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SYMPOSIUM ON DISASTER RESILIENCE AND BUILT ENVIRONMENT EDUCATION: CELEBRATING PROJECT SUCCESSES

Global Disaster Resilience Centre, University of Huddersfield, UK
15th - 17th September 2015

BOOK OF ABSTRACTS



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SYMPOSIUM ON DISASTER RESILIENCE AND BUILT ENVIRONMENT EDUCATION: CELEBRATING PROJECT SUCCESSES

Book of Abstracts

Edited by

Professor Dilanthi Amaratunga
Professor Richard Haigh

Global Disaster Resilience Centre, University of Huddersfield, UK
15th to 17th September 2015

Professor Dilanthi Amaratunga and Professor Richard Haigh
(*edited by*)

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Preface

Among many communities in the EU and beyond, disasters pose significant concerns and challenges. With growing population and infrastructures, the world's exposure to disaster related hazards is increasing. In addition to loss of life, disasters greatly hamper the social-economic capacity of the member countries and also of the union as a whole. Swiss Re's latest sigma report (2014) highlights the 308 disaster events in 2013, of which 150 were natural catastrophes and 158 man-made. Almost 26,000 people lost their lives or went missing in the disasters. Europe suffered the two most expensive natural disasters in insurance terms. The first was the massive flooding in Central and Eastern Europe in May and June, after four days of heavy rain that caused large-scale damage across Germany, the Czech Republic, Hungary and Poland. It led to \$4.1 billion in paid claims on \$16.5 billion in economic losses. The second was the hailstorm that hit Germany and France in late July, causing \$3.8 billion in insurance payments on \$4.8 billion in economic losses. Most of those claims came from heavily populated areas of Germany. Altogether, Europe had economic losses worth \$33 billion for \$15 billion in insurance payouts. For the first time in history the world has experienced three consecutive years where annual economic losses have exceeded \$100 billion.

Disaster risk is a new multi-trillion dollar asset class. Global capital flows have transformed the landscape of disaster risk, creating a new pile of toxic assets for businesses and governments that do not currently appear on balance sheets. Globally, US\$71 trillion of assets would be exposed to one- in-250 year earthquakes (UNISDR, 2013). Compared to the rest of the world, economic loss per capita is high in Europe, in part due to high population density. Countries previously considered as not high risk now need to re-evaluate and strengthen their disaster prevention strategies and capacities in order to become more resilient. UNISDR (2013) added that, *"the trend will probably continue to rise as natural disasters are expected to become more frequent and severe for Europe in the future."* Despite these projections, EU reports (European Commission, 2009) have highlighted the gaps in overall EU civil protection capacity. A major contributory factor to disaster risk is capacity, which needs to be deployed before the hazard visits a community in the form of pre-disaster planning. For every €1 spent in disaster prevention, we save €4-7 in disaster response. Disaster risk prevention has been included in key EU policies, including health, environmental impact assessment, climate change adaptation, eco-systems, agriculture, transport and energy, research and innovation. Effective mitigation and preparedness can greatly reduce the threat posed by hazards of all types. Likewise, capacity can also be deployed following a major disruptive event. The post-disaster response can impact the loss of life, while timely reconstruction can minimise the economic and social damage that may otherwise result.

The future resilience for disasters rests upon shortening the distance between emerging scientific evidence and actionable policy. A rising trend in natural and man-made disasters underlines the need for a well-coordinated European action, both in terms of response and also in terms of preparedness and prevention. New legislation to strengthen European policy on disaster management was approved in December 2013. The revised legislation aims at further improving cooperation and coordination to strengthen preparedness, and provide for a fast and efficient response when a disaster strikes. This means better protection for EU citizens and affected communities worldwide.

It is with this context that the Global Disaster Resilience Centre at the University of Huddersfield has the pleasure of welcoming delegates to this Symposium on Disaster Resilience and Built Environment Education, which is organised in association with three EU based projects aimed at increasing our resilience to disasters and developing built environment education: CEN-EAST (Reformation of the Curricula on Built Environment in the Eastern Neighbouring Area); RESINT (Collaborative Reformation of Curricula on Resilience Management with Intelligent Systems in Open Source and Augmented Reality); CADRE (Collaborative Action towards Disaster Resilience Education). The projects bring together delegates from across Europe and beyond, including

international experts from Belarus, Estonia, Italy, Lithuania, the Russian Federation, Sri Lanka, Ukraine, and the United Kingdom.

The importance of international cooperation and global partnership to tackle disaster risk and increase resilience is explicitly recognized in the Sendai Framework for Disaster Risk Reduction 2015-2030 that representatives from 187 UN member States adopted in March 2015 as the first major agreement of the post-2015 development agenda. The framework acknowledges that given their different capacities as well as the linkage between the level of support provided to them and the extent to which they will be able to implement the present framework, countries require different provisions of means of implementation, including adequate, sustainable, and timely resources, through international cooperation and global partnership for development. It recognises that in addressing economic disparity and disparity in technological innovation and research capacity among countries, it is crucial to enhance technology transfer involving a process of enabling and facilitating flows of skill, knowledge, ideas, know-how and technology.

The Sendai Framework also recognises the vital role of academia, scientific and research entities in tackling disaster risk. It urges them to focus on the: disaster risk factors and scenarios, including emerging disaster risks, in the medium and long term; increase research for regional, national and local application; support action by local communities and authorities; and support on the interface between policy and science for decision-making.

In addressing these challenges, EU Member states need to be able to better coordinate preparation, prevention and eventually respond to disasters in cities within Europe and globally. The management of disaster risks is heavily dependent on scientific knowledge and therefore greater use of science and technology can significantly reduce the devastating impacts of disasters.

It is our intention that this symposium will provide an important basis for academia, science and research entities to interact, share knowledge and contribute to the post-2015 development agenda.

Professor Dilanthi Amaratunga and Professor Richard Haigh
Co-Directors, Global Disaster Resilience Centre, University of Huddersfield, United Kingdom

Acknowledgements

As hosts and meeting chairs of the Symposium on Disaster Resilience and Built Environment Education: Celebrating project successes, we are delighted to have the opportunity to hold these events in association with the following projects: CEN-EAST (Reformation of the Curricula on Built Environment in the Eastern Neighbouring Area); RESINT (Collaborative Reformation of Curricula on Resilience Management with Intelligent Systems in Open Source and Augmented Reality); and CADRE (Collaborative Action towards Disaster Resilience Education). The symposium programme incorporates the final meeting of the CENEAST project, and also key dissemination events of the RESINT and CADRE projects.

We have received exceptional help and support from a number of people, organisations and bodies in the work for this conference. The efforts involved with an event of this scale are significant and it would not have been possible to organise this event without assistance. We would particularly like to acknowledge the support of Sharon Baines, Dr Ezri Hayat and Professor Mike Kagioglou, Dean of Art Design and Architecture at University of Huddersfield, UK. We also would like to thank Sophie Phillips, Dr Chamindi Malalgoda, Dr Kaushal Keraminiyage and Nuwan Dias for being there whenever we needed help.

Workshop organisation

Organised by

Global Disaster Resilience Centre, University of Huddersfield, United Kingdom

In association with

CEN-EAST (Reformation of the Curricula on Built Environment in the Eastern Neighbouring Area)

RESINT (Collaborative Reformation of Curricula on Resilience Management with Intelligent Systems in Open Source and Augmented Reality)

CADRE (Collaborative Action towards Disaster Resilience Education) Project

Organising committee

Professor Dilanthi Amaratunga, University of Huddersfield, United Kingdom

Professor Richard Haigh, University of Huddersfield, United Kingdom

Dr Ezri Hayat, University of Huddersfield, United Kingdom

Dr Kaushal Kerminiyage, University of Huddersfield, United Kingdom

Sharon Baines, University of Huddersfield, United Kingdom

Sophie Phillips, University of Huddersfield, United Kingdom

Global Disaster Resilience Centre, University of Huddersfield, UK

A global leader in multi-disciplinary research, education and advocacy to improve the resilience of nations and communities

What would it be like to live in a world in which government authorities, businesses, communities and individuals work together to create a society that is able to withstand the effects of unforeseen events and threats? At the Global Disaster Resilience Centre we are working with stakeholders at the global, national, municipal and local level to make this happen.

The Global Disaster Resilience Centre is committed to excellence in research, education and advocacy to improve the resilience of nations and communities to disasters. With growing population and infrastructures, the world's exposure to hazards is increasing. When disaster strikes, communities may need to be rebuilt physically economically and socially. At the same time, it is vital that any reconstruction activity pro-actively considers how to protect people and their environment, and reduce a community's vulnerability.

The Global Centre for Disaster Resilience is part of the School of Art, Design and Architecture at the University of Huddersfield in the UK. University of Huddersfield is one of the leading universities in the UK and was named Times Higher Education University of the Year in 2014. In 2013 the University was awarded two Queen's Awards for Enterprise and in 2012 it was awarded the prestigious Entrepreneurial University of the Year at the Times Higher Education Awards. It is also in the top 10 in England for teaching excellence and is ranked in the top 10 nationally for undergraduate and postgraduate employability. In 2014, the University of Huddersfield was awarded the Times Higher Education Best University Workplace and topped the tables in all four main categories in a survey carried out amongst staff in higher education across the country

Research themes

- Disaster resilience
- Understanding disaster risk
- Contingency planning and resource management
- Private sector engagement in the development of disaster resilience
- Public private partnerships in disaster risk reduction
- Capacity building for disaster mitigation and reconstruction
- Risk management and sustainability
- Post-conflict reconstruction
- Social impact of reconstruction
- Public policy, governance & procurement
- Improved disaster resilience through social media interaction
- Community maturity for improved disaster resilience

International activities

The Centre contributes to national and international committees to advise and guide on strategic and technical issues pertaining to disaster management. The Centre also provides leadership in actively helping to determine the research direction of the field, with a major International journal, periodic conferences and events, and frequent publication of cutting edge research in refereed journals, which are acclaimed nationally and internationally.

Recent projects

The Centre's members are very experienced in obtaining European research councils funding. They lead and contribute to major collaborative international research projects that involve partners across the globe. Some examples include:

- *ANDROID (Academic Network for Disaster Resilience to Optimise educational Development) – with 67 international partners*

Symposium on Disaster Resilience and Built Environment Education

- *CASCADE (Collaborative Action towards Societal Challenges through Awareness, Development and Education) – with 17 international partners*
- *CADRE (CADRE (Collaborative Action towards Disaster Resilience Education) – with 7 international partners*

The Centre is keen to develop future projects that address societal challenges and international cooperation, inclusive, innovative and secure societies, support for bilateral, multilateral and bi-regional policy dialogue, and networking and twinning activities to facilitate partnering and competence building.

PhD programme

The Centre's PhD programme lays the foundations of inquiry that are relevant to disaster management. Researchers benefit from its strong research culture and there are strategies in place to ensure PhD research is of the highest quality and can achieve sustained growth. The Centre has defined principles that are applied throughout its work. Protocols are designed to ensure researchers have sufficient time, authority and responsibility to conduct and develop their activities. This mechanism is also designed to maximise the opportunity to invest in and nurture researchers under the mentoring of senior researchers.

