SOCIAL MEASURES OF RESILIENCE
An investigation into community resilience by taking adaptive physical measures through social mediation during infrastructure disruption

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Abstract
This paper intends to break down a local case to grasp the possibility of adaptable measures by individuals and systems through the social exchange during infrastructure interruption on account of considerable precipitation. Finally, the extent of social resilience is assessed through the '5S' framework. The assessment reveals the social capital and the incredible social conditions accomplished by the mix of the particular circumstance and differing interest packs are influencing the adaptable appraisals which can be considered as an important report to structure a strong framework by understanding the tangled social issues and multifaceted nature

Keywords: *Resilience, Hatirjheel, Social-capital, Adaptive-measures*

1. Introduction

Water clogging is a common problem in Dhaka city during the rainy season. But the causes and consequences vary in different parts of the city. To solve this problem, diminishing Hatirjheel has been revived. Yet, the incongruity is, the location of the site under infrastructure disruption is just beside of Hatirjheel. The site BIAM area is named after BIAM Foundation which works as a landmark for the area. Though this is a very small urban area, land-use is diversified and the community is heterogeneous. So, infrastructural disruption has a multifaceted impact. This paper aims at investigating the extent of social resilience in the BIAM area. It has documented the social contexts, social mediations, and adaptive measures under the '5S' framework to assess the level of social resilience. This assessment can be important for the community to better understand their problems, raise awareness among them, and to prioritize community goals. Thus, it will eventually result in better resilience-related activities

2. Methodology

This paper has four facets. In the first stage, to gather knowledge about social resiliency and to find out a framework for assessing social resilience, a meticulous literature review has been taken place. From the literature review, the '5S' framework for social resilience is taken to evaluate the extents of social resilience in the intended area.

In the second stage, the development of the site over time is studied. To do so, both the literature review and site surveying are carried out. Then, the next task is to scrutinize that includes investigating the causes and consequences of the drainage infrastructure disruption during rain, mapping the extent of the problem, damages, and adaptive measures taken to cope up. This investigation has been carried out through extensive site surveys and interviewing local people.

The third stage is interviewing local people for understanding the tangled social issues. 40 people took part in the interview and the household profile of them is as the following chart.

The fourth stage is to present the collected information under the '5S' framework of social resilience. This framework has formulated the study in a structured manner and so, all the social issues are discussed under this framework.

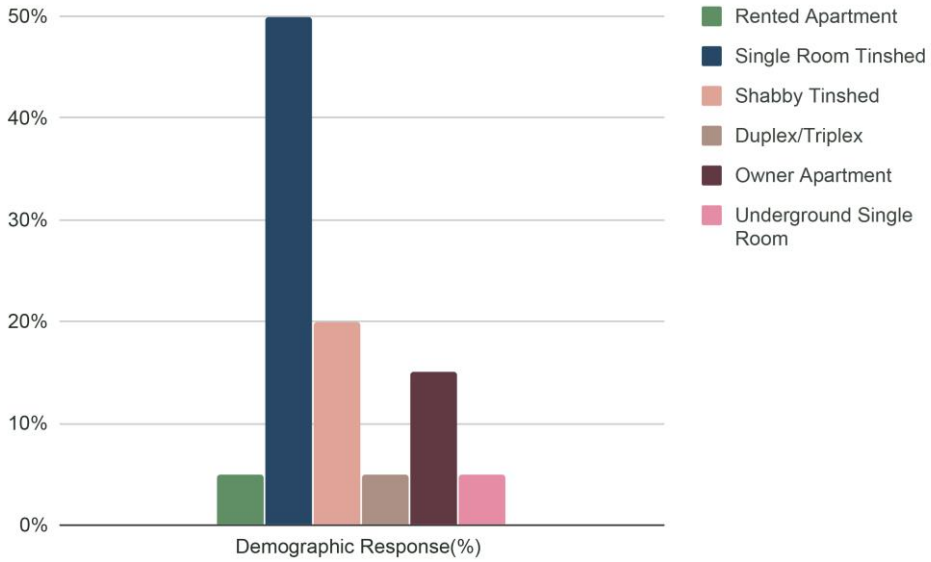

Figure 1, The household profiles of the respondents. *(Source: Field survey mapping: Design Studio Report, BUET)*

