INTEGRATING DISASTER MANAGEMENT PERSPECTIVE INTO ARCHITECTURAL DESIGN EDUCATION AT UNDERGRADUATE LEVEL - A CASE EXAMPLE FROM TURKEY

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ABSTRACT

The paper highlights key points and problem areas associated with integrating management perspective into the architectural design education. Architects with appropriate training can easily broaden their traditional roles to enhance the capacity of the society to respond to disasters through efficient, sustainable, socially and culturally responsible designs. However, the number of undergraduate and post-graduate programs which integrate disaster management perspective into their curriculum as a long-term proactive strategy to build resilience is very low. Based on experience from a series of Construction Project Studios' with different themes and scenarios at Istanbul Technical University, Department of Architecture, the paper compares the typical design process with a disaster-focused process to highlight the differences. There are a couple of key issues in the educational context to integrate disaster management perspective into the architectural education: a shift towards a more collective problem solving space in the design studio along with an intellectual familiarity with the problems of contemporary society; an understanding of the heterogeneity of the needs and characteristics of different vulnerable groups; an adequate background knowledge to filter and adapt common design principles and norms, so that they are relevant to disaster and project scenarios; and a familiarity with technical solutions patterns such as open prefabrication and adaptive re-use. The findings may show directions for future educational research, where little empirical evidence exists.

Keywords: *Architectural Design Education; Built Environment, Disaster Management; Disaster Preparedness.*

1. INTRODUCTION

Disasters, whatever their origin, can be traumatic events for a society, causing extensive loss of life and other large scale material/non-material losses, and disrupting its normal functioning (Malalgoda *et al*., 2010). Many scholars agree that the scale of threats facing the contemporary cities have escalated in recent decades. The vulnerability of the marginalized groups, especially those struggling with poverty in the poorly built urban environments have raised due to economic, demographic and socio-political changes (Bosher and Dainty, 2011; Owen and Dumashie, 2007; Lloyd-Jones *et al*., 2009).

Built environment professionals and the universities are often thought to take critical roles in the disaster management process in cooperation with governmental and non-governmental stakeholders (Amaratunga and Haigh, 2010; Llyoyd-Jones, 2009; Thurairajah *et al*., 2011). Technical know-how and the routines of the built environment professionals concerning the design, construction, planning, procurement and management of the built environment facilities have a clear relationship with the disaster management initiatives and they can significantly contribute to the prevention and minimization of disaster losses if they broaden their traditional roles (Thurairajah *et al*., 2011; Malalgoda *et al*., 2010) with appropriate training (Amaratunga and Haigh, 2010). Bosher and Dainty (2011) argue that "a diverse range of hazards are likely to become more significant in future years and so it has become incumbent upon those responsible for planning, designing and constructing the built environment to take account of these threats as a core part of their professional activity."

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However, disaster management concept is relatively new to the built environment discipline, especially for the architectural designers, "except its regular concerns on effective and strong structural designs" (Thurairajah *et al*., 2011). The number of undergraduate and post-graduate programs which provide disaster management education is very low (Thurairajah *et al*., 2011) signalling the ignorance of the role of built environment professionals (Bosher and Dainty, 2011). Scholars and various international agencies have called for curriculum changes/re-design to incorporate disaster management perspective and skills into the education programmes (Thurairajah *et al*., 2011; Bosher and Dainty, 2011 for additional references). Ideally, these programmes can be multidisciplinary to blend know-how from engineering sociology, architecture, anthropology, finance, management, and other fields; so the professionals can gain familiarity with both the hard and soft dimensions of the disaster management phenomenon (Cage *et al*., 2009).

Based on a series of construction project studio works at undergraduate level, this theoretical paper aims to contribute to the ongoing debate on the integration of disaster management perspective into the architectural design education, as a long term proactive strategy. After a brief summary of the background literature and focusing on the role of architectural designers in the disaster management process, the paper aims to highlight some key points and problem areas based on different project themes or 'technical solution patterns' such as post-disaster camp planning, temporary urban housing, adaptive re-use.

