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Social vulnerability and disaster risk reduction needs: Perspectives of Women

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Abstract

Integration of disaster risk reduction needs and experiences of different groups in the community with the built environment is significant to achieve disaster resilience. It facilitates identifying the nature of disaster vulnerabilities within a particular community leading to achieve disaster risk reduction more effectively. Women's needs and experiences are prominent in this context since women have been identified as a highly vulnerable group to disasters. Women's higher disaster vulnerability is typically determined by their social roles and responsibilities. Their responsibilities over production and reproduction frequently expose them to different conditions in disasters with varying vulnerabilities. This paper is based on a doctoral research that aims to investigate how women's knowledge, experiences and needs and concerns in relation to disaster risk reduction can be identified and integrated with disaster risk reduction in the built environment. A comprehensive literature review has been carried out in order to explore various aspects of social vulnerability, disaster implications on women, women's needs in disaster risk reduction and the means of needs capturing and integration. Participatory methods such as public consultations are suggested as the most effective ways of capturing disaster risk reduction needs of community women in literature whilst the significant role of construction process and people involved in it is highlighted for integrating the needs with the built environment.

Keywords: built environment, disaster risk reduction, social vulnerability, women's needs

1. Introduction

1.1 Background

A disaster is a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts (UN/ISDR, 2009). According to Smith (2007), it is the destructive consequence of a hazard. However, hazard on its own is not capable of triggering a disaster (McEntire, 2001; Sahni and Ariyabandu, 2003). Although a hazard is a physical event or a phenomenon that has the potential of causing loss of life or injury, property damage, social and economic disruption or environmental degradation (UN/ISDR, 2004), it needs to be combined with a set of conditions that affect the ability of countries, communities and individuals to prevent, mitigate, prepare for and respond to hazards to trigger a disaster. These conditions are known as vulnerabilities (Ariyabandu and Wickramasinghe, 2003). In other terms, vulnerabilities are the factors which determine the degree to that someone's life and livelihoods is put at risk by a discrete and identifiable event in nature or in society (Blaikie et al., 1994).

In reducing the risk of natural disasters, it is the vulnerabilities that have to be controlled since the hazard component is inevitable (McEntire, 2001). In controlling vulnerabilities of people, it is important to identify their needs, experiences and knowledge in relation to disaster risk reduction. Incidentally, reducing disaster vulnerabilities is enormously linked with the characteristics of the built environment. According to Duque (2005), disasters occur as a result of hazards intersecting with the built environment, particularly poorly located and poorly constructed development. Further, it is suggested it is the characteristics of the built environment that can be managed to manage disasters (Duque, 2005). In this context, a doctoral research is being carried out aiming at investigating how women's needs, knowledge and experiences in relation to disaster risk reduction can be mainstreamed with disaster risk reduction in the built environment.

The paper is based on a part of the literature review of the aforementioned study and it explores literature on disaster vulnerability, specially the social aspects of it, implications of disasters on women and women's needs in disaster risk reduction. Subsequently, it discusses the importance of integrating women's needs into disaster risk reduction in the built environment and identifies different methods that can be utilised to, capture women's needs related to disaster risk reduction and integrate them into the built environment.

1.2 Methodology

The doctoral research, which this paper is based on was initiated taking the path of pragmatism. Accordingly, the research problem of the study, "how can women's disaster risk reduction related needs, experiences and knowledge be identified and integrated into disaster risk

reduction in the built environment?” was looked at from a view, which argues that the most important determinant of the research philosophy adopted for a study is the research problem not the methods used (Saunders et al., 2007; Creswell, 2009). Having viewed the research problem from a pragmatist viewpoint, it was identified that this research prefers interpretivism in terms of epistemological thinking since the problem is focused on capturing needs and concerns of a group of people to integrate them into disaster risk reduction in the built environment. In interpretivism, the researcher’s intent is to interpret the meanings that others have about the research problem (Creswell, 2009). The epistemological stance of interpretivism leads this research towards the ontology of social construction. Accordingly, the research views reality as being socially constructed. In addition, this research has been identified as a value laden research under axiological philosophical assumptions since the influence of researcher’s values, the personal beliefs or the feelings of the researcher creates a part of the philosophical beliefs of the research. The paper in particular follows the method of literature review in achieving its aim. A comprehensive literature review has been carried out to explore different scholarly views on disaster vulnerability, implications of disasters on women, women’s needs in disaster risk reduction and how women’s needs can be captured and integrated with the built environment.

