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Table of Contents

Articles

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A Framework for Fire Safety Management in School Facilities

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ABSTRACT

Schools are high-risk type of facilities in fire emergencies. This requires the implementation of safety measures, which comprise administrative and operational efforts to mitigate the occurrence of fire accidents. The review of literature indicated the lack of practical approaches that can be easily adopted for safety management in school facilities. This paper presents the development and implementation of a generic framework for fire safety management in school facilities. A literature review in the domain of fire safety in schools was performed to comprehend various knowledge areas in this context. A generic framework for fire safety management in school facilities was developed. The framework was implemented in a secondary school, located in the Eastern Province of Saudi Arabia, as a case study, to illustrate its applicability. An action plan was developed to improve the level of fire safety in the school facility, under review. The findings indicated that the framework provides a methodological and systematic approach for assessing the level of fire safety in schools, as well as determine the possible actions for improving the overall safety condition in such facilities. The paper provides a useful focus for practitioners and researchers concerned with fire safety in the educational workplace.

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1. Introduction

Schools are communal facilities, designed and operated to provide diverse educational services to students (Parnell et al., 2008). The spatial layout of these educational facilities aims to provide different types of spaces, to support teaching the different theoretical and practical sciences (Masły, 2008; Ariani and Mirdad, 2016; López-Chao et al., 2017). Thus, schools need to be planned, designed and constructed to provide the required spaces that support the educational process, namely classrooms, laboratories, art rooms, libraries and other support spaces (Neufert and Neufert, 2012). Design professionals strive to provide these different types of spaces to accommodate a large number of users, within a specific time-frame during the day. Health and safety concerns are of prime significance to parents, teachers and school administrators, to ensure the provision of a

safe built-environment, conducive to learning and achievement of desired outcomes (Frerichs et al., 2016; DeVos, 2018; Campos, 2020). Therefore, schools need to implement a comprehensive management and control system to identify and mitigate the occurrence of all possible types of hazards (Lenzi et al., 2017).

Fires constitute a critical type of hazard in school facilities (Jonsson et al., 2016; Bhebhe et al., 2019). Statistics indicated that a significant number of fatalities and injuries, around the world, have taken place in schools, due to fire accidents (Lambie et al., 2018). This is attributed to two risk factors, namely the availability of a large number of users in a confined space, and the readily available different types of combustibles, such as wooden furniture, combustible paper-based documents, class decorations, and chemicals used in science laboratories (Hassanain, 2006). Despite the presence of these factors, many schools suffer from poor enforcement of fire safety prevention measures (Moore and Lackney, 1993). This managerial shortcoming has led to catastrophic consequences, in many cases around the world (Danielsson and Sjöstedt-Landen, 2019). In Saudi Arabia, the statistics by the General Directorate of Civil Defense for the year 2020 (Civil Defense, 2020) indicated that a total 248 fire fighting operations were conducted on educational facilities, where the leading causes of these fires ranged from electrical circuit malfunction, pranks, open flames, misuse and handling of flammable liquids, and arson. The estimated losses were approximately SR 416,000 (US $111,000). Additionally, in the United States, the issued statistics by the National Fire Protection Association for the year 2020 (NFPA, 2020) indicated that a total of 4,760 fire incidents have been reported in educational facilities, where the leading causes of these fires include intentional acts, cooking equipment, playing with heat sources, heating equipment, electrical distribution and lighting equipment, smoking materials and the use of torches, and burners. The estimated losses of these fires were approximately US $28 million".

This research aims to respond to this concern through developing and implementing a generic framework for the fire safety management in schools. The developed framework endeavours to identify the office and field processes that need to be conducted by the school administrators and facilities managers, to identify possible sources of hazards, and consequently eliminate these hazards. The developed framework contributes to the body of knowledge, through providing a useful focus for practitioners and researchers concerned with fire safety in the educational workplace.

2. Research Methodology

The activities listed below were performed to achieve the objectives of the research:

- Reviewing the literature and standards to comprehend various knowledge areas pertaining to fire safety in schools. Various literature sources have been consulted including the National Fire protection Association (NFPA 101, 2021), the International Fire Code (IFC, 2018) and the Saudi Building Code (SBC, 2018).
- Developing a generic framework for fire safety management in school facilities, to provide a practical guide to administrators and facilities managers, on the processes that need to be conducted for preventing the risk of fire in schools. The framework comprises eight sequential processes, namely: (1) collect all records on school facilities, (2) identify possible sources of fire in school facilities, (3) identify the fire safety requirements in school facilities, (4) develop a fire safety inspection checklist for the school facilities, (5) review the collected records on school facilities, (6) conduct a fire safety inspection, (7) analyze and report the findings, and (8) recommend improvement action plan.
- Conducting a case study on a secondary school facility, located in the Eastern Province of Saudi Arabia, to demonstrate the implementation of the framework.
- Analyzing and reporting the findings of the case study.
- Developing an action plan of recommendations to improve the level of fire safety in the school facility, under review.

3. Literature Review

3.1 Nature of Combustibles in School Facilities

Schools are known to accommodate diverse types of combustibles, which can easily ignite and result in the rapid development of fire. These combustibles are present in a high level of concentration, as well as distributed in different locations within the school (Persson and Simonson, 1998). Since educational activities are mostly paper-based, paper is the most commonly found combustible material in schools (Hassanain and Iftikhar, 2015). Large amounts of paper are present in different locations within these facilities (Blomqvist and McNamee, 2009; DHS, 2007). Paper is present in different forms in schools, including curriculum documents, stored archives and display material (Wade et al., 2007). Chemicals used in science laboratories for demonstrating experimental activities are among the combustible materials that are present in large concentrations in schools (Hassanain, 2006). These chemicals are usually present in liquid, gaseous or even solid forms. They can be easily ignited, since their ignitability is directly influenced by the presence of heat sources and Oxygen (Schmanke, 1973). Furnishings are among the combustible elements in schools. School furniture is present in a high concentration in classrooms, laboratories and offices. The furniture is usually manufactured out of wooden, plastic and fabric material, which can ignite easily in the presence of heat sources, and cause a fire that can propagate easily throughout all the facilities (Hadjisophocleous and Chen, 2010).

3.2 Causes of Fire Accidents in School Facilities

There are several causes of fire ignition in schools. These include electrical, heating, smoking, and intentional causes (DHS, 2007). In addition, poor safety management and housekeeping practices are critical causes of fires in schools (Bhebhe et al., 2019). Electrical fires may occur due to the overloading of the electrical plugs and connections. These conditions lead to the overheating of the electrical wiring, and consequently result in the occurrence of fire (Amuli, 2019). Moreover, the deterioration of the electrical wiring are contributory causes for fires in schools, as deteriorated wiring provides for electrical faults and overheating (Ilori et al., 2019). Further, heat generated from lighting fixtures, equipment and the other appliances in the building facilitates the ignition of the various combustible material, which are usually found in schools (Campbell, 2017). Other human-related causes of fire

accidents in schools include smoking and deliberate start of fires. Smoking in un-supervised locations could result in the development and propagation of fire (Hassanain, 2006). Intentional start of fires, being a serious act of vandalism, is a significant cause of fire in schools (Cooper, 2014). Despite the potential of these causes for school fires, poor safety management and housekeeping practices are also significant causes of fire in schools (McConnell et al., 1996). Such shortcomings can increase the risk potential for the occurrence of fire accidents in schools (Nakitto and Lett, 2010).

3.3 High potential Spaces for Fire Occurrence In Schools

School facilities accommodate many spaces that have a high-risk potential for fire ignition. These spaces include laboratories, libraries, classrooms and storage rooms, where they accommodate a high concentration of combustible material (Hadjisophocleous and Chen, 2010). Laboratories are considered to be the most risky spaces in schools, as they accommodate a high concentration of flammable materials, with the presence of heat sources (Schmanke, 1973). Further, lack of safety awareness, while conducting the science experiments and risky students' attitudes in the laboratories increase the risk of fire hazards in these spaces (Ilori et al., 2019). Libraries are among the high-risk spaces that have high potential for fire hazards in schools (DHS, 2007; Wade et al., 2007), since they accommodate high concentrations of paper load (Hadjisophocleous and Chen, 2010; Hassanain and Al-Ashwal, 2004). Classrooms are the mostly used type of space in schools, since they are the core workplace, in which students spend most of their time during the school day (Moore and Lackney, 1993). This density could be a high risk factor during fire emergencies, where students' response might be random and disorganized during these accidents (Bhebhe et al., 2019). Further, these spaces accommodate a high concentration of combustible materials, in terms of paper as well as furnishings (Ilori et al., 2019). Storage rooms are among the spaces of high risk in schools, because they are known to accommodate a large concentration of combustible materials (Hassanain, 2006). In cases of poor enforcement of safety prevention measures in storage rooms, fire accidents could take place easily (Gairín and Castro, 2011).

3.4 Fire Prevention Measures in School Facilities

There are a set of office and field processes that need to be implemented, as prevention measures, to ensure the provision of an appropriate level of safety in schools (Kurki et al., 2019). Records on the various aspects of school facilities need to be achieved and predictably updated. These records could comprise all the as-built drawings, as well as the school maintenance and inspection reports (Hassanain, 2006). Moreover, a clear hazard prevention plan for fire safety needs to be developed and implemented. The plan needs to ensure compliance with code requirements, for reducing the risk potential of fire ignition in all spaces of the school. The plan needs to indicate the time, resources and information needed for conducting all office and field processes pertaining to fire safety in the school (Vicario, 2012). The field inspection is an essential process that needs to be periodically implemented for assessing the conditions of fire safety in the school (Amuli, 2019), where a checklist can be utilized to guide this process (Hassanain, 2006). The checklist would include all the elements that need to be assessed. The finding of the field inspection would provide for identifying the shortcomings, and developing and implementing prevention measures to improve the condition of fire safety (Gairín and Castro, 2011). A continuous enforcement and improvement of the fire safety measures should be always performed in school facilities, in order to maintain the implementation of an active preventive management (Bhebhe et al., 2019; Naranasamy and Abdullah, 2019).

4. Development of Framework to Assess Fire Safety in School Facilities

This paper presents a generic, systematic framework for fire safety management in school facilities. The framework provides the set of integrated knowledge areas that administrators and facilities managers would need to identify and assess the legislative requirements for fire prevention in schools (Bhebhe et al., 2019; Hassanain, 2006; Vicario, 2012; Lo, 1999). The developed framework depicts the set of office and field processes that need to be performed to safeguard against fire accidents in schools. The framework also considers the processes pertaining to analyzing and reporting the finding of fire risk assessment, as well as proposing an action plan of recommendations to improve the safety condition in schools (Hassanain and Al-Ashwal, 2004; Kurki et al., 2019; Hamida and Hassanain, 2019). The framework is developed to guide facilities managers on the tasks that need to be conducted to assess the condition of fire safety in any school facility. It comprises eight steps, namely: (1) collect all records on school facilities, (2) identify possible sources of fire in school facilities, (3) identify the fire safety requirements in school facilities, (4) develop a fire safety inspection checklist for the school facilities, (5) review the collected records on school facilities, (6) conduct a fire safety inspection, (7) analyze and report the findings, and (8) recommend improvement action plan. Figure 1 illustrates the developed framework for fire safety management in school facilities. The steps of the framework are described below:

- ***Step 1 - Collect All the Records on the School Facilities:*** This step is concerned with the collection of several necessary records to facilitate the ongoing processes of fire safety management in school facilities (Naranasamy and Abdullah, 2019). These records include the as-built drawings to analyze space defects that may impact upon the safety of users, as well the reports that document all previously implemented safety and maintenance works (Hassanain and Saif, 2006).

- ***Step 2 - Identify the Possible Sources of Fire in Schools*:** This step intends to identify the possible sources of fire in school facilities, so that prevention measures to mitigating their potential for causing fire could be developed (Kurki et al., 2019). The review of the relevant literature and standards, in the context of fire safety management in schools, indicated that these sources include smoking, overloaded electrical outlets, faulty wiring, poor housekeeping practices, use of non-standard extension cords,

and excessive storage of combustible materials (Hassanain, 2006).

- ***Step 3 - Identify the Fire Safety Requirements in Schools:*** This step serves to identify the fire safety requirements of school facilities from the published literature, building codes and standards (Hassanain and Iftikhar, 2015; Vicario, 2012). The purpose is to ensure the provision of these requirements, in an operational condition, due to their key role in mitigating all possible risks in the built-environment (Sanni-Anibire et al., 2020).

- ***Step 4 - Develop a Fire Safety Inspection Checklist for Schools:*** This step intends to develop an inspection checklist that can be utilized in the investigation and assessment processes of the fire safety requirements in school facilities. The checklist serves to summarize all the requirements in a tabular format (Hassanain et al., 2018). The preparation of the inspection checklist entails sorting all the identified requirements, under their respective categories (IFC, 2018). These categories include means of egress, fire protection systems, electrical systems, fire doors and housekeeping practices (Hamida and Hassanain, 2019). Table 1 presents the development of the fire safety inspection checklist for school facilities.

- ***Step 5 - Review the Collected Records on School Facilities***: This is an office activity, which is conducted prior to the field inspection. It focuses on examining the compliance of the school facilities with the fire safety mandates, through reviewing the as-built drawings and previous records of safety and maintenance works (Kurki et al., 2019). The review of the as-built drawings aims at evaluating the adequacy of the means of egress in the original layout of the facility. The as-built drawings serve to indicate the distribution of the fire exits, maximum travel distances for reaching these exits, and the location of the assembly points. The as-built drawings will also serve to investigate the original distribution of all the fire protection systems, namely fire alarms, sprinkler heads, portable extinguishers and smoke detectors (IFC, 2018), in addition to the location of electrical and storage rooms, and fire apparatus access road (Hassanain, 2006). The previous records of safety and maintenance works serve to document the previously conducted fire drills, and performed maintenance and inspection activities of fire safety systems.

- ***Step 6 - Conduct a Fire Safety Inspection***: This step intends to conduct a field fire safety inspection to assess the compliance of the school facilities with the identified requirements in the applicable codes and standards (Chang and Liang, 2009). In this process, the accessibility and clarity of all fire exits and assembly areas need to be inspected (Dunlap, 2016). The inspection includes the verification of the actual distribution of all fire protection systems. In this context, the operation mood of these systems needs to be investigated. The inspection would also focus on assessing the quality and condition of all fire doors (IFC, 2018). In addition, the inspection entails assessing all safety measures in the laboratories, and electrical and storage rooms, in light of the housekeeping practices and the interventions by the end users (Hassanain, 2006). Other targets for inspection include the clarity of the school address, accessibility of the fire hydrant, and availability of the evacuation plans (Vicario, 2012). The developed checklist, as illustrated in Table 1, provides a listing of the fire prevention measures for inspection.

- ***Step 7 - Analyze and Report the Findings***: This step focuses on analyzing the outcomes of the document investigation, and the findings of the field inspection (Kurki et al., 2019). The findings will be tabulated and reported, as per the sequence of the available elements in the developed fire safety inspection checklist (Hamida and Hassanain, 2019).

- ***Step 8 - Recommend improvement action plan***: This step intends to develop an action plan of recommendations to improve the level of fire safety in the school under review (Dunlap, 2016), based on the findings of the document investigation and field inspection (Lindell, 1997).

5. Case Study Building

The selected building for the case study is a secondary school, attended by students of grades 7 to 9. It is located in the Eastern Province of Saudi Arabia. The school is a one-story building, with a gross area of 7,225 m2. The school building accommodates 30 classrooms, 13 administrative offices, 4 faculty rooms, 5 science laboratories, 3 exhibition halls, a library and a playground. The school accommodates other spaces designated for support services, namely storage rooms, electrical rooms, mechanical rooms, washrooms and a first aid room. Figure 2 illustrates the floor plan of the case study building.

The layout of the school building is configured as two main compartments. The gross areas of both compartments are 3,300 m2 and 3,925 m2, respectively. Each compartment is designed to have its own circulation corridors, fire exits and spaces for support services. The maximum number of users is 400, including 350 students and 50 staff (teachers, administrative and operations personnel). According to the International Fire Code, the case study building is classified as group "E" occupancy (IFC, 2018), since it is an educational facility, which is used by more than 6 users, who are under the 12th grade of study. The as-built drawings and maintenance reports of the building were collected and reviewed, to investigate the compliance of the school with the fire safety mandates. The review served to identify the details of the performed maintenance and inspection activities of fire safety systems. Subsequently, a walkthrough inspection was conducted throughout the school, in order to assess the provision and up-keep of fire safety requirements. Both activities, document review and walkthrough inspection, were guided by the developed fire safety inspection checklist, as illustrated in Table 1.

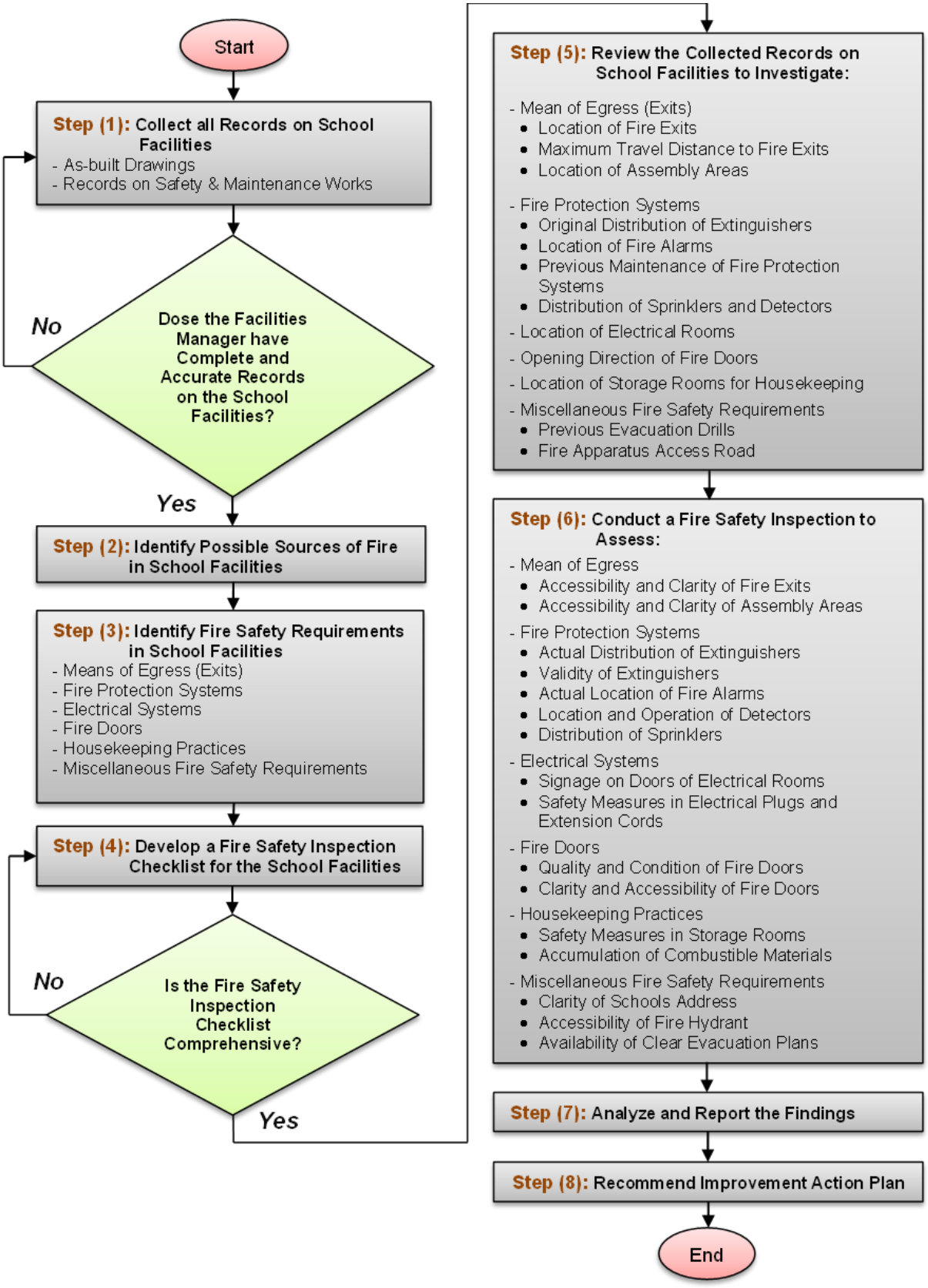

Figure 1. Framework for fire safety management in school facilities

Table 1. School fire safety inspection checklist

I. Means of Egress		**Yes**	**No**
1.	Number of fire exits satisfies the occupancy as per the code (not less than 2)	✓	
2.	Travel distance for reaching the fire exits is not more than 22m		✓
3.	Assembly areas are assigned and clearly demonstrated	✓	
4.	Fire exits are continually accessible to the assembly areas	✓	
5.	Exit signs are illuminated and available in the corridors per each 30 m	✓	
6.	Fire exits are illuminated throughout their avenues	✓	
7.	The phrase "PUSH TO EXIT" is attached in the doors of the fire exits	✓	
II. Fire Protection Systems		**Yes**	**No**
8.	Fire extinguishers are provided throughout the school, with a travel distance that is not exceeding 22 m from any point in the building	✓	
9.	Fire extinguishers are provided in each laboratory space	✓	
10.	Fire extinguishers are installed in clear locations in the building		✓
11.	Fire extinguishers are renewed annually	✓	
12.	Fire alarm systems are provided throughout the compartments of the building	✓	
13.	Fire alarms are inspected periodically and kept in an operational mood	✓	
14.	Smoke detectors are provided throughout the building spaces	✓	
15.	Smoke detectors are inspected periodically and kept in an operational mood	✓	
16.	Fire sprinkler heads are installed in all spaces of the building	✓	
III. Electrical Systems		**Yes**	**No**
17.	Electrical rooms are clearly distinguished in the building by posting the expression "ELECTRICAL ROOM" on their doors	✓	
18.	Power taps are connected directly with permanent receptacles	✓	
19.	Flexible power taps are not be extended through doors, partitions, ceilings or floors	✓	
20.	Electrical plugs are not overloaded throughout the building spaces	✓	
21.	Electrical extension cords are not overloaded by further appliances	✓	
IV. Fire Doors		**Yes**	**No**
22.	Fire doors are manufactured of fire rated materials	✓	
23.	Fire doors are not deteriorated or damaged	✓	
24.	The swing of the fire door is in the exit direction	✓	
25.	The capacity of the fire doors is not reduced or obstructed by any physical elements		✓
V. Housekeeping Practices		**Yes**	**No**
26.	Storage rooms are identified in the building	✓	
27.	Storage rooms are not accessible to the students	✓	
28.	Combustible chemicals are stored in shelves away from any source of hazard	✓	
29.	Storage rooms of laboratory spaces are not overloaded by combustibles	✓	
VI. Miscellaneous Fire Safety Requirements		**Yes**	**No**
30.	Fire drills are conducted and recorded periodically		✓
31.	Accessible fire apparatus road and fire hydrant are provided and clearly assigned		✓
32.	School address number is clearly posted on the school building	✓	
33.	Clear evacuation plans are provided throughout the building corridors	✓	

6. Findings and Discussion

Upon reviewing the school documents and conducting the walkthrough inspection throughout the school, the following are the outcomes of the case study:

6.1 Means of Egress

The floor plan of the case study building was divided into two compartments, as illustrated in Figure 2. The review of the collected records of the building indicated that, there are 10 fire exits, which are distributed throughout the floor plan. The first compartment had four fire exits, and the second compartment had six fire exits. An analysis of the maximum travel distance for reaching the fire exit in each compartment was performed, as demonstrated in Figure 2. The analysis revealed that the maximum travel distance for reaching the fire exit in the first compartment was equal to the maximal allowable distance, which is 22 meters. However, the analysis of the maximum travel distance in the second compartment indicated that the travel distance exceeded the allowable distance by 13 meters. The

document review as well as the walkthrough inspection pointed out to the provision of two assembly areas, outside the school building. Further, the walkthrough inspection indicated that all fire exits were clearly marked, illuminated as well as accessible to the assembly areas.

6.2 Fire Protection Systems

The review of the building records revealed that the school building was designed and constructed, in compliance with the mandates of the International Fire Code (IFC, 2018). The provided fire protection systems included fire alarms, smoke detectors, sprinkler heads, and portable extinguishers. The walkthrough inspection indicated that the portable extinguishers were provided per each 20 meters in the corridors of both compartments. Further, two to three portable extinguishers were provided in each laboratory. However, some of the portable extinguishers in the laboratories were not installed in their recommended positions, as per the requirements of the fire code. Overall, the walkthrough inspection as well as the review of the building records indicated that all fire extinguishers are renewed periodically. The walkthrough inspection indicated that the fire alarms, smoke detectors and sprinkler heads were provided and maintained throughout the building in an operative mood.

6.3 Electrical Systems

The building records indicated the provision of six electrical rooms. The walkthrough inspection revealed that these electrical rooms were not accessible to the end users, including teachers and students, for safety and security purposes. Further, the phrase "ELECTRICAL ROOM" was posted on the doors of all electrical rooms. Furthermore, the conducted walkthrough inspection indicated that all appliances were directly connected to the plugs, where extension cords were banned throughout the school building. In addition, the electrical plugs were not loaded beyond their capacities. These findings indicated that the enforcement of the safety measures over the electrical systems in the school building was adequate.

