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Lifelong Learning needs for Disaster Management Education in the Built Environment

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Abstract

Disasters cause considerable damage around the world every year. It is evident that most of the material damages of disaster have been on engineering related facilities of the built environment and therefore require serious efforts from the construction sector to respond. Therefore, the need to respond, recover, rebuild or reinstate the built environment affected by disaster can be identified as a major challenge for the countries affected by disasters. Construction industry and built environment disciplines have a major responsibility in responding to the above context. Apart from the physical construction process the knowledge and the experience of the construction professionals are essential in the disaster mitigation process. There is a widespread agreement in the literature that disaster management is a continuous process and has no specific end point. This enables to focus on disaster management sector in the context of lifelong learning.

Haigh and Amaratunga (2010) recognise that built environment discipline at each stage of disaster management process has invaluable expertise and key role to play in the development of society's resilience to disasters. Construction professionals are expected to possess specific knowledge and expertise in this regard. The main reason is the peculiar nature of disaster reconstruction. Educating the construction professional to make them act efficiently and effectively in a disaster situation is therefore vital. HEIs delivering Built Environment programmes have a major responsibility to provide specific skills and knowledge that are necessary to be acquired and applied in a disaster situation by the construction professionals. The lifelong learning opportunities further enhance this provision as it will facilitate the HEIs

to act as a continuing education centres providing skills and knowledge in a dynamic environment.

In this context this paper analyses lifelong learning needs for disaster management education in the built environment. This paper is based on an EU funded project titled Built Environment Lifelong Learning Challenging University Responses to Vocational Education (BELLCURVE). The paper explores the complexity of disaster management in terms of its body of knowledge and modes of education. The implications for lifelong learning provision via HEIs are discussed with specific references to governance system.

Keywords: BELLCURVE, Built Environment, Disaster Management Education, HEI governance, Lifelong Learning

1. Introduction

The impacts of disasters on the built environment sector and vice versa have been widely discussed in the literature by various scholars in the field (Haigh & Amaratunga, 2010; ISDR, 2010; Boshier *et al.*, 2007a). An increased importance is given on the aspect of '*Disaster resilience*' which focuses on reducing the vulnerabilities and becoming more resilient to hazards. Capacity building and development would contribute to increase the level of resilience among the society. Capacity development is defined as "*the process by which people, organizations and society systematically stimulate and develop their capacities over time to achieve social and economic goals, including through improvement of knowledge, skills, systems, and institutions*" (UN ISDR, 2009, p2). Though there have been many attempts to increase the resilience through capacity building and capacity development initiatives, capacity gaps are still in existence in various forms. Among the capacity gaps identified in disaster risk reduction in the built environment, lack of disaster management related awareness, lack of proper education and training, lack of skilled and trained human resources (Boshier *et al.*, 2007b) are focused in this paper.

Addressing the aforementioned gaps, it is imperative to educate the human resources, including the built environment professionals, with sufficient knowledge on disaster mitigation, preparedness, and recovery. This paper proposes a lifelong learning approach for disaster management education. This paper is based on an ongoing research project called 'BELLCURVE'. Section 2 provides an overview about the research project. Disaster Management (DM) concepts are explained and explored in Section 3. This section justifies the needs to increase the knowledge on disaster management and resilience. It further discusses the challenges of disaster management learning. The next section justifies lifelong learning as a suitable approach for DM education. Finally the conclusions are made followed by acknowledgements.

2. An overview of the research project - BELLCURVE

BELLCURVE (Built Environment Lifelong Learning Challenging University Responses to Vocational Education) is an EC (European Commission) funded research project currently being conducted at the Centre for Disaster Resilience, School of the Built Environment, University of Salford, UK, in collaboration with Department of Construction Economics and Property Management, Vilnius Gediminas Technical University, Lithuania and Department of Building Production, Tallinn University of Technology, Estonia. This project address issues associated with the mismatch between graduate skills and construction labour market requirements. Construction labour market, due to its labour-intensive, multi-disciplinary and highly fragmented nature, relies highly on the skills and competencies of its workforce. The skills requirements in construction industry are of a dynamic nature, demanding the employees to show good level of skills and competencies if they are to survive. Therefore the construction employers need to concentrate more on acquiring or developing new skills in order to retain in

the industry and to meet various skills demand. Hence a learning element needs to be in-built in their career development process.