2. Women as a highly vulnerable group to natural disasters

2.1 An overview of social vulnerability to disasters

According to UN/ISDR (2004), disaster vulnerabilities are determined by physical, social, economic, and environmental factors or processes and they can be grouped into four categories respectively. Working Group on climate change and disaster risk reduction of the United Nations Inter Agency Task Force for Disaster Reduction (IATF/DR-UN) (2006) elaborates these four categories as follows.

- Physical vulnerability- susceptibilities of the built environment and may be described as “exposure”
- Social factors of vulnerability- levels of literacy and education, health infrastructure, the existence of peace and security, access to basic human rights, systems of good governance, social equity, traditional values, customs and ideological beliefs and overall collective organizational systems
- Economic vulnerability- characterises people less privileged in class or caste, ethnic minorities, the very young and old, the disadvantaged, and often women who are primarily responsible for providing essential shelter and basic needs
- Environmental vulnerability- the extent of natural resource degradation.

In this regard, McEntire (2001) classifies the variables which interact to increase disaster vulnerabilities under physical, social, cultural, political, economic, and technological categories.

- Physical
 - the proximity of people and property to triggering agents
 - improper construction of buildings
 - inadequate foresight relating to the infrastructure
 - degradation of the environment
- Social
 - limited education (including insufficient knowledge about disasters)
 - inadequate routine and emergency healthcare
 - massive and unplanned migration to urban areas
 - marginalization of specific groups and individuals
- Cultural
 - public apathy towards disaster
 - defiance of safety precautions and regulations
 - loss of traditional coping measures
 - dependency and an absence of personal responsibility
- Political
 - minimal support for disaster programmes among elected officials
 - inability to enforce or encourage steps for mitigation
 - over-centralization of decision making
 - isolated or weak disaster related institutions
- Economic
 - growing divergence in the distribution of wealth
 - the pursuit of profit with little regard for consequences
 - failure to purchase insurance
 - sparse resources for disaster prevention, planning and management
- Technological
 - lack of structural mitigation devices
 - over-reliance upon or ineffective warning systems
 - carelessness in industrial production

- lack of foresight regarding computer equipment/programmes

Further, according to Cutter et al. (2003), research literature distinguish vulnerability under three different categories, namely, vulnerability as conditions that expose people or places to natural hazards, vulnerability as a social condition, a measure of societal resistance or resilience to hazards, and vulnerability as the integration of potential exposures and societal resilience with a specific focus on particular geographical area. This simple but comprehensive categorisation is free from some potentially overlapping groups and variables in the other classifications. However, according to all the aforementioned categorisations, it is clear that social factors and processes are a major category of variables that influence disaster vulnerability. In other words, it is visible that there are some particular personal characteristics or characteristics associated with people's household or community which restrict their ability to prepare and respond for disasters (Blaikie et al. 1994, Cannon, 2008).

According to a detailed review of literature by Cutter et al. (2003) in their study of constructing an index of social vulnerability to environmental hazards, the characteristics that influence social vulnerability of people are socio-economic status, gender, race and ethnicity, age, status of commercial and industrial development of a community, employment and occupation, living area (rural/urban), type of residential property, infrastructure and lifelines, family structure, education, population growth, social dependence and special needs populations. In a similar vein, Blaikie et al. (1994) states class, caste, ethnicity, gender, disability, age, or seniority of a person's affects his/her capacity to respond for hazards. Thus, characteristics such as gender, age and income are in a position to determine the extent of risk a person is exposed to in an event of a hazard. Accordingly, there are some individuals and groups in the society whose capacity to cope disasters is lower than the others. In this context, gender is considered as one of the main factors which determines the capacity and vulnerability to disasters (Childs, 2006; UN/ISDR, 2002). According to (UN/ISDR, 2002) gender inequality in particular is a root cause of social vulnerability to disasters and gender relations which are determined by relevant socio, cultural and physical environments pre-condition people's ability to anticipate, prepare for, survive, cope with and recover from disasters. In this context, the following sub section illustrates what are the implications of disasters on women.