International Journal of Disaster Resilience in the Built Environment

ISSN: 1759-5908

Editors: Professor Richard Haigh and Professor Dilanthi Amaratunga

Frequency: 5 issues per year

Indexed in Scopus

Website: www.emeraldinsight.com/ijdrbe

The journal aims to further knowledge and understanding of the link between the built environment and disaster mitigation, response and reconstruction. The journal seeks to:

- Develop the skills and knowledge of the built environment research community and professions working in disaster prone areas, so that they may strengthen their capacity in strategic and practical aspects of disaster prevention, mitigation, response and reconstruction
- Provide a unique forum for novel enquiries into the development and application of new and emerging practices as a source of innovation to challenge current practices
- Promote the exchange of ideas between researchers, educators, practitioners and policy makers
- Influence disaster prevention, mitigation, response and reconstruction policies and practices

International conferences

The Centre organises interdisciplinary conferences and seminars that promote innovation and knowledge exchange on disaster resilience between Higher Education and relevant stakeholders. Members of the Centre established the International Conference on Building Resilience Series in 2008. Most recently, the 4th International Conference on Building Resilience was held from 8th - 11th September 2014, at MediaCityUK, Salford, in the United Kingdom (www.buildresilience.org/2014).

For more information, please contact:

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Editors

Dilanthi Amaratunga is the Professor of Disaster Management at the School of Art, Design and Architecture at the University of Huddersfield, UK where she leads the Global Disaster Resilience Centre. Dilanthi's research interests include post disaster reconstruction, conflict mitigation, gender and projection, capability and capacity building in managing disasters, empowerment of women, and women in construction. An interdisciplinary background in Quantity Surveying, Facilities and Business Continuity Management, Education and Training, Gender and Disasters and Disaster Mitigation and Reconstruction provides her the opportunities to work across a broader construction and disaster management research agenda including developing partnerships of international research teams, government, NGOs and communities. She is the Co-Editor of International Journal of Disaster Resilience in the Built Environment, the only journal to promote research and scholarly activity that examines the role of building and construction to anticipate and respond to unexpected events that damage or destroy the built environment. She is an Advisory Panel Member and Advocate of the United Nations International Strategy for Disaster Reduction (UNISDR) campaign on "Making Cities Resilient". Margareta Wahlström, Special Representative of the Secretary-General (SRSG) of the United Nations for Disaster Risk Reduction appointed her to promote urban disaster resilience in their spheres of influence. It is the normal practice to appoint one advocate per country and with this appointment, Dilanthi will be part of a very strong advocate community of 25 who are based around the world.

She has secured a number of significant, high profile grants including the EC FP7 funded CASCADE (Collaborative Action towards Societal Challenges through Awareness, Development, and Education) with 17 international partners. CASCADE identified societal challenges on which to focus the cooperation and justify them in terms of common interest and mutual benefit relevant to the targeted countries in Southern Asia within the context of Horizon 2020 societal challenges. In January 2014, she was invited by the European Commission to formally launch their Horizon 2020: the new EU Framework Programme for Research and Innovation in South Asia. She has presented widely at international conferences, has led international disaster management workshops and seminars, and is working actively with the United Nations. To date she has produced over two hundred publications, refereed papers and reports, and has made over 50 key note speeches in around 30 countries. The strengths she has brought to these activities are critical scholarship and leadership. Full details of Dilanthi's publications, projects, and national and international activities can be found at www.dilanthiamaratunga.net.

Richard Haigh is a Professor and Co-Director of the Huddersfield Centre for Disaster Resilience at the University of Huddersfield. He is the Founding Editor-In-Chief of the International Journal of Disaster Resilience in the Built Environment, Co-Chair of the 2008, 2011, 2013 and 2014 International Conferences on Building Resilience, Co-Chair of the 2014 CIB International Conference on Construction in a Changing World, and Co-Chair 2005-2007 International Postgraduate Research Conferences, held at Salford Quays, UK and Delft, the Netherlands. His research interests include the conceptual understanding of resilience, the reintegration and rehabilitation of conflict-affected communities in Sri Lanka, and engagement of the private sector in the development of societal resilience.

Richard has secured sixteen research grants since 2005 in the areas of disaster resilience, construction management and education, covering issues such climate change adaptation, social impact of post-conflict reconstruction, gender, curricular development, knowledge management, capacity building for resilience, and education in the built environment. Richard was Principal Investigator of ANDROID (Academic Network for Disaster Resilience to Optimise Educational Development), a partnership of 67 institutions across 31 countries committed to promote co-operation and innovation to increase society's resilience to disasters of human and natural origin. He was also Principal Investigator of Conflict Prevention through Infrastructure Reconstruction, a 12-month intervention to enhance the capacity of local stakeholders to deliver conflict sensitive infrastructure reconstruction programmes within the North and East of Sri Lanka, and thereby to help prevent future conflict in the region. The project was funded by the UK Foreign and Commonwealth Office through the British High Commission in Colombo. Most recently, Richard has been appointed as the UK lead organiser on developing resilient, connected communities to tackle coastal hazards, a British Council Newton Fund: Researcher Links Workshop Grant to develop stronger links between the UK and Indonesia.

Richard has given over 50 invited speeches and keynote presentations for audiences in the UK, Australia, New Zealand, USA, Nepal, Sri Lanka, Bangladesh, Malaysia, Hong Kong, Canada, Estonia, Lithuania, and South Africa. He has also published over 25 peer reviewed journal articles, 1 edited book, 7 book chapters, and 13 reports for a variety of stakeholders. A full list of Richard's publications, projects, and national and international activities can be found at www.richardhaigh.info.

Project summaries

CEN-EAST (Reformation of the Curricula on Built Environment in the Eastern Neighbouring Area)

<i>Funding Scheme</i>	TEMPUS PROGRAMME
<i>Period covered</i>	15/10/2012-14/10/2015
<i>Project</i>	Vilnius Gediminas Technical University
<i>Coordinating Organisation</i>	
<i>Name of the scientific representative of the project (including contact details)</i>	Prof PhD DrSc Arturas Kaklauskas Research Institute of Smart Building Technologies Vilnius Gediminas Technical University Sauletekio av. 11 Vilnius, LT-10223 Lithuania e-mail: arturas.kaklauskas@vgtu.lt phone: +37064026228
<i>Organisation of the scientific representative of the project</i>	Vilnius Gediminas Technical University Research Institute of Smart Building Technologies
<i>Project partners :</i>	<p><i>Alma Mater Studiorum – University of Bologna</i></p> <ul style="list-style-type: none"> - Massimo Bianchi – main contact person - Laura Tampieri <p><i>University of Huddersfield</i></p> <ul style="list-style-type: none"> - Dilanthi Amaratunga – main contact person - Richard Haigh - Chamindi Malalgoda - Kaushal Keraminiyage <p><i>Tallinn University of Technology</i></p> <ul style="list-style-type: none"> - Irene Lill – main contact person - Emlyn Witt - Roode Liias <p><i>Belarusian State Technological University</i></p> <ul style="list-style-type: none"> - Nikolai Siniak – main contact person - Sergey Shavrov <p><i>Yanka Kupala State University of Grodno</i></p> <ul style="list-style-type: none"> - Yury Romanovski – main contact person - Alla Volik - Dzimitry Safonchyk <p><i>Moscow State University of Civil Engineering</i></p> <ul style="list-style-type: none"> - Zinaida Ivanova - Igor Pichugin – main contact person - Michael Eichner - Alevtina Balakina - Natalia Samotesova <p><i>Saint-Petersburg State Polytechnical University</i></p> <ul style="list-style-type: none"> - Nikolay Vatin – main contact person - Elena Nikonchuk <p><i>Kaliningrad State Technical University</i></p> <ul style="list-style-type: none"> - Valeriy Beley – main contact person - Nikolai Elagin - Elena Gordeeva

Symposium on Disaster Resilience and Built Environment Education

- Andrey Nikishin
Moscow State Industrial University
- Andrey Safonov – main contact person
- Irina Tkachenko
National Technical University of Ukraine
- Angela Piatova – main contact person
- Volodymyr Prokopenko
National Technical University "Kharkiv Polytechnic Institute"
- Irina Porunkova – main contact person
- Natallia Samoilenko
SVIMAP Network
- Manuela Malucelli
Association INFOBALT
- Vilma Misiukoniene – main contact person

Project website address www.ceneast.com

Project context Wider Objective of the project is to upgrade the curricula on built environment in the universities of Belarus, Russia and Ukraine according to Bologna practices in order to increase their capacity to continually modernize, enhance the quality and relevance of education of the building and civil engineering students to the labour market needs and to ensure international cooperation.

Project aims and objectives

- To upgrade curricula of BSc/specialists, MSc and PhD programmes with new modules on energetically and ecologically sustainable, affordable and healthy built environment in universities of Belarus, Russia and Ukraine in order to enhance the quality and relevance of education in PC universities to labour market needs.
- To transfer the Bologna practices in education (curriculum development, ECTS, innovative learning, etc.) from EU universities to PC universities.
- To develop a virtual interuniversity networked educational system (intelligent library, intelligent tutoring system, intelligent knowledge assessment system, access to the e-sources of the research and educational information) in order to ensure cooperation among the EU and PC universities in education and research.
- To assist the competence development of staff within the PC universities.
- To train at least 240 students during the pilot project.

Methodology followed The project is organized by 12 universities that will collaborate closely on a European scale and on a national scale with 2 associations. Project aims to upgrade curricula of BSc/specialists, MSc and PhD programmes with new modules on energetically and ecologically sustainable, affordable and healthy built environment in universities of Belarus, Russia and Ukraine, to transfer the Bologna practices in education, develop a virtual interuniversity networked educational system, to train staff within the PC universities and to train at least 240 students.

Planned activities in order to achieve the wider and specific objectives of the project are:

1. Management;
2. Upgrading of BSc, MSc and PhD degree programmes;
3. Development and Exploitation of the Virtual Interuniversity Networked Educational Centre;
4. Monitoring and Reporting of Results;
5. Dissemination.

Executive summary of findings so far Created intelligent systems (Intelligent library, Intelligent tutoring system and Intelligent student assessment system): <http://iti.vgtu.lt/tempus/>
12 framework reports for the common curricular
12 reports on common grounds for teaching and learning
17 module handbooks with peer review reports (9 BSc, 5 MSc, 2 PhD)

3.5. Planned outcomes	Planned	Implemented up to 31/08/2015
Number of cooperating universities	12	12
Number of upgraded programs available	5	5
Number of newly developed	16	22

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modules:	9	8
BSc/specialists	5	12
MSc	2	2
PhD modules		
Virtual interuniversity networked educational centre available	1	1
Number of involved labour market organizations in the preparation of new modules	2	2
Number of staff trained	36 educators and 32 employees	84 educators and 32 employees
Number of students who studied the newly developed modules	240	More than 1000
CENEAST Web site available	1	1

The potential impact and the main dissemination activities and exploitation of results

19 local articles in newspapers, magazines or other sources.

90 research articles in journals and conference proceedings.

61 participation in conferences.