2. DISASTER MANAGEMENT CYCLE AND THE ROLE OF ARCHITECTS

Disaster management is defined as a "collective term encompassing all aspects of planning for and responding to disasters, including both pre-disaster and post-disaster activities" (CERO, 2004). Researchers often highlight a "paradigmatic shift" concerning the approaches to manage and avoid disasters: from reactive to pro-active. The former refers to "response-driven" strategies, which typically focus on rapid mobilization of resources and response to disasters, such as "saving lives, providing emergency relief and marshalling resources for restoration and reconstruction" (Bosher and Dainty, 2011). Pro-active strategies, with a more holistic and long-term approach, place emphasis on "disaster preparedness, hazard mitigation and vulnerability reduction rather than the often reactive focus on disaster management and relief. to address pre-event vulnerabilities" (Ibid.). The priorities for action adopted in The World Conference on Disaster Reduction held in January 2005 in Hyogo, Japan, shed light on how this paradigm shift can be realized and put into practice at national and international levels (Lloyd-Jones, 2009): 'Education to build a culture of safety and resilience at all levels;' and strengthening disaster preparedness for effective response at all levels with a special emphasis on preventative strategies are among those major priorities (Ibid.).The term disaster management cycle (DMC) refers to the process that consists of four interrelated phases of disaster management (March and Leon, 2013; Thurairajah *et al*., 2011; Malalgoda *et al*., 2010): prevention/mitigation and preparedness; response/immediate relief and recovery. The latter is called the 'rehabilitation/reconstruction phase (Thurairajah *et al*., 2011). These phases may be separated by unplanned gaps (Llyoyd-Jones, 2009) or they may be overlapped and "they operate as a closed loop because a major aim of hazard management is to learn from experience and feedback" (Malalgoda *et al*., 2010). Bosher and Dainty (2011) argue that if the relationships between the different phases of this cycle are misunderstood, there is the risk of developing inappropriate disaster responses. Targeting favoured communities instead of the most affected people or being part of overly influenced efforts that are non-conducive to the attainment of social/physical resilience are among the examples of inappropriate responses.

What kind of roles can the architects take throughout the disaster management cycle? What kind of skills do they need to possess? For some authors like Glass (2008), the role of architectural designers is particularly interesting due to their potential to influence the specifications and configuration of materials (Bosher *et al*., 2007). Among the few studies that are concerned with such questions, Lloyd-Jones (2009) focused on the issue and provided a comprehensive summary of the possible roles of architectural designers along with other professionals. Table 1 shows the diversity of the roles that architects can undertake over the DMC. However, while there are researchers who highlight the need for the integration of disaster management perspective into the architectural curriculum (Cage *et al*, 2009; Thurairajah *et al*., 2011), the body of literature which addresses these questions appears relatively scarce. Cage *et al*. (2009) argue that there are few countries where architecture students gain skills to design for disasters. If we

conceive shelter or housing just a delivery problem, the authors contend, there may not be a need for the architect. For architects to be part of the solutions, they need to learn how to talk to people and collaborate with other disciplines. Developing post-disaster solutions, however, may require different skills than a commercial practice (Ibid.) and an ability to understand the contextual differences between normal vs disaster situations (Thurairajah *et al*., 2011). Consequently, "architects might have to 'unlearn' their usual approaches and relearn new ways of working to be effective", where the ability to engage in collective problem solving becomes especially critical (Cage *et al*., 2009). Except for such limited number of remarks, however, there appears a knowledge gap regarding the educational dimension of disaster phenomenon and the current weaknesses of the academia to integrate relevant strategies into the design education. So, what kind of a framework can help us contribute to a theoretical discussion on the issue? This is a methodological question.