In addressing this, BELLCURVE considers ‘student engagement’ as a continuous through-life process rather than a temporary traditional engagement limited by the course duration. This through-life studentship defines the essence of the new innovative “lifelong university” concept, whereby providing an opportunity for learners to acquire and develop skills and knowledge enabling responds to changing construction labour market needs on a continuous basis. BELLCURVE aims to promote the concept of ‘lifelong university’ in modernising Higher Education Institutes (HEIs). Thereby, universities will increasingly become significant players in the economy, able to respond better and faster to the demands of the labour market through providing opportunities to different types of learning and learners.

The project focuses on governance reforms in HEIs delivering Built Environment programmes across the EU, emphasising the ERASMUS programme’s objective “to contribute to the development of quality lifelong learning and to promote high performance, innovation and a European dimension in systems and practices in the field”. To achieve this objective, the existing interactions between the HEIs and the labour market are investigated and any improvements that could possibly be imposed on the nature of such interactions are analysed. This demands the concept of lifelong university to be structured into a framework, identifying the possible components which will either directly or indirectly have an impact on the way the lifelong university has to function.

In this context the objectives of this project are formulated as, to develop a framework for HEI’s to promote the concept of lifelong university in capturing and responding to labour market skill needs in the Built Environment; to refine, test and validate the developed framework through existing HEI Built Environment sectors such as Disaster Management, Quantity Surveying, Construction Management and Civil Engineering; and to provide recommendations on governance reforms for HEIs to become ‘continuing education centres’ for graduates while responding to labour market skill needs.

The following sections of this paper are discussed in the context of disaster management, which has been identified as one of the case study areas for the BELLCURVE framework validation.

3. Disaster management: explained and explored

3.1 Disasters and the need for disaster management

Disasters either natural or manmade cause a significant impact to the entire world. An increased intensity of disasters has been observed worldwide over the past decade resulting, a higher number of mortalities, economic losses and social losses. According to ISDR (2011) in 2010, 373 natural disasters caused the death of over 296,800 people, affected nearly 208 million

others and cost nearly US\$110 billion. The earthquake in Haiti and the Russian heat wave were the two most fatal disasters which made 2010 the deadliest years of two decades. The recent earthquake that hit Japan caused more than 28000 fatalities (USGS, 2011) and it further led to multiple disasters of tsunami and radiation leak. The above statistics illustrates the need for proper disaster management in the current context. Therefore, a well-planned system is necessary to reduce the consequences of these disasters (Pourezat et al., 2010).

The term 'disaster' is interpreted differently by various authors and institutions. Smith (2004) viewed disasters as a social phenomenon that occur when a community suffers exceptional, non routine, levels of disruption and loss. A disaster can occur as a consequence of a hazard which is naturally occurring or a human induced process or an event with the potential to create a loss. When a hazard become the active reality and when damage relevant to man is inflicted it becomes a disaster (McDonald, 2003). Although, the origin and the causes of disasters are diverse, the consequences to the society are more or less similar which include, extensive loss of life; economic losses; destruction of the built and natural environment; and, widespread disruption to local institutions and livelihoods (Haigh and Amaratunga, 2010). These impacts can vary depending on the type of the disaster and the economic conditions of the area that was struck by the disaster (McDonald, 2003).