Websites:

- www.ceneast.com
- <http://www.vgtu.lt/vgtu-international/current-projects/-international-academic-projects/53919>
- <http://www.cib2014.org/proceedings/ceneast.html>
- <http://www.ttu.ee/faculty-of-civil-engineering/department-of-building-production-3/dbp-research/projects-26/ceneast/>
- <http://www.scienzeaziendali.unibo.it/en/research/research-centres-and-projects/tempus>
- www.en.spbstu.ru/TEMPUS-CENEAST/
- <http://www.klgtu.ru/interact/projects/ceneast.php>
- <http://www.salford.ac.uk/built-environment/research/research-centres/disaster-resilience/key-research-projects/ceneast>
- www.grsu.by/en/news/8_3777.html
- <https://www.etis.ee/portaal/projektiAndmed.aspx?VID=999823ba-e6fa-4ce1-a3cc-d10c8b618dfb&PersonVID=37554&lang=en&FromUrl0=isikuProjektid.aspx>
- <http://kpi.ua/en/node/7194>
- <http://www.ttu.ee/faculty-of-civil-engineering/department-of-building-production-3/dbp-research/projects-26/ceneast/>
- <http://www.ec.kharkiv.edu/mp.html>
- http://www.dilanthiamaratunga.net/index.php?option=com_content&view=article&id=114&Itemid=106

RESINT (Collaborative Reformation of Curricula on Resilience Management with Intelligent Systems in Open Source and Augmented Reality)

<i>Funding Scheme</i>	Lifelong Learning Programme
<i>Period covered</i>	01/10/2013 – 31/03/2016 (included an extension of 6 months)
<i>Project</i>	University of Bologna
<i>Coordinating Organisation</i>	
<i>Name of the scientific representative of the project (including contact details)</i>	Prof. Massimo Bianchi Full Professor of Business Management School of Economics, Management and Statistics Forlì Piazzale della Vittoria, 15 47121 Forlì (FC) - Italy massimo.bianchi@unibo.it Mob. +39 320 8394270
<i>Organisation of the scientific representative of the project</i>	University of Bologna, Department of Managerial Sciences
<i>Project partners:</i>	UNIBO University of Bologna (Coordinating Organisation) University of Huddersfield Vilnius Gediminas Technical University Ser.In.Ar. – Servizi integrati d'area Forlì-Cesena Soc.Cons.p. SUDGESTAID SCARL Metaforum S.L. Association of Local Authorities in Lithuania JSC Getweb Ud'ANET University G.D'Annuzio
<i>Project website address</i>	http://resint.eu
<i>Project context</i>	The Project RESINT aims at contributing to the reform and implementing of curricula in resilience management with the collaboration of not academic partners through the elaboration and offer, in an open source platform, of a model that comprehensively reflects best practices in the teaching of Resilience, across the disciplines of business continuity management, security management, post catastrophe practices and IT operations management.
<i>Project aims and objectives</i>	RESINT wider objectives are: <ol style="list-style-type: none"> 1. To promote cooperation and innovation among European Higher Education Institutes (HEI), Government, Associations and Business partners to increase society's resilience to disasters of human and natural origin. To create, test and disseminate in open source new methodologies and didactical tools for the education to the resilience management using augmented reality and Intelligent Computer Learning Systems (its integration); 2. To foster entrepreneurial skills and attitudes of teachers and students by innovative teaching in resilience management in cooperation with Business partners and Associations; 3. To enhance structured mobility by involving members of Associations and Business partners in teaching of disaster management, ensuring students' and staff mobility between academia and business. RESINT specific objectives are: <ol style="list-style-type: none"> 1. To reformate the curricula and syllabuses of BSc, MSc, PhD on resilience management topics according to the exchange of knowledge with not academic organizations with the establishment of communication bodies and process integration with organizations involved in the resilience after disaster. 2. To promote the dialogue among teachers and researchers in a multidisciplinary

approach among different knowledge and create opportunities of teaching and learning exchange with not academic organizations through stage, internship of teachers, researchers, students and not academic organizations.

3. To develop a consortium among project partners for the management of an open source platform for teaching modules and e-learning methodologies using augmented reality, practice firm methodology (Simulimpresa) and distance learning.
4. To provide high accessibility to share the knowledge needed for an integrated and global system of resilience teaching using WEB and other net tools for connecting higher education (BSc, MSc, PhD) curricula and syllabuses. The platform will make available documentations of resilience management education.
5. To enforce the capability of higher education in interacting with the external environment by link between research, teaching and business involved in the resilience management after disasters.

To improve the efficiency and effectiveness of teaching tools in Resilience Management

Methodology followed

RESINT will deliver a network among academic partners and not academic ones with the use of augmented reality, practice management by simulimpresa and the placement of students for internship and stages in external organizations involved in the field. The project is developed along three axes:

- a) Learning technologies – by promoting the joint development of curricula, courses and materials supported on learning technologies;
- b) Collaboration – by promoting the creation of shared knowledge spaces between academia and business companies integrated in the consortium as well as between and with other stakeholders in the target industry;
- c) Mobility – by promoting networking, joint infrastructure and applications for training, and both students, staff and trainers' mobility between members of the consortium.

Executive summary of findings so far

The deliverables of RESINT are:

- 0 Project management handbook; reports and coordination meetings
- 1 Structured Educational Programmes (BSc, MSc, PhD) with Syllabuses and courses
- 2 Pilot modules framed in Short Courses on Resilience Management.
- 3 Manuals and teacher aids on curricula reform on resilience management
- 4 Tools based on Augmented reality and Intelligent Computer Learning Systems (its integration) implemented;
- 5 Innovative didactical methodology (Simulimpresa) applied;
- 6 Training courses with internship and stage in external organizations
- 7 Dissemination plan designed, RESINT web site, conferences and seminars,
- 8 Handbook of Quality
- 9 Career and placement service implemented
- 10 Agreements signed between Universities and Enterprises

All these results will be made available by an open source WEB Site managed by the Project Network and freely disseminating Project Results.

The potential impact and the main dissemination activities and exploitation of results

Diffusion of new didactical tools focused on Modules in Resilience Management with the use of practice management (Simulimpresa), augmented reality and Intelligent Computer Learning System for resilience management. Pilot modules for students, public managers, client designers, economist, contractors, etc. will be organized.

Main Project Web Sites:

<http://www.scienzeaziendali.unibo.it/it/ricerca/progetti-e-centri-di-ricerca/resint-201ccollaborative-reformation-of-curricula-on-resilience-management-with-intelligent-systems-in-open-source-and-augmented-reality201d>
 Simulated enterprise web site Perting – Simulimpresa
<http://perting.poloforli.unibo.it/index.php?page=estieri>
<https://www.unibo.it/sitoweb/massimo.bianchi/contenuti-utili/47ab7902>
<https://www.unibo.it/sitoweb/laura.tampieri/contenuti-utili/bc4ee1c6>
<http://www.vgtu.lt/vgtu-international/current-projects/-international-academic-projects/53919>
<http://www.udanet.it/it/menu/home>

CADRE (Collaborative Action towards Disaster Resilience Education) Project

<i>Funding Scheme</i>	<i>Lifelong Learning Programme (ERASMUS)</i> <i>Funding disclaimer:</i> This project has been funded with support from the European Commission. This publication reflects the views only of the author, and the Commission cannot be held responsible for any use, which may be made of the information contained therein.
<i>Period covered</i>	<i>October 2013 – January 2017</i>
<i>Project Coordinating Organisation</i>	<i>University of Huddersfield, UK</i>
<i>Name of the scientific representative of the project (including contact details)</i>	<i>Prof. Dilanthi Amaratunga</i> <i>QSBG/22 Queens Street Building</i> <i>School of Art, Design and Architecture University of Huddersfield Queensgate Huddersfield HD1 3DH, UK</i> <i>T : +44 (0)845 155 6666</i> <i>E: d.amaratunga@hud.ac.uk</i> <i>University of Huddersfield, UK</i>
<i>Organisation of the scientific representative of the project</i>	
<i>Project partners :</i>	<i>University of Huddersfield, UK</i> <i>Vilnius Gediminas Technical University, Lithuania</i> <i>Tallinn University of Technology, Estonia</i> <i>Northumbria University, UK</i> <i>United Nations International Strategy for Disaster Reduction, Switzerland</i> <i>University of Moratuwa, Sri Lanka</i> <i>Federation of Sri Lankan Local Government Authorities, Sri Lanka</i>
<i>Project website address</i>	<i>http://www.disaster-resilience.net/cadre/</i>
<i>Project context</i>	<i>Among many communities in the EU and beyond, disasters pose significant concerns and challenges. With growing population and infrastructures, the world's exposure to hazards - of both natural and man-made origin - is increasing. A major contributory factor to disaster risk is capacity. This capacity needs to be deployed before the hazard visits a community in the form of pre-disaster planning. Effective mitigation and preparedness can greatly reduce the threat posed by hazards of all types. Likewise, capacity can also be deployed following a major disruptive event. The post-disaster response can impact the loss of life, while timely reconstruction can minimise the broader economic and social damage that may otherwise result.</i> <i>There has been growing recognition that the construction industry and associated built environment professions are a vital component of this capacity. The supporting function of the built environment in serving human endeavours means that when elements of it are damaged or destroyed, the ability of society to function – economically and socially – is severely disrupted. Disasters have the ability to severely interrupt economic growth and hinder a person's ability to emerge from poverty. The protective characteristics of the built environment offer an important means by which humanity can reduce the risk posed by hazards, thereby preventing a disaster. Conversely, post-disaster, the loss of critical buildings and infrastructure can greatly increase a community's vulnerability to hazards in the future. Finally, the individual and local nature of the built environment, shaped by context, restricts our ability to apply generic solutions.</i> <i>Despite this significant role, recent evidence suggests that the construction</i>

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industry and associated built environment professions are ill equipped to support communities in the development of resilient buildings and infrastructure.

Project aims and objectives

CADRE (Collaborative Action towards Disaster Resilience Education) is a 36 month project that aims to address current and emerging labour market demands in the construction industry to increase societal resilience to disasters. CADRE will achieve this by:

- Establishing a framework for ICU integration to address societal concerns;*
- Developing and testing an innovative professional doctoral programme that integrates professional and academic knowledge in the construction industry to develop societal resilience to disasters;*
- Creating world-class curricula and modules to support the programme and address current and emerging capacity gaps in the development of societal resilience to disasters;*
- Exploiting ICT to enable cross-border cooperation in the sharing and delivery of educational resources that support the professional doctoral programme.*

Methodology followed

The CADRE work plan is designed to meet the aim and objectives of the project, and based on the explicit interests and expertise of the partners involved. The work plan has seven clearly defined work packages (WP). Each WP has a clear purpose, detailed method, and specified outputs and outcomes. It achieves an appropriate balance between management (WP1), quality (WP2), dissemination (WP7), exploitation (WP6), and implementation (WP3, 4 & 5). It balances the need to establish effective infrastructure and events that can sustain the project during and beyond the proposed three years, while also proposing meaningful survey and programme development projects. The implementation WPs (3, 4 & 5) have clearly defined phases and milestones to ensure that the project's activities are coordinated.

A constructive & developmental research approach has been selected as the overarching research methodology. This approach began with a detailed market needs analysis, capturing inter-disciplinary needs across a range of stakeholders and countries. Alongside this, an ICU framework was developed to identify how the industry, community and university integration can take place and how the effectiveness of such integration can be measured. These two activities culminated in the first milestone. To ensure that the proposed programme addresses a global, rather than just European perspective, input were also sought from third country partners. Based on these inputs, the development of the academic content of the joint professional doctorate programme and the associated processes will begin. This will involve the identification of the common and specific research areas, and potential for cooperation among partner organisations. This will also result in the second major milestone, the DProf programme specification (WP3). The next phase will involve development of Open Educational Resources (WP5), with a specific focus of imparting the knowledge and skills needed for undertaking doctoral research in disaster resilience in the built environment. In doing so, the programme will ensure that the specific specialities and expertise of disaster management and resilience in the built environment from the partner organisations will be integrated to the proposed joint doctoral programme. The final implementation phase will involve programme validation (WP4).