Table 1: Roles of Architects in the Disaster Management Cycle

Phases	Activities
1. Risk and vulnerability assessment	▪ Assessment of the way people build in the area, their use of dwellings, community facilities and other buildings; ▪ Pinpoint historic and culturally important buildings at risk.
2. Disaster risk reduction and mitigation	▪ Facilitate community surveys and advise on the planning of community shelters and dwellings.
3. Disaster preparedness and pre-disaster planning	▪ Provide advice on building use in the event of hazard.
4. Emergency relief	▪ Design relief shelters for dwellings as well as larger structures for essential services such as medical facilities and vulnerable groups that need special accommodation such as the sick and injured. ▪ Develop survey methods to facilitate the repair and reconstruction of dwellings, vital facilities, community buildings and heritage buildings.
5. Early recovery-transition	▪ Provide an assessment of traditional patterns of use of space, building materials and technology; work as part of social survey teams. ▪ Advise on the selection of building materials and technology that are part of the compensation package. ▪ Work with social development agencies to carry out surveys with community groups and households for which shelter needs to be provided. ▪ Establish footprints of dwellings and other typical and key buildings; draw up local area layouts and site planning in consultation with communities and local authorities. Ensure overall appropriateness to local culture. ▪ Design and layout of transitional shelter. Ensure such shelter is appropriate to social and religious custom. ▪ Volunteer architects to train other volunteers and manage design and planning process. Volunteers also required to be trained for building and construction. ▪ Project management focusing on design and provision of transitional shelter. ▪ Monitor and plan spending on building and construction.
6. Reconstruction	▪ Design and planning of landscape elements. ▪ Work with households and communities to ensure that housing is allocated according to needs and preferences appropriately. ▪ Advice on building related regulations. ▪ Design and building technology for dwellings including covered, open and semi-open spaces and vegetation. ▪ Supervision and advice as the buildings are constructed.

	▪ Develop interface between infrastructure and buildings/boundaries. ▪ Provide training in construction, retrofitting and maintenance of dwellings, non-dwellings. ▪ Oversee the delivery of dwellings/ community facilities with the assistance of community groups and the delivery of facilities such as hospitals with specific clients. ▪ Identify the contribution communities are making to dwellings and non-dwellings and feed that into cost model.
7. Post reconstruction development and review	▪ Review and revisit dwellings and non-dwellings, observing the way people are changing their life-style and habits in relation to the use of buildings. Ensure safe and sustainable adaptations. ▪ Undertake life cycle studies of reconstruction projects and plan for their eventual replacement; work with existing communities to design new developments that reduce their hazards. ▪ Advice on reducing operational and management costs. ▪ Identify regular housekeeping and maintenance procedures to avoid major repair. ▪ Provide training in building design, construction and extensions for professionals as well as communities.

Source: Lloyd-Jones (2009)

3. RESEARCH METHOD

There are different school of thoughts regarding the nature of architectural design studio: For some scholars, design studio is a place where reflection-in-action is key and it is a nonlinear, complex and an anti-rational process, where learner and the 'coach' gradually come to understand each other. According to this view, "end of design would become an open horizon of values and possibilities - not a solution to a problem" (Wang, 2010). Where design is seen as a 'problem solving' process, from a traditional point of view, it typically consists of interrelated and cyclical phases starting with the identification of problems/objectives (Figure 1). For the purpose of this paper, taking design as a problem solving process could allow a simple and practical comparison with a typical design studio process and highlight the differences and potential problem areas concerning the integration of DM perspective into an educational environment. Empirical observations, the basis for such a comparison, were based on a series of construction project studio works with different themes and scenarios at Istanbul Technical University (ITU), Department of Architecture. ITU has five departments in total including architecture, industrial products design, urban and regional planning, interior design and landscape architecture. There were two main motivations behind the initiative to integrate disaster management concept into the current undergraduate curriculum of ITU, especially in a mega city like Istanbul which is statistically on the verge of a catastrophic earthquake and is struggling with a large number of refugees - more than 2.5 million people following the political instabilities and wars in the Middle East: (1) to build/raise awareness among architecture students before they graduate and practice in the industry, and (2) to develop an inventory of root/core technical design solutions to be inputs for future disaster preparedness and research initiatives, in collaboration with selected stakeholders. The following sections summarize the experiences from the studio works of different semesters. Table 2 includes short descriptions of selected projects from different semesters to illustrate the diversity of the problems/themes to address as part of architectural design efforts.

