literature review as important for the success of urban public spaces.

The third part of the analysis was a public survey and key informant interviews. The objective of this part of the analysis was to gain an understanding of the publics' perception of the importance of *Kulangal* from a historical context.

The report by SCDP states that the value of ponds remained only with the older generation and the present generation were quite ignorant of their values and uses. The awareness initiatives to educate the younger generation of the importance of protecting the ponds were not adequate or evident.

After the end of war, rapid urbanization is taking place in Jaffna. This has necessitated effective strategies for effective solid waste disposal, sewage and waste water disposal. These services are inadequate at present and have had a significant causative effect on the derelict condition of the *Kulangal*. Whilst the existence of the *Kulangal*, the lack of amenities is main cause of the pollution of the *Kulangal*. In order to convert the *Kulangal* to a valuable component of public place, the causes of the pollution should be addressed effectively. In order to get the maximum potential of the *Kulangal* further improvements should be made in order to prevent such pollution occurring in the future. By incorporating recreational facilities and making the *Kulangal* and surrounding

public spaces valuable for the community, it encourages the people to preserve the important landscape feature of Jaffna and to regain the cultural significant that was lost.

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