2.2 Disaster implications on women

The attention of researchers towards gender in the context of disasters was drawn by the disproportionate disaster damages brought to women and girls (Neumayer and Plumper, 2007; Enarson and Meyreles, 2004). It has frequently been illustrated that women are more affected by disasters due to their higher disaster vulnerabilities (Cottrell, 2009; Neumayer and Plumper, 2007; Enarson and Meyreles, 2004; UN-HABITAT, 2004; UN/ISDR, 2002; Wiest et al.,1994).

According to Neumayer and Plumper (2007), women's higher disaster vulnerabilities can be caused by their biological and physiological conditions, and the differences in socio-economic status of men and women. Table 1 illustrates various types of conditions that make women

more vulnerable to disasters and the specific implications of disasters on them with some examples from different countries around the world.

Table 1: Disaster implications on women (Source: United Nations, 2009)

Condition/ situation	Specific implications for women	Examples
Direct impacts of sudden onset hazards (floods, cyclones, tsunamis, mud slides etc.)	<p>Women are at greater risk of injury and death due to societal restrictions and gender roles.</p> <p>Swimming is not a skill girls and women are encouraged to learn in some cultures.</p> <p><i>In some regions women's clothing limits their mobility.</i></p> <p>In some societies and cultures, women cannot respond to warnings or leave the house without a male companion.</p> <p>Loss of crops and livestock managed by women (with direct detriment to family food security).</p>	<p>More women die than men from disasters. Statistics from past disasters including the Indian Ocean Tsunami and the 1991 Bangladesh Cyclone have showed women overrepresented in mortality rates.</p> <p>Due to recent floods in Nepal caused by the Saptakoshi River, women report that they cannot feed their children because the river took away their cows.</p>
Impacts of slow onset hazards (drought, desertification, forestation, land degradation etc.)	<p>Increased workload to collect, store, protect, and distribute water for the household – often a responsibility that falls entirely to women.</p> <p>Increased domestic workload to secure food.</p> <p>Increased numbers of women <i>headed households due to men's migration.</i></p> <p><i>Women's access to collect food, fodder, wood, and medicinal plants diminishes.</i></p>	<p>In East Africa, it has been recorded that women walk for over ten kilometers in search of water, and when droughts worsen some even return home empty-handed.</p> <p>In Senegal much arable land is lost due to erosion. As a result, most of the young people and males migrate to the cities to find jobs leaving women in charge of the households.</p> <p>More women than men rely on forest based products to sustain households. Up to 80% of the population of some developing countries rely on traditional medicine as their primary source of health care. Women often have a more specialised knowledge of wild plants used for medicine than men.</p>
Lesser access to early warnings and lower ability to respond	<p>Warnings in many cases do not reach women.</p> <p>Women lack adequate awareness how to act upon warnings.</p> <p>Women lack life saving skills such as swimming and climbing.</p> <p>Women tend to take the responsibility of carrying children and elderly to safety.</p>	<p>During the 2006 tsunami, more women died than men – for example in Indonesia and Sri Lanka, male survivors outnumber female survivors by 3 or 4 to 1.</p>
Lower land and other asset ownership	<p>Less control over production and markets.</p>	<p>Fewer than 10% of women farmers in India, Nepal and Thailand own land.</p>

Condition/ situation	Specific implications for women	Examples
	Less ability to adapt to ecological changes, resulting in crop failure. Loss of income.	In Malawi, the value of assets owned by male-headed households is more than double that of female-headed households. Male-headed households are more likely to own agricultural assets.
Lower income	Greater vulnerability in the face of shocks such as food shortages, crop failure, disasters.	Women earn only 70-80% of the earnings of men in both developed and developing countries. Women have less access to secure and better paid jobs in the formal sector. They are mostly occupied in the informal sector, making less money, with less employment security.
Lower levels of education	<i>Hampers women's access to information, and limits their ability to prepare and respond to disasters.</i>	876 million people in the world are illiterate, of whom two-thirds are women.
Lower levels of participation at decision making bodies	<i>Women's capacities are not applied, their needs and concern are not voiced and they are overlooked in policies and programmes.</i>	Women are poorly represented in decision making bodies. Socio-cultural norms and <i>attitudes bar women's participation in decision-making.</i>
Poor access to resources	Women suffer inequitable access to markets, credit, information and relief services resulting in less ability to recover from disaster losses.	Analysis of credit schemes in 5 African countries found that women received less than 10% of the credit given to men. Women face more difficulties in accessing credit, as they do not possess assets for collateral.