Executive summary of findings so far

A detailed market needs report and an ICU (Industry Community University) framework was developed. The market report aimed to capture the needs of 5 stakeholder groups associated in disaster resilience and management, as well as current and emerging skills applicable to built environment professionals towards enhancing societal resilience to disasters. 87 semi-

structured interviews were conducted with national and local government organisations; community; NGOs, INGOs and other international agencies; academia and research organisations; and private sector.

All needs as well as skills were categorized into five dimensions of resilience (Social, Economic, Institutional, Environmental, Technological) and each of the dimensions of resilience is sub-headed with the five stages of property lifecycle i.e. Preparation, Design, Pre-construction, Construction and Use stage. In the end, each of the identified Needs and Skills were categorized under the above-described headings. The interviews generated a long list of needs and skills with respect to the property lifecycle stages under the respective dimensions of resilience. Finally, the identified needs and skills were combined 'like-for-like' to produce broader level of classifications.

The classifications derived were more or less similar between the stakeholders and all stakeholders demanded a higher number needs and skills. In terms of needs and skills, a comparatively a higher number of needs and skills were demanded in relation to social, institutional and technological resilience compared to the economic and environmental resilience. Also, in terms of property life cycle stages, a comparatively a higher number of needs and skills were demanded at the preparation, design, construction and use stages compared to pre-construction stage. Finally the needs and skills were combined to arrive at a list of classifications. In terms of government stakeholders, more number of classifications was derived from social resilience, followed by institutional resilience. Same results were observed from the private sector stakeholders. Similar results were also witnessed from the community stakeholders where more number of classifications derived from institutional followed by social resilience. However, in NGOs, more number of classifications derived from social followed by technological resilience. In contrast, in academic analysis, more number of classifications was derived from economic resilience.

Most common classifications identified were, Building regulations and planning; Leadership and people management; Stakeholder management and collaboration; Financing, budgeting and estimating; Damage assessment and claims; Disaster risk and need assessment; Contracts and procurement; quality management; Environmental management; sustainability; materials and resource management; health and safety; team working; governance; communication; disaster management and resilience; and construction and project management.

At the next phase of the research it is expected to validate these findings through stakeholder seminars and validation seminars and the professional doctorate will be developed to cater the identified classifications.

The potential impact and the main dissemination activities and exploitation of results

Potential Impact

Benefits to a community of users and how they are involved in the project

The project will improve the quality and relevance of higher education through active cooperation between Higher Education Institutes and partners from outside academia, including construction professional bodies, local / national / international bodies, and social partners.

Members of the partner institutions are the identified short term target group of CADRE, but other groups include: undergraduate and postgraduate students, teaching and administrative staff, researchers, HE and public sector organisations, consultancies, public administrators, policy makers and industry, communities and the public at large.

The potential impact upon and benefits to the target user group

CADRE will make a contribution to both theory and practice in the development of societal resilience to disasters through the development of

curricular and modules to update the knowledge and skills that employees have obtained in the past. It will broaden and deepen the employees' understanding of the disciplines in which they are studying, upgrade their skills, promote inter-disciplinary working, and provide them with appropriate transferable skills.

CADRE will enhance not only academic knowledge, but also the concerns, capabilities and expectations of the relevant industries and communities. In turn, this will create the necessary intra Industry, Community and University (ICU) feedback and feed-forward mechanisms to enable effective lifelong learning.

CADRE will help the construction industry to increase societal resilience to disasters and be better prepared to respond to disasters. It will improve the quality and relevance of HE through active cooperation between HEIs and partners from outside academia, including construction professional bodies, local / national / international bodies and social partners. CADRE will develop modules to update the knowledge and skills that employees have obtained in the past promoting societal resilience to disasters. It will develop an innovative professional doctoral programme (DProf) that integrates professional and academic knowledge in the construction industry to develop societal resilience to disasters addressing the career needs of practicing professionals. Target groups will also benefit from CADRE's other planned outputs, including detailed market needs report (WP3 and WP4), resources that will be available via the OER (WP5) & Promotional seminars (WP7). In addition, CADRE will enable teams of other beneficiaries who are not part of the short-term target group within each partner institution to gain access to, study and learn ways of improving the resilience of society to catastrophic natural hazards.

Through the above-identified outputs, partners within the consortium and other identified stakeholders will find CADRE relevant to enhancing their lifelong learning experience. HEI partners will find the DProf a novel addition to their current portfolio of programmes. Industrial partners will benefit from better access to academic programmes within the context of their industry experiences.

Main dissemination activities and exploitation of results

The project has proposed various innovative avenues to communicate project outcomes to a wider community. Two work packages (WP6 and WP7) are designed for dissemination and exploitation of project outcomes and these are specifically designed to raise awareness of the project and to ensure that the research outputs and activities are disseminated to reach relevant stakeholders and have an impact on the target groups. As part of these work packages, a range of dissemination activities has been implemented.

Marketing and publicity: Marketing materials such as project poster and project brochures were designed, printed and appropriately displayed and distributed. These promotional materials were used to increase the awareness of the project among the stakeholders and also the general public. In addition, the project materials were publicised in various marketing and publicity modes, such as in institutional and other websites, international conferences, mailing list etc.

Project website, virtual space and project dropbox: The project website was developed and regularly maintained with the input received from the project partners and based on the outcomes of the project. The website includes the project details and its activities; work packages; project results; details of partners and working group; news and events; and publications. Some pages of website is also available in partner languages.

However, due to copyright issues and confidentiality, certain information is

made available in a restricted area to be viewed only by members of the partner institutions. To facilitate this, partners are provided with usernames and passwords to view any such materials. In addition, a project dropbox was created to share the resources among partner institutions.

OER: Open Education Resource platform was developed as part of WP5. The platform has been linked to the project website and will provide a means for the project to provide easy and open access to knowledge, and transfer the knowledge produced into economic or societal use. Accordingly all learning materials produced as part of the project are uploaded into the OER platform to support easy and open access to knowledge.

A dedicated seminar series: At least three promotional seminars will be organised, to promote the developed programme across industries, communities and universities. The aim of these seminars will be to increase awareness of the programme and to encourage discussion on how to add value to the developed programme, compatibility with institutional policies and standards and ways and means of promoting the programme beyond partner institutions. In addition, two stakeholder seminars will be organised to promote the project outputs. The project steering committee and all partners will target relevant stakeholders in government, educational policy and practice, encouraging them to take part in these activities and thereby to get involved in DProf programme implementation phase.

Academic dissemination: The project team has published and presented a number of academic publications, during the first half of the project. There will be at least 4 more peer-reviewed joint publications by the project partners in various research conferences and journals in the field. The publications will outline the background studies of the project; explain the overall methodology of the project; illustrate the developed doctoral programme; and communicate the final outcomes of the project. Once the final project results are realised, project will publish a special themed issue on 'disaster resilience education' in an international journal.

ABSTRACTS

Integrated assessment of the built and human environment renovation projects

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The renovation of the built and human environment as a whole has been analysed insufficiently worldwide. The research problem considers increasing the efficiency of the built and human environment renovation from holistic perspective by using multiple criteria decision support methods. Article presents state of the art on issues of built and human environment renovation, a unique conceptual Model for the Integrated Analysis of the Built and Human Environment Renovation Projects, the hierarchically structured system of assessment criteria as well as deals with the multiple criteria evaluation of the built environment renovation projects.

Keywords: built and human environment, renovation, projects, model, multiple criteria assessment

ID: 001

Multiple criteria analysis of the solutions for intelligent residential environment

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The article aims to present solutions for evaluation and enhancement of the effectiveness of intelligent assisted residential environment. In order to perform a detailed analysis of this subject, multi-criteria analysis methods are applied, which result in a complex evaluation of economic, technical, qualitative (reliability, aesthetic, functionality, and comfort) and other aspects of the research subject. Article presents an Integrated Model of Intelligent Assisted Built Residential Environment, system of criteria for detailed description of intelligent residential environment as well as multiple criteria assessment of possible solutions.

Keywords: intelligent residential environment, stakeholders, needs, solutions, multiple criteria analysis

ID: 002

Scientific and methodological aspects of the training module "renewable energy sources"

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The basis of the world power industry are traditional mineral resources, reserves of which are limited. The use of non-renewable energy sources is one of the main sources of pollution.

Depletion of non-renewable energy sources, global challenges related to climate change is an incentive for the use of renewable energy sources (RES). Change of a society development paradigm has decisive impact on the world power development tendencies. The main advantages of the technologies based on renewables are: inexhaustibility; sustainability; the ubiquity that reduces dependence on import of energy; the combination of energy sources in combination with intelligent control technology (SmartGrids) increases the reliability and efficiency of energy supply.

The main objectives that were set and solved during development of the study module: students with the knowledge and understanding of the ecological and energy problems of the world economy, technologies for producing heat and power using renewable energy; getting research skills to prepare and conduct experiments on a given methodology, analysis and evaluation of the results of research involving the appropriate mathematical apparatus; mastery of specific social skills on RES; the development of personal qualities such as: development of module self-study approach, participation in group discussions and preparation and presentation of the abstract presentation on a given topic; understanding of the political framework conditions aimed at promoting renewable energy and the application of knowledge in the calculation of economic efficiency of the use of renewable energy.

The basic material of study module are: lecture notes, test questions and teacher assignments. Students are offered links to basic textbooks and additional materials on the Internet, such as databases, including ScienceDirect, Scopus, electronic library, which will allow to master the proposed course.

Lectures include topics on the issues of renewable energy as the energy of the future for the life cycle of the built environment and the use of RES technologies: solar, wind, water, biomass and geothermal.

The module is prepared by group of higher-education teaching personnel of the Kaliningrad State Technical University on the basis of research works results performed by them which practical approval were shown at various conferences, forums and by the articles publication.

Keywords: educational module, renewables, education, power

ID: 003

An integrated model for the evaluation of curricula in built environment

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The curricula evaluation is a complex process with two main purposes: the first one is to evaluate the proposed curricula from the point of view of programs and information delivered by Higher Education Institutions (HEIs). The second is connected to the performance of curricula once applied in classroom.

The evaluation of curricula is based on templates prepared by Universities and on information available in internet through educational web sites.

As it concerns the performance evaluation, the main sources are the questionnaires fit by students, teachers and third part.

Thus the evaluation gives evidences to three points of view: teachers (AS), students (ST) and the environment (EN) represented by third part that respectively individuates the beneficiaries of educational services.

The evaluation coming from students is considered a matter of Effectiveness as the orientation of educational process involves Results toward its Targets. The one of teachers could be related to the Efficiency, as the ratio between Results and Resources, connected to the educational services delivering. The Adequacy would measure the correspondence of Resources used by HEIs to the commitment received by the environment and made by third part.

Using this model we can calculate the gap eventually existing between the effective and the perceived performances. The last directly derives from the results of questionnaires fit by third part, while the effective one is the ratio between the perceived Effectiveness and perceived Efficiency.