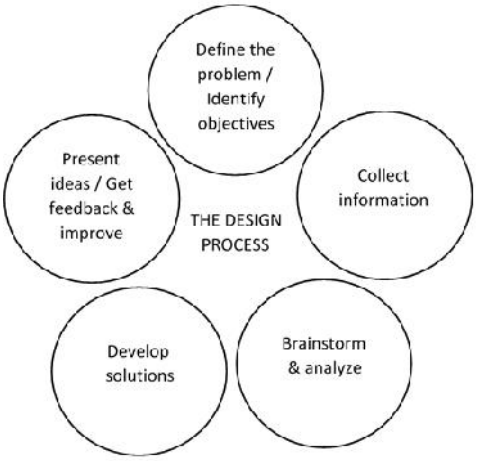

Figure 1: The Typical Design Process

Table 2: Selected Examples of Undergraduate Design Projects

Theme	Scenario
Post-disaster camp planning	Considering the fact that many architectural design solutions units fail to meet the needs of families of varying size in emergencies, the design intervention strategy sought flexible solutions for different demographic scenarios and plan layouts for camp planning (see URL 7 of Annexure I).
Temporary multi-storey urban housing	The project scenario was based on a couple of assumptions: (i) it can be more difficult to find appropriate locations for the horizontal development of housing units after a catastrophic disaster, so vertical solutions can be relatively advantageous when *top-down* governmental strategies are immediately needed; (ii) it can be easier to cost-effectively meet safety and accessibility requirements in multi-storey building which may function as 'neighborhoods' in appropriate locations, in addition to providing common and service areas to meet the psychological needs of masses (see URL 8 of Annexure I).
Adaptive re-use of a steel frame building as a temporary student dorm	Project scenario focused on the transformation of a 3-year old steel-frame building located at the ITU central campus to offer a temporary housing solution for about 500 students. The project sought answer to the following question: 'How can we quickly create an additional housing capacity for students in case of a disaster (i.e. a big earthquake), assuming that the building will keep on serving its original function after a year or more following the event?' (see URL 9 of Annexure I).
Adaptive re-use of a historical bridge as a rehabilitation center for women and children	Creating spaces for craft production with women's labor was the major focus of the design strategy, considering the psychological contributions of production – i.e. the positive effect of 'being a productive person'- in addition to meeting the immediate financial needs of disaster victims (see URL 10 of Annexure I).
Adaptive re-use of a two-storey neighborhood bazaar as a disaster operations center	The project aimed to transform a two-story steel structure - a local district bazaar - ground floor of which partly serves as a car park every week day, into a local disaster operations center - many of which are likely to scatter around the city following a large earthquake (see URL 11 of Annexure I).
Temporary neighborhood bazaar	The scenario focused on the development of a temporary neighborhood bazaar for small business owners, who are often among the most disadvantaged groups after disasters as their bankruptcy rate is significantly higher relative to the medium and large enterprises (see URL 12 of Annexure I).
Other projects	There were other projects focusing on relatively more systemic interventions such as the design solutions to benefit from the logistical capacity of railway networks according to different disaster scenarios (i.e. transportable prefabricated units to build temporary schools, medical facilities, food distribution centers, etc.); adaptive re-use of concrete pipes as temporary shelter, among others

4. A COMPARISON WITH A TYPICAL DESIGN PROCESS

Considering the phases of a typical design process (Figure 1), the following section highlights the specific features of a disaster-prone architectural design process in an educational setting.

Define the problem / identify objectives - This is the stage, where students gain familiarity with the key concepts of disaster management - i.e. resilience, Disaster Management Cycle (DMC), disaster preparedness, disaster psychology, and others). Using a commonly accepted terminology can be quite instrumental at this stage. Various resources such as the recently published glossary by the Disaster and Emergency Preparedness Presidency (AFAD) of Turkey appeared quite valuable for the participants of projects whenever a consensus on terminology was needed (URL 1 of Annexure I).