The conditions and implications in Table 1 highlight that the socio economic conditions of women are more prominent in determining their vulnerabilities than the biological or physiological factors. Wiest et al. (1994) suggest women's vulnerability is primarily cultural and organisational rather than biological or physiological. However, women's role as mothers and primary care takers of elderly, disabled and children which plays a significant role in deciding their socio economic conditions is predominantly determined by their biological and physiological factors. Enarson and Fordham (2001) identify biological factors as one of the five categories of processes which increase women's disaster vulnerabilities. The five categories of processes are as follows.

- Biological
 - Pregnancy and lactation increase vulnerability because of constrained mobility and the greater need for food and water
 - Longer life-spans can lead to increased poverty in the elderly female population, contributing to the feminization of poverty

- Economic
 - Reproductive work of bearing and caring for children and providing other essential family support, on which much male work in the public sphere depends, does not figure in economic (monetary) evaluations
 - Women's time inputs are not recognized and can be ignored when postdisaster relief and rehabilitation resources are being distributed
 - Women's external work opportunities lie disproportionately in part-time, temporary and low-status occupations which place them at greater risk of poverty
 - Lack of access to credit reduces women's ability to recover from disaster
 - Structural adjustment programmes exacerbate the negative impacts of increasing flexibilisation of work and decreasing social programmes, contributing to the feminization of poverty, and making poor women targets for population control and violence
 - Priority in work opportunities may be given to men
- Social
 - Widespread gender inequality in access to educational opportunities
 - Illiteracy (as estimated by UNESCO for 2000, 14.7% for men and 26.4% for women)
- Political
 - Lack of universal suffrage
 - Limited access to, and occupation of, decision-making power structures
- Environmental
 - The domestic environment, especially in remote rural areas, can be particularly vulnerable in disasters but attention is generally focused on how public/commercial realms are impacted
 - The domestic environment is also a work environment for women earning income at home, who are doubly impacted by housing loss
 - Many women support families through homestead gardens and local agricultural production but these activities are not featured in assessments of economic production values nor are likely to be prioritized in disaster recovery programmes

In relation to the factors that influence women's disaster vulnerabilities, Wiest et al. (1994) argue women's vulnerability to disasters is based on the larger number of women and woman-headed households in emergencies and the responsibilities of women related to the stability of the domestic group including a disproportionate responsibility for children who depend on them. Apropos, UN-HABITAT (2004) states women are more vulnerable to disasters than men mainly because they play different roles in society. According to UN-HABITAT (2004), the way men and women behave in their different roles differentiate their vulnerabilities to

disasters. These roles result in different identities, social responsibilities, attitudes and expectations leading to gender inequality cutting across all socio-economic development (United Nations, 2009). Enarson (2000) summarises the main socio-economic reasons behind women's higher disaster vulnerability as follows.

- Women have less access to resources.
- Women are victims of the gendered division of labour.
- Women are primarily responsible for domestic duties such as childcare and care for the elderly or disabled and they do not have the freedom of migrating to look for work following a disaster.
- Housing is often destroyed in the disaster; many families are forced to relocate to shelters.
- When women's economic resources are taken away, their bargaining position in the household is adversely affected.

Further, it is clear that the extent of socio-economic vulnerability of women is varied up on the socio-economic conditions of their community or the country. In particular, women who live in developing countries and poor communities are more vulnerable to disasters (Neumayer and Plumper, 2007; UN-HABITAT, 2004, Wiest et al., 1994). In addition, it is evident based on the aforementioned factors that the cultural aspects of different communities contribute to shape the level of women's disaster vulnerability.

According to the three group categorisation of vulnerability by Cutter et al. (2003), all the aforementioned factors which make women more vulnerable to disasters fall primarily into the category of social vulnerability and they are created by their specific gender roles in the society. However, social vulnerability may lead women to be victims of the higher physical exposure to disasters and also to the vulnerability generated through combinations of exposure and societal roles. United Nations (2009) affirms this by stating that women generally become higher victims to all four different types of disaster vulnerabilities, economic, social, physical and environmental since the differences of their gender roles act unfavourably to women in terms of disaster vulnerabilities and coping capacities.