Smith (2004) too has argued that the relationship between hazard and risk are very much affected by human conditions and actions. It is understood that all individuals and communities are vulnerable to hazards in varying degrees and all have inherent capacities to reduce the vulnerabilities (Ginige et al., 2009). As such the consequence of a disaster would be different if the same event happens in different circumstances and all depend on where it took place and how it was perceived (McDonald, 2003). In fact, the consequences of a disaster are much less severe if it happens in a place where people are well protected, whereas the consequences are considerably more significant if it happens in a poorly protected environment. Accordingly, disaster risk can be reduced either by decreasing the hazards and/or vulnerabilities and/or by increasing the capacities. Therefore disaster risk reduction should incorporate measures to curb disaster losses by addressing hazards and people's vulnerability to them, throughout the disaster management cycle (Palliyaguru and Amaratunga, 2008). Disaster management can be defined as a "collective term encompassing all aspects of planning for and responding to disasters, including both pre and post-disaster activities" (CERO, 2004). It may refer to the management of both the risks and consequences of disaster. Disaster management can be depicted as a cycle of inter related activities. According to Warfield (2004), the disaster management cycle illustrates the ongoing process by which governments, businesses, and civil society plan for and reduce the impact of disasters, react during and immediately following a disaster, and take steps to recover after a disaster has occurred. According to Kawata (2001), disaster management can be divided into four parts such as emergency response and relief; recovery and reconstruction; mitigation and preparedness. Therefore to reduce consequences of disasters and to achieve resilience, it is important to focus on all phases of the disaster management cycle. In this context the term 'resilience' refers to the "ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely

and efficient manner, including the preservation and restoration of its essential basic structures and functions” (ISDR, 2010c).

The recent disasters have clearly highlighted the vulnerability of the built environment and the lack of proactive measures for mitigation of such events (Bosher et al., 2007). In such cases, a disaster can be illustrated as an engineering failure where the impact would have been lesser if built environment were designed appropriately incorporating steps for mitigation. Mitigation includes both structural and non structural mitigation where structural mitigation refers to strengthening of buildings and infrastructure exposed to hazards via building codes, engineering designs and construction practises etc. and non structural mitigation refers to new development away from hazard locations through proper land use planning and regulations and relocating existing developments to safer areas and maintaining protective features of natural environment (Bosher et al., 2007). Therefore disasters need to be managed by minimising the engineering failures while taking proper risk reduction initiatives in order to prevent or reduce the adverse impacts of disasters.

3.2 Educational needs for disaster management and resilience in the built environment

The built environment is an abstract concept used to describe the products of human building activity and includes any physical alteration to the natural environment (Lawrence and Low, 1990). In the recent years there has been a growing recognition that the construction industry and the built environment professionals have a vital role in contributing to society’s improved resilience (Haigh & Amaratunga, 2010). As most of the material damages of disasters are on engineering related facilities in the built environment, a serious effort of the built environment professionals are required for rebuilding efforts after an onset of a disaster (Thayaparan *et al.*, 2010). Accordingly the expertise of the construction sector is essential at the design, construction and operation phases (Bosher *et al.*, 2007). It is also important that resilience is to be systematically built in to the whole design, construction and operation process and not simply added on as an afterthought (Bosher *et al.*, 2007). This would further require expertise of the professionals in the field of built environment. As such the knowledge and the expertise of the built environment professionals are also essential in the pre disaster phase especially in planning, designing and implementing disaster mitigation and prevention methods.

As a result of the increased occurrences and the ever increasing nature of the impacts of disasters, the need for education in the field of disaster management is significantly high. Education and training is an integral part of capacity building in the disaster management discipline as trained personnel respond much better to different disasters and will take proactive measures of mitigation and prevention (IDKN, 2009). Therefore specialised training is essential for all professionals who are engaged in the field of disaster management and resilience. On the other hand the education needs should not be limited to professionals and personnel involved in disaster management. It should be provided to the community as well for them to improve knowledge, attitude and skills to cope with the effects of disasters (IDKN, 2009). According to

Rouhban (2011) knowledge management and education are linked closely to disaster risk reduction efforts and will help communities in hazard-prone areas to cope with the risk of disasters.