3. Literature Review

To scrutinize the degree of social resilience in an area, it is required to illuminate the term 'social resilience' and the "5S' framework of resilience '

Social resilience can be defined as a collective capacity of a neighborhood or topographically characterized zone to deal with shocks and proficiently continue the rhythms of lifestyle through participation taking aftershocks (Aldrich, 2012). From this definition, it can be said that social resilience is characterized by collective action or mediation to withstand in any shock. Then the question arises, how a community can work together when there are contrasting interest groups? To answer this question, it is required to address that there will have inequality between different interest groups. It is often argued by scholars in disaster recovery that risk and access to recovery programs are not equal among all social groups (Wisner, 2004). This is a clue to argue that the uneven extent of social resilience is an obvious result in society to society. Therefore, a framework is needed to understand the resisting capacity of society. There are many approaches to measure social resiliency. This paper is following the '5s' framework (Saja, et al., 2018) which is reflected here :

Social structure:
It indicates the demographic composition of society. It reflects society's heterogeneity or homogeneity from economic, social standing, ethnicity, or other points of view.

Social capital:
(Hanifan, 1916) recognized social capital as friendliness, fellowship, mutual empathy, and social intercourse amongst a collection of individuals and households who make up a social unit

Social mechanisms:
The mechanism by which social mediation engages community people to take part in the resilience-building process towards surviving and adapting to disasters.

Social equity and diversity:
It marks the equality in terms of access to a various set of resources, and services which tends to ensure equity for people with specific needs to manage catastrophes.

Social beliefs:
It denotes the cultural practices, social behaviors, faith-based values, etc can also have an impact on the extent of social resilience

This paper investigated the flood-affected area meticulously and the social conditions are expressed under the above-mentioned framework by (Saja, et al., 2018) to assess the social resiliency of the community.

4. Site development in time with their respective land use, infrastructure and building types

Hatirjheel, according to 'Kingbodontir Dhaka' a book by Nazir Hossain depicts that in the nineteenth century the British government and the local Zamindars used Hatirjheel for elephant bathing. Hatirjheel was a low-lying area with just about a withering water channel up to the Begunbari trench because of infringement by several controversial Highrise structures and, numerous slums. In 1997, RAJUK (Rajdhani Unnayan Kartripakkha or Capital Development Authority) had taken initiative to develop Hatirjheel as a commercial area with a lake. As a commercial area and environment-friendly activities cannot go hand in hand, there were protests from several quarters to prevent it. RAJUK had also planned to construct a multistoried commercial building on 13 acres of Hatirjheel-land, all these were contrary to the preservation of Hatirjheel. This lake can hold around 3.06 billion liters of water, and during the rainy season about 4.81 billion liters of water, making it the biggest waterway inside the capital of Bangladesh. (BBS[1], 2011)

On the eastern bank of Hatirjheel and overlooking the Sonargaon Hotel, the residential area of Biam road and the Dilu road was established after the Pakistan period. (BBS, 2011)

This interesting site, as a contextual setting, was chosen for the intended research because of the diversity of the social class in the same context and to understand their coping mechanism to each problem that appears in a multiscalar approach and how their lives get affected by the Hatirjheel water basin is the intended disclosure.

Figure 2, Hatirjheel and the Catchment area's contextual land use demography (*Source: GIS)*

From figure 2, it can be seen that the area comprised of mostly residential buildings. The BIAM school and Jhil mosque with madrasah are two important landmarks in this area.