The different roles and responsibilities which women have in the society as mothers, homemakers and providers of basic needs result in different needs for women (Commonwealth Secretariat, 1999). An understanding of these needs is significant for reducing women's risk of disasters since these different needs result in varied vulnerabilities or capacities to prepare for disasters. Therefore, the following section gives an account of varying needs of women in disaster risk reduction.

2.3 Needs and experiences of women in disaster risk reduction

Wiest et al. (1994) distinguishes three types of responsibilities that women typically bear. They are, production (responsibilities over earning an income), reproduction (bearing and rearing children) and maintenance of the domestic group. These responsibilities result in different needs of women in preparing for natural disaster and in mitigation measures.

According to Pearl and Dankelman (2010), water, sanitation and health challenges put an extra burden on women, adding to the responsibilities of productive and reproductive labour when there is a disaster and a collapse of livelihood. In most instances, socio-cultural norms and care giving responsibilities prevent women from migrating to look for shelter and work when a disaster hits (Pearl and Dankelman, 2010). In a similar vein, unavailability of sufficient facilities of water, sanitation and healthcare limit women's access to necessary services and resources and make them more vulnerable to disasters. Cottrell (2009) provides a snapshot of different type of needs some Northern Australian women meet in preparing for the region's wet season. The author demonstrates how important it is for women, specially for women with children to have enough stocks of essential home supplies such as canned and dried food, long life milk, batteries and medical supplies for the rainy season.

Further, the significance of proper fittings and fixtures in place is emphasised since they are important for women to ensure the safety and comfort of their family members. In northern Australia, a woman who was an artist and earned her livelihood by selling her work worried about properly storing her art work during the wet season and the safety of her four children because her house was not fitted with shutters on the windows (Cottrell, 2009). As UN-HABITAT (2004) suggests, the ability of women to access economic security has a major effect on their ability to reduce the risk of potential disasters on their livelihoods and well being. In this context, it may be important for some women to have livelihood facilities at home since they have restrictions in going out for work with their care giving responsibilities.

According to a report on mitigating violence against women in disasters, Enarson (1999) indicates that women's lives are at increased risk before, during and after disasters since there is an increased potential of violence against women. Therefore, it is significant to reduce the risk by taking necessary actions prior to a disaster. In this context, women may have greater concerns over issues such as security of their environment and aspects such as safe evacuation in an event of a disaster. Enarson (1999) argues women may be at greater risk of sexual assault due to inadequate public lighting in heavily damaged areas or in temporary housing sites such as trailer camps.

Therefore, it is important that the different roles, capacities, vulnerabilities and needs of women are recognised and considered for effective disaster management (UN-HABITAT, 2004). In addition, as Wiest et al. (1994) suggest, appreciation of the societal and cultural context is important to understand the impacts of disasters on women. In this context, the subsequent section of this paper discusses the significance of integrating women's needs in disaster risk reduction to the built environment in order to achieve disaster risk reduction effectively.

3. Discussion

3.1 Importance of integrating women's needs and experience in disaster risk reduction into the built environment

According to Bartuska (2007), the built environment provides the context for all human endeavours since, it is everything humanly created, modified, or constructed, humanly made, arranged, or maintained. The characteristics of the built environment which are demonstrated in the following quote further emphasise the importance of the built environment to the human society. “The built environment is the aggregate human-constructed ‘physical plant,’ with its myriad of elements and systems. It includes the buildings where we live, work, learn, and play; the lifelines that connect and service them; and the community and region that they are a part of. It is the roads, utility lines and the communication systems we use to travel, receive water and electricity or send information from one place to another. The pipes and transmission lines that carry vital supplies and wastes for use or treatment are other essential elements. Very simply, the built environment comprises the substantive physical framework for human society to function in its many aspects—social, economic, political, and institutional” (Geis, 2000, pg. 8). Therefore, disaster risk reduction is enormously linked with reducing disaster vulnerabilities of the built environment. Particularly, characteristics of the built environment determine the extent of exposure to natural disasters and intersect with all the other types of vulnerabilities to generate disasters. According to Cutter et al. (2003), the hazard potential is either moderated or enhanced by the site and situation of the place and the proximity as well as the social fabric of the place. The social fabric includes community experience with hazards, and community ability to respond to, cope with, recover from, and adapt to hazards, which in turn are influenced by economic, demographic, and housing characteristics (Cutter et al., 2003).