The paper describes the application of the evaluation to curricula prepared in CENEAST Tempus IV Project.

Keywords: curricula evaluation, effectiveness, efficiency, adequacy, performance

ID: 004

The networking approach in project networks analysis for built environment

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In recent years many studies investigated the organizational networks at different levels of analysis. This is connected to the usage of the networking approach encouraged by many factors such as the globalization and the diffusion of technologies. Furthermore the widening of business targets; the entering new markets, the sharing resources and risks, the specializing and distributing works are only some of motivations at the basis of organizational networks.

The paper examines a model of network based on four dimensions: a) 1st order ties existing among units; b) 2nd order ties; c) the distance from the core area of the network; d) the organizational complexity expressed by the relationship between 1st and 2nd orders.

The methodology gives evidence to the criticisms of networks on the basis of organizational principles as govern unity, span of control and shortening of communication lines.

Thus the performance of project networks can be connected to structural conditions concerning the capability of the network to control processes and to disseminate and produce new projects with a continuity.

The analysis is applied to some concrete cases of project management in which the networking approach is underlined by considering the project networks creation in the field of built environment.

Keywords: networking, project networks, built environment

ID: 005

Measuring the performances of pilot courses for resilience in cultural heritage

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Measuring the quality of resilience in cultural heritage depends from the definition of Cultural Heritage (CH) and from the approach in preserving and recovering historical sites with related data and materials.

On the basis of pilot courses managed by University of Bologna, during RESINT "Collaborative Reformation of Curricula on Resilience Management with Intelligent Systems in Open Source and Augmented Reality" project, the paper proposes a framework to evaluate the programs of pilot courses and a template to summarize the performance.

In this framework, we have to consider the two organizational approaches of Clustering and Networking in measuring the quality with a different orientation: the clustering is addressed to concentrate elements, materials, courses in a single space/area preferring the concepts of proximity and efficiency. The Networking is based on the net developed by the cooperation among partners mainly for disseminating courses beyond the project consortium.

The evaluation is based on the parameters: Targets, Results and Resources. These allow to create performance indexes as Effectiveness, Efficiency and Adequacy. Effectiveness as the ratio : Results/Targets measures the capacity to achieve the planned targets. The Efficiency indicates the capacity to maximize the results with the minimum waste of resources while the adequacy as the ratio : resources / targets stands for the capacity to define targets appropriate and feasible with the available resources.

This evaluation template is applied to pilot courses managed by UNIBO within RESINT project giving evidence to two cases related to the different approaches of Clustering and Networking.

Keywords: cultural heritage, resilience, historical sites

ID: 006

The practice management by Simulimpresa in the reproduction of resilient organizations

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The practice management could be used in the education for resilience and to reproduce real organizations in virtual reality. Both approaches have the purpose to prepare better conditions to apply new models of organizations. Following to previous researches the paper analyzes the pilot courses experienced by UNIBO in RESINT project “Collaborative Reformation of Curricula on Resilience Management with Intelligent Systems in Open Source and Augmented Reality” and the level of realized performances.

The aim is to reproduce organizations in resilience using practice management - Simulimpresa. The path real >>> simulated >>> real organization outlines that the real procedure has to be applied in the simulated environment to test the start up and to support the creation of a real organization.

“Simulimpresa” is an innovative didactical methodology consisting in the realistic reproduction of enterprise activities to teach with the method of learning by doing.

The reproduction of real organizations in a simulated environment has been tested in the three pilot modules managed by UNIBO on Resilience Topics with the aim to compare results and to detect the eventual GAP existing between real and perceived performances of evaluated modules.

Keywords: practice management- Simulimpresa, virtual reality, resilience management

ID: 007

Electromagnetic pollution in power-supply systems of built environment facilities and its reduction

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In built environment facilities (residential buildings, schools, hospitals, etc.) the use of equipment and devices with the latest electro-technologies is gradually increasing: energy-saving lamps for lighting, variable frequency drives in water-supply systems, heating, ventilation and air conditioning; welding machines for construction of built environment facilities, computers, video, household appliances, etc.

On the one hand, the latest electro-technologies can significantly reduce power consumption (up to 10 times), as well as justify power-supply systems of built environment based on smart grids.

On the other hand, implementation of new electro-technologies means using non-linear power elements. While operating these elements create electromagnetic interference (EMI) in power-supply systems and become a source of electromagnetic pollution to the environment. EMI includes current harmonics with frequency spectrum from 1 to 2000 Hz emitted by equipment and devices into power-supply networks; pulsed nature of loads leading to fluctuations and voltage dips. As a result, quality of electrical energy deteriorates. Other users connected to this power-supply system have to consume low-quality energy which affects their performance.

Apart from all mentioned, it has extremely negative influence on human body. It is well known that cardiac rhythm is about 1 Hz, oscillation frequency of nerve cells in the brain is about 8.7 Hz, at the frequency of 1000 Hz hearing sensitivity is sharply increasing. It should be noted that the source of EMI in power-supply systems is not only electrical facilities of built environment but also industrial facilities connected to this network. When operating a number of power consumers generate current harmonics and consequently voltage harmonics on a frequency close to 8.7 Hz. These low-frequency oscillations penetrate into lighting networks and create a luminous flux on a frequency of 8.7Hz additional to light emission of 50 Hz. These resonance phenomena cause irritation and headache.

Possible solutions for reduction of EMI and electromagnetic pollution include regulations in the standards for permissible level of EMI for electrical equipment and appliances at the stage of production. Design circuits: isolation of non-linear loads on a separate substation busbars system, filtering devices that are connected directly to the terminals of electrical equipment with a high level of EMI.

Keywords: electromagnetic compatibility, nonlinear load, flicker, supply system

ID: 008

Problems of bio and electromagnetic compatibility in lighting systems of objects of built environment

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Nowadays 20% of total electrical energy production is consumed for lighting purposes. General-purpose light fixtures are commonly used in lighting systems of the built environment. The criteria for evaluating the efficiency of the light source are: light output; lifetime; environmental issues and recycling; the impact on living organisms and its supply network. Our research provides complex assessment of the efficiency of light sources. Fixture based on the incandescent lamp has a very low lifetime and light output; it does not consume reactive power from the network, because the filament has only active resistance. Lamps based on the luminophor reached the limit of light output and lifetime. They generate higher harmonic currents in the supply network, consume a significant amount of reactive power causing overload of conductors and pose a threat to the environment of the built environment. The flicker is an important characteristic of bioelectromagnetic compatibility. It describes a human's perception of fluctuations in the luminous flux of artificial light sources caused by voltage fluctuations in the supply network. Luminous flux of light fixtures mentioned above repeats voltage fluctuations in the supply network they are connected to. It should be noted that share of non-linear loads: televisions, microwave ovens, etc. in power supply systems has sharply increased. It leads to a growth in voltage fluctuations and increase of higher harmonics in these systems. The most negative consequences for the people occur from exposure to fluctuations at 8.8 Hz (frequency of nerve cells in the brain) transmitted through the lighting. In this case, the LED lamp technology with high luminous efficiency, service life and environmental safety is the most effective. On the one hand integration of LED lamps in the lighting system provides a significant reduction in electricity consumption and allows us to solve complex lighting tasks. On the other hand, LED lamps also have high consumption of reactive power and appear as sources of higher harmonics and electromagnetic interference. It should be noted that the interference level of modern LED lamp decreases due to the presence of integrated AC/DC converter (driver). Depending on the technical solution the fluctuations of the luminous flux can be reduced which partly solves the problem of biological and electromagnetic compatibility of LED lamps used in lighting systems of objects of built environment.

Keywords: electromagnetic compatibility, lamp, lighting system, flicker

ID: 009

The newest application areas of wind turbines

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Global technical potential of wind energy on land and in coastal waters is estimated at 278 000 TWh/year. In the long term, up to 14% of this potential can be realized in a sustainable manner. It exceeds the production of electric energy in the world (2013 - 23 300 TWh). The share of electricity produced by wind turbines in global power generation in 2013 was 4.0%, in domestic electricity supply in Denmark - 34% (Table).

№	Country	Installed capacity of wind turbines (MW)		Capacity of wind turbines per inhabitant, W/person
		Total capacity	Capacity of offshore wind farms	
1	China	91 324	389	68
2	USA	61 108	-	195
6	England	10 531	3653	168
10	Denmark	4 772	1271	862
World		318 530	7358	

Plans adopted within the framework of the Global international project Wind Force: 12% of electricity production in the world in 2020, carried out ahead. However decrease of the construction of land-based wind turbines in developed countries, except China, and a significant increase of the construction of offshore wind farms should be stated. The growth of this trend is caused by a high degree of privatization, the high price of land and a high wind potential in coastal areas. The unit cost of capital investments in offshore wind farms in 1.7-2 times higher than in onshore. Electrical generation by offshore wind farms is 25-40% higher than by onshore wind turbines. The new direction of construction of wind turbines and wind farms are the areas of the Far North. Vast and usually sparsely populated areas with severe winter weather conditions have high wind potential. By the beginning of 2015 about 72 GW of installed capacity of wind turbines already built in areas with cold climates in Scandinavia, North America and Asia. The wind turbines designed to work at low temperatures have the heating system and they have a simpler design. With the increasing of capacity of wind turbines and wind farms technical characteristics of electrical grid and power system are becoming increasingly important along with such characteristics as the wind potential and environmental compatibility. Power generation of wind turbines depends on the wind speed. Taking into account a spare capacity, in accordance with the requirements of the stability and reliability of the power system the installed capacity of the largest wind farm in the power system shall not exceed 12%. Resetting the active power of the large wind farms in the large power systems can be forecasted and it increases their share in the balance of the energy system. In recent years, work is underway to accumulate electricity produced by wind turbines. One of the most effective methods for solving this problem is to create a pumped storage wind-hydro power plant. This solves several problems: a wind park is separated from the power grid through an intermediary and has no adverse effect on the operation of the power grid; carried an accumulation of wind energy; electricity from hydroelectric power plant is sent to the power system, and what is especially important that due to the superior maneuverability and mobility of hydroelectric power plant it is provided an efficient and reliable operation of the power system with any capacity of wind farms. This is especially important for low power systems such as island.

Keywords: wind power, wind turbine, wind potential, wind farm, power system

ID: 010

Adaptive building envelope – an examination of global best practice

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Currently buildings are designed mostly as static objects despite the fact, that they are part of a living environment with constant changing factors like user requirements, ambient temperature, humidity, sun position, etc. The article documents the state of the art in adaptive façade design and main types of dynamic façade systems by analyzing global best practice. The authors develop a classification for adaptive facades, considering its urban context, changes of environmental conditions and requirements for human habitation.

As a second step, an adaptive façade case study with application in Russian urban environment was developed.

As living organisms have good adaptability to the environment and its various changes, the search for the case study façade solution was based on bionic analyses to find a sustainable solution for facade systems, based on principles of adaptation to changes of environmental and human conditions. Considering that significant and visual adaptation of living organisms occur in extreme weather conditions, the skin of a bearded dragon, constantly exposed to direct sunlight acted as a study object, to identify its characteristics and apply results for the development of an adaptive façade.