5. Diagnostic Scrutiny: Causes and consequences of the drainage infrastructure disruption during rain

[1] BBS: Bangladesh Bureau of Statistics

5.1 CAUSES AND CONSEQUENCES:

The infrastructure disruption of the BIAM area is a result of undertaking segregated development projects of the Hatirjheel which ignored the necessity of integrating its services with the existing infrastructure of the surrounding area. Before the construction of the Hatirjheel bypass road, the road on the east side of the lake was quite lower than the present road level. So, the bypass road worked as a barrier for surface stormwater runoff and eventually caused water clogging in the rainy season. After the construction of the bypass road, the peripheral road level was raised 3' than the existing level, and the sewerage line and stormwater drain were installed above the existing line. As a result, the pre-existing infrastructure of the sewerage system failed to meet the new infrastructure system of Hatirjheel. The preceding system then runs towards Dilu road and finally crosses at the BGMEA (see figure 2) intersection to meet the gradient. The rainwater drainage pipe previously ran parallelly and met the BGMEA crossing which also failed to meet the proper gradient, substantially was another cause of water clogging of this area.

The accessibility of the BIAM road (see figure 2) is reduced as people need to take rickshaw with a high rent as much as 20 takas to cross the water clogged portion of the road which is hardly 100m. Slum-dwellers face problems in terms of preparing food, damaged furniture, clogged toilets, odor, and health issues. The disruption of infrastructure also affects social infrastructures here. BIAM school remains closed during rainfall for more than 4 hours due to water clogging. The jheel mosque also faces an accessibility problem. Besides, the ablution space is also clogged which makes severe inconvenience to the Musulli.

5.2 MAPPING THE EXTENT OF THE PROBLEM

To map the extent of the problem the BIAM area was visited and the problems were documented. Relation among duration of rain, water level, and duration of water stagnancy is mapped. From that data, it can be seen that if rainfall takes place for more than six hours the height of the water reaches as much as 4 feet and the water becomes stagnant as long as 48 hours. When the duration of rainfall lies between 1-2 hours, the height of water fluctuates between 2 to 3 feet and remain stagnant for 2 to 5 hours. And if the time of rainfall increased to 3 hours water level fluctuates between 3 to 4 feet and longevity gets a two-digit figure like 10 to 14 hours.

Figure 3, Water clogged BIAM road. left: disrupted pedestrian and vehicular movement. Right: Disrupted economic activity. *(Source: Author)*

On the other hand, the local nature of the flood in terms of the degree of disruption within the range of high to low is mapped. It can be seen that the slum area, the BIAM school(see fig 2), and the building opposite to BIAM school are mostly affected.

The slum area becomes severely affected with 1 to 3 feet high water level that seems to stop their regular life with the scarcity of drinking water and food.

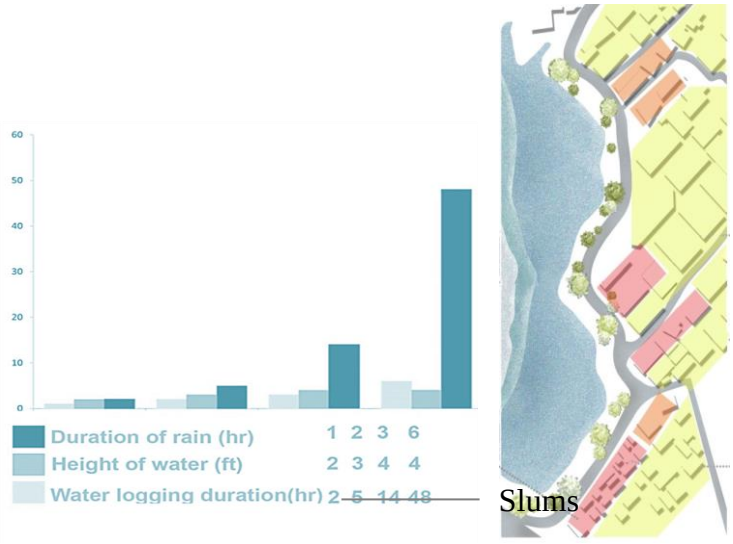

Figure 4, (left): relation among duration of rain, the height of the water, and water clogging duration. (*Source: Field survey. Graph: Design Studio Report, BUET)*. (right): The Map of the affected area. Red: Most affected, Orange: Medium affected, and Yellow: Less affected area *(Source: Field survey mapping: Design Studio Report, BUET)*

6. '5S' Framework of social resilience

6.1 SOCIAL STRUCTURE:

In terms of occupants' characteristics, this area houses diverse professionals including secretaries, politicians, service holders, shopkeepers, day-laborers, street vendors, etc. Most of the residents are job holders in various government and private organizations and banks. The slum residents work nearby in the shops and some as street vendors of various items. For their livelihood, the women work as house-help and work from house to house.