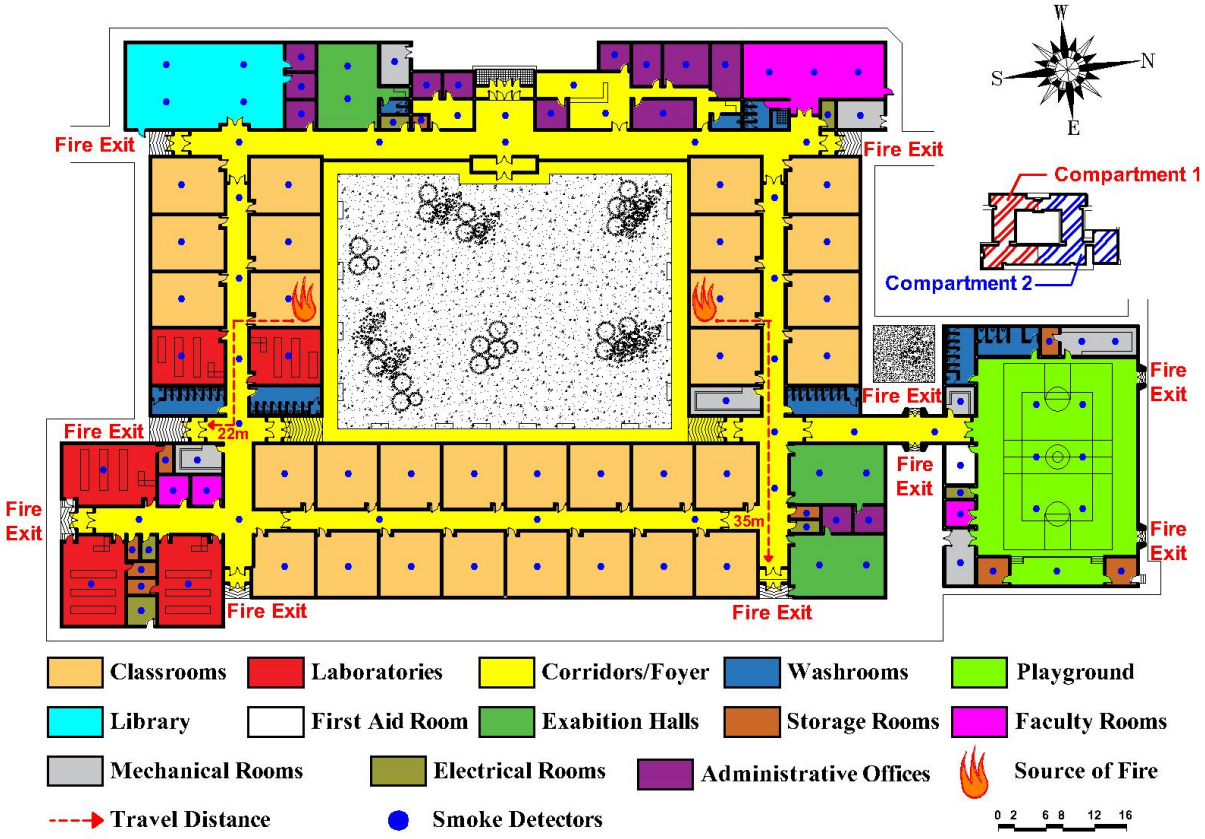

Figure 2. Floor plan of the case study building

6.4 Fire Doors

Both, the review of the building records and the walkthrough tour indicated that all fire doors were swinging in the direction of exit, and manufactured out of fire rated materials. The inspection revealed that these fire doors were maintained in an acceptable condition, to perform their function in the case of fire emergencies. Further, the capacities of the fire doors were maintained as planned, since all physical obstructions were banned throughout the fire exits.

6.5 Housekeeping Practices

The building records indicated that there were nine designated storage rooms, throughout the school building. The walkthrough inspection indicated that these storage rooms were

not accessible to the students, especially those provided in the science laboratories. The inspection of the laboratories' storage rooms indicated that adequate housekeeping practices were maintained. Chemicals were safely stored in special shelves in the laboratories. The storage rooms were not over stocked with chemicals.

6.6 Miscellaneous Fire Safety Requirements

The review of the building records indicated the absence of previous fire drills. The walkthrough inspection indicated that the apparatus road was blocked by the school gate. Further, it was observed that the fire hydrants were not clearly visible and accessible from the road. One the other hand, the school address number was clearly posted on the school fence. Additionally, clear evacuation plans were sufficiently posted in different locations of the case study building.

7. Conclusions and Recommendations

Schools are among the high-risk facilities for fire hazard, due to the presence of various types of combustible materials and sources of fire ignition. These facilities are used by a large number of users within a specific time during the day, which increases the magnitude of risk to these users. Despite the harmful potential of these hazards, active enforcement of fire safety measures could be inadequate in many schools. This may be attributed to the absence of managerial frameworks that can be applied by the school administrators. This paper aimed at presenting the development and implementation of a generic fire safety management framework in school facilities. The development of the framework was guided by the knowledge obtained from the literature review. The framework was implemented in a secondary school building, as a case study, which is located in the Eastern Province of Saudi Arabia. The case study indicated that the framework provided a methodological approach for fire safety management in school facilities. The implementation of the framework served to identify all the shortcomings in the case study building. These shortcomings included: (1) exceeding the allowable travel distance for reaching the fire exit in one compartment, (2) placement of the fire extinguishers in invisible locations at the science laboratories, (3) lack of implementing fire drills on periodic basis, (4) blockage of the apparatus road by the school gate, and (5) placement of the fire hydrants in visible and accessible locations in the street.

The implementation of the framework served to develop an action plan of recommendations, for the purpose of improving the fire safety condition in the case study building. These recommendations include:

- An additional fire exit needs to be provided in the second compartment of the building, to satisfy the code requirements.
- The portable fire extinguishers need to be mounted on the walls in all science laboratories.
- Fire drills need to be planned and conducted periodically.
- Awareness programs about the significance of fire safety in schools should be conducted periodically.
- The apparatus road should be accessible.
- The fire hydrants need to be visible and accessible from the street.

This paper presented the development of a practical guide for administrators and facilities managers, on the processes involved in the fire safety management in school facilities. The paper provides a future research avenue for researchers concerned with fire safety management in the educational workplace.

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Tragedy of the Anticommons (ToA) in Agricultural Land Partition involving Fragmented Co-proprietorships: An Analysis of Malaysian Case Laws

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ABSTRACT

There is a lack of understanding of the theory of the Tragedy of the Anticommons (ToA), a type of coordination breakdown or a hold-out problem involving multiple fragmented co-proprietorships with undivided shares, in the land partition context. This paper, hence, discusses how ToA occurs particularly in the agricultural land partition that is primarily governed under the National Land Code 1965 propose potential legal and non-legal approaches and mechanisms to address the land tragedy. An abductive content analysis of (9) case laws extracted from the LexisNexis database was performed through which themes and codes were developed to explain how ToA hindering land partition takes place. Subsequently, judicial decisions in solving disputes arising from land partition and existing best practices in dealing with the tragedy were reviewed. The case laws review indicated that unsuccessful agricultural land partition associated with high transaction costs in securing co-proprietors consensus is a form of simultaneous ToA, that most of the unpartitioned land (anticommons) may be subject to underinvestment (land mismanagement) and disuse. Key factors leading to disagreement among co-proprietors and consequently ToA are as follows: (i) unequal (unfair) proportion or shares of land; (ii) uneven geographical partition and spatial distribution of government reserves; and (iii) potential damages and negative effects (e.g., loss of income and property). To address ToA, these are legal mechanisms proposed: statutory enforcement of the National Land Code (NLC) 1965 (via land forfeiture and reversion), the Land Acquisition Act (LAA) 1960 on compulsory land acquisition, and judicial decisions (e.g., land partitions may take place if it is fairly distributed and made by the majority shareholders), while non-legal approaches cover negotiation and arbitration; en-bloc sales (partition); collective action through enhanced social capital; and imposition of a tax on underutilised land. By showcasing various agricultural anticommons tragedies and their potential negative externalities in the land partition context, this paper offers policy and management insights that help land officers and local authorities ensure the maximum efficiency and productivity (i.e., highest and best use) of the land.

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1. Introduction

The word "fragmented" refers to a state of being small, incomplete, or broken off from its original part. It is also known as pulverisation, parcellation, and scattering of one farm with numerous spatially separated parcels (Demetriou, 2014), and it is normally owned by multiple owners. According to the National Land Code (NLC), multiple land ownership, also known as co-proprietorship under the Malaysian law, is defined as "*the holding of alienated land by two or more persons or bodies in undivided portions*" (The National Land Code (Act 56 of 1965) & Regulations, 2020). Consent and approval from all co-proprietors are necessary to be secured when involving land dealing and/or development, which often brings complications. In this case, it can affect the land in various aspects, such as its development, economic value, and social relationships.

There are several main reasons causing land to be fragmented and therefore underutilised. Demetriou outlined four reasons which are inheritance, population growth, land markets, and historical/cultural perspectives. In some countries, it is a statutory requirement that the land of the deceased should be subdivided among all heirs. This makes land partition a continuous process, with each land parcel becoming smaller as generations pass through informal credit and inheritance systems (Demetriou, 2014; see also Khalid & Yusuf, 2012). According to Section 140(1) of the NLC 1965, land partition means land held under Registry or Land Office title by two or more persons as co-proprietors is partitioned to vest in each of them, under a separate title, a portion of the land of an area proportionate as nearly as may be to his undivided share in the whole.

If the land partition is successfully undertaken, it opens up better development opportunities. In other words, for development to happen, developers or relevant landowners need to apply for land sub-division and land partition (only if applicable) specifically when the land is owned by multiple co-proprietors. However, the land partition process can be time-consuming and challenging, especially when the land is owned by many co-owners. For land to be partitioned, approval or consent by co-proprietors has to be obtained according to Section 141(1)(a) of the NLC. As opposed to private land with single ownership, land involving several co-proprietors (also called anticommons) may prohibit development from happening (due to higher transaction costs in communication and reaching consensus from all co-proprietors) (see Figure 1); hence, this situation signifies that types and number of ownerships do matter and have significant impacts on the likelihood of success of land development and other land transactions (see Sulong and Taha, 2016).

When a land partition process is unsuccessful, any potential development may be hindered. Sulong and Taha argued that the fractured relationship between co-owners was one of the reasons leading to problems in land partition, citing Duyong Island development as an example where family problems had disrupted the development project. Additionally, co-owners with clashing visions to develop the land will lead the land to be left idle and uncultivated (Sulong & Taha, 2016). The process of land partition itself is a big factor contributing to unsuccessful partition. Taking into account the enormous amount of transaction costs incurred and time spent during the process of partitioning, it might halt one's interest to take part (Khalid & Yusuf, 2012).

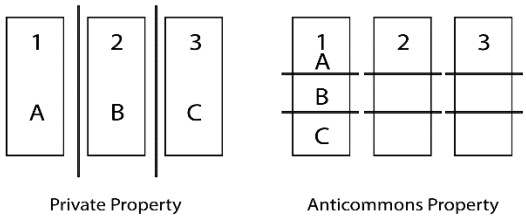

Figure 1: Differences between private property and anticommons property (source: Heller, 1998). Note that numbers (1,2, and 3) indicate land plots while alphabets (A, B, and C) entail owners

One of the best examples to visualise the real problems of multi-ownership in Malaysia is the Kampung Bharu case, which demonstrates there was no consensus and cooperation formed among owners. According to a paper presented at the briefing sessions for landlords in Kampung Bharu, the greatest problem faced is the multiple ownerships in addition to the existence of small, fragmented lot sizes with 31% of the lots owned by more than 5 owners/co-proprietors while the average land was owned by 8 to 30 co-proprietors. In terms of the land area, it is found that 83% of the lots have an area of less than 1000 square meters. A piece of land with an area of 809.345 square metres was owned by a total of 141 people, with its smallest portion of 7/424320 or 0.01335 square metres. All planned development and activities that may significantly increase the land value in Kampung Bahru by the Kuala Lumpur City Hall have been hindered as approvals are hard to be obtained from these co-proprietors (Sulong & Taha, 2016). This is largely due to individuals' behaviours and social relationships between co-proprietors.

Against the above background, which provides contextual issues of fragmented, multiple land ownerships, and that land partition is deemed to be an alternative to addressing the land predicament, this paper showcases that unsuccessful agricultural land partition and its potential consequences can be linked to the theory of the Tragedy of the Anticommons (ToA). The Tragedy of the Anticommons (ToA) is a mirror image of the Hardinian Tragedy of the Commons (Parisi et al., 2000). The Anticommons tragedy theory was first introduced by Michelmann in 1982 and was popularised by Heller and is deemed as a coordination breakdown or hold-out problem. Anticommons is a gap that exists in the ownership spectrum and highlights the dilemma of fragmented ownership of private property (Heller, 2013). Heller (1998) further asserted that "*When too many owners hold such rights of exclusion, the resource is prone to underuse- the tragedy of the anticommons…resources can become stuck in low value uses*." In short, anticommons is a paradoxical concept (see Ying, 2019) where on one hand, private ownership is usually deemed to be an effective regime to address the Hardinian commons tragedy and simultaneously increase the efficiency of the use of scarce resources, but the tragedy, unfortunately, occurs due to the existence of multiple private owners, endowed with exclusive

rights over a scarce resource, preventing others from using it hence resulting in underused, underinvested, and underdeveloped resources (in this case, resources are referred to as land) (see Parisi et al., 2000).

This phenomenon, similar to the tragedy of the commons, is another depiction of a social dilemma (i.e., conflicts occur between individual interests and collective interests) (Ling et al., 2019a,b; see also McCarter et al., 2019); due to the self-interested behaviour of a landowner, prohibiting any optimal use of land, land dealings and development (e.g., partition, subdivision, conveyance and lease), both collective (other owners') interests and land resources outcome are compromised. McCarter et al. (2012) likened this phenomenon to a saying of 'too many cooks spoil the broth' where cooks here are referred to as owners/co-proprietors that each of them can make decisions influencing resource outcomes. Rather than fragmented ownership, Heller viewed the formation of ToA as a result of fragmented decision-making. Additionally, the existence of many uncoordinated actors, such as different legislators, agencies, and courts could also become an obstacle to the resource (Heller, 2013). These parties must agree on common ground, otherwise, the resource will remain idle. Although some scholars suggested gathering all rights in usable private property as a way to abate this problem, this approach can be tedious and complex hence making it unfavourable (António Filipe et al., 2011). Based on the literature search, much ToA research has been conducted across ownership or property rights subjects, ranging from patents and intellectual property rights, water markets in the United States (Bretsen and Hill, 2009), enterprise licensing in China (Ying and Zhang, 2008) to cyberspace (i.e., internet) (Hunter, 2003). Application of ToA in urban and land resources (e.g., land dealing and development) is not entirely new (Lueck and Miceli, 2007). For example, see Lin and Huang, 2013 on ToA in the urban redevelopment in Taiwan, see Takamura et al., 2021 and Takahashi et al., 2021 on TOA in common property forests in Japan; Loehr, 2012 on ToA in land reforms in Cambodia, Ying, 2019 on ToA in new building and infrastructure development in China; however, compared to the Hardinian Tragedy of the Commons, ToA is still a foreign concept and its potential solutions have been paid less attention, especially in the agricultural land partition context in Malaysia, despite various aforementioned partition issues have implicated underutilisation of agricultural land and ToA. Hence, this paper has a twofold objective. First, to theorise and discuss how ToA occurs in agricultural land partition involving multiple fragmented ownerships with undivided shares that are primarily governed under the NLC 1965 (Act 56). Second, to propose legal and non-legal mechanisms and approaches to addressing the land tragedy. To encapsulate the above discussion and intentions of the study, a conceptual framework is provided in Figure 2, demonstrating how anticommons property and unsuccessful land partition due to various factors lead to the ToA that consequently requires both legal and non-legal interventions. The remainder of the paper is structured as follows. In Section 2, the methodology covering both data collection and types of analysis is presented. Then in Section 3, results and discussion are reported, following the conclusion in Section 4.

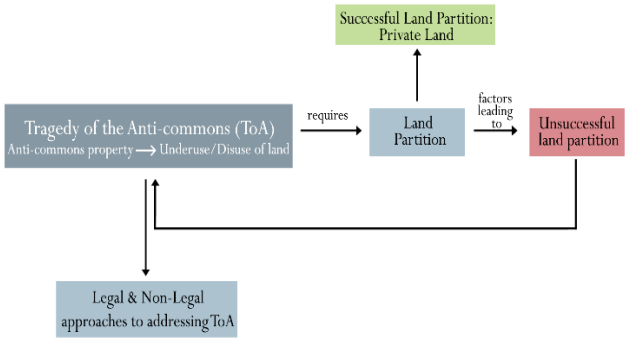

Figure 2: Tragedy of the Anticommons in agricultural land partition

2. Methodology

2.1 Data Collection

This study was primarily based on empirical secondary data (case laws) and the literature review on best practices for ToA abatement. While the literature was sourced from key journals such as the International Journal of the Commons and the Journal of Forest Research mainly covering research areas of new institutional economics and land economics for collective resource/goods management, case laws were extracted from the LexisNexis database using the following keywords, namely 'Anticommons', "Land partition –co-proprietors" and "land partition-agricultural land". Initially, using the approach of PRISMA, a total of 475 cases were identified based on the keyword "land partition" alone, and the cases were reduced to 102 when combining land partition with another keyword, i.e., co-proprietorship. However, after further screening those cases with another keyword "agricultural land" and other sub-criteria, such as problems of, and factors leading to, unsuccessful land partition, only nine (9) cases were selected and included for content analysis. The selected cases ranging from 1991 to 2020 involved 2-6 individuals, mostly had been held at the level of High Courts and several at the Courts of Appeal. In terms of geographical settings, most of the cases were based in West Malaysia where land matters are governed under the NLC 1965, and only one case was from Sarawak (East Malaysia) using the Sarawak Land Code.

2.2 Data Analysis

This study adopted abductive content analysis (i.e., combining deductive coding: predefined codes from the literature review and inductive coding- open coding based on data). According to Timmermans & Tavory (2012), abductive analysis is a qualitative data analysis, aimed to generate creative and novel theoretical insights. This analysis emphasises the importance of observing and developing new concepts from the empirical cases, simultaneously building on preconceived theoretical ideas. Therefore, through the engagement of data with a multiplicity of theorisations, the abductive approach is believed to be more robust and comprehensive in encapsulating possible themes and

codes in this study. Table 1 describes the types of analysis and key themes used for the twofold objective.

Table 1: Types of analysis and themes established for the twofold objective

Objective	**Types of Analysis**	**Key Themes**
1st Part: Factors causing land partition failures, as well as potential consequences on the land	Abductive approach: using both deductive and inductive codes for factors causing unsuccessful land partition and deductive codes for the potential consequences of land as a result of unsuccessful land partition.	**Factors:** -unfair share of land -uneven geographical distribution and placement of reserves -negative impacts of land partition: loss of income **Potential consequences:** -underused, disused land, underinvestment, abandoned, idle, land -low values of land, opportunity costs of unsuccessful land partition
2nd Part: Legal and non-legal mechanisms and approaches to solving ToA in relation to land partition	Abductive approach: inductive coding on judicial decisions; deductive coding on statutory provisions of land laws, as well as best practices from the literature review	-Land partition may be allowed if co-proprietors have the majority of shares -Unfair and unjust spatial distribution may lead to dismissal of land partition - En bloc sales, collective action, social capital, taxation, statutory enforcement, negotiation

3. Results and Discussions

3.1 An Analysis of Case Laws

A review summary of 9 Malaysian case laws on agricultural land partition issues is shown in Table 2. For a more systematic coding process of the case laws, the summary comprises the following: (i) Names of the cases; (ii) year; (iii) facts and issues; (iv) judges' verdicts and reasonings; and (iv) potential implications of land in relation to ToA.

Table 2: A review summary of the 9 case laws

Cases	**Year**	**Facts and Issues**	**Factors Leading to Land Partitioning Issues**	**Judicial Decisions and Reasoning**	**Potential Implications of Land in relation to ToA**
Ku Yan Bte Ku Abdullah V Ku Idris Bin Ku Ahmad & Ors [1991] 3 MLJ 439	1991	This partition involved one plaintiff with a 5/7 share and four defendants with a total of 2/7. The Plaintiff's first application together with a proposed plan to the Land Administration was rejected and brought to the High Court. Later, the application was amended, and a new plan was included.	Defendants argued that they were not informed and did not give consent to the land partition.	The objection was dismissed. Co-proprietors with the majority of shares can apply to the High Court for partition without others' consent.	By allowing the partition to happen, the Plaintiff may be able to commence her plans to develop the land at its best prospect. Since the land partition was allowed, ToA may not occur.
Ngu Leh Ngiik & Anor V Lee Yiu Ping & Ors [2019] 4 MLJ 681	2019	The appeal involved 2 Appellants and 4 Respondents. Appellants and Respondents had consented to a plan (A1) prepared by the surveyor, dividing the shared piece of land into two parts according to their shares which are 69/240 (Appellants) and 171/240 (Respondents).	Appellants opposed as they were allegedly deceived into signing. Additionally, A1 reduced their share of land and did not provide proper access to the second Appellant's building from the main road. The Appellants also stated that their consent as co-proprietors is important to be considered.	The appeal was dismissed. Consent from other co-proprietors is not required. A1 was drawn by a qualified surveyor and has been approved by the Land and Survey Department of Sibu. Also, the partition included an existing road that connected subdivided plots hence the Appellants' claims were refuted.	The land could be developed to its best use, hence the value of the proposed partitioned land will be enhanced. This case has been brought to the Court of Appeal, signalling that the Appellant tried refuting the High Court's decision. The Appellant's appeal had only increased the transaction costs of the whole process.

					Since the land partition was allowed, ToA may not occur.
Naik Diew Kong V Ling Sing Hang & Co Sdn Hhd & Ors [2016] MLJU 1518	2016	The case involved one plaintiff against three defendants to partition the land. Plaintiff is a co-proprietor with ½ share of land while the defendants each have 1/6.	Defendants refused to give consent when given the Notice.	The partition was not allowed. The 1st Defendant's application was allowed with cost. The court views Plaintiff's OS as no reasonable cause of action. The Plaintiff could not rely solely on the power of court for partition but must prove that he initially intended to apply to the Land Administrator but was forced not to, due to the absence of cooperation from other co-proprietors.	Unsuccessful land partition is an opportunity cost; if partition were to take place, the land might have been developed to its highest and best use. Delaying land partition incurs higher costs which subsequently increases potential transaction costs. The unpartitioned land is believed to be subject to ToA.
Zuriati Binti Osman V Butterworth Lim Construction Sdn Bhd [2020] MLJU 467	2020	The land was owned by 3 co-proprietorships namely Saw, Plaintiff, and Defendant. Saw and the Plaintiff both owned 2/3 shares of the said land and wished to partition the land according to the proposal made by both parties.	The Defendant had rejected the partition and the Plaintiff's proposal due to the existing electrical power line and a service road running over the Defendant's plot.	Plaintiff's application was dismissed. Despite Section 145, the proposed land partition by the Plaintiff is deemed unjust towards the Defendant.	Since the unpartitioned land is situated in a valuable area, it is an opportunity cost for the land as it risked losing future development to take place and thus the underinvested land cannot be developed to its highest and best use (higher value). This situation is a form of ToA.
Moo Hon Yee V S Abdul Rahman Bin Pak Shaik Abdul Kader [2018] MLJU 1822	2018	The Plaintiff applied for termination of co-proprietorship for a land he bought from a third party in an OS. The case involved a plaintiff with ¾ undivided share of the agricultural land and the Defendant owning the remaining.	The Defendant refused as Plaintiff's plan will demolish some part of the Defendant's grocery shop. No compensation was offered to the defendant. Additionally, the Defendant's partitioned land value (based on the Plaintiff's plan) would be lower compared to the present value as it was close to a small lane (not the main road).	The OS was dismissed hence partition did not take place. However, both parties were at liberty to make a fresh Section 145 application with credible evidence from the surveyor and valuers.	The Plaintiff should have provided compensation to the Defendant and redesigned the partition layout to possibly achieve a win-win solution for both parties. Since the Plaintiff did not do so, he lost the opportunity to develop the land to its highest and best use which may offer higher value to the land (i.e., opportunity costs). Therefore, ToA may occur.
S Subramaniam & Ors V Inderjit Kaur D/O Karnail Singh & Anor [1997] 3 MLJ 366	1997	Plaintiffs are the majority co-proprietors and wanted to partition land to obtain a separate title. The case involved 4 Plaintiffs and 2 Defendants.	Defendants did not give consent to the land partition.	The application was dismissed. The court did have power but was limited to a certain extent. Hence, only when the application was rejected by the Land Administrator, the Plaintiff may come to a court to seek redress.	Land may require a separate title to allow development to take place. Although Plaintiffs owned the majority of the shares, due to the procedural issue of the partition application process, the land partition was unsuccessful. This case can be likened to ToA as potential development and dealing that may increase land value are prohibited.
Koh Boh Huat & Ors V Tan Niam Neo & Anor [2007] 1 MLJ 328	2007	Plaintiffs received a proposal for development from a company. Plaintiffs owned 9/10 of the undivided share while the defendant owned the remaining. The Defendants were notified of this through a letter and the	The Defendants refused to allow the partition with no reasonable ground for objections.	Partition was allowed. So long as partitioned plots must be more than 0.4 hectares. The court helped facilitate the termination of the co-proprietorships.	Since the court helped facilitate the termination of the co-proprietorships, the developer company will be able to get the partitioned land from the co-proprietors and hence develop the land according to plan. This development

		proceeds of the sale will be distributed according to the shares with no prejudice.			will increase the land value. Thus, ToA, in this case, may not occur.
Tong Ah Kau @ Tong Fong Yam Dan Lain-Lain V Tong Faung Onn & Lain-Lain [2015] MLJU 1984	2015	3 Plaintiffs applied for the partition of agricultural land of 5.8932 hectares against Defendants (3 individuals). Plaintiffs were the co-proprietors with the majority shares of 24/45.	The Defendants cited that the OS would disappoint a few applications done to the Court, and it was beyond the Court's power. Additionally, they stated that no discussion was held between all parties by the Plaintiffs before the application and plan were made.	Partition was allowed. The judge decided that the word 'may' used in the NLC did not refer to a must, hence making it an option. Reasonings provided by the Defendants were discarded as there were no basis and untrue, and the partition was fair.	When the land partition was allowed, it opened up for more potential development hence the land could be developed to its highest and best use. Defendant's refusal had only increased the transaction costs of the case which involved more time and costs. Thus, ToA, in this case, may not occur.
Phang For Fatt V Phang Meow Fook & Anor [2019] MLJU 1199	2019	The Plaintiff owned 15/30 of the undivided share while the 1st Defendant owned 10/30 and the 2nd Defendant 5/30. The land was used for the cultivation of fruit trees. However, the Plaintiff decided to terminate the co-ownership and proposed a plan, made by a qualified surveyor. Plot 1 would be given to the Plaintiff as his family has been residing there while plot 2 was to be given to the 1st Defendant.	Defendants opposed the Plaintiff's proposed subdivision as it was deemed unfair, unjust, and unconscionable as it is uneven. The Defendants would receive a substantially rocky and uncultivated part of the land, compared to the subdivision that would be received by the Plaintiff which was filled with fruit trees.	The OS was dismissed with costs. The land partition was not allowed. The land had been used as a source of income for the Defendants and Plaintiff's family and both Defendants were dependent on it. An unequal division of the land would certainly affect the livelihood of the Defendants.	Although the unpartitioned land would generate income for the Defendants (probably for the short term), it incurred a greater opportunity cost (loss) for the land as future development with high economic values leading to its best and highest use would be stymied. A partition of land with a separate title provides freedom to its owner to develop the land to its full potential. Unpartitioned land would be subject to future problems that might arise between both parties, which will increase transaction costs for all parties as the problem persisted through generations. Thus, ToA may occur.