Raising awareness on the potential roles of architectural designers in the DMC appears critical in the early steps. One major cognitive barrier here is the widely shared view among the students that architect's roles are confined to developing individual prefabricated units for emergency or temporary housing. Such an isolated view of the architect's roles may be unsurprising for many, considering the typical emphasis placed on 'individual space' and an 'architecture of ego' in a traditional instructional environment. An understanding of the general context appears critical to "go beyond unit" and assess the wider role of architect. This is necessary, first, to build awareness on the idea that a design solution which might be influential under certain circumstances may become less efficient or totally dysfunctional when the disaster scenarios or needs change. Accordingly, there are multiple patterns of architectural design solutions for different disaster scenarios. Second, people with disabilities, sex workers, divorced women or other groups can easily find themselves in a disadvantaged position after a disaster. Understanding and appreciating the heterogeneity of vulnerable or targeted groups in terms of their characteristics and needs requires an intellectual familiarity with the problems of a contemporary society. "The widening separation of architecture from the humanities" as Wang (2010) observed, can be one of the barriers to building such an intellectual capacity. D4D, however, requires skills such as collective problem solving; understanding living patterns and value systems of vulnerable groups; developing empathy with people and gaining more familiarity with the psychology of masses, in addition to that of individuals. Otherwise, architectural design is less likely to result in an enhanced capacity of a society to respond to disasters through efficient, sustainable and socially-culturally responsible solutions. Considering that social media can easily support and disseminate this perspective, a Facebook group was started (URL 2 of Annexure I) to function as a digital extension to the design studio to build/raise awareness on the political, technical, social, cultural and historical dimensions of the disaster phenomenon. This group now has members from different universities and disciplines, some of whom have actively taken part in the process at different semesters.

To address the diverse needs of vulnerable groups, an ability to assess the relevancy of available technical solution patterns or themes (see Table 2) is another critical issue. For example, both bottom-up and top-down (community-based/participative) strategies are available to provide temporary housing. While the former generally deploys small number of units through local efforts, top-down strategies aim to deploy large number of units in the shortest period of time. Quick response to housing needs of people helps establish a sense of dignity, identity and privacy, and it helps people return to normalcy through daily activities such as working, cooking, housekeeping, socializing and school (Felix et al., 2013; Aslan and Cosgun, 2008). Post-disaster camps, on the other hand, might be at the bottom of the hierarchy of governmental intervention strategies. However, they are often inevitable solutions as evidenced by the current political crisis which urged Turkish government to host more than 2.5 million refugees from Syria and Iraq in recent years. Adaptive re-use pattern can also be a very efficient intervention strategy due to its potential to provide relatively low-cost and rapid design solutions. Governmental organizations can quickly transform buildings such as schools, sports halls or shopping centres to meet the needs of the displaced masses. In the relevant literature, adaptive re-use of existing structures is classified under the "collective centres" category as one of the transitional settlement options or typologies. Also referred to as 'mass shelters', collective centres are generally located in pre-existing structures such as public buildings and community facilities including schools; barracks; community centres; town halls; disused factories; gymnasiums; hotels; warehouses; disused factories; and unfinished buildings (İdemenet al, 2016). In addition to the re-functioning of an existing building, adaptive re-use can take the form of a transformation of artefacts (i.e. transformation of cement water pipes or shipping containers into shelter

or service units). Awareness on these technical solutions patterns is key to developing a perspective for students to 'go beyond unit'.

Collect information and develop scenarios - Identifying and getting in touch with the relevant governmental/non-governmental organizations (NGOs) and individuals with different expertise for collaboration can be critical at this stage. In the case of ITU, informal interactions (i.e. individual communications by students) and formal interactions (i.e. invitation by ITU) were quite useful to benefit from the extensive on-site experience of various experts. AKUT Search and Rescue Association (URL 3 of Annexure I); Turkish Red Crescent Society (URL 4 of Annexure I); and individuals with different backgrounds such as interior designers, industrial designers and urban planners were among the actors that provided valuable expertise at different semesters.