As for the children, they tend to go to the nearby madrasah for education as well as work as shop-helps in local tea-stalls or assist the street vendors.

A majority of the residents, the women, and the elder people tend to walk around the lake in the evenings, and children play on the street overlooking the lake. The younger people tend to gather around the tea stalls to talk and socialize. They try to maintain a mosque-based community and try to voice their demands through a guardian body elected as the mosque committee. In recent years, a new neighborhood welfare foundation has started its journey with the help of Mrs. Rouf, naming the "Abdur Rouf Foundation" in commemoration of founder-curator of Bangladesh Film Archives late A.K.M AbdurRauf (1935-2000).

Figure 5, Two spectra of demography; Left side: Slum dwellers on the vicinity of Hatirjheel context, Right side: Middle-class people's dwelling places. *(Source: Author (left), Design Studio Report, BUET (right))*

6.2 SOCIAL MECHANISM:

The mosque plays a vital role in this community. This is the only place where people from all social groups can congregate. Sometimes, the mosque committee works to various voice raising issues for the community. Through this voice raising process, some developments also accomplished. For example, a secondary water chamber was established near the jheel mosque so that it can immediately absorb the rainwater, and then it would meet the main rainwater drainage line which ran towards Dilu road.

Therefore, the social mechanism works better in taking adaptive measures to solve the accessibility problem of the mosque during the flood. To provide accessibility to the mosque, temporary sandbags are laid on the ground so that people can use it to approach the mosque. Community people also collected money and constructed a stepped flood barrier to protect the mosque from being flooded.

On the other hand, BIAM school is an institutional building, and the students of this school face accessibility problems during a heavy downpour. Biam School authority usually gives early holiday and as the campus is 5' lower than the constructed road, a passageway made by using benches is provided temporarily for students, teachers, and staff to use

Figure 6, Community people using different adaptive measures for Biam school and the mosque. (*Source: Author)*

During rainfall, residents try to unclog the surface drains which gets clogged because of littering waste.

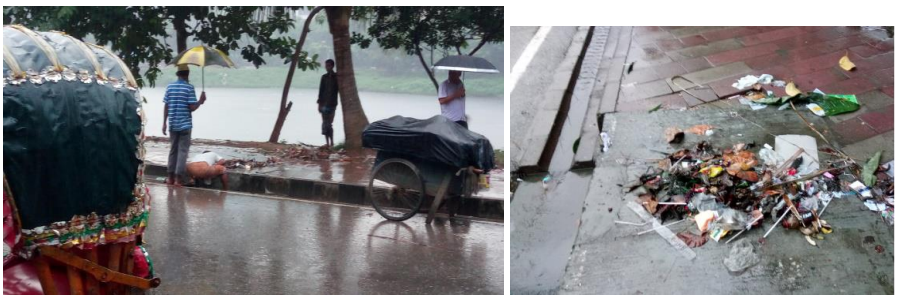

Figure 7, Community people unclogging the surface drain for better passage of stagnant water. (*Source: Author)*

6.3 SOCIAL CAPITAL:

This is known by now, social capital refers to the social connection between individuals. So, this is a very difficult thing to determine the extent as it is a subjective measure. Instead of any questionnaire survey, this paper depends on the empirical evidence that reflects the state of the affairs among the members of the society. The followings are some empirical evidence that can be considered as a determinant of the social capital of the community.