3.2 Factors leading to unsuccessful land partition

The above cases in Table 1 illustrate land partition problems that mostly occurred (whether the partition is successful eventually) are due to underlying disagreement and discontentment among co-proprietors. Apart from the land partition procedural issue (see *S Subramaniam & Ors V Inderjit Kaur D/O Karnail Singh & Anor [1997] 3 MLJ 366*) and uneven spatial placement and positioning of reserves (see Zuriati Binti Osman V Butterworth Lim Construction Sdn Bhd [2020] MLJU 467) resulting in dismissal of land partition, the most prominent causes of objection is attributed to the feeling of discontent with the unequal (unfair) quantum or proportion of land received. Sulong and Taha stressed the importance of finding the middle ground between all co-proprietors as any unhappy feelings might hinder future land activities, which therefore leads to abandonment of land hence allowing ToA to happen (see Sulong & Taha, 2016).

In cases such as *Ngu Leh Ngiik & Anor v Lee Yiu Ping & Ors [2019] 4 MLJ 681* and *Moo Hon Yee v S Abdul Rahman Bin Pak Shaik Abdul Kader [2018] MLJU 1822*, the Defendants objected to the application due to potential damages and negative effects (e.g., loss of income and property) and unfair shares of the land partition. The proposed plan drawn by Plaintiff did not propose direct access from the main road and contains a services road. These issues put the Defendants (other co-proprietors) in a disadvantaged position. Furthermore, as seen in the case of *Phang For Fatt v Phang Meow Fook & Anor [2019] MLJU 1192*, since the land has been a source of income for the Defendants where the land had been cultivated by three families for decades, and the profits from the fruit sale were divided between them all, an unequal division or share would affect their livelihood.

3.3 *Judges' Verdicts on Land Partition Issues*

Based on judges' decisions, Table 2 provides cases comprising both successful and unsuccessful land partition instances in which 5 of them, which had been held unsuccessful, can be associated with ToA. Two primary reasons are leading to the judge's

dismissal of the land partition. Firstly, it is common for the judge to dismiss a partition application when the application itself did not fulfil the requirements that allow the court to exercise its power to facilitate termination. Next, according to Section 136, a subdivided land has to fulfil a few criteria which include a subdivided agricultural land to be not less than two-fifths of a hectare or 0.4, having a shape that is suitable for the purpose for which it is intended to be used and the availability of a satisfactory means of access from each portion either to a road, a river, a part of the foreshore or a railway station or to appoint within the land where access is available. Hence, plaintiffs who did not fulfil these criteria have a high possibility of having their application dismissed by the judge. Secondly, the land partition should be reasonably fair, proportionate, and even in terms of the quantum of share units of the partitioned land and the spatial distribution and placement of government reserves to all co-proprietors regardless of being minority or majority shareholders. In the case of *Phang For Fatt V Phang Meow Fook &Anor [2019] MLJU 1192* the Plaintiff's application for land partition was rejected as it would violate one of the above criteria.

Nevertheless, judges could decide to approve a land partition application based on a few reasons. Although any co-proprietor (whether majority or minority) could apply for a partition, it is apparent that being a majority co-proprietor and an administrator provide some leverage in winning the case. As seen in the cases of *Ku Yan bte Ku Abdullah v Ku Idris bin Ku Ahmad &Ors [1991] 3 MLJ 439* and *Koh Boh Huat &Ors v Tan Niam Neo &Anor [2007] 1 MLJ 328*, espousing Section 141A of the NLC, even without other co-proprietors' consent, the land could be successfully partitioned so long as applicants are the majority co-proprietors who also provide sufficient, valid documents and plans, made by a qualified surveyor or such co proprietorship could be terminated by the court (see Section 145 of the NLC) (see also *Ngu Leh Ngiik &Anor V Lee Yiu Ping &Ors [2019] 4 MLJ 681)*. While, in the case of *Boh Huat &Ors v Tan Niam Neo &Anor [2007] 1 MLJ 328*, this rule was used by the judge to terminate co-proprietorship if the subdivided/partitioned land is not less than 0.4 hectares each as clearly stated in Section 136(1)(f)(i) and Section 145 of the NLC.

3.4 Alternatives to Curbing the Tragedy of the Anticommons (ToA)

3.4.1 Malaysia's Statutory Mechanisms via Land Acquisition Act 1960 and National Land Code 1965

Apart from the above judicial decisions on the land partition that could likely take place, importantly transitioning anticommons property to private property, to help prevent ToA, there are other legal mechanisms which include the exercise of compulsory land acquisition via the Land Acquisition Act (LAA) 1960, where it allows the State Government to acquire land from private landowners for public or economical purposes (normally for large-scale projects with higher values) as outlined in Section 3(1) of the LAA, without needing to obtain consents from co-proprietors, in principle, so long as proper notifications and declaration forms (see Sections 4 and 8 of the LAA) are served. However, although affected landowners will be adequately compensated according to the Federal Constitution (see Article 13(2)) based on the market value of the acquired land, this measure is considered drastic since it involves high transaction costs and could result in dispossession and eviction of landowners. Furthermore, also relevant to the multiple ownership regime, through Section 127(1)(a) of the NLC, breach of any conditions of the land, especially the implied one (being underused or underdeveloped owing to the above co-proprietors coordination breakdown possibly leading to ToA) may result in land forfeiture to the State Authority. In addition to Section 127, Section 46(1)(c) of the NLC on the reversion of land to the State Authority, due to the circumstances mentioned in Sections 351 and 352 (which relate respectively to the death of a proprietor without successors, and the abandonment of title by proprietors eventually leading to underinvestment and underuse of land) can be enforced. Implicationally, the above legal mechanisms proposed can change anticommons property to state property (state land), that the latter, which is freed and discharged from interests and titles, is believed to be more feasible for potential development (via land alienation)

Despite the availability of these legal avenues, they are not likely to be enforced due to several factors (i.e., high transaction costs involving complex and time-consuming processes and procedures and multi-stakeholder coordination). Still, they are worth being imposed where necessary and particularly made known to the public (co-proprietors) facing land fragmentation and decision-making and coordination breakdown, as a form of penalty, to avoid land abandonment (underuse) and thus ToA. It is hoped that via the awareness of the legal implications of underused land, full cooperation and consensus will be reached among co-proprietors through non-legal approaches.

3.4.2 Non-legal Approaches and Mechanisms

3.4.2.1 Negotiation or Arbitration

Negotiation via effective communications could help facilitate discussions between co-proprietors to reach a consensus on the optimum division of land to address the land partition dispute. However, if negotiation is not possible, arbitration, an alternative dispute resolution governed under the Arbitration Act 2005, can be employed instead in private with an arbitrator being an impartial third party (private judge) to obtain a collective decision. There are several arbitration avenues available in Malaysia to suit different needs (i.e., at the district land office, the courts, private or semi-private bodies). To resolve the land fragmentation issue, it is the utmost priority to provide solutions that will keep the land intact (Khalid & Yusuf, 2012). Negotiation or arbitration (outside of court), which is less formal, is believed to be more cost-effective and less time consuming compared to court proceedings.

3.4.2.2 En-bloc Sales & Partition of Anticommons

A collective sale is a type of collective action that involves multiple owners, usually in a strata development agreeing to sell their separate units to the same party or joint venture to allow redevelopment of the site and be paid a market price. Often, said

land possessed a great potential through development that could easily elevate its value higher than the individual units' aggregate value, or it is not optimally utilised (Christudason, 2009). In the case of a collective sale, each member or co-proprietor can work together and form an agreement to sell their units and therefore contribute to a greater good, which in this sense is to allow development to happen hence ensuring that the land is used to its full potential with minimal government intervention. This is possible through the presence of trust, a sense of justice, and reliability, which act as a catalyst that leads to a collective act, rather than selfishness as provided by the rational egoism theory (Kremer et al., 2019; Ostrom, 2005) (see the next section on enhanced collective action via social capital). Although the collective/en bloc sale method is predominantly used in strata schemes, this mechanism is also deemed applicable to multiple land ownership (i.e., anticommons property), particularly in addressing dealing restrictions faced by unpartitioned land. This entails that instead of promoting land partition to sell the land individually, which may not be optimal and efficient in terms of land use planning, collective sale (conveyance) of unpartitioned land (anticommons) can be preferable in this case to promote a larger scale of development (i.e., higher land or property value) and therefore avoid the anticommons tragedy.

To implement en bloc sales of stratified units or anticommons more effectively, every country has a different majority percentage threshold. Once the threshold is achieved, although there are a minority of owners or shareholders opposing the dealing, the sale will be effective. This is similar to the land partition approach, as it is difficult to reach full agreement from all co-proprietors to consent to the transaction of property; thus, a partition, *ceteris paribus*, is normally allowed when the majority of co-proprietors have agreed to it. For example, in Singapore, development of fewer than ten years old requires consent with at least 90% of the share value meanwhile developments that are more than ten years old must obtain a percentage of at least 80% of the share value (Christudason, 2012). Similarly, Australia, under Part 10 of the Strata Schemes Development Act 2015 calls for a 75% or more approval rate to effectuate a sale or redevelopment (Strata Schemes Development Act 2015 No 51, 2015). Based on some of the best practices, an ideal range of majority percentage that could be adopted by the Malaysian legislation body to pass a collective sale would be between 75% to 80%. This proportion or percentage suggested can be a good guide for the case of land partition, since there is no explicit definition of the word "majority share" used in the NLC 1965, which is often interpreted as more than 50%.

3.4.2.3 Collective action via enhanced social capital

The term social capital encapsulates the idea of social bonds and norms that facilitates a sustainable livelihood, eliminating dilemmas that arise in a community through collective action (Halimatussadiah, 2013; Pretty, 2003). It accelerates cooperation in the community through important aspects, such as trust, communication, reciprocity, common rules, norms and sanctions and connectedness (Halimatussadiah, 2013; Pretty, 2003; Wiesinger, 2007). Through social capital, a sustainable livelihood is possible as the community develops to improve their social and physical situation with all residents' interests addressed. Thus, rather than being passive, community is at the centre of decision making, making them in charge of their situation instead of only reacting to it (Grewe, 2003).

The core of social capital lies in trust between social actors (Pretty, 2003). The presence of trust will indirectly reduce the transaction cost as there is little need to monitor others. Trust calls for a social obligation to reciprocate whether in the form of specific or diffuse reciprocity that will generate a long-term obligation, which has a positive impact on the community. It is normal for co-proprietors to be related as siblings or family members for instance since unpartitioned, fragmented land (anticommons) is mostly inherited; hence, social capital becomes particularly crucial in this context. The presence of trust in this context giving lower transaction costs could expedite and facilitate the process of land partition and thus development, which leads to higher property value. With strong social capital, common interests can be established among co-proprietors, creating homogeneity in terms of objectives and vision in the community that consequently helps achieve a unanimous decision concerning land partition.

The above arguments strengthen the notion that social capital is an ideal solution to land partition problems involving fragmented co-ownerships (anticommons). Rather than imposing rules and regulations and taxes from external authorities, social capital is a self-enforcing method that provides better long-term improvement. Having the opportunity to create their collective rules and incentives (motivations) and establish sanctions, these co-proprietors can solve land partition problems of their own accord more effectively (see Takahashi et al., 2021).

3.4.2.4 Tax Imposition

To curb land underutilisation, many countries including Washington D.C of the United States, the Philippines, and some Latin American countries, have policies and indirect interventions in the forms of taxation that are under government regulations. Governments would impose a tax on underused or underinvested agricultural lands (FAO, 1986)(whether they are associated with the anticommons tragedy). Such imposition of a high tax is necessary and can be further explored as it could act as a warning/penalty to co-proprietors to discourage the holding of idle anticommons property (see FAO, 1986; Bird and Slack, 2002). As a consequence, tax imposition on anticommons property may promote cooperation behaviours among co-proprietors, thus addressing ToA. Meaning that, to avoid the levy or tax imposed on disused land, (i) co-proprietors may collectively agree to partition the land to have a separate title, i.e. see Figure 1 that private property is better in incentivising land dealing and development) (Sulong & Taha, 2016); (ii) en bloc or collective sales to the same entity (i.e., developer for high-value development) can be a likely option, as well as (iii) collective action among communities, although challenging, to maintain the fragmented anticommons property should be promoted.

4. Conclusion and Recommendations

The Tragedy of the Anticommons (ToA) by Michael Heller has highlighted a gap that exists in the property ownership spectrum. Its application in dealing with land ownership has been widely recognised by numerous scholars but remains limited in the agricultural land partition setting. Therefore, the objectives of this paper are to (i) conceptualise the ToA theory in the agricultural land partition context that involves multiple fragmented co-proprietorship with undivided shares and (ii) suggest legal and non-legal approaches that could help address this tragedy. Through the lens of ToA, where 9 Malaysian case laws were reviewed, the paper affirms (simultaneous) anticommons issues involving agricultural land partition (see Parisi, 2004). Underused or idle land (or ToA) is likely to occur if such anticommons partition is not undertaken. Based on the findings, key factors contributing to unsuccessful agricultural anticommons partition, essentially due to disagreement among co-proprietors, and consequently ToA are as follows: (i) unequal (unfair) proportion or shares of land; (ii) uneven geographical partition and spatial distribution of government reserves; and (iii) potential damages and negative effects (e.g., loss of income and property). To remedy ToA, while legal mechanisms cover statutory enforcement of the NLC 1965 (via land forfeiture and reversion), the LAA 1960 on compulsory land acquisition, and judicial decisions (e.g., land partitions may take place if it is fairly distributed and made by the majority shareholders), non-legal approaches suggested are negotiation and arbitration; en-bloc sale and/or partition; collective action through social capital; and imposition of a tax, as a penalty, on underutilised land.

The contribution of this study is twofold: (i) theoretically and conceptually, the study employed the theory of ToA in demystifying land partition and ownership issues occurring in Malaysia through an empirical case laws review where factors leading to unpartitioned land and potential implications are discussed; and (ii) the study suggests the importance of understanding ToA and its effects in the land partition context as well as offering insights to policymakers on possible legal and non-legal solutions that could help remedy ToA and its negative externalities that are caused by unpartitioned anticommons. This is crucial to ensure such agricultural land (anticommons) is optimally and efficiently used and managed to achieve its highest and best use, therefore contributing to the Sustainable Development Goal (SDG) 11 on sustainable cities and communities in Malaysia. Despite the above contributions, as this study was carried out solely based on literature review and analysis of secondary data such as case laws, research articles, and statutes, future empirical research could consider including stakeholders' (e.g., land officers, town planners and affected landowners) inputs via questionnaire survey and interviews supported with official documents and site observations (i.e., agricultural anticommons conditions) to further validate and expand the above findings.

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Local Community Knowledge for Flood Resilience: A Case Study from East Coast Malaysia

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ABSTRACT

Malaysia as a tropical climate country is vulnerable to dreadful climate change events; particularly floods. These frequent occurrences of floods severely affect one or other parts of the country. In reducing disaster risk and strengthening local initiatives towards climate adaptation, vulnerable communities particularly in rural areas have developed valuable local knowledge for flood resilience. This local knowledge is continuously practiced in facing disasters and it is passed down to the next generations. This study aims to examine measures taken by communities based on local knowledge they possessed from the three stages of disaster management cycle namely, before, during and after disaster. Local knowledge as asserted by scholars could complement scientific knowledge and build a comprehensive disaster risk reduction approach for local context implementation. A mixed method approach was adopted; case study method and household survey involving 90 respondents for quantitative data collection and field observation for collecting qualitative data. Three case study areas in East Coast of Malaysia have been selected for further observation including; 1) Lubok Setol village in Kelantan state; 2) Teladas village in Terengganu state; and 3) Gajah Mati village in Pahang state. Findings from this study indicated that all study cases have developed and adopted local knowledge strategies for flood preparedness and responses including; 1) agriculture techniques and livestock trading; 2) stock piling of food and other necessities; 3) marking flood level as historical record; 4) floodproofing animal shelter; 5) constructing overhead storage cabinet and outdoor hut, and; 6) saving boats for emergencies. As a conclusion, it is proven that local community knowledge plays crucial roles in reducing disaster risks hence contributing towards building a resilient community.

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1. Introduction

Since the last few decades, the advancement of multi-hazards and risks has significantly changed the environment and its ecosystem. Since climate change events particularly floods, have affected many parts of the country; hampering the socioeconomic growth and undermining sustainable development of the nation, it become obvious for the government of Malaysia to play a more proactive role in translating global disaster risk reduction (DRR) strategies into national policy framework (Omar Chong and

Kamarudin, 2018). The continuous process of mainstreaming DRR into national and local policies and strategies is unarguably in line with UNISDR (2005) statement that calls for states and local authorities to collaborate with local communities for the systematic development and application of DRR policies and strategies to minimise vulnerabilities, hazards and the unfolding disaster impacts, hence to achieve a resilient community agenda. According to Omar Chong and Kamarudin (2018), it is common for any policies related to disaster risk management to be bestowed to relevant authorities including of army force or civil protection institution of a country. Under military chain of command, disaster is treated as an enemy in the battle field, which raises issues among scholars particularly on tendency for development of command and control (top-down), and challenge in building trust between policy makers and local community. As a result, communities which are the most impacted victims by natural hazard or the marginalised and economically unequal groups (Fastiggi et al., 2020) might become more disintegrated from the disaster risk reduction system. Furthermore, the marginalised local communities that pose specific knowledge suitable for resilience to disasters might find their local knowledge and practices to be neglected from overall DRR process (Cuaton and Su, 2020; Dennis et al., 2019). On another paper, Pelletier (2017) stressed that local knowledge is vital in DRR decision making and action coordination particularly at local level. This is regardless of local knowledge or scientific knowledge, or combination of both type of knowledge.

This study aims to identify the construct of local knowledge and practices related to DRR and the extent to which this knowledge has been integrated by respondents before, during and after disaster. Specifically, the study intended to link between adoption of local knowledge with local capacity building; science in DRR and resilience through disasters impact reduction whilst improving recovery period. Local knowledge has been described using various terms by different researchers. According to Lejano et al. (2013: 61), local and/or traditional knowledge is often described as knowledge which is 'passed on within a community as part of its cultural heritage', while, science is assumed to be a 'continuous testing, refutation or confirmation, and improvement of knowledge'. Other researchers such as Cuaton and Su (2020); and Hooli (2016) are using the term traditional knowledge or local people knowledge. Regardless of differences of the term they have been used, local knowledge implies to a set of knowledge owned and developed based on local people experience and learning from long term interaction with their surrounding environment. Since the meaning of local knowledge could cover a wider range of knowledge and discipline of studies, there were also some efforts for integrating local knowledge interpretation into the context of disaster-related research (Table 1).

Interestingly, generation of a word cloud using the definition of local knowledge offered by the scholars shows that the most frequently used word is 'through' (Figure 1). According to the Cambridge Dictionary, 'through' means from one end or side of something to the other, or beginning to the end of a period of time. For the purpose of this paper, 'something' should refer to a group of people inhabiting within the same geographical area. This is taking into account that natural disaster is disruption resulting from a physical agent; which is also termed as community (Cuaton and Su, 2020). 'Something' also refers to the understanding of a particular event in a particular area. In conclusion, local knowledge here is an understanding of flood gathered through experience, accumulating and snowballing through generations within a community. In a more recent study by Omar Chong (2020), adoption of local knowledge in DRR reflected the four stages of community resilience strategies; prevention, prediction, preparation and coping mechanisms. For instance, local people improved their building techniques and/or using floodproofing materials for construction as prevention measures. In some communities, their prediction on future flooding is based on observation of animal behaviour and environmental changes etc. Other than physical elements, local people are also using spiritual and religious, dream and ritual to guide their preparation for disaster. As for coping mechanisms, they make sure to provide safe storage for rice and other staples, trading livestocks for cash during emergency, etc.

Table 1 Local knowledge defined by scholars

Term	Field	Definition	Reference
Local indigenous knowledge	Disaster	Traditional knowledge is regarded as a sort of a collectively spoken and articulated narrative that is shared by everyone in a community	Cuaton and Su (2020)
Indigenous and local knowledge	Ecosystem services	The multi-faceted arrays of knowledge, know-how, practices and representations that guide societies in their innumerable interactions with their natural surroundings. A body of different types of knowledge and practices of societies accumulated through a continuous interaction with their natural surroundings.	Sin and Månsson (2017)
Indigenous knowledge	Disaster	Heterogeneous combination of different knowledge and it varies between different localities. It is also accumulated from the observation, experimentation, beliefs, behaviours, and the holistic worldviews of local people.	Hooli (2016)
Local and indigenous knowledge	Development practice	Understandings, skills and philosophies developed by societies with long histories of interaction with their natural surroundings	Hiwasaki *et al.* (2014)
Indigenous knowledge	Agriculture	Unique, traditional, local knowledge existing within and developed around the specific conditions of people indigenous to a particular geographic area.	Derbile (2013)

Term	Field	Definition	Reference
Indigenous knowledge	Disaster	A body of information passed down through generations in a given locality and acquired through the accumulation of experiences, relationships with the surrounding environment, and traditional community rituals, practices and institutions.	Kelman *et al.* (2012)

Figure 1 Review of literature on definition of local knowledge word cloud

1.1 Integration of Local Knowledge into the Building of Community Resilience

As mentioned by Fastiggi et al. (2020), local knowledge was given low priority for local/practical applications by community due to larger influence by scientific knowledge, hence restricting its full potential in DRR. In this light, strengthening of local knowledge adoption into DRR requires firstly, a clear understanding on the concept of resilience community, particularly on how the four stages of local knowledge on DRR (Omar Chong, 2020) can be mapped and synergised with the four stages of disaster management cycle (DMC); prevention/mitigation, preparedness, response and recovery (Chen and Quan, 2021). Many researchers in the field of resilience study explains the level of resilience with specific reference to capital/resources component (vertical axis) and time component (horizontal axis) (see Omar Chong, 2020; Akter and Mallick, 2013; Wilson, 2012 and others) (refer to Figure 2). The capital/resources axis represents community's economic, social and environment components. The notion of this model is that the more capital a community possess; the more resilient that said community will become in the event of a disaster (Wilson, 2012). These capitals can be developed through the process of mitigation and preparedness in disaster management cycle (Cuaton and Su, 2020). Meanwhile, the horizontal axis represents the time consumed by the community to get back to the original state or build back better prior to the disaster.

With reference to Figure 2, there are four (4) possible scenarios which can be assessed in relation to the concept of community resilience (Chen and Quan, 2021; Omar Chong, 2020) namely: (1) 'bounce back better' which refers to community's ability to absorb disturbances and improve most of its functions as compared to before the disaster; (2) 'bounce back' refers to community's ability in getting back and restore its original state and main functions similar to its condition before the disaster; (3) 'recover, but worse than before' means the community still shows some sign of disaster recovery but at a slower phase and with decreasing of local capacity to carry out the recovery tasks: and (4) 'collapse' indicates community's failure in managing the disaster risks including failure in post-disaster process and unable to restore community's basic functions needed for rebuilt of their livelihood. As defined by Hayashi (2017), damage is equal to the sum of hazard, exposure, and vulnerability (Figure 2). Damage that resulted from disaster could be reduced by implementing suitable prevention/mitigation and preparedness measures (in pre-disaster stage). The triangle shape marked in blue represents the ideal situation for disaster resilient progress where the vertical axis shows the implementation of prevention/mitigation measure to alter hazard and reduce vulnerability.

Meanwhile, the horizontal axis indicates any appropriate activities which carried out to speed up recovery process after disaster and to initiate community 'bounce back process' or in a more ideal situation, shall increase community's ability to bounce back better (Omar Chong et al., 2018). With reduction of hazard and vulnerability, and improvement of community's capacity building would increase the chances for community to be more resilient hence to reduce future disaster risk (Chen and Quan, 2021; Omar Chong et al., 2018). The process for obtaining and cultivating the bounce back process also would require strategic adoption of

community resources including local knowledge in nurturing and building a resilience community.

This study aims to examine measures taken by communities based on local knowledge they possessed from the three stages of disaster management cycle namely, before, during and after disaster. This study has been carried out in three rural settlements in East Coast of Malaysia during 2016 to 2019.