As built environment professionals are required to play a major role in disaster management process, it is of paramount importance to design and deliver education and training programmes in order to provide knowledge to perform the tasks effectively. It is identified that due to the peculiar nature of disaster reconstruction the built environment professionals are expected to possess specific knowledge and expertise to act effectively in a disaster circumstances (Thayaparan *et al.*, 2010). Some of the factors which contribute to the unique nature of disaster reconstruction are limited time available for rebuilding; low cost; use of local resources; need for well developed communication links and relationships including trust and respect between the parties (Masurier *et al.*, 2006). In addition, the disaster reconstruction differs from normal construction based on funding arrangements, project planning and monitoring, stakeholder involvement, and need for adaptation of disaster risk reduction strategies (Bosher *et al.*, 2007; Freeman, 2004; Thayaparan *et al.*, 2010).

In this context, it is important to educate the stakeholders of disaster management on how to act efficiently and effectively in a disaster situation and HEIs are required to supply specific skills and knowledge which are necessary to act proactively in such situation. The lifelong learning opportunities further enhance this provision as it will provide an opportunity for the HEIs to act as continuing education centres which provide skills and knowledge in a dynamic environment (Thayaparan *et al.*, 2010a).

3.3 Challenges of disaster management learning

Disaster Management has become a discipline into itself as people worldwide attempt to gain greater control over their environment and circumstances (Amaratunga and Haigh, 2010). However, with the increase in the number of natural and human-made disasters, and the growing acknowledgement of the relationships with non-engineering aspects such as gender, conflicts, climate change, governance, public policy, etc., disaster management has become a multi-faceted subject area. The complexity of disaster management can be acknowledged due to its multidisciplinary nature, multi-institutional involvement and inclusion of all the basic management functions. As such for Higher Education Institutions involved in delivering Disaster Management, the aforementioned complexity and multi-facetedness brings both opportunities as well as challenges.

University-based degree (and other programmes) that prepare students for careers in disaster resilience, have an important contributions to make in terms of the content of the curriculum, educational methods and study materials. However, degree programmes offered by Higher Education Institutions are generally characterised by drawbacks such as lack of multidisciplinary nature and engagement with industry and private sector.

Involvement of the private sector in disaster management has already proven beneficial; hence, the need for greater private sector engagement in facilitating mutual learning is highlighted. Working with agencies to design educational and training programs that meet the needs of the humanitarian agencies to improve the industry engagement, developing multi-disciplinary curricula to prepare students for careers in humanitarian work, and facilitating cooperation and communication among university programs devoted to aspects of humanitarian studies and research are some of the suggestions that could enhance the effectiveness and efficiency of disaster management learning. On the other hand meeting the quality demands of such a multi-faceted subject area requires effective and optimal linking of teaching and research, in ways that are innovative in both outcome products and delivery processes.

The concept of learning has gone through a process of redefinition in recent years. On one hand learning is seen more and more as an active individual process, where learners construct their own knowledge base (Niemi, 2009). Learning is also increasingly seen as a process based on sharing and participation with different partners in a community, and is viewed as a holistic constructing process which is inter-connected with learners' social and cultural premises. As argued by Niemi (2009), in order to meet new challenges of learning, Higher Education Institutions need high quality multidisciplinary teaching on how to build empowering learning spaces and how to support different learners in their life situations. This proves very relevant to disaster management teaching, learning and education. The challenging circumstances within which Higher Education Institutions are required to operate mean that quality of teaching and research requires to be conducted in not only with a competitive advantage but also within effective and efficient ways.

The concept 'lifelong learning' has been used very often to describe adult learning. Today it is used increasingly as a concept of learning at different ages, as a life-course process (Niemi, 2009). It draws attention to the learning that takes place in the spaces surrounding activities and events with a more overt formal purpose, and takes place in a much wider variety of settings than formal education or training (Eraut, 1985). It can also be considered as a complementary partner to learning from experience, which is usually construed more in terms of personal than interpersonal learning. The concept 'lifelong learning' has increasingly been viewed as a way of addressing challenges of disaster management learning; complexity, multi-facetedness, engagement, interdisciplinary and dynamic nature. Succeeding sections of the paper highlight the suitability of lifelong learning approach to disaster management education.