Acquiring knowledge on regional disaster scenarios is part of the data collection stage. In particular to Istanbul, for example, geographical proximity to sea was among the major site selection criteria at different semesters since the majority of the urban population cluster in areas which are within five-kilometer range from the Marmara Sea and the disaster scenarios predict that most of the main roads will be out of function in case of a large earthquake. Accordingly, developing design solutions close to coastal areas and using water ways was a priority in many cases (see URL 8, URL 10 and URL 12 of Annexure I). Supporting the design studio efforts by different collaboration and learning channels can facilitate the sustainability of efforts to build/raise awareness about disaster management. In the ITU case, benefiting from the potential of social media was extremely conducive. Resource pooling via cloud storage systems (i.e. Google Drive), a closed project blog and a Facebook group (URL 2 of Annexure I) facilitated the ease of access to many resources such as scholarly papers, media news, international standards, and exchange experience with projects' participants. This repository includes many examples/readings on the different aspects of disaster phenomenon such as disaster psychology, which is a critical issue to understand the role and the tools of 'returning to normalcy'. Without an adequate understanding of the role of contextual factors, the students cannot be able avoid the pitfall of approaching the problem merely from a techno-centric perspective.

Brainstorm and analyse ideas - Students were encouraged to get in touch with and receive feedback from potential users and site visits were arranged for the analyses of project locations. While the communication with governmental bodies is essential to grasp regional disaster scenarios and projections, collaboration with NGOs, which are directly related to the project themes, is crucial to benefit from their extensive on-site experience. For example, a seminar by Turkish Red Crescent Society was very helpful to clarify the common problems associated with camp planning (see URL 7 of Annexure I). In another case, an interview with an experienced member of the AKUT Search and Rescue Association helped to clarify the architectural program of a temporary disaster operations center project (see URL 11 of Annexure I). Small business owners were interviewed to identify their priorities and expectations, when the students were developing the architectural program for a temporary neighborhood bazaar project (see URL 12 of Annexure I). PhD students and colleagues from different departments of ITU were involved with both the brainstorming sessions and the design processes.

Develop solutions - Cage *et al.* (2009) contend that "architects might have to 'unlearn' their usual approaches and relearn new ways of working to be effective", where the ability to engage in collective problem solving becomes especially critical. According to Keitsch (2012), "the call to examine practices and methods as well as values and norms is growing louder" in architecture, accompanied by a call for interdisciplinary cooperation and teamwork to address the complexity of problems. Team working skills are important not only for interdisciplinary collaboration, but also for collaborative problem-solving. ITU experience suggests that an efficient process can involve the following steps: Providing individual space and the discussion of individual design proposals; developing a common understanding and identification of needs; division of labor for teamwork; returning back to individual level or 'individual space' whenever needed to explore alternative views and approaches; and disseminating information on different technical matters, once a group consensus is reached. For some of the students however, who are very much used to exploiting an individual space throughout their architectural education, movement between the individual and collective problem solving levels were painful at times. In such cases, efforts were paid to alter the misperception that collective problem solving is a threat to the use of individual space for

developing creative solutions. Respectively, readings on team working and conflict resolution were part of the projects' resource pool.

The technology dimension of D4D efforts has multiple facets. Technological paradigm of the disaster management cycle, especially in the case of top-down intervention strategies, is generally based on fast, flexible and modular design solutions. Most of the top-down approaches rely on prefabricated, mass-produced and standardized solutions (Felix *et al*., 2013). Open prefabrication systems might be appropriate solutions in many cases, which are based on the provision of standardized components in factories and their transfer to the construction sites "to allow various possibilities of assembly into different forms and configurations" (Abulnour, 2013). Open prefabrication brought a variety of advantages to analyse horizontal or vertical growth scenarios in the student projects (see URL 7; URL 11 of Annexure I). On the other hand, the adaptive re-use of buildings require different types of solutions when compared with the new construction processes (see İdemen *et al*, 2006). For example, the assessment of the capacity of a building or structure to meet new/additional functions may require additional effort (see UR1 9, URL 10 and URL 11 of Annexure I). Interestingly, neither the prefabrication systems, nor the adaptive re-use patterns find themselves adequate place in the current architectural design education, and ITU is not an exception.