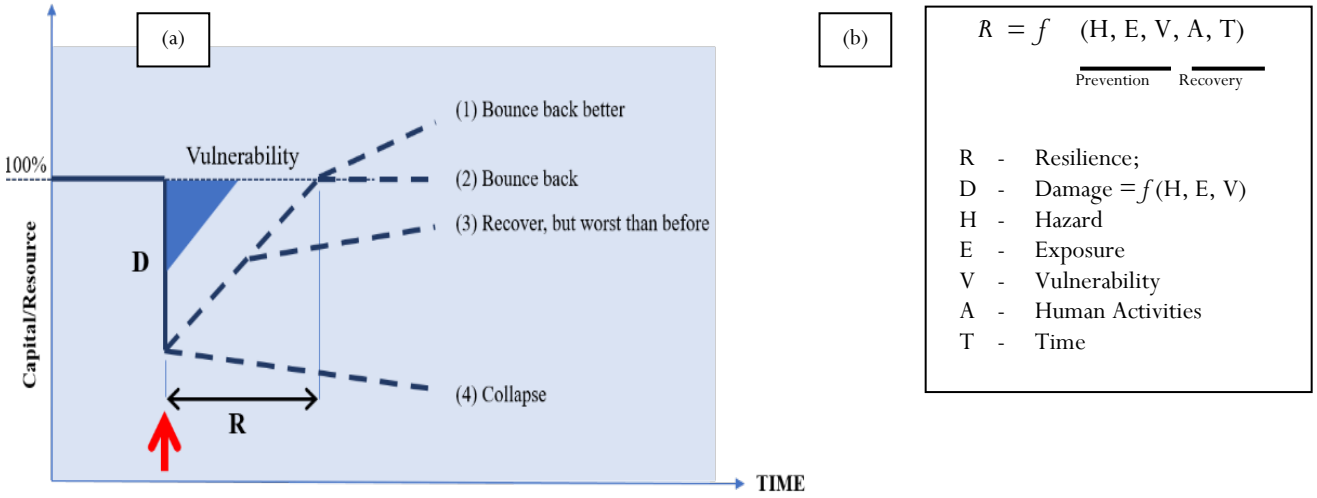


Figure 2 (a) Resilience towards disaster illustrated in lifeline (Chen and Quan, 2021; Omar Chong, 2020; Hayashi, 2017; Wilson, 2012; Akter and Mallick, 2013); (b) The resilience towards disaster as illustrated in Mathematical Model (Hayashi, 2017)

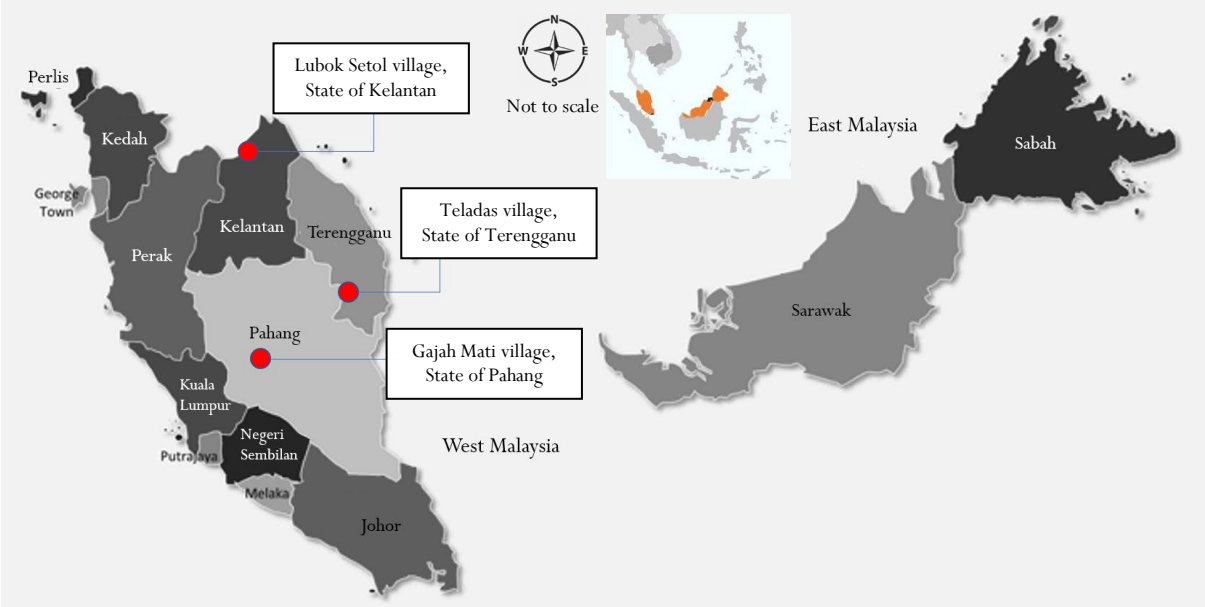
2. Methodology

2.1 Description of Study Area

According to the National Rural Physical Planning Policy 2030 (NRPPP 2030) (PLANMalaysia, 2016) report, the east coast region of Malaysia has the highest number of disaster risk villages. Based on similar report, Kelantan is the leading state with the highest number of 1,472 disaster risk villages, followed by Pahang (1,434 villages) and Terengganu (1,319 villages). Cross examines of data from the Social and Welfare Department, SWD (Malaysia Social and Welfare Department, 2015), indicated flood as the most common disaster which dominantly impacting people as compared to other types of disaster particularly in East-Coast region. Using latest information from NRPPP report and SWD, then it would be more appropriate for the study to focus only on flood risk villages in the East-Coast region of Malaysia. Selection of suitable study cases shall be based on the following five criteria, namely:

a) The case must be the traditional village(s) with disaster risk as identified by NRPPP 2030 report (C1);
b) Village(s) located in East Coast region which frequently experienced disaster occurrences based on record provided by the Malaysia Social and Welfare Department (JKM) (C2);
c) Village(s) with own disaster response team established under Village Development and Security Committee (JKKK) (C3);
d) Village(s) which has Standard Operating Procedure (SOP) for disaster response endorsed by Disaster Management agencies (C4); and
e) Village(s) that participated in Community Based Disaster Risk Management (CBDRM) Program conducted by MERCY Malaysia (C5).

A total of three villages with flood disaster risks have been identified as the most suitable candidates for further study. These villages are; 1) Kampung Lubok Setol in the State of Kelantan; 2) Kampung Teladas in the State of Terengganu; and 3) Kampung Gajah Mati in the State of Pahang (Figure 3).



State	Village	Comments of Assessment Criteria				
		C1	C2	C3	C4	C5
Kelantan	Lubok Setol	Listed as traditional village with disaster risk	Experienced most frequent flood occurrence in Pasir Mas	Have established disaster response team sub-committee	Coordination meeting lead by evacuation center manager (JKM officer)	Not available
Tereng-ganu	Teladas	Listed as traditional village with disaster risk	Experienced most frequent flood occurrence in Kemaman	Have established disaster response team sub-committee	With SOP acknowledge by NADMA	Not available
Pahang	Gajah Mati	Listed as traditional village with disaster risk	Experienced most frequent flood occurrence in Temerloh	Have established disaster response team sub-committe	Coordination meeting lead by evacuation center manager (JKM officer)	Participated in CBDRM by MERCY

Figure 3 Location and distribution of selected case study areas based on selection criteria (C1-C5)

2.2 Data Collection

This study utilises a mixed method for data collection including household survey using questionnaire (quantitative approach), followed by several qualitative approaches including partial-participatory observation, interviews with key informants, photograph and content analysis (reviews of relevant documents and reports related to topics researched). 'Partial-participatory observation' is an operational term which derived from the original term 'field observation'. Due to time and financial constraints, as well as the long distance/location to commute to each study area, forcing researchers to conduct structured field observation within the limited period of time (i.e. partially observed the community's daily activities and DRR-related practices) (Saunders and Luck, 2014; Kamarudin, 2013). This approach seems more appropriate under current limitations and the data gathered from the field study will be combined with inputs from questionnaire survey and review of relevant documents for analysis of findings. Kamarudin (2013) has applied the participant observation technique to verify and cross reference with data collected through questionnaire interview. For instance, during the pilot study, the local community was given a set of questionnaires about their knowledge and experience during flood including the severity of flood occurrences, highest flood water level they have experiences over few years and strategies undertaken to reduce losses or damages from the flood.

It was noted that many respondents have recorded flood water level on the wall or pillars of their houses. In order to record these observations, researchers are using photographs to capture and store images for further analysis. Other than taking photos, informal interviews with key informants including the village heads and house owners in the study areas have been conducted to gather detail and/or in-depth information regarding local knowledge and practices related to DRR. Documentary resources or known as the secondary resources are also important source of data. According to Deschilder-Omoro (2013), documentary sources include book, journal, governmental report, village profile report, thesis and publications by agencies. Deschilder-Omoro (2013) asserted that documents are able to provide guideline and information to assist researcher in cross-checking information from other source of field data. In this context, researcher shall review various documents to extract relevant information relating to historical background of floods in east coast region. Previous studies done are also reviewed in order to understand the disaster risk and formulation of actions for resilient rural society.

3. Results and Discussions

3.1 Background of Respondents

A total of 90 respondents from the Malay race group had participated in the survey using questionnaire-guided interview. Distribution of sample size of all three study cases is shown in Table 2.

Table 2 Distribution of sample size (by village)

Village	Number of families	Each village (%)	Sample size *(n=90)*
Lubok Setol	131	40	37
Teladas	121	37	32
Gajah Mati	70	23	21
Total	322	100	90

As illustrated in Table 3, in terms of respondents' types of employment, a majority of respondents in Lubok Setol are (30%) currently working in agricultural-related sectors as rubber tappers or as land owner rubber plantations. Employment as manual workers was ranked in second place (19%), followed by working in government sectors (14%), businessman/entrepreneur and retiree (8% respectively), followed by unemployed and housewife (3% respectively) and others (15%). For Teladas, majority of respondents are currently working as self-employed person to carry out local and odd-jobs or wage earner (transportation driver, shop assistant, and babysitter) (35%). In the second rank is manual workers (22%), agricultural-related (16%), businessman/ entrepreneur (9%), government and housewife (6% respectively), unemployed and retiree (3% respectively). In Gajah Mati, majority of respondents are retiree (33%) followed by workers in agricultural-related sectors (24%). In terms of age structure, majority of respondent from all three villages are above 50 years old with Lubok Setol (62%), followed by Teladas (59%) and Gajah Mati (57%). According to a study conducted by Hooli (2016), community with many older respondents could provide more inputs due to the notion they have been living and interacting within their community for a long period and therefore might possess vast amount of local knowledge. In this light, this study assumes older respondents within these three communities would possess unique local knowledge in relation to DRR.

Table 3 Profile of respondents (n=90)

No.	Information	Answers	Study areas					
			Lubok Setol		Teladas		Gajah Mati	
			Frequency	%	Frequency	%	Frequency	%
1	Ethnic group	Malay	37	100.0	32	100.0	21	100.0
2	Types of occupation	Unemployed	1	2.7	1	3.1	0	0.0
		Retiree	3	8.1	1	3.1	7	33.3
		Businessman/entrepreneur	3	8.1	3	9.4	2	9.5
		Professional	2	5.4	0	0	2	9.5
		Government	5	13.5	2	6.3	1	4.8
		Housewife	1	2.7	2	6.3	0	0.0
		Manual worker	7	18.9	7	21.9	2	9.5
		Agriculture-related	11	29.7	5	15.6	5	23.8
		Others	4	10.8	11	34.4	2	9.5
		Total	37	100.0	32	100.0	21	100.0
3	Religion	Islam	37	100	32	100	21	100
4	Age category	<30 years	2	5.4	4	12.5	4	19.0
		31-34 years	3	8.1	2	6.3	0	0.0
		35-39 years	3	8.1	2	6.3	1	4.8
		40-44 years	4	10.8	5	15.6	2	9.5
		45-49 years	2	5.4	0	0.0	2	9.5
		50-54 years	6	16.2	3	9.4	2	9.5
		55-59 years	7	18.9	4	12.5	3	14.3
		60-64 years	5	13.5	1	3.1	5	23.8
		>65 years	5	13.5	11	34.4	2	9.5
		Total	37	100.0	32	100.0	21	100.0
5	Marital status	Single	2	5.4	3	9.4	3	14.3
		Married	32	86.5	29	90.6	17	81.0
		Others	3	8.1	0	0.0	1	4.8
		Total	37	100.0	32	100.0	21	100.0
6	Level of Education (highest education	No formal education	4	10.8	4	12.5	1	4.8
		Primary school	11	29.7	12	37.5	1	4.8

No.	Information	Answers	Study areas					
			Lubok Setol		Teladas		Gajah Mati	
			Frequency	%	Frequency	%	Frequency	%
	received)	Secondary school	15	40.5	15	46.9	17	81.0
		Certificate/Diploma	5	13.5	1	3.1	1	4.8
		Degree an above	2	5.4	0	0.0	1	4.8
		Total	37	100.0	32	100.0	21	100.0
7	Monthly household income (in US Dollars)	Below 200	19	51.4	15	46.9	3	14.3
		201-250	5	13.5	7	21.9	4	19.0
		251-750	12	32.4	9	28.1	13	61.9
		751-1250	1	2.7	1	3.1	1	4.8
		1251-1750	0	0.0	0	0.0	0	0.0
		>1751	0	0.0	0	0.0	0	0.0
		Total	37	100.0	32	100.0	21.0	100.0

In terms of level of education, majority of respondents from all three villages received up until the secondary education. However, there are few respondents from Lubok Setol village (19%) which received up until tertiary education. It is also worth to highlight the relationship between level of education and respondents' types of job in study areas because majority of them did not participate in professional work; i.e. many are working in agriculture-related sectors, operating local business and other works which might not require higher academic qualification. This situation is also reflected in the assessment of household income whereby majority of them are living below the poverty line (<USD200/month).

3.2 Background of Floods in the Study Areas

3.2.1 Lubok Setol village, Kelantan

Lubok Setol village is located in the district of Rantau Panjang, Jajahan of Pasir Mas, Kelantan, about 8 km from the nearest town (Rantau Panjang) and 30 km from the town of Pasir Mas (Figure 3). The village is stated in National Rural Physical Planning Policy 2030 report as one of the disaster-risk villages (PLANMalaysia, 2016). The village is administered by the Neighborhood Watch (Rukun Tetangga) under the Department of National Unity and Integration. Kampung Lubok Setol was established as a linear village along the road within an area of 576 hectares.

The village is located adjacent to Sungai Golok (the Golok River) (national boundary for Thailand and Malaysia), which is considered the main contributor to the flood in the monsoon season. During the field study, information from local leader on flood inundated areas were transferred into base map. Almost 93.00% of Kampung Lubok Setol was inundated during ordinary floods, and the portion of the inundated area can reach as high as 97.38% during severe flooding e.g. major flood in 2014. During ordinary floods, the areas safe from flood are Kasban Road, the main road, the police station, and the evacuation centre. Whereas during a severe flood, only the evacuation centre and the police station were inundated.

3.2.2 Teladas village, Terengganu

Teladas village is located in Mukim Tebak, Kemaman District, State of Terengganu. The village is about 28km from the town of Kemaman, 150km from Kuala Terengganu. The village has been identified in the NRPPP 2030 as one of the disaster-risk villages (PLANMalaysia, 2016). Administered by the Village Development and Security Committee (MPKK) of Kampung Teladas, the village has a population of 774 people (121 households), all of whom are Malays (100%). From the field observation of physical element, it was noted that Kampung Teladas is characterised by scattered dwellings stretched in an area of 762 hectares.

The village is located adjacent to the Kemaman River, which is considered the main contributor to the flood in the monsoon season. Based on the interview with key informants during the field study, only 0.11 % (9.24 hectares) of the areas were inundated at two different areas within the village: one is the area close to the river and bridge which connects Kampung Teladas with Air Putih village, and another is at the centre of the village. Both areas were inundated due to the low elevation of the lands. During the severe flood in 2013, 96% of Kampung Teladas was inundated, including the evacuation centre and the surau, leaving only a small area spared from flooding.

After the flood event in 2013, the existing standard operating procedure (SOP) for flood management has been improved with the support from Kemaman's member of parliament, YB Datuk Sri Ahmad Sabery Chik. The improvements include (1) completion of the inventory of village population for immediate registration at the evacuation center in the flood event, (2) development of Flood Management System (SPB) software developed for flood management in Kemaman only, and (3) forming the evacuation center committee. The SOP had been awarded the Gold Medal for the best SOP in 2014.

3.2.3 Gajah Mati village, Pahang

Kampung Gajah Mati is located in Mukim Mentakab, Temerloh District, in the state of Pahang, approximately 125 km away from Kuantan, the capital state of Pahang. The population of

Kampung Gajah Mati in 2017 was 554 people (75 households). However, no information was obtained regarding the land size of the village due to an incomplete village profile. Kampung Gajah Mati is a link village (or Kampung Rangkaian) currently administered by MPKK Sungai Buloh (as a main/core village). MPKK Sungai Buloh is responsible for managing seven other villages, namely Lubuk Kechemas, Batu Hampar, Sungai Buloh, Batu Kapur Sekolah, Sungai Buloh Seberang, Bukit Netas, and Bukit Intan.

Among these villages, Kampung Gajah Mati was identified as a traditional village with a disaster risk, as stated in the NRPPP 2030 Report. Kampung Gajah Mati experienced series of major floods including in 2013 whereby almost 72.7% of the village area was inundated, and the most severe flood occurred in 2016 when 460 victims were forced to leave their homes and transferred to an evacuation center. Few residents were also left stranded at their houses due to logistic issues. According to the JKM officer, Kampung Gajah Mati is severely impacted by annual flood. The exposure to high intensity of disaster could have become one of the main criteria for the village community being selected for the disaster relief programs organized by MERCY (such as training for disaster preparedness, health and medication, logistic equipment/boat and etc.).

3.3 The Impacts of Floods to Community

According to the results from household survey, majority of respondents (approximately 87%) from all three villages indicated a high vulnerability to flood. Respondents in Teladas is the most vulnerable to annual floods with 97% mentioned they have suffered several losses, followed by Lubok Setol (84%) and Gajah Mati (76%). A total of 87% of respondents also agreed the annual floods that occurred during monsoon season (November to February) have affected their livelihoods including damaging properties and disturbance of local jobs and loss of income particularly among farmers and rubber tappers. Field observations have been carried out to assess physical quality of each village. The result indicated that components of property owned by community that were seriously damaged by floods included houses with wooden structure and soil erosion involving agriculture land adjacent to the main river. Since most of the respondents experienced work and income disruptions for almost three months prior to the flood, they faced financial burden after flood since more money was needed to reconstruct damaged houses and slope maintenance works, with addition to the daily living costs (Figure 4).

Figure 4 Physical damages caused by flooding. (Photo, from left) wooden house structure damage by flood, debris in the river and main road in the village was covered by thick mud after flood receded

3.4 Disaster Risk Reduction

Table 4 indicates more than 81% of respondents have been living for more than 20 years in their villages. Based on the interview, many of them were born in the village and it is also common for some of them to inherit properties from their parents including house, farm land, local businesses, etc. As mentioned by the literature review, local knowledge is an accumulation of knowledge and practices by local community prior to the long engagement and/or interaction with nature and surrounding environments (Cuaton and Su, 2020). This knowledge has been tested and modified through various trial-and-error processes over the years. With advancement of disasters and introduction of modern mitigation approach to DRR, local community still rely on local knowledge to enable them in managing disasters together with assistance from agencies. Having said that, local knowledge is often not applicable to immigrant groups; as these groups are lacking in experience of managing local disasters as well as they lack of integration with the local community for information sharing (McAdoo et al., 2009).

Table 4 Information related to respondents' length of stay in the village (n=90)

No.	Information	Answer	Study Area					
			Lubok Setol		Teladas		Gajah Mati	
			Frequency	%	Frequency	%	Frequency	%
1	Length of stay in the village	<2 years	3	8.1	1	3.1	1	4.8
		2-5 years	4	10.8	2	6.3	0	0.0
		6-10 years	0	0.0	1	3.1	0	0.0
		11-15 years	2	5.4	1	3.1	0	0.0
		16-20 years	0	0.0	0	0.0	2	9.8
		>21 years	20	75.7	27	84.4	18	85.7
		Total	37	100.0	32	100.0	21	100.0

Based on the survey, almost all respondents (99%) did mention they have direct experience in local disasters. Only one respondent that also a housewife (age 30 years old) from Teladas village mentioned she did not experience the flood because she got married in 2017 (field work was carried out in 2018) and moved into the village after the flood occurred. Table 5 (based on research fieldwork in 2018) presents the results from assessment of respondents' awareness and preparedness towards floods in case study areas using mean value and standard deviation analysis. A total of eleven questions or statements using Likert Scale of 1 to 5 were constructed. The value of 1 denoted 'strongly disagree' and value of 5 denoted 'strongly agree'. Results with mean value of 4.0 and above will indicate high level of awareness and preparedness among respondents.

Table 5 Assessment of respondents' awareness and preparedness towards flood in case study areas (n=90)

No.	Statement	Minimum	Maximum	Mean	S.D.
1	I am able to predict flood occurrences (using local knowledge)	2	5	4.48	0.796
2	I am fully aware that flood occurrences cannot be avoided	3	5	4.83	0.404
3	My house was built to withstand flood	2	5	4.29	0.753
4	I have prepared an emergency bag	1	5	4.31	1.056
5	I know the location of evacuation centres	3	5	4.67	0.519
6	I am aware that sharing of experience about DRM is essential	3	5	4.51	0.623
7	I think humanitarian aids provided by government is sufficient	2	5	3.92	0.851
8	I think government will assist in recovery process	1	5	3.41	0.911
9	I know which agency to refer for assistance during disaster	1	5	3.96	0.833
10	I think my community still rely on government and NGO assistance in facing floods	1	5	3.41	1.048
11	I am aware the importance of practicing DRR among member of community	2	5	3.96	0.616

The above table indicates utilisation of local knowledge in flood prediction among respondents remains high with mean value of 4.48 (i.e. from agreed to highly agreed). Based on interviews, many respondents are using local knowledge to alert them about the flood water level from nearby river (by marking the water level at the pillar in their houses). Marking of water level will enable the community to decide for evacuation strategies later on. Having local knowledge in flood early warning is helpful, however, many of respondents also agreed flood occurrences are unavoidable (mean value = 4.83) and therefore, they have to accept any consequences living in flood-prone areas. Many respondents also agreed their houses were constructed using appropriate building materials to withstand flooding (mean value = 4.29).

Majority of respondents also mentioned they prepared an emergency bag where they put important documents, flashlight, medicine, water and food supply in small quantity (mean value = 4.31). The respondents are also aware of the location of nearby evacuation shelter (mean value = 4.67). In terms of knowledge and experience sharing, the respondents agree that experience sharing is important (mean value = 4.51). The remaining five questions with moderate consensus (i.e. mean value <4.0 and above 3.0) among respondents included "sufficient humanitarian aids by government" (3.92), "government will assist in recovery process" (3.41); "aware of agencies to be contacted for assistance" (3.96), "rely on government and NGO in facing floods" (3.41), and "aware of the importance of practicing DRR among community members" (3.96).

3.5 Adoption of local knowledge for flood preparedness and response

3.5.1 Agricultural Techniques and Livestock Trading

Occurrences of flood in all case study areas as discussed in previous section has impacted the wellbeing of respondents since many of them are actively engaged in agricultural-related activities; as rubber tappers they need to halt their work at the plantation during monsoon season (normally for more than three months). Usually, local community will spend all their annual savings during the monsoon season to buy food and other necessities. For those whose livelihood is damaged by flood, selling assets (including jewelries and livestock) is a normal solution to raise fund for reconstruction and damage repair. This is also the reason for local community to safeguard their livestock (cows or goats) during flood by keeping it in higher shelter.

3.5.2 Stock Piling of Food and Other Necessities (Clean Water, Construction Materials, etc.)

Based on series of interviews with local leaders from three villages, it is a common practice for local people to create stock pile of food and materials supplies as preparation for flood. According to Omar Chong (2020), stock piling of food and materials also termed as "stock up on provision" and become a normal practice by other communities in flood-prone areas in Malaysia. Safeguarding other necessities including clean water however, becomes a huge issue for respondents in Lubok Setol since they are largely dependent on local wells as the main source of water (Figure 5). This is because supply of water by state water agency often disrupted during flooding due to low water pressure. Local community has voiced out their concern

with water contamination issue (water in wells mixing with flood water) after flood receded as this might result in the spread of water-related diseases. In this light, local community needs to stock up clean water for the usage during flood together with sufficient food supply for some period of time. Currently, among strategies to store clean water is to purchase packed reverse osmosis water from local shops. During field study in 2018, it can be observed that many respondents have purchased few bottles of RO water in jumbo size of 10 liters as early preparation. Respondents also raise the barricade surrounding their well to prevent flood water penetration. On top of the well, respondents constructed a high platform to place a water pump. After flood receded, the officers from District Health Department will conduct water treatment process to ensure local communities received clean and safe water for everyday consumption.

Figure 5 (from left) Water supply from local well is an important source for clean water among residents in Lubok Setol village; (right) Local community stock up "RO water" (reverse osmosis water) that they purchased from local shops for their usage during flood season

3.5.3 Marking of Flood Water Level and Construct Higher House Elevation (Raising the Floor Level)

After the devastating tsunami strike in 2004, a research team for Japan has initiated DRR practices suitable for local community i.e. through construction of higher poles and, marking of water level during tsunami (as documentation). This knowledge transfer approach had begun since 1854 in Japan called "height pole" (Sugimoto et al., 2010).

Figure 6 (from left) Marking flood water level on the house pillar; Local leader standing beside house pillar with marking of flood water level showing the highest water level is above his head; Marking of water level on the wall beside staircases

Interestingly, in Lubok Setol, marking of flood level (for documentation of each flood event and to share their story with future generations) served as a physical record and it has been initiated by local communities (similar to Japanese approach). The oldest record on flood water level in Lubok Setol is dated back to 6th Jan 1967 (Figure 6). Based on field observation, every respondent marked the annual flood level at different places in their house such as on the wall, house pillar, main entrance staircase and staircase to kitchen area. During the visit, the head of the village pointed one flood height pole that measured water level of 2014 major flood that went above his head i.e. approximately 1.6-meter height. Based on the interview, the height pole became a vital indicator as to guide every owner of the house (many of respondents inherit house from their late parents) that wanted to renovate or extending their houses (Figure 7).

Figure 7 (from left) Valuable asset store in the new; (right) House elevation is raised to a new level to surpass the highest flood water level recorded over the years

Materials for housing construction as observed during the fieldwork also gradually changed from traditional timber and wooden houses to the use of mix building materials i.e. concrete and timber and entirely concrete. There is a strong perception among respondents that concrete building is stronger and may provide better protection during flood. Using concrete materials also could reduce structure vibration caused by strong water current hence will reduce missing sections. This is because previous construction using timber/woods often missing or severely damaged by the floods. Changes in construction materials also mentioned in research carried out by Chan and Khan and Ahmad (2017) using the term 'permanent flood proof building'. This measure also adopted by local communities in all three cases through integration of local knowledge. The owners will urge the constructor/builder to increase or raise the height of the new section to be above the highest marking of flood water level. Using this marking system also helps residents to arrange home furnishings and install higher storage cabinet sets.

3.5.4 Constructing Higher Structure for Animal Shelter

Buildings for livestock or animal shelters in all three villages also have been constructed at higher elevation to provide better protection for animals during flood. Keeping their livestock safe is important to local residents considering the potential income to be generated from selling of animals that could be used to fund reconstruction process after the flood. Evacuation of livestock is considered a costly process hence it is more

sustainable solution to construct higher structure for animal shelters.

3.5.5 Placing valuable items/goods on a higher overhead storage cabinet

Research field work recorded that every house in all three villages has installed the overhead cabinet functioned for additional storage spaces. The main purpose of constructing an overhead storage cabinet is to place valuable items including furniture, electrical appliances, motorcycle and valuable assets away from the water line. Hooli (2016) in her study in Northern Namibia offered similar observation when local community in flood-prone areas often constructed overhead storage as a mean to protect their valuable items and goods from floods.

3.5.6 Keeping a Boat for Emergency Use and Mobility during Flood and Building Outdoor Hut for Extra Storage

Based on the field observation, local community in Gajah Mati obtained more storage space for their household items by constructing an outdoor hut. An outdoor hut is also a practical approach to secure valuable assets during the flood. Based on the interview, residents who are stranded during flood (i.e. their houses were spared from flood but somehow unable to reach local facilities because the road was submerged), they were survived even staying at their own house because of sufficient storage of food and other needed supplies in huts and overhead storage cabinet. It is also a common sight to see residents store boats under the huts for emergency and mobility during flood (to get food supply and other necessities). It is also a common sight to see residents store boats under the huts for emergency and mobility during flood (to get food supply and other necessities) (Table 8).