The result of this research is a model of an adaptive façade system for the MGSU's new campus dormitory, providing optimal conditions for human activity over time, based on the main features of the skin structure of the reptile “bearded dragon”. The facade shell consists of separate mobile elements, depending on numerous environmental factors including the position of the sun and daytime. The movable elements creating shading on the facade, in order to reduce exposure to direct sunlight and create optimal lighting and privacy conditions in the building.

Keywords: dynamic architecture, adaptive facade, environment, solar protection, biomimetic

ID: 011

New technologies for façades constructions of educational buildings

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The article deals with the problem of formation of architecture facades in buildings consist with education. These facades are made with eco-stoves (FEP). The principles of the organization of virtual space with new facade ecosystems stated in this article. At the same time it provides statistics on the state of the environment and the internal environment in educational buildings. It raises questions about that we need to research the usage of protective properties of solar cells to design facades. In modern architecture and construction practice of the time of learning façade ecosystems and environmental facade panels (solar cells), we meet with a great variety of species both in visual and aesthetic characteristics. For review some principles of organization visual space of facades it means necessary to analyze the entire spectrum of materials and arrange them on the main feature of the classification.

Keywords: environmental front plate (FEP), facade ecosystem in facade formation, visual space, educational buildings

ID: 012

Sustainable architecture and reconstruction technology of housing buildings of the 60's and 70's in Russia

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Reconstruction of mass housing buildings like prefabricated multistory housing blocks and 3 to 5 story-housing buildings of the post war Stalin period is still neglected by nearly all actors of the construction sector in Russia. The main reasons are likely to be housing politics, buildings codes and developers practice, still seeing new mass housing development as priority and easier to realize. The authors carried out research on a sustainable approach for building reconstruction of Russian post war housing complexes, systemizing factors and planning modules for the project and construction stages and developed a pilot reconstruction project, where interests of inhabitants as well as economic interests of investors, technical and structural conditions of the building stock and socio-cultural requirements of the public are equally considered. They see the balancing of these partly contradicting factors as the key to success for the development and implementation of sustainable reconstruction concepts.

Housing areas, built during soviet times lack very often density, central urban places for multipurpose activities and a mix of apartment typologies. One of the main tasks of the design and research project was, to show, how urban blocks in Russian cities can be transformed into lively and social diverse neighborhoods with social milieus, changing from single social classes to young families and middleclass proportions of residents.

The pilot design project shows a way of protecting and developing architectural heritage of the Russian housing stock and improve their future urban quality. Reconstructing buildings and districts should have priority to demolition and new construction and architects and engineers should be aware of the resource saving, energy saving and social and cultural advantages of reconstructing the existing housing building stock of the 1950's and 60's in Russia based on sustainable principles.

Keywords: reconstruction, sustainable architecture, housing reconstruction, urban transformation, integrated planning

ID: 013

Public Spaces Mixed Use (PSMU)

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Nowadays, public spaces see high profile, in contrast to buildings they become parts of urban realm. Moreover, they become mixed use, such as public walking area, transport nodal point, small public center (underground and ground). In such a way, public spaces mixed use is a new typology in architecture and urban realm. Of the process of designing the above spaces architect should use wide range principles, such as relief use, new materials and technologies use. These fields must have some functions (sport, relax, education, community).

The space, as a cultural and administrative center of the county, helping to solve the problem of leisure all residents of the area to be involved in the creation of barrier-free environment and improve the social situation in the district. The field provides recreational areas of youth: open and closed small cafes, shops with hand-made products, pergolas and gazebos with benches. Also the public spaces mixed use should involve playground where there are some small indoor pavilions.

In addition the projects of PSMU proposed to organize a quiet recreation area for the elderly, and for fans of the sport around the perimeter of the site, there are bike paths. In the spaces are organized in itself the installation, for open-air exhibitions of young artists, photographers and architects.

Thus the PSMU takes on an educational function, contributes to the development of amateur sports and is a place to enjoy your holiday with family.

Keywords: public spaces mixed use, sustainable development, ecology, architectural technologies, design scenarios

ID: 014

The monitoring of the built environment heat loss by remote sensing methods

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Analysis of radiation-thermal regime involves an assessment of the thermal conditions of high and low thermal background for the purposes of designing the built environment. Monitoring of heat losses in the heat supply systems are no less important. The relative values of the heat loss of the territory of South-Eastern district of Moscow were determined by temperature contrasts the surface. For these purposes, we used IR band remote sensing data, which allowed determine the radiation surface temperature. The intensity of thermal radiation of the 6th heat channel camera Landsat ETM+ was converted to numeric values in ScanEx Image Processor and imported into the GIS program. The resulting surface temperature cartograms are the basis for planning of urban areas and the development of energy conservation measures.

Keywords: built environment, heat loss, remote sensing, temperature choropleth map

ID: 015

The integration of intelligent systems class “smart house” and V2I (vehicle-to-infrastructure).

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Modern development of information and telecommunication technologies suggests the creation of intelligent objects of human life. Since the technology used in the creation of systems of "smart home" use various currently available communication protocols within the system "smart home" and to keep in touch with the owner, thus ensuring full awareness and control.

In turn, many of the major car companies are starting to equip their cars for wireless communications to provide and the development of intelligent transport systems (ITS), due to which the car as an object of this system can "communicate" with other members of the movement, and in addition, transmit or receive the necessary information from the roadside funds or of urban network located at a considerable distance from the vehicle concerned.

As a result of these two trends it becomes possible to integrate building systems class "smart home" systems and intelligent vehicle for the realization of intelligent urban environment.

ID: 016

Features of environmentally sustainable cities development in Ukraine

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The majority of Ukrainian residents live in cities. Meanwhile, large cities are industrial centers of the country. They have a quite developed economic component of sustainable development, but a bad environmental one. Nowadays, there is an expanding tendency to growth of large cities. Therefore, the existing problems of environmentally sustainable development of urban environment concern these cities. Despite the currently experiencing decline in industrial production in Ukraine, the industrial zones of cities pose environmental threats. Primarily, they are connected with the accumulation of industrial waste and other negative anthropogenic effects. Besides, acute economic and social problems in the country led to the deterioration of the housing and communal services of cities. They concern housing, water and sanitation, energy networks. Particularly notable are the issues concerning collection and disposal of municipal solid waste (MSW) as well as public transport. They have a complex character and depend on changes in the economic and social sectors which further form different kinds of environmental transformations. Areas of such transformations are associated with the modernization of industrial facilities and public utilities, which requires increasing resource and energy efficiency and environmentally friendly technologies. The major components of changes in the environmentally sustainable urban development are increasing housing construction and reconstruction of buildings, improving of MSW management, landscaping and environmental friendliness of transport. The article considers the issues of public participation in decision-making for the environmentally sustainable cities development and aspects of environmental conscienceness and education of citizens. It also provides the information on practical activities on the creation of eco-cities elements in Ukraine, as well as a smart sustainable city, including the environmental area as one of its components.

ID: 017

Estonian attitudes towards disaster vulnerability and disaster resilience education for built environment professionals

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Despite suffering the worst transport disaster in Europe in the last hundred years, being prone to geopolitical upheaval, flooding and forest fires and having among the highest projected per capita climate change adaptation costs, there is a sense that Estonians consider their country relatively safe from disasters and do not consider disaster resilience education a current national priority.

Under the auspices of the European Union funded CADRE (Collaborative Action towards Disaster Resilience Education) Project a series of interviews was conducted among disaster resilience stakeholders in Estonia. The purpose of these interviews was to determine current and emerging needs for disaster resilience education relating to the built environment. However, the interview transcripts also contain insights into the respondents' opinions and attitudes towards Estonian vulnerability to disaster risk.

This research analyses the interview transcripts in order to gain insight into stakeholders' views of disaster vulnerability and resilience in the Estonian context in order to make recommendations for a comprehensive investigation of disaster resilience awareness in Estonia.

Keywords: built environment, disaster resilience education, Estonia

ID: 018

A general method for the appraisal of building retrofit investments

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The built environment must adapt to a changing technological, social and environmental context. Since buildings have a relatively long service life in comparison with the rapidity of many these changes, this adaptation must primarily take place through the retrofitting of existing buildings rather than by the replacement of old buildings with new ones.

Whatever the purpose of a building retrofit, there is a need to determine whether it represents a worthwhile and competitive investment. This calls for robust approaches to the evaluation and comparison of costs and benefits. Although there is general agreement on the appropriateness of discounted cash flow (DCF) techniques for investment appraisal, earlier research has shown that actual DCF – based methods in use tend to be limited and to include questionable assumptions. These relate to their input parameters (such as the selection of discount rates and calculation periods in relation to the particular type of investor involved), their methods (for example, the ways in which uncertainty is dealt with or ignored) and their choice of output metrics (for example, net present value, present value of lifecycle costs, benefit to cost ratio, etc.).

This research draws on examples of currently used approaches as well as best practices from the literature to outline a general method for appraising building retrofit investments. Guidance for the selection of appropriate input parameter values and output metrics is additionally proposed.

Keywords: building retrofits, built environment, discounted cash flow, investment appraisal

ID: 019

Life cycle analysis for the built environment

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A thorough built environment's life cycle (brief; design; raw material extraction, transport and processing; construction materials production and distribution; construction; use, repair and maintenance; demolition; disposal, reuse, or recycling) analysis is quite difficult to undertake, because a buildings and its environment are a complex system (technical, technological, economical, social, cultural, ecological, etc.), where all sub-systems influence the total efficiency performance and where the interdependence between sub-systems play a significant role. It can be noticed that researchers from various countries engaged in the analysis of a built environment's life cycle but its stages did not consider the research's object as was analyzed by the authors of the present investigation. Various stakeholders (clients, users, architects, designers, utilities engineers, economists, contractors, maintenance engineers, built environment material manufacturers, suppliers, contractors, financing institutions, local government, state and state institutions) are involved in the life cycle of energy-efficient built environment, trying to satisfy their needs and affecting its efficiency. A life cycle of a built environment may be described as follows: the stakeholders involved in its life cycle as well as the micro, meso and macro environments, having a particular impact on it and making an integral whole. Intelligent Decision Support System of the Built Environment's Life Cycle Analysis that was developed with the help of methods multiple criteria project analysis specially developed by authors for this purpose and is presented in this paper.

ID: 020

Intelligent library for the CENEAST project

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Research shows that various scientists have specialized in depth the different and very important areas of text analytics, text mining, entity recognition and extraction, retrieval systems, intelligent libraries. Currently authors participated in the CENEAST (Reformation of the Curricula on Built Environment in the Eastern Neighbouring Area) project. CENEAST project is being carried out with the financial assistance of the TEMPUS programme. CENEAST objective is to upgrade the curricula on built environment in the universities of Russia, Ukraine, Belarus according to Bologna practices in order to increase their capacity to continually modernise, enhance the quality and relevance of education of the building and civil engineering students to the labour market needs and to ensure international cooperation. One of the main tasks of CENEAST project was to develop a virtual interuniversity networked educational system (intelligent library, intelligent tutoring system, intelligent knowledge assessment system, access to the e-sources) in order to ensure cooperation among the EU and PC universities in education and research. The purpose of this research was to develop an Intelligent Library for the CENEAST project that would be more flexible and more informative in selecting out and integrating rational electronic information by the desired area as much as by coverage and that would allow the actual users to participate and have an influence during the operation by automatically designing, evaluating and selecting the most suitable information for themselves. This article overviews the Intelligent Library for the CENEAST project and presents a practical example to demonstrate how the developed Intelligent Library works.