Filtering architectural principles and norms through the special requirements of disaster situations can be difficult and time consuming for many students at this stage. Especially for temporary housing projects, students should gain familiarity with some well-recognized norms (The Sphere Project, 2015).to understand how D4D context varies from a typical residential building project. Collaboration with industrial designers can be quite useful to develop efficient design solutions for micro and small spaces, where the victims share lives for considerable durations under traumatic conditions. A thorough understanding of the dynamics of public spaces and the consumption/living patterns of various vulnerable groups will be valuable intellectual assets at this stage.

Present ideas / Get feedback and improve design - Relevant external and internal stakeholders should ideally take place in these stages, before architectural solutions are finalized.

5. CONCLUSION

Many authorities share the view that hazards are likely to become more significant in future years due to ecological, political and economic crises. Although education is considered as a proactive and long-term strategy to build resilience at all levels due to the paradigmatic shift in the disaster management field, an overwhelming majority of the architects graduate without an adequate knowledge of disaster management perspective and skills. A quick analysis of the literature suggests that design-for-disaster (D4D) is not considered as an integral part of the disaster management cycle except for concerns for strong structural designs. Architects can more efficiently take role in the process to enhance the capacity of the society to respond to disasters via sustainable and socially/culturally acceptable design solutions. ITU experience suggests that there are a couple of key issues in the educational context to achieve this goal: (i) shift towards a more collective problem solving space in the design studio along with an intellectual familiarity with the problems of contemporary society; (ii) an understanding of the heterogeneity of the needs and characteristics of different vulnerable groups especially in collaboration with the representative NGOs; an adequate background knowledge to filter and adapt common design principles and norms, so that they are relevant to disaster and project scenarios; (iii) a familiarity with different technical solutions patterns such as open prefabrication and adaptive re-use. A thorough understanding of the local disaster scenarios is a prerequisite for any kind of design effort to be able to adapt general design principles and norms and put them into practice. Current tendencies show that urban areas will be increasingly threatened by disasters in the near future (e.g., The Sphere Project guidance document on 'Using Sphere Standards in Urban Settings' was being piloted when the authors submitted this paper in May 2016). Future efforts should focus on alternative approaches and methodologies in higher education system to help convert these standards into professional knowledge. Finally, more systemic interventions such as making D4D part of accreditation processes are likely to generate quick results in integrating disaster management perspective into the higher education system.

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Annexures I

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URL 8: Figure 3: Temporary Urban Housing. Available from:- https://drive.google.com/file/d/0B-6upb4OsaVmSnhFakxBSW4tc1E/view?usp=sharing

URL 9: Figure 4: Transformation of the Central Lecture Hall into a Student Dorm. Available from:- https://drive.google.com/file/d/0B-6upb4OsaVmakRJc0JuUWp5ZkU/view?usp=sharing

URL 10: Figure 5: Transformation of the Historical Galata Bridge into a Rehabilitation Centre. Available from:- https://drive.google.com/file/d/0B-6upb4OsaVmUjVfUVk0TUotb1U/view?usp=sharing

URL 11: Figure 6: Transformation of a District Bazaar into a Disaster Coordination Centre. Available from:- https://drive.google.com/file/d/0B-6upb4OsaVmT3JuSEwyeFFBbEk/view?usp=sharing

URL 12: Figure 7: Temporary Neighbourhood Bazaar for Small Business Owners. Available from:- https://drive.google.com/file/d/0B-6upb4OsaVmYy05UkEwNEFzLTg/view?usp=sharing