In this context, Cutter et al. (2003) emphasise the importance of the nature of human settlements which consist of housing type and construction, infrastructure, and lifelines and the built environment in understanding social vulnerability highlighting their influence in determining potential economic losses, injuries, and fatalities from natural hazards. Hence, strategies to reduce vulnerability must be an integral part of long term development planning in order to reduce the risk of natural disasters. However, Enarson (1999) predicted that increasing numbers of women will be at increasing risk of disasters based on social trends and patterns whilst demonstrating the insufficient attention given to the needs of women by disaster planners. Thus, the built environment needs to be supportive in facilitating women's different needs in relation to security, livelihood facilities at home, health and sanitation, evacuation, etc. in the context of a disaster in order to prevent them being more vulnerable. In particular, the integration of disaster risk reduction into the built environment requires to mainstream specific needs of women in the planning and designing decisions.

Existence of necessary infrastructure and non interrupted access to them in an event of a disaster are significant in this context. As explained earlier, water, sanitation and health facilities become critical for women in reducing negative consequences of a disaster. In

addition, as demonstrated in the northern Australian examples, houses with enough and proper storage facilities for essential supplies is important for women in combating disasters. Further, disaster resilient construction of houses and other built facilities can protect women, their dependents and their properties during disasters. Also, aspects such as street lighting or lighting in public spaces and safe evacuation paths become concerns for women in facing disasters and minimising the risks involved with them. Hence, the types of needs that women possess in relation to disaster risk reduction and their concerns should be considered in planning and designing built facilities. Their experiences based on previous disasters and knowledge on particular types of needs and concerns are extremely important to be integrated in to construction planning. Therefore, the next section attempts to demonstrate how women's needs or their specific experiences can be integrated into the built environment in planning new built facilities in order to reduce the risks associated with particular types of disasters.

3.2 Ways of integrating women's needs and experience to the built environment

UN/ISDR (2002) highlights gender mainstreaming as a way of bringing a gender perspective into disaster reduction as it could translate into identifying the ways in which women and men are positioned in society and their varying vulnerabilities. Therefore, the concept of gender mainstreaming can be brought in to the built environment to identify any disaster risk reduction needs of women in a particular community and integrate them to the planning decisions. In the context of disaster risk reduction, gender mainstreaming is defined by the UN/ISDR as fostering awareness about gender equity and equality etc., to help reduce the impact of disasters and to incorporate gender analysis in disaster management, risk reduction and sustainable development, to decrease vulnerability (Inter-agency Secretariat for the ISDR, 2002).

In this research, gender mainstreaming refers to identifying experiences, knowledge, interests, needs and concerns of women in relation to disaster risk reduction and integrating them into the decisions during planning and designing of a built facility aiming at decreasing disaster vulnerabilities. The aim of this research is to investigate what are the methods and ways that could be adopted to, identify the aforementioned experiences, knowledge, interests, needs and concerns of women and integrate them into the built environment. This ultimately promotes the role of women in development and empowers them. Wiest et al. (1994) see fair and effective participation of women in the community decision making roles as a way of empowering women during reconstruction and development and show as a likely outcome of their integration into disaster prevention, mitigation and preparedness efforts. Apropos, UN/ISDR (2002) views promoting the role of women in the field of development and integrating women's values into development work as an integral part of gender mainstreaming.

In capturing women's disaster risk reduction related needs and experiences participatory methods are significantly useful. They allow women to express their own ideas to the planners and decision makers in the built environment. Stringer and Reed (2007) used interviews, focus groups and household questionnaires for capturing local knowledge in their study of

investigating the potential for integration of local and scientific knowledge to enhance the accuracy, coverage and relevance of land degradation assessment. Similarly, Mercer et al. (2010) approached the community through group discussion in identifying indigenous knowledge to develop a framework for integrating indigenous and scientific knowledge for disaster risk reduction. Commonly, these methods can be named as consultation methods. In this regard, West Berkshire Council in United Kingdom (2011) provides a list of community consultation methods as follows under two main categories, namely, qualitative methods and quantitative methods.