Figure 8 Keeping boat for emergency use and mobility during flood is a common sight at all three villages

As majority of members of the community are still living in poverty, there is a little doubt that living in flood prone areas makes the community to be more vulnerable and becoming less resilient to flood. Despite economic disadvantages, all three communities have managed to utilise their local knowledge and experience to reduce flood risk. As explained in section 3.5.1 to 3.5.6, the communities have also demonstrated strong will and ability to adapt to occurrences of flood and changing environment. Meanwhile, assessment of respondents' level of awareness and preparedness towards flood in case study areas as presented in Table 5 also provided crucial insights regarding high level of communities' utilisation of local knowledge in flood prediction. Results from interviews indicated many respondents are using local knowledge to alert them about the flood water level from nearby river (by marking the water level at the pillar in their houses). Marking of water level enables the community to decide for evacuation strategies in times of the flooding. Although majority of respondents are aware that flood is an inevitable event however, through utilisation of local knowledge that they gathered through long term engagement and learning from their surroundings, combined with modern approach (based on scientific knowledge) from training and awareness programs by agencies and NGOs, they can adapt to the changing environment while minimising negative impacts from flood to livelihood and surrounding environment. This situation has in turn enriched their awareness and preparedness about local flood phenomena by constructing appropriate DRR strategies.

This study finding was indeed in-line with previous studies on community-lead DRR by Fastiggi et al. (2020) and Cuaton and Su (2020) as discussed in subsection 1.1 of this article on the importance for integrating both strands (i.e. local knowledge and scientific knowledge). Figure 9 presents the overall findings of this paper that emphasis on combination of these two knowledge strands supported by elements of flood resilience practices from data analysis in section 3.4 and 3.5, as well as inputs from literature review in section 1.1. It is worth mentioned that in the case of the three communities, local knowledge is applicable for disaster prediction, prevention, preparation and coping purposes and also concurrent with existing DRR measures stipulated by scholars in both strands (see Omar Chong, 2020; Cuaton and Su, 2020 for details). Therefore, the best wisdom for flood mitigation and preparedness must require an integration of local knowledge application with scientific knowledge with reference to disaster management cycle prevention / mitigation, preparedness, response and recovery (see Omar Chong, 2020; Fastiggi et al., 2020 for detail discussions).

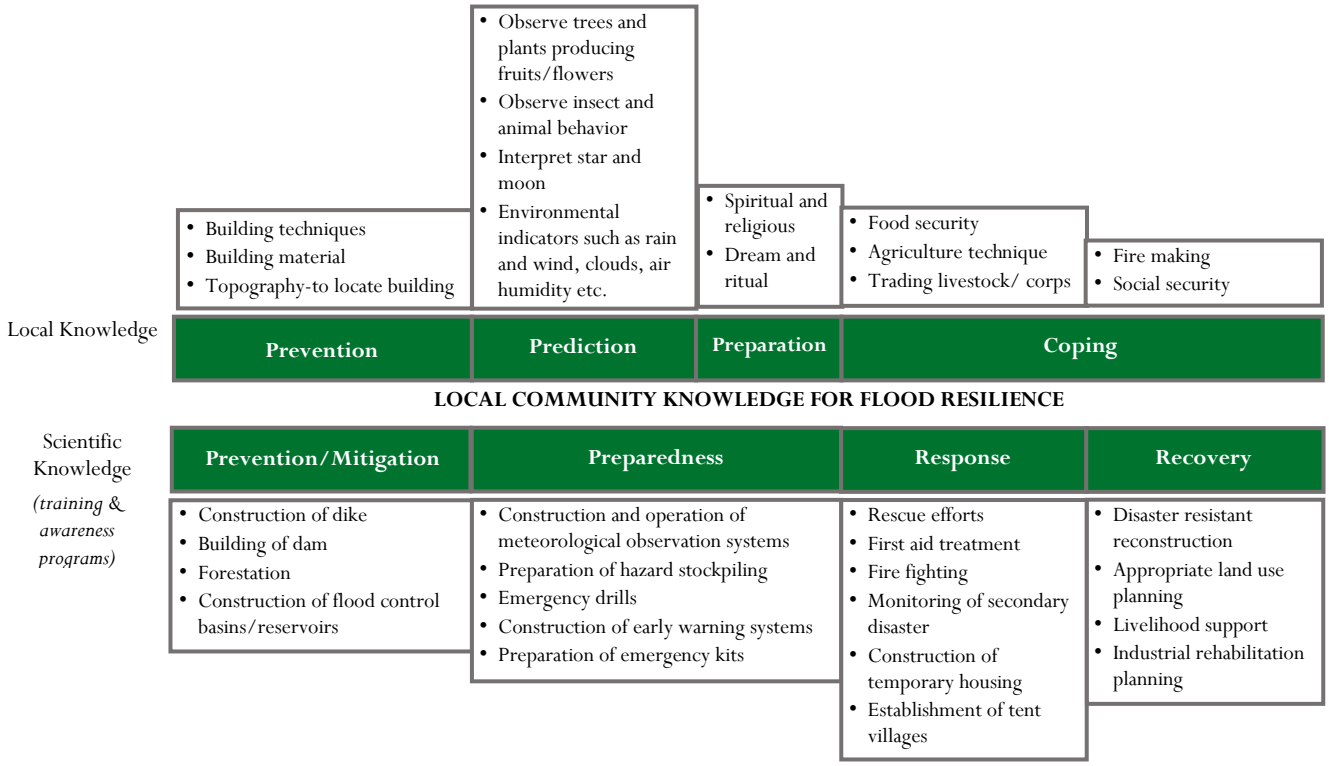


Figure 9 Integration of local knowledge and scientific knowledge in strengthening local community knowledge for flood resilience – combination of study findings and literature review

As shown in all three cases, implementation of local knowledge is more focused on flood prevention and coping with post-flood effects. Flood prevention strategies implemented as observed include; 1) improving building techniques and building materials (using concrete in construction); and coping strategies including 2) ensuring food security and sufficient emergency supplies; 3) improving agriculture/farming techniques; 4) safeguarding livestock for future trading after flood – fund for reconstruction works and; 5) strengthening social security/safety net by increasing household savings. Also, with clear evidence from the field visit and interview with key informants, it can be concluded damages to community livelihood that caused by flood could be reduced by implementing suitable prevention/mitigation and preparedness measures in all three villages. This finding is indeed in line with lifeline model as previously explained by Hayashi (2017) in Figure 2. The implementation of flood preparedness and response measures to alter hazard and reduce vulnerability to some extent, might put the three villages into the triangle shape (marked in blue in Figure 2) which represents the ideal situation for flood resilient progress. With reduction of hazard and vulnerability, and improvement of community's capacity building through disaster education and preparedness programs, would increase the chances for community to be more resilient hence to reduce future flood risk.

Integration of the knowledge is crucial to strengthen DRR practices both at local and agencies' level. In this case, the government agencies and/or local authorities are directly involved in policy making for DRR combined with local knowledge which are inherited, hold and developed by the communities from generations has proven to be a powerful tool for building local capacity and resilience to flooding. On the downside however, many of these measures are not well documented and disseminated for wider applications (although it is widely practices at community level); hence the government agencies and other external parties are unaware and do not take them (local knowledge practices) into consideration for flood management activities.

This study has provided an important first step for integrating local knowledge and scientific knowledge into DRR which later on can be pick up for further applications by relevant agencies and stakeholder. This is where the role of government agencies and non-governmental bodies are vital to assist local communities by providing long term prospects of utilising both local knowledge and scientific knowledge into DRR practices in the case study areas in the future. Integration of both local knowledge and scientific knowledge are essential for the communities to successfully adapt to any future flood occurrences.

4. Conclusion

The popularisation of the discourse on community resilience concept at the international and national levels including in the Sendai Framework for Disaster Risk Reduction (SFDRR) should be understood in the broader context of growing awareness on the long-term sustainability of people's livelihood especially those with direct exposure to disaster risks and limited capacity

to carry out effective climate adaptation measures. At national planning level, the agenda for strengthening a disaster-resilient community has been highlighted in two significant policy documents namely the National Physical Plan (NPP) 3 (2017–2040) and the National Rural Physical Planning Policy (NRPPP) 2030. Formulation of national level planning and policy indicated a strong political commitment from country's top management to translate SFDRR priority areas and Sustainable Development Goals (SDGs) into local context and application. These efforts bring forward the concept of resilient community as a new way for government and the community to address pertinent issue related climate change events particularly floods, which have affected many parts of the country; hampering the socioeconomic growth and undermining sustainable development of the nation. The continuous process of mainstreaming DRR into national and local policies and strategies has become more common practices by various agencies at federal, state and local level, and unarguably in line with UNISDR for empowering local community to achieve better preparedness to disasters. With a strong buy-in from government agencies, existing DRR strategies for building a resilient community tended to comply with top-down approach i.e. leading by government with expectation that local community will embrace the ready-made initiatives. This situation, to some extent, has undermining the value and contribution of local knowledge in building local resilience to disasters.

Review of literature indicated various labels have been introduced in explaining local knowledge including; peasant knowledge and/or folk knowledge, local and indigenous knowledge, traditional knowledge and/or local people knowledge. Regardless of differences of the terms, local knowledge generally implies to a set of knowledge owned and developed based on local people experience and learning from long term interaction with their surrounding environment. Local knowledge plays a vital part in resilient community concept as explained by Hayashi in the lifeline model, claiming that its underlying strengths are to promote local community's ability to bounce back better, reducing hazards and disaster risks, and enhance local capacity building for climate adaptation through DRR applications that suited local context. Assessment of community resilience performance and the role of local knowledge for flood resilience then carried out using case study of three rural communities in East Coast of Malaysia. East Coast region was selected due to regularity and severity of floods occurrences caused by torrential rain during annual monsoon season. Using a mix method, all relevant data were collected using household survey (questionnaire-guided interview) and field observation.

Findings from data analysis indicated that all communities under studied acquired local knowledge linked to DRR practices. Although the rate and speed for recovery after flood might be different for each village and very much determined by various socioeconomic factors, nevertheless, with continuous adoption of local knowledge and via training inputs from agencies, majority of respondents in all three villages become more aware on their changing environment and highly prepared to face the next flood should it occur. In conclusion, the case study analysis has put forward meaningful empirical evidence about the practical use and integration of local knowledge by rural communities in disaster management is indeed in line with previous studies by other scholars as described in the early section of this paper. It is noted that the measures for flood mitigation and preparation by local communities could be improved by utilising modern and advanced knowledge. However, it is important to ensure that these improved measures are locally appropriate for long term sustainability. It is proven that local community knowledge plays crucial roles in reducing disaster risks hence contributing towards building a resilient community.

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Sandy Beaches Changing in Line with Urbanization Visual Quality Values

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ABSTRACT

The coasts are the intersection area of land and sea ecosystems, where people are always interested and benefit from many activities. However, unplanned developments as a result of rapid population growth and migration in these regions are destroying the living environments necessary for all living things. Beaches are important coastal ecosystems. At the same time, it offers people many recreational opportunities such as entertainment and rest. They are the city's attractions. Increasing population, industrialization and urbanization endanger coastal ecosystems. Within the scope of this study, it was discussed how the landscape perception of the users changed with the construction of sandy beaches. It has been questioned which sandy beaches people prefer and why. The study was carried out in Trabzon, a coastal province located in the eastern Black Sea Region of Turkey. Turkey is a country that hosts different geomorphological units and has intense natural and human interaction. The most used beach in Trabzon has been researched. SPPS and AHP methods were used as statistical methods within the scope of the study. As a result of the study, it has been revealed that natural sandy beaches are more important in terms of biodiversity, in terms of visual quality. At the same time, it is seen that people want to go to all three alternatives at the same rate. This means that people prefer sandy beaches no matter what. At the same time, on the sandy beaches where urbanization is intense, the results and biodiversity are very low in terms of naturalness parameters.

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1. Introduction

An individual takes his characteristics of being an individual from his experience and knowledge throughout his life. These experiences and information obtained through visual perception play an important role in renewing the perceptions that make up it. Various illusions during these perceptions and the individual's collection of information from the environment suitable for their purposes are also included in the basic features of visual perception. Visual Perception is a phenomenon that varies according to the individual (Goler, 2009); It is expressed with concepts such as visuality, beauty, satisfaction, and aesthetics (Daniel, 2001; Kiper et al. 2017). For this reason, "visual perception" is included as a variable in many studies such as space use planning and resource management decision-making-strategy development and management stages (Clay and Daniel, 2000; Tüfekçioglu Kugu, 2008; Kiper, Korkut, Ustun Topal 2017, Çaglayan Kaptanoglu, 2008; Jahany et al 2012, Huang 2014, Acar et al 2018).

The visual impact of an area has a significant impact on the perception of its surroundings, good or bad, and whether users enjoy it or not. (Özgeris 2014). "Visibility" occurs with the emotional and logical expressions that the sum of the images formed in our eyes creates in the sensors (Elinc 2011). Visual landscape quality is a visual perception process that includes how the environment is perceived, interpreted and evaluated by humans. The phenomenon that occurs at the end of this process is called visual landscape quality. It is the joint product of landscape features, which consists of the interaction of the observer's perceptual and emotional psychological processes (Tugce, 2021). The important point about visual quality; determining the natural quality and making this planning process in connection with natural landscapes (Asur and Alphan 2018).

One of the most important parts of the planning and design process is visual perception. Visual perception is the result of concrete research in psychology, logic, and so on. This process encompasses a complex process. In this process, it is known that color, contrast and many similar perceptions play important roles in the processing of visual data. Visual perception begins when the eye receives incoming visual information in the form of light waves. (O'Connor, 2015).

Visual perception in a design is made by the designer. The designer should use this perception-orientation process consciously. In this process, necessary design formulas are used. In order to establish the correct construction of visual perception, it is necessary to use the basic rules and principles of design in place and to construct the perception correctly (Begum, 2021).

Visual landscape quality interacts with the perceptual and emotional psychological processes of the observer. How this effect of the environment on human behavior is perceived, how it is interpreted and how it is evaluated is defined as the "visual landscape quality" formed as a result of the visual perception process. Visual landscape quality can be defined as "the relative aesthetic perfection of a landscape" and can be measured through the appreciation of the observer (Daniel 2001; Kalın 2004; De La Fuente vd. 2006; Guneroglu 2017). Therefore, visual perception increases the "liking or acceptability" of a design or landscape.

In the visual perception process, individuals primarily acquire two-dimensional superficial information about the concept. In this detection, width and heights are perceived as priority. Then, a detailed perception process about the concept begins (Eristi vd. 2013, Yagmur, 2014). In this process, as the quality values of the landscape increase, it becomes easier for individuals to adopt the organization of that design. The harmony of dimensions, forms and positions provides individuals with many adjectives such as "beautiful design, original design and useful design.

Coasts affect people's quality of life closely (Guneroglu et al 2013; Dihkan et al. 2015; Bekci, 2021). Today, to reveal the quality of visual landscape units by evaluating; In the management of visual resources, it is required for preserving, repair, strengthening, concealment decision-making and development stages during space use planning and design studies (Asur, Alphan 2018). The purpose of visual landscape analysis is to determine the degree of sensitivity to possible changes by providing information about its current visual characteristics and situation. This information will guide the decision making and strategy development phases of land use planning and resource management studies (Çakcı 2007). "Visual landscape quality is the collective product of certain (visible) landscape features that interact with the perceptual and emotional psychological processes of the observer. He defines how this effect of the environment, which transforms into human behavior, is perceived, how it is interpreted and how it is evaluated, as the "visual landscape quality" formed as a result of the visual perception process. Visual landscape quality can also be defined as "the relative aesthetic perfection of a landscape" and can be measured through the appreciation of the observer." (Guneroglu et al 2016, Daniel 2001; Kalın 2004; Asur 2019; Özgeris and Karahan 2015; Gültürk and Sisman 2015, Güneroglu, 2017).

All over the world, sandy beaches are regions with special ecosystems (Guneroglu et al 2015, McLachlan and Brown 2006). They have both economic and tourist-attracting features. This means a larger user base than any other coastal ecosystem (Maguire et al. 2011; Schlacher and Thompson 2012). Sandy beaches harbor a rich and dense fauna and flora (McLachlan and Brown 2006; Harris et al. 2014). To summarize, designing sandy beaches is synonymous with "urbanization" (Felix et al 2016.

2. Research Aim

In line with increasing urbanization, many things in the city are differentiated and deteriorated. Coasts are seriously affected by this deterioration. Changing coastal uses and sandy beaches are changing both aesthetically and ecologically. Within the scope of this study, 3 sandy beaches in the same province were examined. On the basis of the study, it has been revealed how the sandy beaches, which have changed in line with urbanization, affect the visual quality values and usage preferences.

3. Material and Method

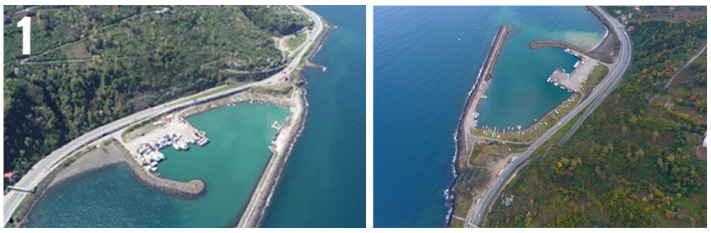
3.1. Material

We analyzed natural sandy beach, semiurbanized sandy beache and urbanized sandy beach: 3 in Turkey-Trabzon (Figure 1). All sandy beaches were located within the urban area, but they exhibited different levels of urbanization and some were more accessible than others. In total, 3 beach samples were examined.

Trabzon, which receives abundant rainfall, has a lush vegetation. Forests can be found up to an altitude of 2300 m. There are large tea gardens in the east of the province. 45% of the provincial lands are forests, 33% are cultivated-planted areas and the rest consists of meadows and pastures. The summers are cool and the winters are warm, and all seasons are rainy. As you reach the mountainous region to the south, the climate becomes

harsher. Precipitation, which is seen as rain on the coast, turns into snow in high places (URL-1). It is among the semi-urbanized beach group; Yoroz beach is 35 km from the city center and 31 km from the Surmene Camburnu plan. Sana beach, which is between the urbanized central beaches, is 10 km away.

A. Natural Beach



B. Semi-urbanized Beach (Yoroz Beach and Surmene Camburnu Beach)

C. Urbanized Central Beach (Yalıncak Beach)

Figure 1. Study area

3.1. Method

The method was carried out in 3 stages. These stages are; field and observation study, establishment of criteria and statistical method (SPSS and AHP). More than one method was used for the purpose of the study. In the first stage, the area constituting the material of the study was visited and an observation study was made. Aerial photographs of the studies were obtained. Statistical studies were first started with SPSS. Factor analysis and Anova test were performed in SPSS. Then the AHP method was used. AHP; It is a method that allows individuals or groups to make decisions in a complex situation. The survey study was carried out with 55 experts. The experts consist of the landscape architect, interior architect group. Drone images were obtained in order to bring the images to a standard view for the survey. It is presented to experts in the same standard view in all three alternatives (natural beach, urbanized beach, semi-urbanized beach). For the analysis, a hierarchy of criteria was created in the first stage. This is called decision modeling (Figure 2). Decision modeling was created by following the steps below (Saaty, 2010, Baby 2013; Srdjevic et al 2013; Leal 2020; Onur, Koc Altuntas 2022).

1. The main purpose of the decision-making process is determined
2. The purpose is written at the top of the modeling.
3. At the second level of the matrix, alternatives that meet the primary goal are identified.
4. Alternatives were formed in 3 groups; Natural Beach, Semi-urbanized Beach, Urbanized Central Beach.

5. At the third level of the matrix, 22 criteria are defined that define each criterion and alternative. Quality parameters have been prepared objectively by evaluating previous studies (Clay ve Smidt, 2004; Müderrisoğlu ve Eroğlu, 2006; Acar ve Sakıcı, 2008; Acar ve Güneroğlu, 2009, Güneroglu 2017).

After these steps were carried out and the matrix was created, another stage was started. This is the stage where expert opinions are included. The comparison of the criteria is done both among themselves and among all alternatives for which each criteria is determined (Dagdeviren and Eren, 2001). Thus, a transition to the decision stage is achieved in producing solutions. Shows the (weighted) comparison between these criteria. Consult experts (Figure.2.) for comparison between criteria.

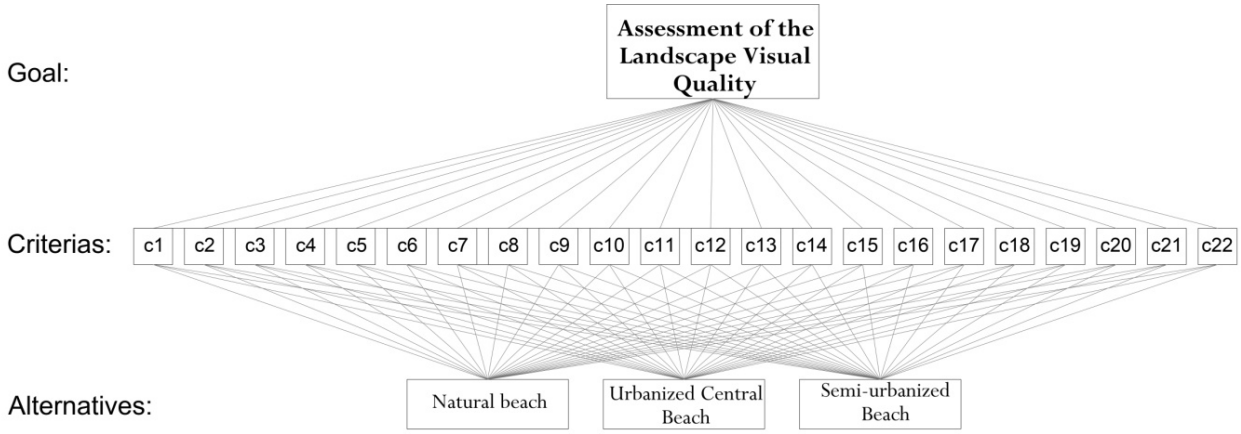


Figure.2: Hierarchy of spatial quality criteria for AHP proces

The final step in the AHP process is to calculate their relative weights for the criteria. The relative weights of the criteria with respect to each other were obtained. The importance or weight of each criterion is different, and therefore, firstly, a numerical scale developed by Saaty (2012) was used. This scale made it possible to establish the relative priority of each criterion over the others through pairwise comparisons. Consistency ratio was calculated to determine the consistency of pairwise comparisons. Since it was 0.10 and below as a result of the calculations, it was accepted that it showed sufficient consistency (Kuruüzüm and Atsan, 2001). As a result of the AHP, it was determined which criteria had more weight under which alternative and groups were formed.

3. Findings

3.1. Assessment of the Landscape Visual Quality via SPSS

First of all, Cronbach's alpha value was found to determine whether the criteria were reliable. Cronbach's alpha value was found to be 0.8. This value; It ranges from $.9 > x \geq .8$ on the Cronbach's alpha scale. Therefore, the reliability level of the criteria within the scope of the study is quite good. After determining that the criteria are reliable, in order to make the variables in the criteria a small number of significant and independent factors; "factor analysis" was carried out. “Analysis of variance (ANOVA)” was conducted to check whether there was a significant difference according to the “visual quality values of sandy beaches” criteria.

In the evaluation phase, in order to obtain the findings of the principal components analysis and criteria, 3 components were identified, which constitute approximately 95% of the total data variances, as a result of factor analysis to the data set containing 22 criteria. Factor loading and common variance values according to factor analysis results are given in Table 1.

As a result of the analysis, it was determined that the factor loads ranged from 0.998 to -.903. As a result of the analysis, it has been determined that the 1st factor load, which constitutes 68.650% of the total variance, has the parameters of "harmonious", "integrity", "privacy", "recreational", "protected". It was determined that the 2nd factor load, which constituted 21,523% of the total variances, was "rememberable", "beautiful", "authentic", "must be developed", "I want to go" parameters. As seen in this analysis, the 1st factor load has a higher load than the other factors. Therefore, it has been determined that the parameters of “harmonious”, “integrity”, “privacy”, “recreational” and “protected” are important factors in the evaluation of the visual quality of the coasts (Table 1).

Table 1. Factor analysis

	Component			Extraction Sums of Squared Loadings
	1	2	3	% of Variance
Beautiful	,817	,405	,090	68,650
Original	,896	,349	,228	21,523
Influential	,933	,183	,287	5,722
Perceptible	,933	,183	,287	
Legible	,944	,261	,089	
Inviting	,896	,349	,228	
Continuity	,148	,431	,771	
Memorable	,040	,712	,613	
Comfortable	,727	,002	,666	
Relaxing	,390	,317	,856	

Accessible	,911	,305	,079
Natural	,913	,392	,005
Compatible	,998	,026	,040
Integrity	,989	,071	,064
Variation	,933	,183	,287
Privacy	,997	,017	,011
Sufficient	,933	,183	,287
Recreational	,997	,017	,011
Protected	,997	,017	,011
must be renewed	,381	,863	,184
should be developed	,167	,958	,016
ı wanted to go	-,012	,903	,421

The parameters that reveal the visual landscape quality between the 3 selected areas within the scope of the study were examined according to the results of the ANOVA test. natural beaches; "Beautiful" (4.64), "impressive" (4.30), "perceptible" (3.24), "Perceptible" (4.55), "Relaxing" (4.46), "Harmonious" (4.44), "Unity" (4.55), " Continuity" (4.45), "Safe" (4.40), "Careful" (4.71), "Available" (4.58), "Memorable" (4.67), "Recreational" (4.83), "Protected" (4.60), "Diversity" " (4.26), "Line" (4.33), "Color" (4.20), "Form" (4.54), "Texture" (4.31), "Like" (4.63) parameters got high scores ($p<0.01$). In Urbanized Central Beach, on the other hand, it received high scores in the parameters of "integrity, I need to be renewed and I wanted to go" ($p<0.01$) (Table 2). Finally, Semi-urbanized Beach has the highest rates; integrity, needs to be developed and I wanted to go parameters.

