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Flood vulnerability, local perception and gender role judgment using multivariate analysis: A problem-based "participatory action to Future Skill Management" to cope with flood impacts

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ABSTRACT

Flood impacts and social vulnerability are substantial threats for the sustainable development of the developing world. This study focuses on some particular points of flood impacts and the local concept towards existing management capacity. Additionally, significant focus was given to gender roles and how they may impact measures that aim towards reducing flood risks. Both qualitative and quantitative techniques were applied during the research, in order to understand the perception of the char-land communities on natural hazards, social crisis, resource accessibility, climatic uncertainty and the gender role to cope with flood consequences. Concurrently the questionnaire survey and focus group discussion (FGD) was performed among the local people. This study revealed that majority of the people was directly threatened by the destructive consequences of flood hazards, which in turn, badly influenced the household economies, alongside its education, security and infrastructural prospects. Some decades ago, the application of indigenous techniques was deemed successful as the communities managed to effectively reduce the risk involved with potential floods. However, now the solution is no longer clear as it is disturbed by external climate components. Results showed the vulnerability of the local communities in terms of knowledge, resource access, communication system, proper information dissemination, health, and livelihood. The gender variability is believed to have significant value in terms of flood disaster risk reduction, household development, and family caring activities. Principal component analysis (PCA) and cluster analysis (CA) has clearly identified the gender role in the char-land community. The women's activities are profoundly focused in terms of the flood risk management, and the families generally do not properly appreciate the value of women and their role. However, the problem-based "Participatory Action to Future Skill Management (PFM)" for flood risk reduction in the char-land area can ensure to knowledge empowerment and capacity builds up, to achieve community resilience and sustainability in adverse climate conditions. The government should take appropriate actions in order to figure out the basic problem, and should issue focused policy practices among the char-land communities to bring them in sustainable trends.

1. Introduction

Climate change is a concerning issue for community development in some areas of the world. Uncertainty in meteorological parameters leads to an imbalance of environmental components. Anthropogenic activities dramatically influence the atmospheric composition of planet Earth because of the large amount of input from different greenhouse gasses in the atmospheric layer. Long-term continuation of these processes may act as a driving force to make the unstable condition of atmospheric pressure, humidity, temperature, rainfall and the net vaporization process. Temperature variation and rainfall uncertainty are correlated with each other. In some countries, rainfall uncertainties frequently bring about flood and drought hazards. Consequently, in Bangladesh, flooding hazards are common phenomenon owing to the unsteady condition of

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meteorological parameters. Subsequently, different types of flood (e.g. severe and moderate) like the tidal flood, flash flood, and river flood negatively affect 45.5 million people. A number of severe floods in different years like 1998, 1988, 1987 and 1974 caused the death of 1000, 2379, 1657 and 30,000 lives respectively, and damaged enormous amount of properties, agricultural crops and public infrastructure, such as roads (CCC, 2008). Crops, roads and structures were damaged during recurring floods in 2004, 2003 and 2002 respectively (Flood Archive, 2004).

Nowadays, developed and developing countries are significantly affected by climate change. Water stress and flooding are projected to increase due to the climate change effects during this century (Ebi and Bowen, 2016; Rakib et al., 2015b). Greenhouse gas emission scenarios, estimate that 920 to 3400 million people worldwide will be exposed to an increased number of natural hazards by 2050 (Arnell and Lloyd-Hughes, 2014). On the other hand, 100 to 580 million people will be exposed to the highest rank of river flood risk by 2050 (GFDRR, 2014). The consequences of climate change increase the vulnerability of social components. In Bangladesh, flooding hazards and their social impacts influence social development. However, social development is considered as a critical aspect for the social and human wellbeing in adverse climatic conditions. A regular occurrence of floods significantly inhibits social and human security. More than 68% area of Bangladesh was severely affected by flood (Hossain et al., 2014). In terms of social sustainability, it is important to ensure that the basic needs and/or fundamental rights of the local people are met. In the total area of Bangladesh, around 5% of the land is considered char-land[1] and from the total number of the population about 6.5 million people live in char-land (Environment and GIS (EGIS), 2000; Sarker et al., 2003; Unnayan Onneshan, 2008). In the char-land area of Bangladesh, a large number of people frequently face social and environmental crisis due to unwanted rainfall, flood, char erosion, river channel shifting and social crimes. Excessive rainfall during monsoon season regularly damages char-land farming activities, settlements and communication networks (Islam et al., 2010). A study revealed that around 25% of the population of char-land (Brahmaputra River char areas) migrated three times over the last decades (CARE--Bangladesh and DFID-B, 2002).