4. Lifelong learning as an approach to disaster management education

The above mentioned sections justified the educational needs to increase the knowledge and skills on disaster management due to the peculiar nature of disasters and their impact on the built environment. It further discussed that the available approaches for education and the challenges such approaches face when responding to the educational needs in a disastrous situation. The above section also suggests that the concept of lifelong learning will be an

appropriate approach in this regard. Accordingly this section further emphasises the suitability of lifelong learning approach to disaster management education.

4.1 An overview of lifelong learning

By majority of the people in a society, the learning has been considered as an activity which is part of their life and which takes place throughout their lifetime. The learning process can mainly contain 3 classified elements namely formal, informal and non-formal learning. In short, formal learning is achieved through organised programmes delivered through schools and other providers and is recognised through a qualification or part of a qualification; non-formal learning is achieved through an organised programme or instruction, but is not recognised through a qualification; and informal learning is achieved outside of organised provision (OECD, 2004). Lifelong learning generally includes all of these three elements in its learning system.

General awareness of the need for the development of lifelong learning policies, both at national and international levels, has been dated from the period immediately after World War II (Kallen, 2002). Thereafter, rapid expansion on various forms of education such as in-house training, adult education and vocationally oriented training took place. The rapid growth in education and training to meet the growing demand for qualified personnel generated another incentive for reshaping and rethinking lifelong learning (Kellen, 2002). The changing nature of work and the labour market has been identified as one of the forces emphasising the need for continuing upgrading of work and life skills throughout life. The demand is for a rising threshold of skills as well as for more frequent changes in the nature of the skills required (OECD, 2004). To manage this change, individuals are expected to adopt the flexibility of being able to transfer skills and competences between jobs in respect of lifelong learning policy (Evans and Kersh, 2004).

The concept of lifelong learning as an educational strategy emerged some three decades ago, through the efforts of the Organisation for Economic Co-operation and Development (OECD), United Nations Educational Scientific and Cultural Organisation (UNESCO) and the Council of Europe. It was also agreed by these three bodies that the initial education and training needed to be followed by lifelong opportunities accessible to all citizens, irrespective of their social or economic status. OECD (2003) defines lifelong learning as “all learning activity undertaken throughout life, with the aim of improving knowledge, skills and competences within a personal, civic, social and/or employment-related perspective”. OECD Education Ministers, in choosing the goal of “lifelong learning for all” in 1996, have adopted a ‘cradle to grave’ concept with more comprehensive view that covers all purposeful learning activity that aims to improve knowledge and competencies for all individuals who wish to participate in learning activities (OECD, 2004).

When considering institutionalised form of learning, it takes various forms ranging from pre-school education, compulsory education, higher education, further education, adult learning and

vocational education and training. Each form of learning fulfils only partial needs for those who want to qualify to perform in the labour market by updating their skills and competences. However, if all of these forms of education are obtained collectively it will enable individuals to participate effectively and fully in social, political and economical life. Therefore creating a comprehensive educational system covering all learning is essential. In practical terms, it is hardly possible to cover 'all learning' by a single education provider. This demands a proper coordination between various educational providers to enhance the lifelong learning opportunities to a wider community. In support of that Kallen (2002, p.36) claims that "*not that this goal of an all-inclusive educational service (or system) was clearly formulated in the earlier lifelong learning concepts. Its implementation would have required at least a close coordination between all forms and places of learning and a policy-making structure that would cover all of them*". Kallen (1980) further argued that universities, in particular, missed the opportunity to recognise their teaching so as to open their doors to new clientele. Hence, all the education and training providers are required to take necessary actions to promote the lifelong learning concept and reform the system of education to support this agenda.

The next section analyses the concept of lifelong learning for disaster management education and the need to reform system of education provided by HEIs with specific focus on HEI governance.