Table 2. Anova Test

Mean	Std. Deviation	95% Confidence Interval for Mean		
		Lower Bound		Upper Bound
Beautiful	**4,6415**	,87493	,08498	4,4730
	1,5905	,84005	,08198	1,4279
	2,4286	1,24697	,12169	2,1873
	2,8924	1,63333	,09188	2,7116
Original	4,1698	1,44401	,14025	3,8917
	1,7810	,75931	,07410	1,6340
	2,3429	1,29962	,12683	2,0913
	2,7690	1,57776	,08876	2,5944
Influential	**4,3019**	1,27369	,12371	4,0566
	1,8667	1,07477	,10489	1,6587
	2,2571	1,35184	,13193	1,9955
	2,8133	1,63492	,09197	2,6323
Perceptible	**3,2453**	1,65507	2,9265	3,5640
	2,9333	,99292	2,7412	3,1255
	2,2571	1,35184	1,9955	2,5188
	2,8133	1,41868	2,6563	2,9703
Legible	**4,1698**	,90996	3,9946	4,3451
	2,9810	,97054	2,7931	3,1688
	2,2095	1,08038	2,0004	2,4186
	3,1234	1,27514	2,9823	3,2646
Inviting	**3,5849**	1,28632	3,3372	3,8326
	1,7524	,91757	1,5748	1,9300
	2,3429	1,29962	2,0913	2,5944
	2,5633	1,40491	2,4078	2,7188
Continuity	**3,3774**	1,57633	3,0738	3,6809
	3,1429	,84840	2,9787	3,3070
	3,2476	,87465	3,0784	3,4169
	3,2563	1,15227	3,1288	3,3839
Memorable	**3,4717**	1,64002	3,1558	3,7875
	3,4667	,78538	3,3147	3,6186
	3,1905	1,10153	2,9773	3,4036
	3,3766	1,23209	3,2402	3,5130
Comfortable	**2,7736**	1,74183	2,4381	3,1090

	1,7619	,96600	1,5750	1,9488
	2,6000	1,18920	2,3698	2,8302
	2,3797	1,40795	2,2239	2,5356
Relaxing	3,6792	1,19958	3,4482	3,9103
	1,6762	,64294	1,5518	1,8006
	2,1429	1,03244	1,9431	2,3427
	2,5032	1,30566	2,3587	2,6477
Accessible	3,1321	1,37432	2,8770	3,3871
	2,0000	1,57505	1,6952	2,3048
	3,1810	1,78013	2,8365	3,5255
	2,7722	1,65769	2,5887	2,9556
Natural	4,5094	,90759	4,3346	4,6842
	1,2667	,62429	1,1459	1,3875
	2,3619	1,22572	2,1247	2,5991
	2,7184	1,65033	2,5357	2,9010
Compatible	4,1132	1,04490	3,9120	4,3144
	2,4667	1,36626	2,2023	2,7311
	2,9238	1,86411	2,5631	3,2846
	3,1709	1,61616	2,9920	3,3498
Integrity	3,9811	1,11254	3,7669	4,1954
	3,2952	,96001	3,1095	3,4810
	2,9429	1,97984	2,5597	3,3260
	3,4082	1,48253	3,2441	3,5723
Variation	3,5094	1,65181	3,1913	3,8276
	1,7714	1,15407	1,5481	1,9948
	2,1619	1,17771	1,9340	2,3898
	2,4842	1,53780	2,3140	2,6544
Privacy	3,4528	1,79487	3,1072	3,7985
	1,3048	,46251	1,2153	1,3943
	1,8842	,97700	1,6852	2,0832
	2,2288	1,52572	2,0571	2,4004
Sufficient	3,5094	1,86826	3,1496	3,8692
	1,5333	,66603	1,4044	1,6622
	2,2571	1,35184	1,9955	2,5188
	2,4367	1,60726	2,2588	2,6146
Recreational	3,7736	1,34719	3,5141	4,0330
	1,8571	,97496	1,6685	2,0458
	2,0857	1,11902	1,8692	2,3023
	2,5759	1,43779	2,4168	2,7351
Protected	3,6981	1,80565	3,3504	4,0459
	1,9429	1,02684	1,7441	2,1416
	2,1810	1,30665	1,9281	2,4338
	2,6108	1,61454	2,4321	2,7895
must be renewed	3,5283	1,56879	3,2262	3,8304
	3,9619	1,34396	3,7018	4,2220
	2,7429	1,43466	2,4652	3,0205
	3,4114	1,53325	3,2417	3,5811
should be developed	4,2830	1,16091	4,0594	4,5066
	2,4381	1,55615	2,1369	2,7392
	3,1238	1,08924	2,9130	3,3346
	3,2848	1,49110	3,1198	3,4498
ı wanted to go	4,3962	1,31424	4,1431	4,6493
	3,4667	1,04759	3,2639	3,6694
	3,1333	1,15248	2,9103	3,3564
	3,6677	1,28990	3,5250	3,8105

3.2. Assessment of the Landscape Visual Quality via AHP

The AHP method matrix was constructed with a total of 3 alternatives and 22 sub-parameters constituting these alternatives. In total, 22 relative comparison matrixes were created for each parameter. Relative matrices were calculated according to 22 sub criteria (Natural Beach, Semi-urbanized Beach, and Urbanized Central Beach (Table 3). Then, the data were normalized and the result of the normalized matrix was obtained (Figure 3) The survey study was carried out with 55 experts. Experts consist of landscape architects and interior architects. The given matrix was filled by each expert, with 9 being the highest and 1 being the lowest. The scale of values corresponding to the scores is given below.

- 1: Equally ahead
- 3: A little more important
- 5: Quite important
- 7: Very important
- 9: Extremely important
- 2-4-6-8: Intermediate values

Table 3. Matrix of Comparisons according to the characteristics of sandy beaches

1. Beautiful	Natural beach	Urbanized Central Beach	Semi-urbanized Beach
Natural beach	1	9	9
Urbanized Central Beach	0,111	1	7
Semi-urbanized Beach	0,111	0,143	1
2. Original	Natural beach	Urbanized Central Beach	Semi-urbanized Beach
Natural beach	1	9	9
Urbanized Central Beach	0,111	1	7
Semi-urbanized Beach	0,111	0,143	1
3. Influential	Natural beach	Urbanized Central Beach	Semi-urbanized Beach
Natural beach	1	9	9
Urbanized Central Beach	0,111	1	7
Semi-urbanized Beach	0,111	0,143	1
4. Perceptible	Natural beach	Urbanized Central Beach	Semi-urbanized Beach
Natural beach	1	9	9
Urbanized Central Beach	0,111	1	7
Semi-urbanized Beach	0,111	0,143	1
5. Legible	Natural beach	Urbanized Central Beach	Semi-urbanized Beach
Natural beach	1	9	9
Urbanized Central Beach	0,111	1	7
Semi-urbanized Beach	0,111	0,143	1
6. Inviting	Natural beach	Urbanized Central Beach	Semi-urbanized Beach
Natural beach	1	9	9
Urbanized Central Beach	0,111	1	7
Semi-urbanized Beach	0,111	0,143	1
7. Continuity	Natural beach	Urbanized Central Beach	Semi-urbanized Beach
Natural beach	1	9	9
Urbanized Central Beach	0,111	1	7
Semi-urbanized Beach	0,111	0,143	1
8. Memorable	Natural beach	Urbanized Central Beach	Semi-urbanized Beach
Natural beach	1	9	9
Urbanized Central Beach	0,111	1	7
Semi-urbanized Beach	0,111	0,143	1
9.Comfortable	Natural beach	Urbanized Central Beach	Semi-urbanized Beach
Natural beach	1	9	9
Urbanized Central Beach	0,111	1	7
Semi-urbanized Beach	0,111	0,143	1
10.Relaxing	Natural beach	Urbanized Central Beach	Semi-urbanized Beach
Natural beach	1	9	9
Urbanized Central Beach	0,111	1	7
Semi-urbanized Beach	0,111	0,143	1
11.Accessible	Natural beach	Urbanized Central Beach	Semi-urbanized Beach
Natural beach	1	9	9

Urbanized Central Beach	0,111	1	7
Semi-urbanized Beach	0,111	0,143	1
12.Natural	Natural beach	Urbanized Central Beach	Semi-urbanized Beach
Natural beach	1	9	9
Urbanized Central Beach	0,111	1	3
Semi-urbanized Beach	0,111	0,333	1
13.Compatible	Natural beach	Urbanized Central Beach	Semi-urbanized Beach
Natural beach	1	9	9
Urbanized Central Beach	0,111	1	3
Semi-urbanized Beach	0,111	0,333	1
14.Integrity	Natural beach	Urbanized Central Beach	Semi-urbanized Beach
Natural beach	1	9	9
Urbanized Central Beach	0,111	1	7
Semi-urbanized Beach	0,111	0,143	1
15.Variation	Natural beach	Urbanized Central Beach	Semi-urbanized Beach
Natural beach	1	9	9
Urbanized Central Beach	0,111	1	7
Semi-urbanized Beach	0,111	0,143	1
16.Privacy	Natural beach	Urbanized Central Beach	Semi-urbanized Beach
Natural beach	1	9	9
Urbanized Central Beach	0,111	1	7
Semi-urbanized Beach	0,111	0,143	1
17.Sufficient	Natural beach	Urbanized Central Beach	Semi-urbanized Beach
Natural beach	1	9	9
Urbanized Central Beach	0,111	1	7
Semi-urbanized Beach	0,111	0,143	1
18.Recreational	Natural beach	Urbanized Central Beach	Semi-urbanized Beach
Natural beach	1	9	9
Urbanized Central Beach	0,111	1	7
Semi-urbanized Beach	0,111	0,143	1
19.Protected	Natural beach	Urbanized Central Beach	Semi-urbanized Beach
Natural beach	1	9	9
Urbanized Central Beach	0,111	1	7
Semi-urbanized Beach	0,111	0,143	1
20.must be renewed	Natural beach	Urbanized Central Beach	Semi-urbanized Beach
Natural beach	1	9	9
Urbanized Central Beach	0,111	1	3
Semi-urbanized Beach	0,111	0,333	1
21.should be developed	Natural beach	Urbanized Central Beach	Semi-urbanized Beach
Natural beach	1	9	9
Urbanized Central Beach	0,111	1	3
Semi-urbanized Beach	0,111	0,333	1
22.ı wanted to go	Natural beach	Urbanized Central Beach	Semi-urbanized Beach
Natural beach	1	3	3
Urbanized Central Beach	0,333	1	7
Semi-urbanized Beach	0,333	0,143	1

After the normalized matrix results, the result table in Table 3 was obtained. Comparative matrix results of the alternatives were obtained according to 22 criteria. In this, as in the other steps, a matrix was created using the values in the standard preference table (Table 3, Figure 3). When we look at the final results obtained with the AHP method, natural beach (.824-82%) has the highest weight, followed by semi beach (.120 - 12%) and Urbanized Central Beach (.056 - 5%). When we reach this result, it emphasizes the importance of "Natural beach" in visual quality and prefer ability.

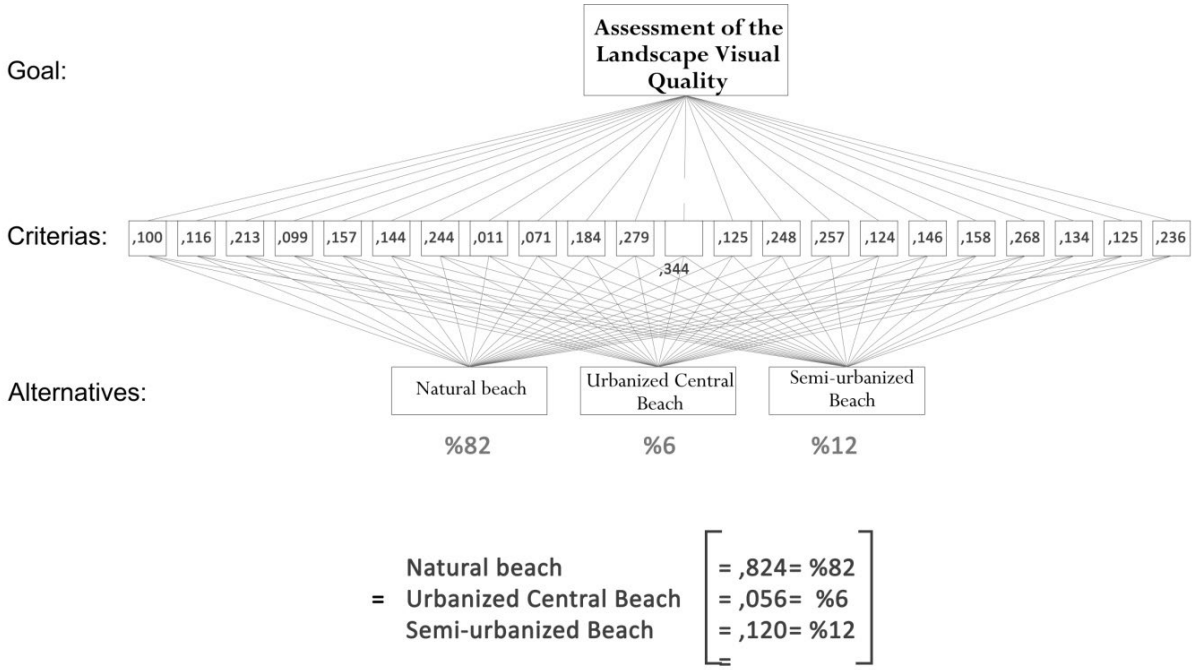


Figure 3. Comparative matrix results

4. Conclusion and Recommendations

In this article, a fuzzy logic-based framework and methodology are presented for evaluating 22 landscape value parameters questioning the visual quality and prefer ability of courtyard sandy beaches. In this context, 3 sandy beaches in Trabzon were examined.

The results obtained within the scope of the study are grouped under two headings as "SPPS" and "results obtained as a result of the AHP method". The grouped results can be listed as follows:

The results obtained as a result of the SPSS method:

• Total SPSS survey was conducted with 106 people.

• The reliability of the statistical results has been tested and the results have been evaluated accordingly.

• The highest factor load was the 1st factor load. The high-resulting parameters of this factor load are respectively "harmonious", "integrity", "privacy", "recreational", "protected" parameters. Therefore, it has been determined that the parameters of "harmonious", "integrity", "privacy", "recreational", "protected" are important factors in the evaluation of the visual quality of the coasts.

• In the results of the ANOVA test, natural beach got the highest result. When I examine the results of the parameters of the alternative; "Beautiful" (4.64), "impressive" (4.30), "perceptible" (3.24), "Perceptible" (4.55), "Relaxing" (4.46), "Harmonious" (4.44), "Unity" (4.55), " Continuity" (4.45), "Safe" (4.40), "Careful" (4.71), "Available" (4.58), "Memorable" (4.67), "Recreational" (4.83), "Protected" (4.60), "Diversity" " (4.26), "Line" (4.33), "Color" (4.20), "Form" (4.54), "Texture" (4.31), "Like" (4.63).

• In Urbanized Central Beach, it received high scores in the parameters of "integrity, I need to be renewed and I wanted to go" ($p<0.01$).

• Semi-urbanized Beach has the highest rates, integrity, parameters to be developed and wanted to go.

The results obtained as a result of the AHP method:

• AHP method was used within the scope of the study as it became more complicated to question the landscape value, visual quality and preferability of sandy beaches.

• As a result of the literature studies, 3 main sandy beach types and 22 sub-criteria have been established.

• In the ranking made relative to the criteria, it was seen that the most weighted criterion was the "Natural beach (52%)" alternative.

• However, it has been stated that the statistical results obtained in the study are reliable, consistent and appropriate.

• Semi-urbanized Beach (12%) has the highest value after Natural beach.

• The lowest rate was seen in the Urbanized Central Beach criterion.

• "Natural (.344)" among the alternatives received the highest alternative value.

• In this alternative, the lowest weight "detectable (,099)" criteria and "beautiful (,100) parameter values are taken.

In the light of the results and findings obtained within the scope of the study

The important point in revealing the visual quality; determination, protection and improvement of natural quality. The best way to do this is to be connected with nature. This is the synthesis of an interdisciplinary study. It is seen that sandy

beaches change shape depending on human needs, but turn into harmful uses for different benefits.

In the planning studies of sandy beaches, revealing the visual quality or determining the aesthetic value is very important to increase the landscape quality. Landscape quality reveals whether sandy beaches are different or better than others in the planning process. In other words, in this design period; it can be said that it is the feature that makes an area different from other areas close to it. It is the more prominent and protected state of the landscape parts, which are the distinctive features of sandy beaches.

• In both statistics, the landscape value of the natural ones of the sandy beaches was higher. However, in terms of accessibility, Semi-urbanized Beach and Urbanized Central Beach are higher. For this reason, the interventions to be made on sandy beaches should primarily be to protect the naturalness and ensure that it is accessible. It is predicted that it will be a correct design when it facilitates accessibility and at the same time preserves naturalness.

• "I would like to go to this field" parameters were found to be quite high in all 3 alternatives. It is a rather important conclusion that people want to go to all alternatives. With this result, we can say that sandy beaches are important recreation areas where people want to go.

The change of beaches with urbanization also affects the preferences of users (Table 3).Users expect a harmonious and holistic design approach from sandy beaches. This result is also demonstrated by statistical studies (Table 3, Figure 3).

"Compatibility" is among the results, where beaches are the most important factor for the user. In the studies conducted on the beaches, it is seen that the users attach importance to this parameter.

According to the results, natural beaches are among the most important places for all users who are tired of city noise. Naturalness is the most dominant part of the visual quality of sandy beaches (Figure 3).

Every intervention made for design and recreation is to turn beaches away from naturalness. Each of them has its own paradoxes from positive/negative aspects. Natural beaches are an escape point for everyone with the calmness and silence they offer. They are the most important escape places for people who spend most of their day in urban centers in daily life.

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Assessment of User Perception on Public and Private Spaces within Urban Context

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ABSTRACT

Public spaces are vital features in the urban context which offers inclusive environment for everyone in the society. Traditionally, urban public spaces (UPS) were developed by the government intended for places of interaction with the aims of social welfare and public health. In the recent past, private sector involvement in the public space provision was visible with significant changes in the form and functions influenced by market-based motives. Although commercialization or privatization aspects of public space was often debated, the user perception of the use of public spaces from ownership and access control aspects were less studied in the context of developing countries. This study aimed at identifying the attributes for which people differentiate and experience in four public spaces owned and operated by the government and private sector in the city of Colombo, Sri Lanka. The study used 35 semi-structured interviews and 119 online questionnaire surveys to identify the user defined features of ownership and access control for public space use. The results revealed that government owned and operated spaces were preferred by the users due to easy access and freedom for activities while privately owned spaces were preferred due to better infrastructure, safety, and security within. Also, each public space offered benefits to specific user profile regardless its ownership or access controls. However, the freedom and openness provided by government owned spaces were identified as important in comparison with the restrictions imposed by private sector operated public spaces. This study provides key insights for urban planners and policy makers to identify the role of private sector in the provision of effective urban spaces in the fast-growing cities as well as possible pitfalls and negative externalities created by unregulated spaces.

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1. Introduction

Public spaces are vital elements for the urban dwellers to fulfill their leisure and recreation needs. Form and function of urban public spaces (UPS) are commonly studied in urban planning literature due to its inextricable linkages to quality of life in cities. The identity of any public space is created by not only the physical space, but also relationships between humans and the place (Ujang,

2012). Private sector intervention on the public space provision is increasingly popular in modern urban environment with significant amount of regulated public elements. Various researchers have studied positive and negative impacts of these "privatized" public spaces in the urban environment (Henry, 2008; Johnson & Glover, 2013; Bandara, Silva, & Navarathna, 2013; Torbati, 2018). At the same time, government led public space projects are considered inefficient due to vulnerabilities caused by social/ common dilemmas and negative externalities (Ling, et.al. 2019). In this context, debate lies on the promotion of private sector led public entities as the user access and activities have largely been governed by market led controls. However, public spaces created through government led planning interventions were not necessarily being used by the people (Carmona M., 2018). Meanwhile, privately owned public spaces have shown public attraction, especially among youth in Colombo, Sri Lanka (Nambuge, Peiris, & Kalugalla, 2020) and its significance for urban users have not been studied comprehensively. Therefore, it is important to understand how people perceive the differences between private sector owned and operated UPS against public sector owned entities.

Privately-owned public space offer ownership and access related restrictions to users (Bandara, de Silva, & Navarathna, 2013) while such spaces are considered contested places for recreation in cities due to land constraints and limited novel approaches by the government (Johnson & Glover, 2013). Even though the tangible prospects and constraints are explicit in nature, this paper focused on the behavioral perspective of users in using UPS in urban context. Role of private sector in facilitating the urban user needs is an important regeneration strategy of city governments (Roberts & Sykes, 1999). Therefore, user perception was considered as the determinant factor in responding to public spaces within government and private led enclosures. Since modern privately operated spaces are contested to generate common ground with government owned spaces, its importance in terms of place making principles in urban areas are yet to explored from user perception. This paper aimed at identifying the attributes for which people differentiate and experience UPS within four different publicly and privately owned entities in Colombo, Sri Lanka. To achieve the aim, the questions intended to answer are threefold, 1. What factors determine the use of public space in urban context? 2. To what extent ownership and access controls influence on public space use? 3. Why and how user preference shaped by physical and functional attributes within urban public space? Public perception is used as the proxy to measure preference using form and functional attributes.

Rapid urbanization led economic development in Colombo, Sri Lanka experienced the private sector involvement for the provision of urban amenities in the past decade. It is visible that people were attracted to newly developed public spaces within private shopping malls while several public spaces created by public sector (government) within shopping areas attracted comparatively less crowd in various occasions. It is argued that public spaces must be governed by behavioral norms with freedom for everyone to experience and interact (Carmona, Magalhães, & Hammond, 2008). However, it is less clear that ownership of the public space and market led controls play a significant role on the use or user perception within respective domain. On most occasions, private sector is increasingly involved in creating public spaces within commercial properties. Traditionally, public spaces are the responsibility of the government considering social welfare and public health reasons (Bandara, Silva, & Navarathna, 2013; Torbati, 2018). This paper focused on the 'modern' view of public space by evaluating the potential of privately owned spaces to provide the same. Meanwhile, it is important to note the divergence of traditional public space provision agenda that goes beyond health and welfare concerns of urban citizens (Nambuge, Peiris, & Kalugalla, 2020). Also, the user behavior and socio-cultural perspectives that govern the use of public spaces was evaluated for better planning of such spaces in future. Considering the Sri Lankan context, limited research has been conducted to evaluate the user perspective in relation to public space within private entities. So, this study will be unique, important, and useful for urban planning and relevant fields to improve planning decisions and policy making on objective driven public space projects.

Public space has been recognized as social construction (Lefebvre, 1978) and an important element of urban identity (Lynch, 1960). With the introduction of market-based elements into public domain, publicness within UPS was debated among scholars and policy makers. However, newly added features into UPS by private sector such as privacy, security and safety measures were attractive enough to ensure the public attraction (Carmona M. , 2018; Byers, 1998). The scope of the study was to identify the public perception within access and ownership-regulated environments. To apply the conceptual understanding, four types of case studies were selected based on the ownership and access control-based criteria. Case studies were selected within Colombo city limits and other factors influenced on the public space use were considered static. Cases were classified under fully public owned, semi-public owned, semi-private owned and fully private owned spaces. Key constraints for the comprehensive understanding of user behavior were limited research in Sri Lankan context and COVID-19 pandemic restrictions during study period. Moreover, study was confined into permitted UPS and users were requested to respond with pre-pandemic usage to minimize the impact of pandemic and generalization needs.

2. Literature Review

Public spaces in cities have a long history. Market place in ancient Greece was identified as one of the historic public places where people met and exchanged ideas about socio political matters (Minton, 2006). Public spaces were studied in the past to improve the public realm (Jalaladdini & Oktay, 2012) and eventually shaped by the socio-cultural factors to support the dynamic nature of human behavior (Crouch, 2006). In Sri Lanka, traditionally public activity was emerged in traditional village fair called "Pola" and in the paddy fields (Chandrasekera, 2015). Today, it has been extended to modern public spaces within shopping centers and recreational spaces in cities (Nambuge, Peiris, & Kalugalla, 2020). Furthermore, public spaces were identified as places shared with strangers with visual and physical access (Walzer, 2006) while it was also known as places to view the unity and disagreements of the public (Henry, 2008). Functional needs of public space and its decline due to various factors have been highlighted by Jacobs (1961), Gehl (1971) and Mitchell (1995) in the 20th century.

Need of the public space in cities was identified by various authors, its use and provision has been a common debate in recent past. Access, control, behavior, and activity pattern were considered as differentiated factors of public space while private sector contributed for public space under the supervision of public sector (Leclercq, Pojani, & Bueren, 2020). But an increasing trend of creation of public spaces within private control was visible in the form of shopping malls, plazas, and restaurants. Provision of public space was identified as privatization of public rights and questioned the development from the form, functions, and sustainability perspectives (Schmidt & Németh, 2010; Carmona, Magalhães, & Hammond, 2008; Kettaf & Moscarelli, 2004). Also, the differentiation between the public spaces by public and private sector was studied under ownership and accessibility criteria (Johnson & Glover, 2013). Accordingly, public space was categorized based on ownership and the level of access as shown in Table 1.

Table 1 Categories of Urban Space

Ownership	Easy-Access control	Difficult-Access control
Private Ownership	Public-private spaces (i.e., food court)	Common space (i.e., Walking path)
Public ownership	Space for parking (i.e., Vehicle Park)	Open yard (i.e., Children Park)

(**Source:** Johnson & Glover, 2013)

It is no doubt that public space is an essential element for urban life. The characteristics of a 'good' public space include togetherness, informal surveillance, lively activity to assemble (Jacobs, 1961), integrate and invite spaces (Sennet, 1974). At the same time, public space was identified as a place of contact and place of representation of public (Kilian, 1997). In many instances, researchers have illustrated on the use of public space from its form and functional characteristics (Henry, 2008). Another view mentioned that social behavior would be characterized by the physical space and controlled by the provision of physical and temporal controls (Mantey & Kepkowicz, 2018) .

Place-making theory described that interaction between the people and physical environment creates the place in an authentic and unselfconscious way (Relph, 1976). The way people perceive the place (as the meaning) was an important element in integrating the physical environment with public use (Chandrasekera, 2015). Relph (1976), explained the place making theory from two (02) main viewpoints namely 1. Interaction on space and 2. Essence of place. Along with the place making theory, new theoretical concepts were emerged to examine the public behavior such as placeless-ness, inside-ness, outside-ness, sense of place, and so on. (Aguila, Ghavampour, & Vale, 2019). Public perception on public space represented the mental cognition and progressive process that compare past with present (Kaplan, 1987; 1995; Aguila, Ghavampour, & Vale, 2019).