ID: 021

Smart video about the CENEAST project

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Smart video about the CENEAST project is a personalised attempt to entice and attract prospective students to the developed BSc/specialists, MSc and PhD modules, Intelligent library, intelligent tutoring and intelligent knowledge assessment systems, to promote the developed modules and systems adequately, and to make prospective students aware of it. Since the developed modules and systems are open to people of various ages, nationalities and sexes, living in different countries, working in different jobs and having different personality types, this personalised instrument is an efficient way to promote the CENEAST project in order to attract students and get them interested in the study programme by considering their needs. The following steps were taken to create the smart video: two-tier personalised questionnaires were compiled; answers were scripted and short clips prepared; the intelligent subsystem that combines short clips into a personalised video was created. The facial emotion analytics subsystem was integrated into the smart video. The face analytics subsystem detects viewer emotions in real time. If the viewer's emotions show dissatisfaction, the current short clip is skipped and the next one played. Clips can be also skipped by the viewer. This article presents the Smart video about the CENEAST project, its composite parts and case study to demonstrate its validity, efficiency and usefulness.

ID: 022

Sociological and psychological methods for sustainable development of a city

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One of the main objectives of the CENEAST Project (Reformation of the Curricula on Built Environment in the Eastern Neighbouring Area) is preparation of city planners for practical implementation of the knowledge obtained during educational process. The module “Sociological methods for sustainable development of a city” supposes ethnological education of the students: the knowledge of ethno-demographic, ethno-confessional structure of the city, the size and the direction of migration flows, the skill to design and zone a city space with account for these processes and demands of the citizens. A multicultural city, a cosmopolitan community is a clash area of different values, norms of behavior, religions, family structures and habits. A sustainable city supposes integration of migrants into the city cultural environment, absence of social conflicts, tolerant attitude of the citizens to each other. In frames of the module the students learn to apply cultural assimilators (integrators) or the methods of cognitive orientation. The aim of this method is to teach a person to look at situations from the point of view of different groups, understand their perception of the world and the peculiarities of their behavioral models. A cultural assimilator may be also called the techniques to raise the intercultural sensitivity. It is efficient information medium on the difference of cultures, means to ease interpersonal contacts in another cultural context.

The use of cultural assimilators while educating the future urban planners and group leaders has not yet become a common practice in the higher educational system of the Russian Federation. The article justifies the necessity of their use and gives some examples.

In frames of the module the students also develop new programs of sociological investigation using the methods of poll and content analysis, develop question lists for interviews and questionnaires. The article presents the results of student researches.

Keywords: multicultural city, tolerant attitude, cultural assimilators (integrators), intercultural sensitivity, case study, questionnaires.

ID: 023

CENEAST Project - Perception of the Students

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The higher education is transformed by global relations, global streams of people, ideas, knowledge and capital. The closeness of national education, the absence of exchange of academic programs, students and teachers with foreign universities lead to the decrease in the training degree. This affects not only the national economy and the intellectual capacity of the country, but the world economy as a whole.

Russia occupies a weak position on the international market of educational services. The mobility of the students to foreign universities is low (0,5%). The graduates can't compete on equal terms on the international labor market because of the difference in curricula and lack of innovative technologies. For example, many experts believe that the architects-graduates from European universities are better educated for scale projects implementation, they follow the modern architectural trends, know the methods of computer design, follow the requirements of ecological sustainable construction. For this reason a great problem occurs – a problem of integration of the Russian architectural and town-planning education into the EU space. The students themselves know about such a necessity.

In frames of the project Tempus “Reformation of the Curricula on Built Environment in the Eastern Neighboring Area (CENEAST)” in the Moscow State University of Civil Engineering an opinion poll was carried out on the demand and practical use of the developed teaching modules. The students of the 1st-3rd years with a specialization in urban planning and engineering were polled. The majority of the respondents emphasized that the modules are relevant for their specialization and it is necessary to include them into the curriculum. Another poll was carried out by the students themselves. The respondents were questioned about the necessity of Euro integration and the results of Bologna system integration into the Russian education.

The article presents the analysis of the poll results.

Keywords: globalization and internationalization of education, international labor market, integrated modules, opinion poll

ID: 024

Evaluation of critical success factors for construction projects – an integrated approach

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Construction is described as a complex, risky and time- and cost-intensive industry. Construction projects are no exception. Construction projects implementation involves numerous parties, various processes, different phases and stages of work and a great deal of input from both the public and private sectors. All parties, both in the public and private sectors, involved in construction projects—owners, contractors, engineers and consultants—aim to finish their project successfully and on time, to budget, to the best quality and in the safest manner. However as construction projects are becoming ever more complex and project parties constantly change, basic factors are no longer enough to measure the success of construction projects in the work environment. A clear understanding is also lacking what exactly contributes to the success of construction projects in a specific region or country. It is a worthwhile attempt, therefore, to single out critical success factors that cover external and institutional environment and project characteristics, as well as factors related to the project manager, team, builder and contractor as a tool that would assist project stakeholders to achieve their goals as planned.

A new weight-calculation methodology that takes into account that groups contain different numbers of factors was applied in the system of critical success factors in the implementation of construction projects. The integrated calculation of factor weights was used to determine the top 10 of critical success factors in the implementation of construction projects in Lithuania.

The success of construction projects depends on their successful execution. The research findings can be applied in any construction company that undertakes construction projects. The system of factors presented here can be used by clients, developers and managers involved in construction projects. Taking account of the success factors introduced here and their impact on project implementation, stakeholders can prevent adverse outcomes of project implementation and finish their project as planned. When critical success factors are identified, they can help analyse possible causes that made a project a success or a failure, select team members by identifying the development needs and forecasts about project implementation level, make effective allocation of limited resources, help project team members identify and give priority to critical issues of the project implementation plan, and achieve the biggest gains.

ID: 025

A multiple criteria decision support system for assessment of building sustainability

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The research includes a scientific analysis of building sustainability assessment systems used by developed countries and the Lithuanian building sustainability assessment system. The scientific analysis of building sustainability assessment systems used by developed countries was a process of several stages. First stage included the scientific analysis of the needs and requirements for building sustainability assessment in developed countries. The next stage looked at the expansion of building sustainability assessment and the factors that affect it in developed countries. Alongside the experience of developed countries, the current situation in Lithuania was analysed. Practical part of the research is dedicated to the implementation of the building sustainability assessment system. In addition to an outline of the system's possible structure, the proposed assessment procedure and mathematical methods employed, this stage also introduces an experimental model of such system operating in internet.

ID: 026

In search of the best network structure for the dissemination of project results. The case of CENEAST project

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Paper aim is to describe and apply a model of analysis to a Concrete Case of Project Network concerning the dissemination of results and the reproducibility of teaching modules. The model is based on a four dimensions grid detecting the structure of the network and its connections with its capability to maintain the organizational control and to disseminate project results. The case of CENEAST Project is concerning the reform of curricula in built environment supported by a networked system of Universities so the analysis is focused on interdependencies among project partners in the management of teaching modules proposed. The performance of the network would be measured considering a system of evaluation based on Effectiveness, Efficiency and Adequacy indexes. The results of the analysis will bring to the definition of Real and Perceived Performance and evaluation of the GAP between them with the purpose of individuate the more adequate structure to control and disseminate the results of Project Networks.

ID: 027

Market demands in the construction industry to increase societal resilience to disasters

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Among many communities in the EU and beyond, disasters pose significant concerns and challenges. A major contributory factor to disaster risk is capacity. There has been growing recognition that the construction industry and associated built environment professions are a vital component of this capacity. However, recent evidence suggests that the construction industry and associated built environment professions are ill equipped to support communities in the development of resilient buildings and infrastructure.

In this context, EU funded CADRE (Collaborative Action towards Disaster Resilience Education) aims to address current and emerging labour market demands in the construction industry to increase societal resilience to disasters. It will develop an innovative professional doctoral programme (DProf) that integrates professional and academic knowledge in the construction industry to develop societal resilience to disasters. Accordingly a structured professional doctoral programme will be developed in order to reflect how the construction sector and its professionals can contribute to achieving resilience in the case of increasing threats from natural and human induced hazards.

Development of the programme involves a substantial level of research activities to study and analyse market needs in order to capture the labour market requirements for disaster resilience and its interface with the construction industry and its professionals. Accordingly, the first phase of research involved, capturing the needs of 5 stakeholder groups associated in disaster resilience and management as well as current and emerging skills, applicable to built environment professionals towards enhancing societal resilience to disasters. Consequently, 87 semi-structured interviews were conducted with national and local government organisations; community; NGOs, INGOs and other international agencies; academia and research organisations; and private sector. The interviews were aimed at capturing the needs as well as skills, applicable to built environment professionals towards enhancing societal resilience to disasters. The interviews generated a long list of needs and skills with respect to the property lifecycle stages under the respective dimensions of resilience. The needs and skills identified were more or less similar among the identified stakeholder groups. Most common classifications identified were, Building regulations and planning; Leadership and people management; Stakeholder management and collaboration; Financing, budgeting and estimating; Damage assessment and claims; Disaster risk and need assessment; Contracts and procurement; quality management; Environmental management; sustainability; materials and resource management; health and safety; team working; governance; communication; disaster management and resilience; and construction and project management. These will form the basis for the initial programme specification for the proposed DProf. Based on these a structured doctoral programme will be developed in order to reflect how the construction sector and its professionals can contribute to achieving resilience in the case of increasing threats from natural and human induced hazards.

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Keywords: disaster resilience, professional doctorate, built environment, construction, professionals

ID: 028

Priorities for EU-South Asia cooperation in research and innovation to address societal challenges

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The 18 month CASCADE (Collaborative Action towards Societal Challenges through Awareness, Development, and Education) project undertaken by a consortium of eighteen organisations from five European countries and seven South Asian countries aimed to provide the foundation for a future International Cooperation Network programme targeting South Asian Countries, which will promote bi-regional coordination of Science & Technology cooperation. The project examined the policy and interests of Afghanistan, Bangladesh, Bhutan, Maldives, Nepal, Pakistan and Sri Lanka with respect to the seven thematic societal challenges identified under the EU's Horizon 2020 research and innovation programme: Health, demographic change and wellbeing; Food security, sustainable agricultures, marine and maritime research and the bio-based economy; Clean and efficient energy; Smart, green and integrated transport; Climate action, resource efficiency and raw materials; A changing world - inclusive, innovative and reflective societies; and, Secure societies - protecting freedom and security of the country and its citizens. The findings of seven country based national position papers and one South Asian regional position paper developed as part of the project revealed that there are wide ranging opportunities for real breakthrough research and radical innovation in response to societal challenges. The main priorities for EU-South Asian cooperation include: Poor health indicators, Reducing the burden of NCDs; New and climate resistant crops and varieties, and technologies to increase productivity and sustainability, Protecting agricultural lands; Harness hydro, wind, solar, biomass and other renewables, Conservation and efficiency improvements through smart national power grid; Environmentally friendly, green transport, 'Smart' traffic management; Integration of climate change adaptation within national policies and planning, Early warning, preparedness and mitigation towards increased resilience; Improve transparency and accountability towards good governance, Greater inclusivity and improved social harmonisation among diverse populations; and Disaster risk reduction, including related information systems, Border security, crime, and surveillance.