4.2 Lifelong Learning in the context of disaster management education

One of the main reasons to focus on disaster management sector in the context of lifelong learning is due to the widespread agreement in the literature that disaster management is a continuous process and has no specific end point. According to Haigh and Amaratunga (2010) the built environment discipline at each stage of disaster management process has invaluable expertise and key role to play in the development of society's resilience to disasters. According to Warfield (2004), the disaster management cycle illustrates the ongoing process by which governments, businesses, and civil societies plan for and reduce the impact of disasters, react during and immediately following a disaster, and take steps to recover after a disaster has occurred. It is therefore important to take appropriate actions at all points in the disaster management cycle and it will lead to greater preparedness, better warnings, reduced vulnerability or prevention of disasters (Adams and Wisner, 2003).

The construction professionals are generally expected to possess specific knowledge and expertise to act effectively in a disaster situation. The main reason is the peculiar nature of disaster reconstruction. Further, disaster management involves a multi-disciplinary approach and expertise. In order to cater the dynamic nature of such industrial requirements, the HEIs should update their knowledge and skills provision on a continuous basis. However, it is a challenge for the HEIs to use their formal learning approach to respond to the frequent and continuous changing needs. Therefore, considering the challenges identified with the formal

learning process provided by the HEIs, it is suggested that a lifelong learning approach will be more suitable in this situation.

Lifelong learning is an emerging concept of acquiring new skills throughout the life of an employee. This enables the employees to respond effectively and efficiently to the labour market needs. As mentioned earlier, the lifelong learning approach can accommodate the non-formal and informal learning elements in addition to formal learning. Therefore the challenges identified with the formal learning process adopted by the HEIs are either partially or fully minimised by taking a lifelong learning approach. The recognition for learning is achieved through the process of recording achievement of individuals arising from any kind of learning in any environment and also when the individuals make their knowledge and skills visible (Hozjan, n.d.). Further, the recognition of non-formal and informal learning has become a burning issue (see Hozjan, n.d.) due to the changing nature of the labour market requirements. OECD (2005, p14) also emphasises that *“there is an increasing evidence that countries realise that their qualifications systems need to be able to change and evolve to meet rapidly-changing needs in the world of learning and in the labour market”*. Thus, adopting a lifelong learning approach in the context of disaster management education will be solution to update the knowledge and skills of the built environment professionals on a continuous basis.

The CITB Construction Skills (2009) has identified that more employers are supporting the lifelong learning and have begun to use associated products and toolkits. However, little has been realised by the HEIs to adopt lifelong learning within their education system, despite the fact that lifelong learning is a core concept in modern education. The HEIs provide knowledge and skills to their students to the extent to which the students are able to get employed and work in the industry. However, it has been claimed that the skills and knowledge of the graduates do not always meet the expectations of the industry. It might be true that what is produced by the HEIs is an incomplete package and needs further improvement on a continuous basis. There are various ways and means to provide continuous supply of skills and knowledge, few to name are training and development provided by the industry and/ or professional bodies; other forms of education and training provided by HEIs, vocational training and education and further education. This demands HEIs to accommodate a model which ensures continuous supply of knowledge and skills to those who are in need to update their knowledge and skills to effectively perform in the industry.

Currently, the system of HEIs is not flexible enough to explicitly accommodate a lifelong learning model. This suggests a reform in the system to make it more responsive to the changing skills requirements and to make the HEIs to become continuing education centres. One of the main areas of reform as identified in the modernisation of agenda (European Commission, 2010) is governance reform which is where the focus of the ongoing BELLCURVE research project lies. Governance of HEIs can act as an agent for change in the system. In this context, the recommendations provided on governance reform proposed through this project will ensure that the HEIs will be more responsive and dynamic in providing the appropriate mix of skills and knowledge, to the target audience at the appropriate time.

5. Conclusions

Given the increased occurrences of disasters and the damages caused globally, the need to respond, recover, rebuild or reinstate the built environment affected by disasters is identified as a paramount need and a major challenge. Construction industry and built environment disciplines have a major responsibility in responding to the above context. The continuous and multifaceted nature of disaster management has resulted in the formal study programmes generally offered by higher education institutions, and the one-off engagement between the student and university is inadequate to cater to the needs of the disaster management sector. Lifelong learning is proposed as a suitable approach.