Modern lifestyles paved the way for new types of public spaces owned and operated by private sector which were demanded by the urban community (Oldenburg, 1999). Urban Public Space (UPS) provided by the private sector could decide upon the acceptable uses, users, and behaviors. Such control measures have eventually entertained selected social groups for the full access to the urban space features (Németh & Schmidt, 2011). This created the controversy on the use of public spaces and fundamental elements within the public space as a city element. As Lynch (1960), Jacobs (1961), Gehl (1971) and Mitchell (1995) stated, this "privatization" caused death of public space by the market economy controls. At the same time, a few researchers have identified the importance of privately managed public spaces due to different factors that can be accommodated by using innovative strategies by private sector (Johnson & Glover, 2013; Glover & Burton, 1998; Slack, 1999). However, differences in physical and functional activities in UPS managed by private or public entities were evident from physical and functional views. Torbati (2018) has classified UPS in to 4 categories based on its level of management functions as depicted in Table 2.

Table 2 The urban space classification based on ownership and access controls

Category	Description
Full-public, public spaces (i.e., Open spaces/ Coastal parks)	urban spaces accessible for public and fully owned and operated by the government agency or entity.
Semi-public, public spaces (i.e., Combined shopping areas within public parks/ restaurants)	urban spaces are designed and suggested for relatively distinctive groups of people. Parts of public spaces are managed by private sector where the authority of controlling the access to public is given for certain functions.
Semi-private, public spaces (i.e., Private shopping malls/ arcades)	Limits and spaces selected and designed to the special groups of the society and fully controlled by the private sector. But there are common spaces that can be accessible by public without any control.
Full-private, public spaces (i.e., Privately operated leisure parks)	Special public spaces designed for special and completely private group. The owners can determine the users with full restricted access. To enter such places, public need special permission or paid tickets.

(**Source** Torbati, 2018)

Based on the public space categories as mentioned in Table 2, key words that created the debate is 'privacy' and 'publicity'. Deutsch (1992) argued that privacy is the power to exclude access while publicity is the power to gain access for any space. So, the balance between privacy and publicity is a general critique that need to be tested. At the same time, this can be viewed as a struggle between

liberal view versus the conventional view of public space (Kilian, 1997). Moreover, Ho, et.al., (2021) revealed that publicness of open public space is caused by the perceived performance and satisfaction of users in the urban environment. It is noted that government owned public spaces performed better than private open spaces due to control differences between facilities and amenities in place. However, the perception of publicness is highly context specific and influenced by many confounding factors.

The differentiation between the public and private UPS are very thin today. Traditionally, ownership determined the management function of public space (Németh & Schmidt, 2011; Carmona, Magalhães, & Hammond, 2008). In Sri Lanka, publicly accessible spaces created by the private sector are mostly in the form of shopping malls, arcades, theme parks and restaurants. Next critique was the 'publicness' of so called quasi-public spaces. It is argued that publicness was lost with the change of ownership of public space when ownership determined the fundamental qualities of public space, access, and control (Varna & Tiesdell, 2010; Franck & Paxson, 1989). Németh & Schmidt (2011) explained that publicness of a public space was determined by ownership, accessibility and inter subjectivity. The 'tri-axial' model (2011), 'Star' model (2010) 'OMAI' model 'spider' diagram of CABE'S Spaceshaper (CABE, 2007) and the 'place diagram' of PPS (2000) are such models developed to understand the level of publicness in UPS. The definition of public space has its own ambiguity (Johnson & Glover, 2013) where the public can be a subjective term and can be determined from various viewpoints. For example, certain social groups (beggars or marginalized groups) can easily be excluded from public spaces while certain social groups could demand for activities affordable by a few (Kilian, 1997). Government and private sector managed public spaces are common in Sri Lankan context, especially in Colombo. Due to urbanization, the focus of government was on green cover improvement and public open space in the form of public parks and recreational parks (Bandara, de Silva, & Navarathna, 2013). Attention was also given for the public open space and its impact to city functions (Daily News, 2020) through environmental and urban social activities (Pussella, 2017; Karunananda, Rajapakse, & Rathnayaka, 2018) by the urban development agencies in Sri Lanka. Chandrasekera (2015), argued that influence of private sector on public space users and their activities was from corporate symbols which can create false sense of place due to artificial application of physical features.

Several researchers argued that socio-economic changes could be understood through changes in urban space organization (Lefebvre & Nicholson-Smith, 1991; Harvey & Martin, 1973). Mandeli (2019) argued about how urban spaces are used, providing more accurate predictions of its appropriateness for users and its broader context, and establishing guidelines and policies to transform public spheres. The planning and environmental perspective of public space transformation was focused here and has not considered on social behavior or user perception on UPS. Ho et.al., (2021) revealed the importance of public space in high density urban environments (i.e., Hong Kong SAR, China) to provide multiple socio ecological functions on diverse user groups including elders and children. Policy implications of inclusive open spaces offered by both the government and private sector was considered vital for achieving publicness within existing public spaces. Hence, semantic research has critically pointed out the need of comprehensive research on role of private public-spaces in cities. In Sri Lanka, government agencies such as Urban Development Authority (UDA) use public funds in developing UPS while private sector has actively engaged in the same with profit motives. Therefore, this study provides insights for urban planners and designers to manage the limited resources and maximize the efficiency of urban public spaces in cities.

3. Methodology

3.1 Case Study Selection

Publicness of public spaces in urban context was determined by various factors where this research focused on access and control factors within public and private entities in urban areas. Four cases selected within Colombo city based on the classification explained in Table 2. namely: 1. Galle Face Green (GFG), 2. Arcade Independence Square (AIS), 3. Colombo City Center (CCC) and 4. Excel World Entertainment Park (EWEP). Each case study was different from one another in terms of ownership control, and accessibility. Classification of case studies according to the ownership and access factors are shown in Table 3 while the case study location map is shown in Figure 1.

Table 3 Classification of selected urban public spaces

Case Study	Classification
Galle Face Green (GFG)	Fully public access and public owned (Open green space owned and operated by the government)
Arcade Independence Square (AIS)	Semi access and publicly owned (Shopping arcade leased to the private sector by the government)
Colombo City Center (CCC)	Semi access and privately owned (Private mixed development project with public shopping areas)
Excel World Entertainment Park (EWEP)	Fully private access and privately owned (Private entertainment district with access allowed through tickets)

(**Source** Compiled by Author)

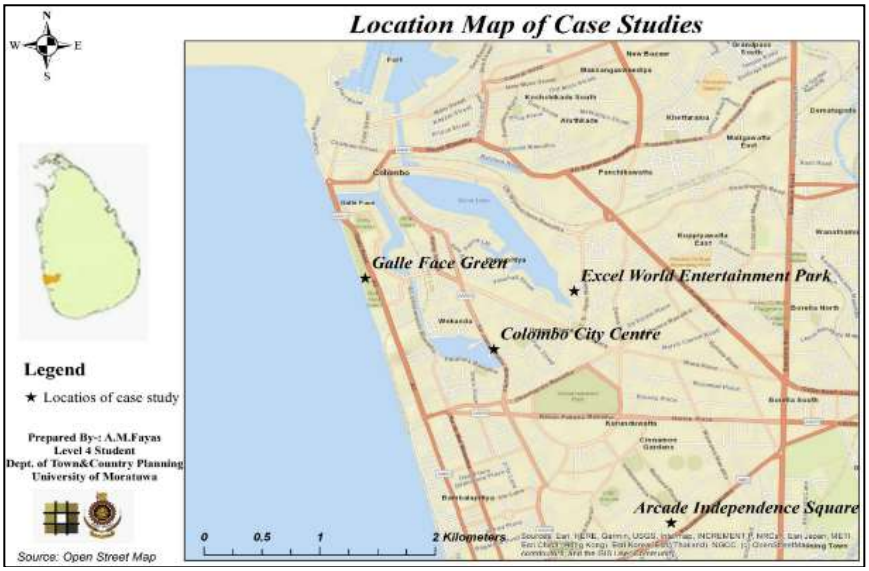

Figure 1 Selected case studies within the study area of Colombo, Sri Lanka (**Source** Survey Department of Sri Lanka, Open Street Maps)

3.2 Data Collection Method

Three types of data collection methods used in this study namely, physical observations, online questionnaire survey, and semi structured interviews. Physical observations were conducted in each case study to understand the form and functions of each location and to determine the differences of physical controls for accessing public spaces and the response from users. Photographs taken with the permission of the management of each case study was used to reveal the differences. Online questionnaire survey was used to understand the user behavior, purpose of visits and temporal profile of different user groups. In addition, opinion on the user preference (reasons for visit, comparative advantages, and areas of improvement) was obtained to validate the user perception findings. Semi structured interviews were conducted within each case for in-depth knowledge on UPS usage and preferences. The interviewees were selected through observational survey where author acted as an observer and participant to determine the UPS use. Content analysis was used to analyze the data through NVivo software. Themes of the analysis were derived from literature review and tested based on primary data. Primary data was collected from 119 online questionnaire responses and 35 semi-structured interviews from the users at each case study. Observation surveys at each UPS were undertaken prior to the interviews to determine the major user groups and the temporal usage of each space. Content analysis was used to identify the key themes for using the public space from user perspective. Cobweb and Space-shaper model diagram used to identify the publicness and difference between UPS.

Observation data such as photographs were used to illustrate the physical activities in each of the case studies. The analysis used mixed method approach where user behavior was measured based on the online survey, interview findings used for identification of themes of preference, and photographs with user controls were used to determine physical controls imposed in each location.

3.3 Data Analysis

3.3.1 Descriptive Analysis

The content analysis was conducted by using NVivo software for the coding process to identify user preference of 154 responses obtained through surveys and interviews. Online survey was conducted to cover the user perception of the use of public space in three categories. First, to obtain a specific user profile considering age, gender, and social status, second, to identify specific attributes for the usage of UPS within each case, third, to differentiate advantages and disadvantages of each case related to pre-defined criteria of UPS use and thereby to recognize key areas of improvement for each public space.

For the online survey, 54% of the participants were Female and over 90% of the responders were in between the age group of 18 to 55 years. 77% were less than 35 years of old and majority were visiting the case studies with their friends and family. Frequency of UPS usage within the sample and accompanied groups were shown in Figure 2 and Figure 3.

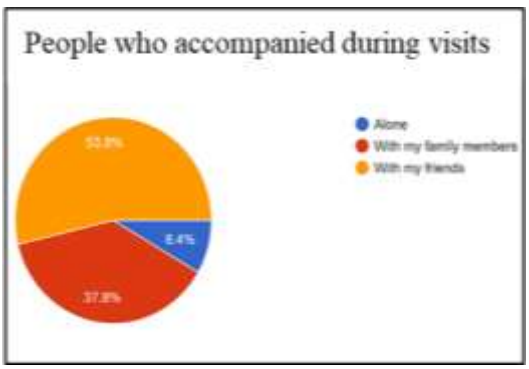

Figure 2 Social relationship on public space visitation (Source: Online Questionnaire Survey)

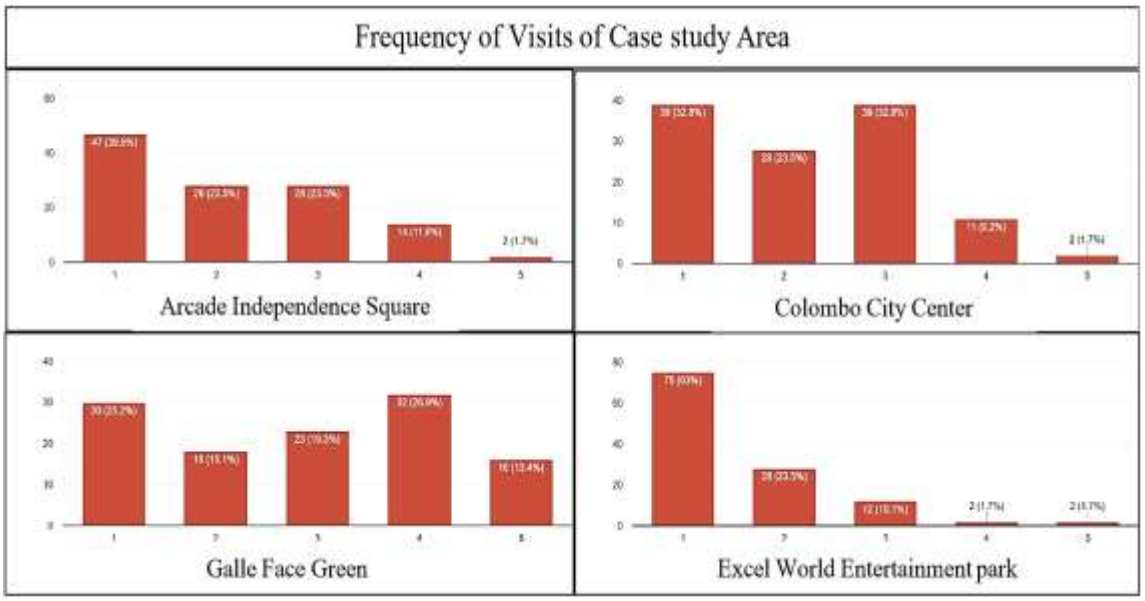

Figure 3 Visit Frequency Of Each Public Space Among Responders (Source: Online Questionnaire Survey)

Interviews were conducted by using judgmental sampling method and completed over a period of four weeks. Out of the sample, 68% of interviewees were in between the age of 18 to 35 years. Gender distribution was maintained equally and 60% of the responders were single. About 70% of the responders have visited the public space on weekly or monthly basis. However, majority of the users (87%) in the online questionnaire survey were less frequently visited EWEP in which results were dependent on interviews.

It is observed that the users and public spaces related to each other in its own way. There were multiple categories of people visited each place. The observations were conducted in different times including weekdays, weekends, and morning to evening where time was a critical factor for UPS usage. Entrances of each case study was shown in Figure 4.

Figure 4 Entrance of each case as means of access controls (Source: Author)

According to the observations, entrances showed initial control feeling in privately owned spaces. At the same time, the publicly owned spaces (AIS, GFG) gave a feeling of freedom due to non-availability of gates. The entrance was an indicator to show the control of public presence of public spaces. Publicly owned spaces indicated general and human behavior related instructions through sign boards, while privately owned spaces reflected pricing instructions, and outside food restriction. The physical form and functionality of spaces for people to sit and spend the time in each location varied in each context. The seating in publicly owned spaces were open to all but in private spaces, access was allowed only for specific groups of people. Seating arrangement and common spaces indicated that people have freedom to do their own personal activities, privately owned spaces have provided seating but mostly for special events So, it revealed the identifiable differences on UPS provision between privately and publicly owned spaces. The seating arrangements and directional control of the use of public elements were illustrated in Figures 5 and 6

Figure 5 Variations in Common space provision and Seating Arrangements (Source: Author)

Figure 6 Sign boards as symbolic interpretation of control (Source: Author)

According to the Figure 5, GFG has the least amount of seating arrangement while users were free to arrange their own with minimum controls. However, other three case studies offer formal activities where seating arrangement was pre-defined and utilized an orderly arrangement. In contrast, Figure 6 shows the physical control sign boards which were available in each case study. AIS and GFG (owned and operated by the government at the time of the study) has clear instructions for public on use of

common areas. AIS has restricted the movement on the grass while GFG restricted the photography and videography of certain parts of the open space (Figure 6). GFG is located next to high security zone which is one of the reasons for restrictions. However, users perceived the control within the space itself due to surrounding activities. CCC and EWEP has not shown controls as indicated in the government owned case studies and the directional guidelines were shown on restaurant food pricing and lining arrangements. Nevertheless, privately owned spaces contain pre-fixed security guards who constantly monitor the users and their behavior. It was noted that CCC and EWEP imposed controls for users which put a threshold for freedom of activities taken place at each venue.

3.3.2 Word Cloud Analysis

Semi-structured interviews were transcribed as inputs for the coding purpose and then merged as themes. Themes identified through published literature was used to test the UPS preference. Exploratory design approach was followed to identify additional themes specific to local context and classified to suit the aims of the study. Survey and interview findings were used to understand the identity of each case study from user cognition and functional aspects on further use of UPS.

Word cloud analysis was used to understand the role of public space for users. Word cloud analysis results were obtained from both the semi-structured interview and online survey. It is revealed that responders considered place identity as the key preference to use each public space. Public perception on the public space within case studies based on ownership were shown in Figure 7. In addition, activities and shopping, family and friends, easy access and relaxing environment were the key words highlighted by responders.

Figure 7 Word cloud analysis of user preference at each venue (Source: Analysis findings)

The functions of each public space were different since the intended activities were different for every case study. However, users were requested to provide a comparative feedback of case studies based on two or more public spaces visited during pre-pandemic conditions. Accordingly, word cloud assessment was conducted collectively for all the case studies to view the overall perspective on functionality of urban public spaces as depicted in Figure 8.

Figure 8 Word cloud analysis of functional elements identified as important by responders (Source: Analysis findings)

According to Figure 8, most preferred functions of UPS were food (restaurants), shops (shopping experience) and play (recreational spaces). The functions of urban spaces indicated by users were taken as coding references, and the percentage of reference coverage is shown in . Functions and activities as described by the users were identified in the coding exercise and colored according to the frequency of repetition words during each interview. So, the priority given by the responders for UPS function could be understood.

According to Table 4, each responder was taken as unique functional preference indicator and word count frequency was updated for the output obtained in the Figures 7 and 8. The number of functions and activities related words/ terms from each interview was extracted and analyzed for its frequency count. Highest frequency of word count received at AIS while lowest number of preferred elements counted at EWEP. Color codes show the highest and least preference of each responder while remaining words were filtered as redundant values. Priorities of each respondent for UPS functions vary accordingly and purpose of travel and expected functional elements at each public space was different for different user groups. The target user groups for each public space are different so as their scale of preference of specific activities.

Table 4UPS function responses based on interview reference

Responder Ref. No.	AIS	Responder Ref. No.	CCC	Responder Ref. No.	EWEP	Responder Ref. No.	GFG
R1	14.76%	R1	2.43%	R1	7.27%	R1	11.47%
R2	9.79%	R2	6.25%	R2	12.06%	R2	5.80%
R3	10.41%	R3	4.08%	R3	6.74%	R3	10.14%
R4	8.82%	R4	7.20%	R4	4.60%	R4	7.64%
R5	7.80%	R5	3.81%	R5	10.20%	R5	4.26%
R6	11.98%	R6	3.28%	R6	6.87%	R6	9.32%
R7	4.25%	R7	1.31%	R7	6.13%	R7	5.94%
R8	6.51%	R8	4.68%	R8	11.83%	R8	5.34%
		R9	11.31%			R9	6.55%
		R10	6.29%				
Legend:	*Very High*		*High*	*Moderate*	*Low*	*Very Low*	

Source Compiled by Author

3.3.3 Cobweb and Space-shaper Models

Matrix Coding Query (MCQ) analysis was used to calculate the user perception on various attributes of each case study. Every case study was coded using reference to identified themes. Then the Cobweb/Radar diagram was created using MCQ. The case study areas and the factors were separately analyzed to understand the priority themes identified by the users in each UPS. Based on the preference, the factors were divided into two partitions to indicate the level of the determinant factors as the right-hand side indicated positive preference and left-hand side indicated negative preference by users (Figure 9).

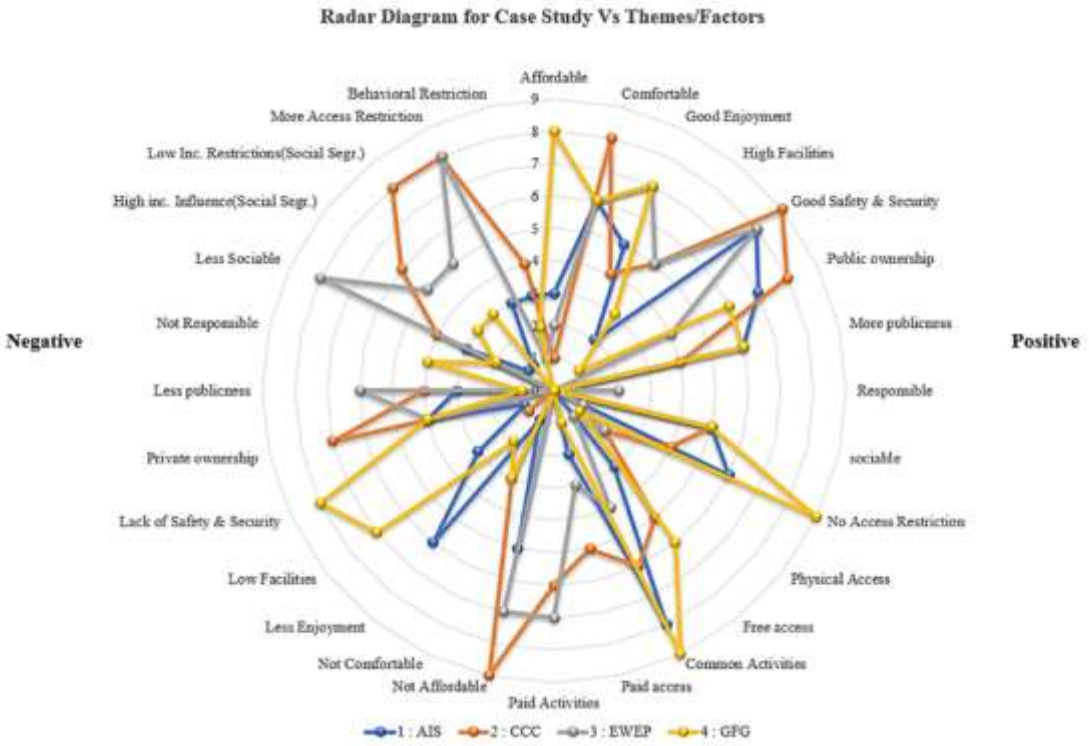

Figure 9 Cobweb Diagram of each case study with "High Demanded features" along right side of circle and "Less Demanded features" at the left side for each case study area (Source: Semi structured interview results)

Right side arc/ positive side of the Figure 9 shows aggregated 'High Demands' of the factors while left arc represents negative or 'Less Demands' of each case study. There is an identifiable difference between publicly and privately owned spaces. GFG reflected highest number of positive determinants such as common activities and full accessibility, while it depicted lack of facilities, poor safety as negative factors. Most of the themes of EWEP have spread over the negative side of the diagram which indicated its own unique private factors. At the same time, EWEP indicated on high safety and security, good facilities, good enjoyment with comfortability as positive factors for users. Users were comfortable with safety and security and indicated satisfaction on the facilities available in semi-public and semi-private spaces. However, users gave more value for public ownership as admired the public ownership than private. Access restriction, social segregation, unaffordability, and behavioral restrictions were considered negative factors in privately owned spaces.

3.3.4 Text Search Query Analysis

The role of UPS was evaluated within private and public ownership categories by using Text Search Query analysis (Figure 10). According to the interviews, users mentioned the ownership preference in each case study area and words expressed in relation to private and public ownership were accumulated and connected to identify the occurrence of the wording or references in each theme.

Figure 10 Overall preference for Ownership factor by the users (Source: Semi structured interviews)

According to Figure 10, public sector ownership received higher preference (58%) than private sector (38%). Contrastingly, users at of privately owned UPS (EWEP and CCC) indicated public ownership as a better option when it comes to public space provision.

3.3.5 Cluster analysis

Cluster analysis was used to identify the clusters among case studies, to differentiate the features based on similar or different characteristics. User preferences were categorized as different codes and themes/factors and Jaccard's Coefficient Analysis was used to differentiate and analyze those preferences (farthest neighbor). Vertical Dendrogram diagram was created to show the correlation between four case study areas. Every feature from coded dataset was overlapped with other features and based on the overlapped intersection values (large union represents high relationship). Figure 11 shows the clustering of case studies based on the similarity and diversity of the sample sets.

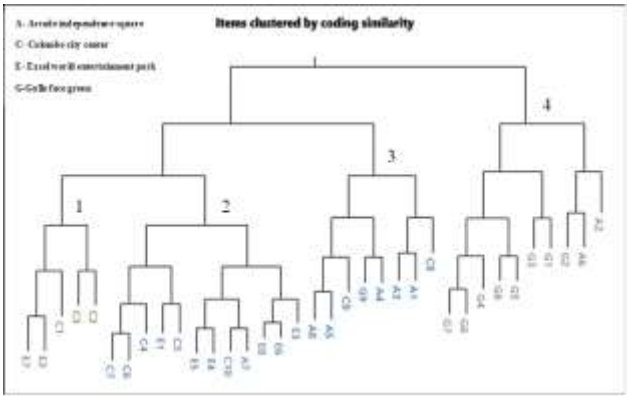

Figure 11 Vertical Dendrogram for Cluster Analysis

As per the Figure 11, four sub clusters were identified and within which three clusters were classified under first category that included AIS, CCC and EWEP. The second category included AIS and GFG. It depicts that privately owned spaces clustered among publicly owned space, hence the "privateness" of the UPS was increasing and the publicness was decreasing.

4. Discussion

Observations and word cloud analysis revealed that restaurants, shopping spaces, relaxation and recreation were the main reasons for people to visit UPS. The functional needs of public spaces included walking, sitting, studying, relaxing, eating, social events, gatherings with family or friends, etc. The functional needs were varied in case studies due to the ownership and access variations. Hierarchy chart analysis was used to understand the level of influence, where "Ownership" and "Access" factors indicated as priorities in every case study. It's an important finding as users expected the access controls to ensure the safety and security while maintaining the social order within UPS. Social segregation was a new factor found in the study.

This study considered on the public space use indicators to check the preference of government owned and operated spaces to privately owned and operated spaces. One of the important confounding factors is the socio-economic status of the population. In this study, the preference indicators were highlighted, and social segregation was evident both in spatial and temporal views. Privately owned spaces encourage people to buy products and used sign boards like "Customers Only" to restrict the free access to public facilities within. In addition, pricing of restaurants and other product lines were unaffordable for many users as identified by Nambuge, et.al., (2020) at the AIS which raise the question of should the affordability play a role in experiencing a public space in cities? At the same time, cultural segregation and exclusiveness was visible where activities intended for specific age groups and user groups within privately owned or operated spaces. However, social segregation is a fact that needs further research with new line of resources and indicators.

Evaluation of the role of urban public space in the context of private and public setting is important where the paid entrance was considered a freedom to use the space for specific users.