- Qualitative methods: Focus groups, individual interviews, paired interviews, service user groups, citizens' workshops, citizens' jury, mystery shopper, public meeting
- Quantitative methods: Postal surveys, electronic surveys, telephone surveys, face-to-face surveys

In addition to the aforementioned consultation methods, risk mapping and vulnerability analysis/assessments are also useful tools to serve the purpose of reducing risk of disasters through identifying varying needs of different social groups in a community. According to Morrow (1999), local risk mapping can locate where high-risk groups are concentrated and the vulnerability maps are invaluable tools for emergency managers and disaster responders to prepare informed estimates of anticipated community needs at all levels of crisis response. Although, the author explains the use of the method in relation to response, it can also be used in the risk reduction stage to identify the different needs of the users of a particular built facility during its planning stage.

In integrating identified needs into development plans in the built environment, construction process and people who are involved in the process play key roles. Commonwealth Secretariat (1999) states, a successful process of gender mainstreaming in organisations involves decision makers at senior levels representing gender equality interests at each stage. Further, as the aforementioned points of gender mainstreaming emphasise, on principle, widening women's equitable participation at all levels of decision-making is necessary for integrating a gender perspective. Thus it is suggested that women professionals in senior level planning and decision making in the built environment are in a better position in identifying and integrating specific needs of community women related to disaster risk reduction. Incidentally, women's subordination in male led decision making processes has been shown as a reason for women's higher vulnerabilities for disasters (Groots International, 2008). Therefore, it is important to have professional women in the construction industry involved in disaster risk reduction decision making process in the built environment to identify any specific need and concerns of women in a particular community. Toscani (1998) affirms that the technical and professional participation of women in the disaster risk reduction stages is important to emphasise the specific needs of most vulnerable social groups. Then, the equality of gender specific needs and concerns related to disaster risk reduction could be more effectively taken into consideration in decision making leading to reduce women's disaster vulnerabilities.

In addition to the involvement of women in planning and designing in the built environment, a construction brief can perform a significant role in integrating aforementioned needs of women to the built environment. According to Barrett and Stanley (1999), construction briefing is critical in understanding the needs of the client. Historically, briefing is the process by which client requirements are investigated, developed and communicated to the construction industry (Constructing Excellence, 2004). It seeks to minimise the likelihood of a client receiving an unsatisfactory building by ensuring that project requirements are fully explored and communicated as clearly as possible (Constructing Excellence, 2004). Thus, the specific needs of women which are identified through consultations and various assessments can be integrated into a construction brief in order to transmit them into the relevant planning and designing decisions.

This section reviewed literature to explore various possible methods of mainstreaming women's disaster risk reduction related needs with the development activities in the built environment. Combining the aforementioned literature findings with the study's empirical findings, this research intends to develop a comprehensive guideline on how to mainstream women's needs into disaster risk reduction in the built environment.

4. Conclusions

Women are a highly vulnerable group to disasters. Their responsibilities over production and reproduction, in particular, their roles as mothers, primary care takers and domestic maintainers make them socially more vulnerable to disasters. Thus, their different social roles and varying vulnerabilities result in different needs in disaster risk reduction. These needs should be incorporated into the built environment to reduce the vulnerabilities of women and achieve overall results of disaster risk reduction efforts in the built environment more effectively. In this regard, disaster resilient houses, existence of necessary infrastructure such as health and sanitation and water, uninterrupted access to these facilities in an event of a disaster, proper storage facilities for essential supplies during a disaster and a safe environment which protect them from abuse have been identified as major needs of women that should be integrated into disaster risk reduction in the built environment.

In incorporating women's disaster risk reduction needs into the development activities of the built environment, capturing needs becomes a prerequisite. In this context, utilisation of participatory methods or consultation methods such as interviews, questionnaires, focus groups or public meetings and risk or vulnerability analysis is significant. In integrating these needs construction process and people who are involved in the process play an important role. Literature suggest construction briefing and involvement of women in higher level decision making roles in the built environment as possible means of integrating women's needs into disaster risk reduction.

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