The role of the higher education in providing lifelong learning is a major focus of the BELLCURVE. The project proposes that universities become catalysts for lifelong learning provision by adopting a through-life studentship approach. It also proposes that HEIs be modernised to enable speedy response to emerging skills needs in disaster management while maintaining academic quality and rigour. Reforming governance is one the measures to achieving such organisational responsiveness. Next stages of the BELLCURVE research project will investigate how the aforementioned responsiveness can be achieved.

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References

Adams, J. and Wisner, B. (2003), *Environmental health in emergencies and disasters: a practical guide* [online]. World Health Organization. Available from: http://www.who.int/water_sanitation_health/hygiene/emergencies/emergencies 2002/en/ [Accessed 19 May 2006].

Amaratunga, D and Haigh, R., (2010), Disasters and the Built Environment: Towards a Mature Discipline, Editorial: *International Journal of Disaster Resilience in the Built Environment*, 1(1), 1-5.

Bosher, L., Dainty, A., Carrillo, P. and Glass, J. (2007a), Built-in resilience to disasters: a pre-emptive approach, *Engineering, Construction and Architectural Management*, 14(5), 434-446.

Bosher, L., Dainty, A., Carrillo, P., Glass, J. and Price, A. (2007b), Integrating disaster risk into construction: a UK perspective, *Building Research and Information*, 35(2), 163–177.

CERO, (2004), *Disaster Management for Students, Managing Disasters* [online]. Barbados, Central Emergency Relief Organization. Available from: <http://cero.gov.bb/pages/students.html> [Accessed 13 May 2010].

CITB - Construction Skills (2009), CITB - *Construction Skills: Annual Report and Accounts 2008* [Online], Construction Industry Training Board, Available from <http://www.official-documents.gov.uk/document/hc0809/hc03/0326/0326.pdf>. [Accessed May 2009].

Eraut, M. (1985) Knowledge Creation and Knowledge Use in Professional Contexts, *Studies in Higher Education*, 10(2), 117-133.

European Commission (EC) (2010), *The Higher Education Modernisation Agenda* [Online] Available at http://ec.europa.eu/education/higher-education/doc1320_en.htm [Accessed August 2010]

Evans, K. and Kersh, N. (2004), Recognition of tacit skills and knowledge Sustaining learning outcomes in workplace environments, *Journal of Workplace Learning*, 16 (1/2), 63-74.

Freeman, P.K. (2004), Allocation of post disaster reconstruction financing to housing, *Building Research and Information*, 32(5), 427-437.

Ginige, K., Amaratunga, D. and Haigh, R. (2009) Mainstreaming gender in disaster reduction: why and how?’, *Disaster Prevention and Management*, 18(1), 23-34.

Haigh, R. and Amaratunga, D. (2010), An integrative review of the built environment discipline’s role in the development of society’s resilience to disasters, *International Journal of Disaster Resilience in the Built Environment*, 1(1), 11-24.

Hozjan, D. (no date), *Recognition of knowledge and skills and labour market* [Online], Powepoint presentation, Available from: www.institute-ibis.si/EMUNI/EMUNI-LLL%20and%20DC.ppt [Accessed 7 May 2011]

IDKN. (2009), *Planning for safer tomorrow* [online]. India, India Disaster Knowledge Network. Available from: http://www.saarc-sadkn.org/countries/india/major_safe.aspx [Accessed 13 May 2011].

ISDR. (2011), *Killer year caps deadly decade – reducing disaster impact is “critical” says top UN disaster official* [online]. Geneva, United Nations International Strategy for Disaster Reduction Available from: <http://www.unisdr.org/archive/17613> [Accessed 11 April 2011].

ISDR. (2010b), *Strategy outline for the 2010-2011 ISDR world disaster reduction campaign on building resilient cities, addressing urban risk* [online]. International Strategy for Disaster Reduction – ISDR. Available from: [www.unisdr.org/.../campaigns/campaign20102011/.../230_Campaign Strategy.doc](http://www.unisdr.org/.../campaigns/campaign20102011/.../230_Campaign%20Strategy.doc) [Accessed 28 Feb 2010].