Users at EWEP highlighted that paid entrance provided the ownership sense for users as no controls were there to use the UPS. Cluster analysis revealed that users have preferred semi-public spaces to provide further freedom for using the UPS. In comparison, public ownership has influenced the users to expect publicness like GFG. The way users perceive "public" ownership was an important factor. Vertical Dendrogram revealed that GFG was perceived differently than all other case studies. In comparison, GFG is a public open space with strong historical and cultural identity. Therefore, GFG is perceived by everyone as the common and known example for the freedom of use. The study used GFG as the benchmark case study for ownership and access so other case studies can be easily comparable. Nevertheless, public perception dominated on public ownership regardless of user location. This has been the case at high density urban environments in developed countries as recognized by Ho, et.al., (2021) in the context of Hong Kong. As in a developing country like Sri Lanka, affordability plays a major role in accessing the privately owned space as market forces restrict the access to specific socio-economic groups. In that context, ownership and access controls influence on urban users in Colombo as the results revealed the same.

Privateness was available in private, semi-private and semi-public spaces with different levels of access and control features. Photographic survey has also validated that physical structure of UPS determined the user perception. According to the Radar diagram (Cobweb), the ownership and access characteristics evaluated based on user reflections. Ownership preference indicated that people expect reduced access controls for effective use of UPS. Cobweb model analysis identified how public space influenced by privateness based on determinant factors. Users admired the safety and security, comfortability, and sanitary facilities within privately owned spaces which could be important factors in developing UPS in future. Therefore, this study provides important insights on the importance of public space provision by private sector in the urban development. Since private sector plays an important role in user perception of public space (Nambuge, Peiris, & Kalugalla, 2020), this study revealed the ownership and access controls matter less for the users to experience and recognize public space in cities. Also, the privatization of public space has been a common urban regeneration strategy (Roberts & Sykes, 1999) where state can encourage the private sector participation for UPS provision through effective regulation and frequent monitoring of the outcome. Also, it was revealed that user perception on public space provision needs special attention in the pre and post planning stages.

5. Conclusion

This study aimed at identifying attributes of public space offered by government and private sector in the urban context of developing countries. Four case studies with different levels of ownership and controls were selected in Colombo, Sri Lanka with strong emphasis on the user perception as the determinant factor. The results revealed that specific user groups have their own preferred factors while government owned and operated spaces still dominate the comparative preference as identified as 'full freedom to use and explore'. However, it is noted that private sector provides sustainable public spaces which are interactive, self-managed, and offer strong sense of security and safety for users. The findings are useful for urban planners, investors as well as policy makers to adopt innovative approaches in promoting urban public space and provide inclusive solutions to every user group in the society.

This study used four case studies with semi structured interviews as the key source of information on public perception. To obtain a comprehensive picture on the user behavior, additional number of case studies and confounding factors can be used. For example, other public spaces in the vicinity, transport costs and distance to travel, and socio-economic status must be studied to obtain a generalized picture on the public preference. To obtain objective views of user behavior at public spaces, quantitative Machine Learning models and Big Data Analytics could be adopted, and Point-of-Interest (POI) features can show more realistic aspects of user behavior than surveys with large sets of data. Also, this study can be expanded to study the user perception on specific forms and functional spaces in cities ranging from open spaces to indoor recreation spaces. Moreover, temporal and climatic factors was not considered in this study and the user behavior during different times of the day and different seasons of the year could also new findings on the perception. Also, a comparison between a user defined criteria with the planning criteria in developing UPS could provide insights for planning of urban spaces. The research can develop into a common definition of public space based on the user perception and to integrate the necessary elements for public space into urban regeneration policies in city scale. Finally, this research provides the importance of business mix in developing public space where market-based inputs are necessary for future planning of public spaces.

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Preferred Neighborhood Projects Among Millennials: Yes, In My Backyard

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ABSTRACT

The millennial generation, Gen Y and Gen Z, have different residential preferences compared to the previous generation. This study aims to understand the millennial's preferences towards the type of project development and their willingness to pay for the premium towards the preferred type of development to be built in their neighborhood. A total of 407 responses were collected through online survey and analyzed by using relative important index and frequency analysis. The results imply that millennials prefer recreational park, police booth, community garden, transit station and feeder bus route to be built within their neighborhood. Nevertheless, millennials are more willing to pay for the transit station, followed by educational institution, recreational park, police booth, and integrated public transport terminal. This study will help planners, developers, and the local authority to understand the preferences among the millennials, thus matching with relevant development to enhance liveability and better marketability of their residential project.

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1. Introduction

As with other developing nations in Asia, Malaysia registers a high proportion of youth among its 32.6 million people and the largest generational cohorts is Generation Y (Gen Y, 26%) and Generation Z (29%) (Tjiptono et al., 2020). Seventy percent of the global workforce will comprise millennials by 2025, reaching an age at which they will need to plan and make decisions on their preferred residential (Seri Vijay, 2019). The Gen Y is born in between year 1980 and 1994 and Gen Z born after 1995 to 2009. By 2021, Gen Y and Gen Z will fall into age 27–41 and 12–26, respectively. The age segmentation has greatly assisted marketers to target different groups and in turn tailor their property development projects to meet the demands and preferences of each generation. The same process may also be used to analyze the property market, especially the residential and retail sectors, as millennials represent a significant segment of the world population (Hoxha & Zeqiraj, 2020; Mansouri, 2007).

It is commonly reported that Gen Y is confident, competitive, willing to change, sociable, and close to friends and family (Islam et al., 2011). In terms of work–life balance, Bujang et al. (2015) mentioned about Gen Y being more inclined to spend their free time with family, entertaining themselves and participating in sport, rather than working mostly. Gen Y prefers to live in a neighborhood that is accessible to public transportation, workplaces, retail outlets, restaurants, and sport centers, so they can easily perform their daily activities, such as shopping, watching movies, working out in the gym, and many others (Lachman & Brett, 2010). In other hand, the survey of Aminuddin et. al.(2009), in Malaysia, 22% of Gen Z engage in regular sports or exercise for at least 4,200 minutes each week. Moreover, in the study of Larkin et al.(2018) emphasized a connection with nature environment will be considered a pushing force for Gen Z to improve their productivity also mentality. Therefore, recreational activity was integrated into project development of 1 Malaysia Youth City and it was conduct at suburban area to mitigate the immigration of youth. (Shahrul Zaman Yahya, 2016.)

The fickle spending habits of millennials make them least favorable to own a property, as mentioned in the study of "Beyond the bricks" – only 33% of millennials in Malaysia can afford a property ("The Edge Investment Forum on Real Estate 2018: Bridging the Generation Gap in the Rental Market ,"

2018). Unsurprisingly, according to the survey of realtor.com, 2021, nearly half (49%) of Gen Z prefers future residential locations in suburban areas, indicating that Gen Z are less likely to afford houses in urban areas and have been moving to the suburbs in 2020 (George Ratlu, 2021). In addition, the study compared millennials and Gen X, which showed that 20 to 29 year-olds who are willing to pay more on housing prefer places that provide favorable space and facilities to fulfil their leisure and recreational activities and turn down lucrative job offers in urban areas (Ghani et al., 2018; Lee et al., 2019).

As shown by studies, Gen Z were particular about work–life balance, and they will turn down job offers if they find that work–life balance is unprocurable (Tjiptono et al., 2020). In other words, the priority of Gen Z was that the surrounding neighborhood should be able to provide healthy leisure activities, which influenced decisions of property purchase of Gen Z. In terms of owning a vehicle, Gen Z are less likely to own cars and they eschew driving; they will willingly find alternative ways of commuting (Lance, 2019). Furthermore, Gen Z are economically dependent on their parents compared with the prior generation. A majority of Gen Z were raised by live-in grandparents, and in general they enjoy spending time with family (Klein & Smart, 2017; Tjiptono et al., 2020). One of the trend and popular culture from Gen Z - "FAM" which indicate Gen Z used it for friends who feel like family (Charise Rohm Nulsen, 2021; Gen Z and Gen Alpha Infographic Update , n.d.). Obviously the bonding between family and friends are considered significant social capitals among Gen Z (Mulyano et al., 2020).

As regards making decisions on a property purchase, the millennials are concerned that the residential surroundings would affect their lifestyle habits (Said & Juanil, 2013). The government is well aware about the importance of the concern of this group. The Federal Department of Town and Country Planning had published the Housing Development Guidance to provide different housing demands to cater to the needs of the millennials, by considering the Transit Oriental Development, Green Neighborhood, Open Space, Safe city Program and Land Readjustment.

By understanding the type of project development preferred by millennials, the developer and local authority can match their project development with such preferences. In this study, we aim to determine the millennial's preferences towards the type of project development and their willingness to pay towards the preferred type of development to have in their neighborhood. Using the "Yes, in my backyard" (YIMBY) phenomenon as the grounded concept, we determine what preferred project development is supported and is favorable to millennials, as the fundamental aspect of YIMBY refers to the establishment of neighborhood project development that caters to the lifestyle of millennials. The major concern of Housing Development Guidance 2016 was urban sprawl and change in demographics; hence, a different type of project development was provided to resolve the issues in order to match with market demand. Additionally, YIMBY movement aimed for a diverse, mixed land use, reduce urban sprawl and protect the environment with the call for all organizing planner meanwhile recount prospective and preference from the rising group of millennials (Ben Myers, 2017).

2. The yes, in my back yard (YIMBY) projects

Dissimilar housing demands between millennial and different generational cohorts have resulted in millennials' distinct personalities, values, and lifestyles. Millennials' lifestyle shows a great deal about how they would spend their time, what they value, and how they influence communal life. Understanding how this cohort's preferences differ from other generations becomes increasingly important for societies undergoing transformation as it enters a more mature life stage (Leblanc & Davis, 2018). To date, more than 75% of Malaysians live in the country's towns and cities (Grunsven & Benson, 2020). Malaysia had already transformed from a rural population to an urban-majority society. In the study of Choguill (2008), neighborhoods are actively changing to encourage economically feasible, socially acceptable, and environmentally responsible growth. At the same time, the changing of neighborhood and growth of millennials occurred simultaneously. Neighborhood satisfaction can be defined as the assessment of attributes of the physically built and social environment that affects the level of quality of life amongst residents ((Hur & Morrow-Jones, 2008). The findings of Holleran (2020) indicate that the millennial YIMBY view the liveable neighborhood tied with more affordable house, higher density, better public transit, and a common place for gardening or recreational space.

The Gen Y generation has a comparatively high level of environmental awareness and dedication (Taylor & Keeter, 2010). As a result, the greater awareness of nature will prefer a more natural-designed landscape when they purchase a house (Zheng et al., 2011). A community that provides mass transport, workplace, and sport centers is a preferable option for millennials, as these allow the high accessibility for them to carry out their daily routine (Lachman & Brett, 2010; Thanaraju et al., 2019). In addition, work-life balance and healthy lifestyle were gaining attention among the millennials (Kam et al., 2018). The access to additional green spaces and the walkability, for instance, parks, gardens, and lakes, which also provide relaxation and interaction between nearby residents, is gaining a high level of acceptance among the Gen Y and Z (Omar, 2017). Accessible green spaces near residences have been demonstrated to increase home prices by 5–6% (Tajima, 2003). In the millennial buyer housing preference study conducted by Soon and Tan (2019), neighborhood qualities had people rating them as "most important" at 65.3%. The intangible benefit of the neighborhood was one essential element to be considered as a good neighborhood such as a sense of harmony as well as the relationship amongst residents in the neighborhood where this can be sustained by a community hub (Teck-Hong, 2008).

Respondents choose a home that is closer to their school and workplace when it comes to locational features. In terms of security, proximity to their workplace and the physically built environment are essential factors. As a result, the walkable distance to recreational parks, retailing outlets, and schools are found to be associated with young buyers (Tan, 2012; Wang & Li, 2006). Millennials favor walkable, transit-oriented, and socially diverse communities than Gen Xers, who are more prevalent in urban cores (Pfeiffer et al., 2019). Table 1 summarizes the potential projects preferred among millennials in Malaysia and categorise them as (1) Transit Oriental Development Project, (2) Green Neighborhood, (3) Open Space, (4) Safe City Program, and (5) Land Readjustment.

Table 1 Summary of YIMBY's Project Development in Residential Neighborhood

Types of Project Development	Authors
Transit Oriental Development ▪ Transit Station ▪ Working Place/Commercial area ▪ Feeder Bus Route ▪ Integrated Public Transport Terminal	Boon et al., 2014 Kay et al., 2014 Abdullah & Mazlan, 2016 Litman, 2014 Olaru et al., 2011 Newman & Kenworthy, 2006
Green Neighborhood ▪ Project Adopted Waste To Energy Conversion Factory (e.g.: reprocessing & treatment of solid waste material into new materials) ▪ Solar Farm ▪ Community Garden ▪ Recycle Centre	Omar, 2017 Ahmad et al., 2017 Teck-Hong, 2011 Choguill, 2008 Dasar Perbandaran Negara National Urbanisation Policy, 2006 Pereira et al., 2005
Open Space ▪ Recreational Park	Othman et al., 2020 Brown & Glanz, 2018 Hamzah, 2017 Al-hagla, 2014 E. M. J. b. Ahmad, 2011 Hin, 2008
Safe City Program ▪ Police Booth	Shamsuddin et al., 2013 Salwa Najlaa, 2020; Salwa Najlla & Tarmidi, 2020
Land Readjustment ▪ Educational Institution ▪ Small Office Home Office (SOHO) ▪ Low Cost & Affordable Houses ▪ Community Hub ▪ Worship Place	Yusoff et al., 1998 Hamzah, 2017 Litman, 2014 Supriatna & Van Der Molen, 2014

The transportation as the main purpose of Transit Oriental Development covered a few elements such as transit station, working place/commercial area, feeder bus route, and integrated public transport terminal. The practice of on-site renewable energy as well as create greenest within the neighborhood was under the purpose of Green Neighborhood. Therefore, Green Neighborhood cover several elements namely energy conversion factory (e.g.: reprocessing & treatment of solid waste material into new materials), solar farm, community garden and recycle center. Project development should prioritize neighborhood walkability, recreational activities, and relaxing lifestyle; hence the element of Open Space was recreational parks. The element of Safe City Program was police booth as the major concern because of the fear of crime and crime incidents. The educational institution, small office home office (SOHO), low cost and affordable houses, community hub, and worship place were under the list of project Land Readjustment as this project development was catering the demand of nearby residents.

3. Methodology

A survey was carried out to determine the millennial's preferences towards the type of project development and their willingness to pay for the premium towards the preferred type of development to have in their neighborhood. In this study, quantitative method was adopted with the questionnaire designed with a five-point Likert scale to allow respondents to indicate their level of preference towards the YIMBY's project development (Halstead et al., 1993) and an open-ended question to allow respondents to indicate their willingness to pay for the premium for such project development in their neighborhood (Whitehead & Haab, 2013). The questionnaire was distributed online and the targeted millennials are familiar with this method and comfortable to complete the survey online (Pelz, 2021). The questionnaire consisted of three parts.

Part I asked about the demographic background of each respondent, Part II indicated the level of their preference on the following project development within their neighborhood, and Part III asked how much extra would the respondent be willing to pay for the premium for the following development to be

built near their neighborhood (see Appendix I for the questionnaire).

For this study, the targeted sample size was 400 respondents in order to validate the questionnaire results (Gleen, 1992). The respondents who are eligible to answer the questionnaire are Gen Y who were born between 1980 and 1994 and Gen Z born after 1995 and 2019 in Malaysia. According to Department of Statistics Malaysia (DoSM) 2019, 22.7 million people are of working age (defined by DoSM as individual aged between 15 and 64 years old). Also, the age of Gen Y and Gen Z comes under the legal working age by 2020. The study area of this research is district Kajang, which has grown into one of Malaysia's most populous cities, with an estimated population of 800,000 people in 2010, or 15% of Selangor's 5.4 million inhabitants, while the local town council (MPKj) anticipates Kajang's population to exceed 1 million by 2013. The distribution of questionnaires was conducted on a social media survey group. In this survey group, there were 3,500 Malaysian user accounts, and the individuals of these user accounts were pursuing study in college and university. In order to ensure the questionnaire was answered by targeted respondents, a one-to-one exchange of questionnaires was adopted and 407 responses were collected.

In this research, the Descriptive Statistics Analysis and Relative Importance Index (RII) was adopted to analyze the data with Statistical Package for Social Science (SPSS) software. Descriptive statistics are useful and effective as it can summarize a large amount of data like a group of samples and populations. This involved the use of frequencies, percentage, and means for presenting descriptive finding of the survey. It was also used for the initial analysis of rating score data of the various research variables (Akadiri, 2011). Furthermore, RII is a method used to find out the ranking for each project development, and the level of preference of each project development was examined. RII was used to calculate the priority ranking among the type of YIMBY's project development (Hatkar, 2016; Kassem et al., 2020). To determine the ranking of each project development, the RII is computed by using RII equation (Hatkar, 2016).

4. Results and Interpretation

The number of total complete questionnaires was 407. Cronbach's alpha was employed to verify the intercorrelation of questionnaire and its value which was 0.869; the value considered good internal consistency for the data set (Bernard et al., 2018). Table 2 summarizes the demographic data.

Table 2 Respondents' Demographic

Variable	Description	Frequency	Percentage (%)
Gender	Male	154	37.8
	Female	253	62.2
What race do you identify as?	Malay	122	30
	India	27	6.6
	Chinese	250	61.4
	Indigenous	8	2
Year of birth (generation)	1980-1994 (Gen Y)	104	25.6
	1995-2009 (Gen Z)	303	74.4
Educational background	SPM	16	3.9
	STPM	6	1.5
	Diploma	28	6.9
	Degree	319	78.4
	Master	38	9.3
	PhD	0	0
Employment	Full-time employment	90	22.1
	Part-time employment	15	3.7
	Self-employment	28	6.9
	Students	265	65.1
	Unemployed	9	2.2
What is your monthly income?	No income	219	53.8
	Below RM1,500	54	13.3
	RM1,501 - RM3,000	63	15.5
	RM3,001 - RM4,500	31	7.6
	RM4,501 above	40	9.8

Source: Author Compilation

Figure 1 reveals that millennials prefer to have a recreational park within their neighborhood and averagely willing to pay additional 6.86% as the property's premium for the recreational park development, followed by police booth development with the willingness to pay additional 6.26% of the premium. Recreational park development and police booth

development are under the categories of Open Space and Safe City Program, respectively, and these findings align with the research of Wang and Li (2004), Teck-Hong (2011), Tan (2012), and Thanaraju et al. (2019).

The millennial was looking at the neighborhood with a larger open space for recreational activities and low crime rate of the residential surrounded area. Moreover, in the study of Bujang et al. (2015) and Kam et al. (2018), the millennials prefer the work–life balance concept and healthy lifestyle; therefore it would be their concern if the project developments within their neighborhood can support recreational and sport activities. Besides, community garden has been ranked third with the mean percentage premium at 6.01% as willing to pay for such YIMBY's project development. This is consistent with the findings of Tajima (2003) – green gardens within walking distance of dwellings might enhance property values by 5–6%. Furthermore, the concept of "go green" project such as planted trees, pocket green spaces, is widely acceptable among the Gen Y. In other words, the presence of trees and shrubs within the neighborhood gained the support from millennials (Taylor & Keeter, 2010).

Project Development	Ranked	Willingness to Pay for the Premium, %
Recreational park	1	6.86
Police booth	2	6.26
Community garden	3	6.01
Transit station	4	7.28
Feeder bus route	5	5.30
Integrated public transport terminal	6	6.25
Community hub	7	5.40
Education institution	8	7.21
Working place / Commercial area	9	6.17
Low cost & affordable houses	10	5.28
Recycle centre	11	5.51
Worship place	12	5.54
Small office home office (SOHO)	13	4.75
Solar farm	14	6.08
Project adopt waste to energy conversion factory	15	5.62

Note: Respondents vote for their preferred project development by a 5-point Likert scale. Respondents were asked for their willingness to pay for the premium of such project development by open-ended questions.

Figure 1 Summary of ranking and willingness to pay for the premium for each project development

The fundamental of Transit Oriental Development refers to the 'optimum land use,' using the land in the most efficient manner or by constructing conducive activities on it to achieve certain goals. In fact, Transit Oriental Development is a concept of development centered on a rail or bus public transport station. This development promotes an environment that has high connectivity, as well as friendly to public transport, pedestrians, and bicycles, to reduce dependence on motor vehicles (Norshahzura, 2019). Furthermore, transit provides local or regional multi-occupancy-passenger vehicle service, which is open to everybody upon payment of a fixed charge, indicating the enhancement of the commute mobility within the neighborhood. Transit station, feeder bus route, and integrated public transport terminal, under the categories of Transit Oriental Development, are ranked fourth, fifth, and sixth of YIMBY's project development, respectively. The mean percentage premium that the respondents are willing to pay for transit station, feeder bus route, and integrated public transport terminal is 7.28%, 5.30%, and 6.25%, respectively. Similar to the findings of Abdullah and Mazlan (2016) and Kay et al. (2014), transit development was linked to higher property prices, implying that residents and future residents appreciate these amenities. The fourth, fifth, and sixth rankings of YIMBY's project development were under the same categories of Transit Oriental Development; however, there was a difference of willingness to pay for each development. Different rapid transit modes have different effects on property values: positive advantages on property prices are larger for commuter rail stations than for heavy rail stations, and Bus Rapid Transit might even lower neighboring property prices (Bartholomew & Ewing, 2011). In the survey of Lachman and Brett (2010), two-thirds of its Gen Y respondents point out that the walkable and mass-transit communities were either essential (24%) or preferable (47%) as walkability is a necessity for them; overall, millennials prefer transit-system-oriented lifestyle.

Community hub ranked seventh with 5.40% as mean percentage premium that the respondents are willing to pay for such YIMBY's project development in their neighborhood. According to Hin (2008), the public place with various community activities had an improved sense of community's harmony within the residential neighborhood, serving as a common meeting place for residents, although no substantial empirical test is available. Moreover, intangible benefits like the sense of harmony with the surrounding residential are found to be significant to millennials' home ownership (Teck-Hong, 2011). Educational institution and working place/commercial area ranked eighth and ninth, respectively, with the willingness to pay for the premium at 7.21% and 6.17% for educational institution and working

place/commercial area, respectively. According to Teck-Hong (2011), a good locational neighborhood should consist of convenient developments such as school, workplace, and retail outlets, all of which would attract the attention of millennials. Besides, convenience to daily goods shopping is an important consideration for young homebuyers (Wang & Li, 2006). The tenth-ranked YIMBY's project development was the low cost and affordable house with a willingness to pay for the premium at 5.28%. A well-equipped neighborhood is important, but millennials are the new generation and tend to buy houses close to where they originally lived or close to their parents' homes (Parkes et al., 2002), which supports the proof of Tjiptono et al. (2020), Gen Z tend to be family oriented and in general enjoy spending time with family. Most of the Gen Z were raised by live-in grandparents, which might influence the close relationships they enjoy with their families. Furthermore, according to Federal Department of Town and Country Planning (2011), the application of green technology and recycling were the focus of natural resource conservation and consumption in the green neighborhood. The recycle center was ranked eleventh of YIMBY' s project development, and the willingness to pay for the premium was 5.51%. As claimed in Omar (2017), one element of green neighborhood was recycled centers, which were gradually infused into neighborhood development projects and are gaining support from millennials.

The worship place ranked twelfth among the YIMBY's project development, and the willingness to pay for the premium was 5.54%. The sense of religion among millennials was either very low or absent in their lifestyle compared to Gen X (Adam & Rubia R, 2018). In other words, the worship place was not the main priority in their neighborhood among the millennials. Ranked thirteenth of YIMBY's project development was small office home office (SOHO) and the willingness to pay for the premium was 4.75%. This contradicts Andrew and Toshio's (2017) study, who concluded that most millennials preferred to run own small businesses at home. However, solar farms and projects adopting waste to energy conversion factory (e.g. re-processing and treatment of solid waste material into new materials) were the bottom two among the YIMBY's project development with the mean percentage premium at 6.08% and 5.62%, respectively. This finding is contradicting the suggestions by Zachary (2018), who mentioned that the solar orientation development should be promoted as project development in the neighborhood of the millennials. Moreover, the bottom ranking of projects adopting waste to energy conversion factory was contradicted by Malaysia Habitat Magazine (2019). In the Malaysia Habitat Magazine (2019) there was a set-up of Permatang Nibong Green Enterprise Cooperative in the neighborhood of Permatang Nibong run by young adults and its purpose is to convert the waste material into useful resource. Such development project is less appealing among the millennials.

In brief, the findings of the willingness to pay premium for such YIMBY's project development were inconsistent with the YIMBY's rankings. Planners and developers should take note of this phenomenon, as the implication of the findings suggests that, although developments such as recreational park, police booth, and community garden are among the favorable developments, millennials are more willing to pay for transit station and educational institution to be built in their neighborhood. The findings also prove the statement of Bujang et al. (2015) and Holleran (2020), who claimed that millennials have a positive mentality about the idea of work–life balance and a healthy lifestyle, and they are hesitant to spend the majority of their time working, preferring instead to spend time with family, entertainment, and sports, as well as making their neighborhood with mass transit more viable. Their uniqueness of lifestyle makes them advocate the project development they prefer in their neighborhood (Hahn, 2017).

5. Conclusion and Recommendation

This study disclosed the preferable YIMBY's project development and the willingness to pay for the premium to preferred YIMBY's project development among millennials in their neighborhood. The list of millennials' preferences to develop in their neighborhood provides an insight for planners and developers. Developers can use this list as a reference to plan project development within residential neighborhoods and have a better marketability for future residential projects or existing property projects. By referring to this list of millennials' preferences of YIMBY's project development, a residential neighborhood is recommended to develop a recreational park with the willingness to pay for the premium of 6.86%, followed by police booth with the willingness to pay for the premium of 6.26%. Nevertheless, the highest willingness to pay for the premium was under transit station development, which was 7.28%, and it ranked fourth among the YIMBY's project development. The second highest willingness to pay for the premium was 7.21%, which is the educational institution development. For the local authority, the list of millennials' preferences list can be considered for land-use planning and approval of dwelling developments to attract more millennials. The attraction would increase the population and economic development of districts, at the same time raising the income of the local authority. Public and potential buyers benefit from the list of preferred project development because it was added value to surrounded property. Despite buyers are purchasing for investment or self-occupation, they gain knowledge and confidence before buying a property. It is reasonable to believe that the newly introduced concept of "Yes, in my back yard" contributes to the knowledge of the real estate industry in Malaysia. In addition, YIMBYism was first discovered in Fremont, in the San Francisco Bay Area, and it has been gaining attention among young people for decades. Also, the concept of YIMBY acts as an important part of the bridge among all stakeholders. Hence, it can improve the process and impact of the whole project development. The millennial preference towards residential property is influenced by other factors such as structural attributes, financial ability, location, available of facilities, type of property, etc, which is the limitation for this study, as these factors are not included. We suggest that future studies should be taken into account the aforementioned factors.

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