Flooding hazard is one of the main causes of social crisis as it can directly worsen the condition of the socioeconomic status in the local communities. Among the rural communities, children, women and disabled people have more experience on flood related hazards, and the risks associated with it, alongside the undesirable feedback which is originated at the regional level. The most vulnerable people in those disaster-prone areas are children, adolescent girls (DFID, 2004; IPCC, 2007), women (Hines, 2007; Dasgupta et al., 2010), and more than 75% of displaced people (GoB, 2008). In the categorical aspect of vulnerability, women are more frequently victimized compared to men because of the traditional socialization and work related practices. Women possess comparative less strength to combat natural disasters and in some cases, they take up inferior positions in the society (Duddy, 2002). Regarding the gender specific capacities, women are obliged to abide by specific social roles even though it has proven that whole community is to be benefited if they act otherwise (i.e. if they become active members of the community). Additionally, it is believed that local women, can shape their community using adaptive mechanisms in the vulnerable areas (UNDP, 2010). Moreover, women carry out a wide range of activities to meet their family's basic demand. They adapt to new situations and attempt to cope with climate change and/or other forms of disasters. Furthermore, women bring about their distinctive experiences in term of flood forecasting, preparedness and mitigation approaches. This paper aims to investigate the consequences of floods and the traditional social concepts of the char-land communities. It will also thoroughly look into gender roles and resource accessibility in regards to flood hazard risk reduction, and how efficient they are to cope with the flood hazards and what would be the best approach to empower the char-land community. Further, vulnerability evaluation, community empowerment and capacity judgement is an inseparable part of the social sustainability.

[1] Char-land is one type of Island in the middle point of mighty river such the Brahmaputra river or adjacent to riverbanks which is covered by vegetation and/or sand bars.

2. Research methods

2.1. Justification of the study

This research was performed at the “Baladoba Char” under the Buraburi Union, Kurigram district in Bangladesh (Fig. 1). The location of the study area is located in line with the main Brahmaputra river and its shifted channel known as distributary water body. Soil quality of the char-land was not fully supported by the agricultural activities, and the major portion of the fixed volume of soil is recognized as sand dominated and infertile. At the time of flooding hazards, alluvium deposition on the upper part of top soil helped to increase soil fertility and production rate. A greater number of people were found to be completely illiterate and agro-economy dependent. Basically, agricultural production rate drive the socioeconomic condition of the char-land community. Natural disasters like flood and drought are considered to be the principal factor that change and destabilize the condition of their livelihood pattern. However, short and long term environmental problems lead to livelihood crisis and food insecurity. The prospective study is emphasized to figure out the problematic causes, probable effects and the role of community participation to cope with the natural disaster and to maintain a stable socioeconomic condition.

2.2. Research settings

Regarding the aims and objectives of the paper, this study was carried out using qualitative and quantitative techniques. The potentiality of the research methodology is significant because it aims to answer and explore the arguments surrounding the char-land hazards and social crisis. This technique was more noteworthy to chalk out for research planning and data interpretation depending on target theme. Furthermore, it was divided into four sections. Firstly, this paper presents the survey techniques and the formal discussions with the local people such as questionnaire surveys, focus group discussions (FGD), informal dialogues and the statistical analysis. Owing to fulfill the research goal, the questionnaire was structured to follow a holistic approach which would search the real problem andfurther divide it into four sections. Each of the sections contains different information to meet the research demands. Accordingly, the first section was structured with local demographic information, which may reflect the basic information of the respondents. The second section consists of several aspects of natural disaster and its existing condition along with probable effects on local economy. The third section was formed with some of the crucial points of gender role and disaster management at different stages, and the fourth and last section contained disastrous scenarios like social crimes and gender violence. The feedback forms (e.g. semi-structured) were randomly distributed among the local respondents to fulfill the prerequisite condition of research method. The formulated questions and required answers were significant and relevant to the purpose of the study. The qualitative survey was performed among aged people who are involved in household economy development activities. Some of the qualitative questions were given to the local women because of their active participation in family wellbeing's, while a maximum number of the significant questions were answered through FGD. However, FGD is one of the significant social research techniques which can indicate the prospective field of thematic views on the social crisis in the aspects of target questions. The FGD questions were structured following the aim of the research objective which embodied several aspects of natural disaster and negative consequences of its derivatives. FGD were carried out in the following two groups: the total number of participants in group one was