ISDR. (2010c). *Terminology: basic terms of disaster risk reduction* [online]. International Strategy for Disaster Reduction – ISDR. Available from: <http://www.unisdr.org/eng/library/lib-terminology-eng%20home.htm> [Accessed 28 Feb 2010].

Kawata, Y. (2001), *Disaster mitigation due to next Nankai earthquake tsunamis occurring in around 2035* [online]. Kyoto, Kyoto University. Available from: http://www.pmel.noaa.gov/its2001/Separate_Papers/1-08_Kawata.pdf [Accessed 25 February 2010].

Lawrence, D. L. and Low, S. M. (1990), *The Built Environment and Spatial Form, Annual Reviews*, 19, 453-505.

Masurier, J. L., Wilkinson, S. and Shestakova, Y. (2006), *An analysis of the alliancing procurement method for reconstruction following an earthquake, Proceedings of the 8th US National Conference on Earthquake Engineering*, 18-22 April, California, USA.

McDonald, R. (2003). *Introduction to Natural and Man-made Disasters and their Effects on Buildings*. Oxford: Architectural Press.

Niemi, H., (2009), *Why from Teaching to Learning?*, *European Educational Research Journal*, 8(1), 1-17, www.wwwords.eu/EERJ

OECD. (2003), *The Role of National Qualifications Systems in Promoting Lifelong Learning: Background report for Ireland* [Online], OECD, The National Qualifications Authority of Ireland, Available from: <http://www.oecd.org/dataoecd/41/20/33978011.pdf> [Accessed 14 April 2011]

OECD. (2004), *Lifelong Learning* [Online], OECD Policy Brief, Available from: <http://www.oecd.org/dataoecd/17/11/29478789.pdf> [Accessed 10 April 2011]

OECD. (2005), *The Role of National Qualifications Systems in Promoting Lifelong Learning: Report from Thematic Group 1* [online], Available from: <http://www.oecd.org/dataoecd/41/39/33977045.pdf> [Accessed 10 April 2011].

Palliyaguru, R. and Amaratunga, D. (2008), Managing Disaster Risks through Quality Infrastructure and Vice Versa: Post Disaster Infrastructure Reconstruction Practices, *Journal of Structural Survey*, 26 (5), 426-434.

Pourezzat, A. A., Nejati, M. and Mollaei, A. (2008), Dataflow model for managing urban disasters: The experience of Bam earthquake, *International Journal of Disaster Resilience in the Built Environment*, 1(1), 84-102.

Rouhban, B. (2011), *Knowledge management and education for disaster reduction* [online]. The Environment Times. Available from: <http://www.grida.no/publications/et/ep3/page/2618.aspx> [Accessed 25 February 2011].

Smith, K. (2004), *Environmental Hazards*. 4th ed. London and New York: Routledge.

Thayaparan, M., Siriwardena, M., Malalgoda, C., Amaratunga, D., Kaklauskas, A. and Lill, I. (2010), Reforming HEI to improve skills and knowledge on disaster resilience among construction professionals, *The Proceedings of the Construction, Building and Real Estate Research Conference of the Royal Institution of Chartered Surveyors (COBRA)*, 2-3 September 2010, Dauphine Université, Paris.

UNISDR. (2009), *UNISDR Terminology on Disaster Risk Reduction (2009)* [Online], United Nations International Strategy for Disaster Reduction, Available from: <http://www.unisdr.org/eng/terminology/UNISDR-terminology-2009-eng.pdf> [Accessed July 2010]

USGS (2011), *Largest and Deadliest Earthquakes by Year 1990 – 2011* [Online], United States Geological Survey, Available from: <http://earthquake.usgs.gov/earthquakes/eqarchives/year/byyear.php> [Accessed 13 May 2011]

Warfield, C. (2004). *The Disaster Management Cycle* [online]. Kobe, The Global Development Research Centre. Available from: http://www.gdrc.org/uem/disasters/1-dm_cycle.html [Accessed 15 April 2010].