6.3.1 Road development :

The proposal for raising the road level is weakened by the disapproval of a significant amount of community people. Here is a demonstration of responses from different interest groups which shows that about 40% of the respondents are negative about raising the road elevation as their houses will go under road level if the road is elevated. It indicates the direct conflict in the community and their inclination towards individual benefit is expressed

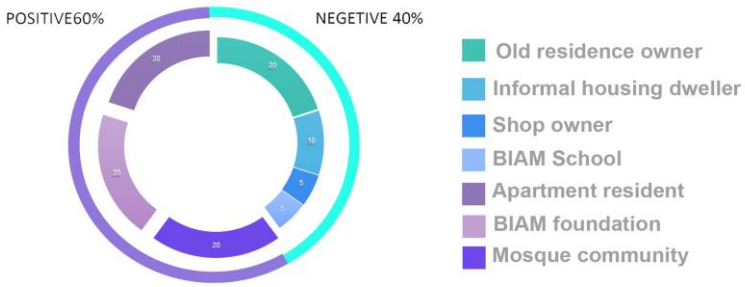

Figure 8: Positive and Negative response regarding road elevation and the breakdown of the participant's profile (*Source: Design Studio Report, BUET)*

6.3.2 individual efforts to adaptation:

This is evident from the field survey that people are more tending to depend on individual adaptation mechanisms, as the community is unable to take unified action due to conflicts among different interest groups. This individual adaptation mechanism is comprised of several actions such as using a water pump to drain out water from personal premises, constructing a flood wall, elevating the plinth level, etc. All of them are subject to a high amount of cost and so only accessible to upper or upper-middle-class people. But the slum dwellers do not have the luxury to adopt any mechanical means or elevating the plinth level of their houses. On the other hand, pumping out water from the personal premise and obstructing the water by flood wall increase the amount of stagnant water in the BIAM road, which eventually worsen the situation for common people. So, there is no cohesion in social groups in individual-level adaptation. Instead of improving the situation, it is making the problem more severe for common people.

Figure 9, Pumping out water to BIAM road from personal premises (left), flood wall (right)(*Source: Author)*

6.3.3 scarcity of food and drinking water in the slum area :

From the field survey, it has been seen that many slum dwellers face acute scarcity of drinking water and food during the flood as their cooking place goes underwater. They can't cook food to eat and can't boil water to drink. Some of the slum dwellers have elevated their cooking places to adapt to the flood.

Though the problem of food and water is acute, no community involvement is evident to support their helpless neighbors. Respondents from the slum area have expressed their miseries and helplessness during the interview. This is evidence of a loose connection between the slum dwellers and the other part of the community.

Figure 10, Water clogged slum area causing scarcity of drinking water and food.(left), elevated gas burner for adaptation(*Source: Design Studio Report, BUET)*

From the above mentioned conspicuous shreds of evidence, it can be concluded that social capital is very weak and can't play a significant role to tie the community to withstand the shock as a whole.

6.4 SOCIAL EQUITY AND DIVERSITY:

There is no equal access to resources and services for the entire community. The slum dwellers face problems regarding electricity, drinking water, food, etc. and these problems become more acute during any infrastructural disruption. There is no evidence of sharing resources to ensure equity in the community level. So, it can be concluded that this community lacks equity in terms of access to resources or services.

6.5 SOCIAL BELIEFS:

The community people have strongly believed in the power of residents who are bureaucrats or politicians to come forward to solve the problems. Though the community people have no or little interaction with that elite group, they trusted the power of the social elites. But the development of the Hatirjheel bypass road was conducted by another authority (Bangladesh Army) and so no political or bureaucratic influence could have changed the situation. This social belief had the promise to unify the community under strong leadership. But, it didn't take place due to the heterogeneity of the community profile and the weakness of the social capital. This reasoning is stated based on the interviews of the local people

7. Discussion

From the '5s' framework it can be deduced that the society under consideration is heterogeneous in demographic profile and the social capital is also very loosely tied. Social equity isn't evident and the social beliefs can't contribute due to loose social connections. The only social entity that plays a role in mediating tangled issues is the mosque where people from all the interest groups congregate regularly. From this observation, it can be claimed that the social interaction at the mosque has created the opportunity. And to strengthen the social capital this mosque can house other sorts of communal activities or other social organisms that provide the opportunity to mix different social groups, can be launched.

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