Keywords: societal challenges, South Asia, policy analysis, international cooperation

ID: 029

Existing syllabus for safety of human activities and key findings of the decade of education for sustainable development

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Moving towards sustainable development presents tremendous challenges. Sustainable Development (SD) is created using the three dimensions - Economy, Environment and Society. This three pillars model is based considering the society, it implies that people are within the ecosystems and economy. Achieving SD thus, requires more effective, open, and productive association among the people themselves. The role of education as a catalyst for building a better and more sustainable future for all has gained increasing recognition, leading to the declaration of the United Nations Decade of Education for Sustainable Development in 2005. Education empowers people with the knowledge, skills and confidence they need to shape a more stable and peaceful future. Education is critical for promoting sustainable development and improving the capacity of the people to address environment and development issues. Sustainable development cannot be reached through technological solutions or financial instruments alone. Achieving SD requires a change in the way people think and act. Among key SD challenges the basic are the issues of human security and development and environment protection. It also requires participatory teaching and learning methods that motivate and empower learners to change their behaviour and take action for sustainable development. Education for Sustainable Development (ESD) consequently promotes competencies like critical thinking, imagining future scenarios and making decisions in a collaborative way. Aichi-Nagoya Declaration emphasizes the potential of ESD to empower learners to transform themselves and the society they live in by developing knowledge, skills, attitudes, competences and values required for addressing global citizenship and local contextual challenges of the present and the future, such as critical and systemic thinking, analytical problem-solving, creativity, working collaboratively and making decisions in the face of uncertainty, and understanding of the interconnectedness of global challenges and responsibilities emanating from such awareness. Module **“Human safety, natural and technological problems in the 21st century”** is designed during CENEAST project (TEMPUS) with the aim: *to allow graduate to solve professional and lifestyle tasks in conditions of risk of internal and external hazards that may cause emergencies and their negative consequences and formation of responsibility of the students for personal and collective security*. As a result of studying the module bachelors must have a number of basic common cultural and professional competences, among them: safety culture and risk-oriented thinking in which human security and preservation of the environment are considered as the most important priorities of human activities; a basic knowledge of the dangerous and harmful factors of the man-made environment and the ability to identify the type of dangerous situation and assess the level of danger; ability to make decisions on human safety within their responsibilities, etc.

Keywords: human security, education, sustainable development

ID: 030

Features of energy audit in accordance with international standard ISO 50001

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The international standard ISO 50001 energy management states that during the energy audit process it's necessary to assess not only the technical aspects of energy savings, but also the purely administrative side, as well as enterprise management. The result of energy audit is a report that determines organizations degree of compliance with international requirements to energy management.

Energy examination conducted in accordance with the following procedure:

- preliminary departure of experts on place to review the documentation and provide data on organizations energy facilities;
- primary processing and systematization of data;
- conducting a comprehensive analysis and definition of the main areas of energy saving;
- survey and inspection on a site by experts;
- measurements on site with handheld measuring equipment;
- providing analysis and conclusion report.

The report shows possible energy saving activities and their ranking on the following parameters:

- complexity/difficulty;
- payback period.

The report provides client an opportunity to choose the simplest and most cost-effective in terms of implementation measures with a short payback period, and plan other activities for a longer period.

Requirements for energy auditors include three components: skills, activities and professional knowledge.

Methodology for conducting an energy audit depends on the information that tends to get and for which the client is willing to pay, and also on used in the survey of test and measurement equipment. On the one hand, an energy audit can be a simple overview of the energy consumption based on the company's data metering. On the other hand, an energy audit can be complex and time-consuming process of defining and identifying all areas of energy consumption, include the installation of new permanent measurement equipment, long time period testing and measurement process, and as a result of detailed examination provide particular recommendations.

To assess the potential for energy savings is necessary:

- collect information and compile profile of the object;
- carry out calculation of objects regulatory energy consumption over the reporting period or for the reporting year;
- for each energy carrier type and water, compare the actual consumption rate to standard rate received during the analyzed period.

The difference between these rates characterize the potential of savings for each energy carrier type and water (www.patriot-nrg.ua, www.electroprivod.kpi.ua, www.esouz.ru).

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and the Commission cannot be held responsible for any use which may be made of the information contained in it.

Keywords: energy savings, energy management, energy audit, information

ID: 031

Cross institutional module development, sharing and delivery: issues and constraints

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The EU funded CENEAST (Reformation of the Curricula on Built Environment in the Eastern Neighbouring Area) research project aims to upgrade curricula of BSc, MSc and PhD programmes with new modules on energetically and ecologically sustainable, affordable and healthy built environment in universities of Belarus, Russia and Ukraine. The project consist of 14 EU and Eastern neighbouring institutions, which together will develop modules for 9 BSc, 5 MSc and 2 PhD (in total 16 modules), including frameworks and teaching materials. Modules will be developed jointly and each partner will contribute towards module development within their areas of expertise. The developed modules will be incorporated into excising curricular of BSc, MSc and PhD programmes for building and civil engineering students in universities of Belarus, Russia and Ukraine. As part of this project, this paper intends to analyse the issues and constraints related to cross-institutional module development, sharing and delivery. In doing so, the paper will first provide an introduction to partnerships and collaboration in academia. The paper will then provide a brief introduction to cross-institutional module development, sharing and delivery followed by benefits of such arrangements. Then the paper will highlight the issues and constraints in cross-institutional module development, sharing and delivery followed by conclusions. Among many challenges of cross institutional module sharing, access to geographically dispersed knowledge, defining a common module, defining a common assessment criteria, ability to share resources, language and culture, intellectual property, technology readiness, maintaining quality, administrative constraints and sustainability have been identified as major challenges. Accordingly, the paper aims at evaluation of such issues and challenges associated with cross-institutional module sharing and delivery and will be used as a basis to analyse institutional protocols associated with cross institutional collaboration and partnerships.

Keywords: module development, module delivery, collaboration, partnerships, built environment

ID: 032

Market needs analysis for built environment higher education

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In the former Soviet Union built environment was mostly considered as the necessity of implementation of the construction of buildings and other structures at affordable costs. Generally, the interests of the tenants who occupy these buildings were not taken into consideration. Furthermore, the energetically and ecologically sustainable, affordable and healthy built environment policy was not considered essential by the Russian, Ukrainian and Byelorussian universities. As such energetically and ecologically sustainable, affordable and healthy built environment policy has not been incorporated in the curricula of BSc, MSc and PhD programmes for building and civil engineering students. In this context, one of the key problems faced by Russian, Ukrainian and Byelorussian universities was the lack of high-level educational and research literature in energetically and ecologically sustainable, affordable and healthy built environment. Due to insufficient demand for the energetically and ecologically sustainable, affordable and healthy built environment in these countries, graduates lacked the multidisciplinary character of knowledge in built environment, including technical, technological, organizational, management, social, environmental, economic, cultural, psychological, political and other aspects.

In order to solve the above-mentioned problems, the EU funded CENEAST (Reformation of the Curricula on Built Environment in the Eastern Neighbouring Area) research project aimed at upgrading the curricula on built environment in the universities of Belarus, Russia and Ukraine. The curricula were continually modernized to enhance the quality and relevance of education of the building and civil engineering students to the current labour market needs. At the initial phase of the project, a study was conducted to analyse the market needs of the built environment higher education. In doing so, a comprehensive literature review was conducted to identify the evolving market needs of the built environment and the need for energetically and ecologically sustainable, affordable and healthy built environment. In parallel, a detailed study was conducted to analyse the existing built environment related BSc, MSc and PhD programmes across United Kingdom. Methodology adopted within this section has taken the form of an extensive web search. With the increase in demand for built environment higher education, the number of built environment related courses had increased, and more and more institutions had started offering courses in this field. As such "University League Table 2013" was taken as a basis to identify the top most universities offering built environment courses. "University League Table" assesses the performance of UK universities in nine quality factors. In identifying the universities, 'architecture', 'civil engineering', 'land and property management' and 'town and country planning and landscape' areas were taken into consideration. Accordingly 18 universities have been shortlisted for the study. The second stage was to identify modules of BSc, MSc and PhD programmes promoting energetically and ecologically sustainable, affordable and healthy built environment. Based on the data available on each and every university's web site, a detailed list of modules that promotes energetically and ecologically sustainable, affordable and healthy built environment was identified. Finally the list of modules was analysed to propose a list of themes for BSc, MSc and PhD programmes to be implemented in the universities of Belarus, Russia and Ukraine. Based on the needs of built environment market and analysis of BSc, MSc and PhD programmes conducted within UK universities, a list of themes have been recommended to implement in universities of Belarus, Russia and Ukraine.

Keywords: module development, sustainability, built environment, curricular reforms

ID: 033

Principles of disaster mitigation and reconstruction

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The EU funded CENEAST (Reformation of the Curricula on Built Environment in the Eastern Neighbouring Area) project aims to upgrade curricula of BSc, MSc and PhD programmes with new modules on energetically and ecologically sustainable, affordable and healthy built environment in universities of Belarus, Russia and Ukraine in order to enhance the quality and relevance of education. The project consist of 14 EU and Eastern neighbouring institutions, which together have developed modules for 9 BSc/specialists, 5 MSc and 2 PhD (in total 16 modules), including frameworks and teaching materials. As part of this exercise, the paper aims to introduce the 'principles of disaster mitigation and reconstruction' module developed by the university of Huddersfield. Principles of Disaster Mitigation and Reconstruction module addresses capacity gaps and shortcomings in current disaster management practices that were exposed by recent disasters, with particular emphasis on the role of the built environment. The module provides an opportunity for students to study contemporary issues surrounding disaster management theory and practice, including disaster risk reduction and disaster resilience, combined with the wider study of built environment applications across the disaster management lifecycle, thus providing a unique and intellectually challenging module of study. Students will be equipped with the skills needed to practice disaster mitigation, preparedness, response and long-term reconstruction of disaster affected built environments. The module is designed for professionals working with, or who anticipate having responsibilities for increasing built environment's resilience to disasters, and who wish to critically evaluate and improve their working knowledge of both theory and practice. These professionals may be working with or for local and national government agencies, relief agencies, private sector companies, public sector agencies, UN organisations, national and international aid agencies, civil and military services, and insurance appraisers and investigators. This Module is studied within one semester, which has duration of 12 weeks. The module is sub-divided into six learning packages with a typical duration of 2 weeks per each package. The learning packages include: understanding disaster resilience; phases of the disaster management cycle; reducing risk and continuity management; reinstating and supplying temporary services and shelter; restoring major infrastructure and rehabilitating communities; and linking reconstruction to sustainable economic development.

Keywords: disaster, disaster mitigation, reconstruction, module, built environment

ID: 034

Virtual research centre as a part of the virtual interuniversity networked educational centre

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CENEAST (Reformation of the Curricula on Built Environment in the Eastern Neighbouring Area) is an EU funded research project aimed at upgrading the curricula of BSc, MSc and PhD programmes with new modules on energetically and ecologically sustainable, affordable and healthy built environment in the universities of Belarus, Russia and Ukraine. As part of this project, an innovative virtual inter-university networked educational centre was established to enable the delivery of the proposed modules. The centre enables and promotes lifelong learning at large within the society by making study material accessible outside traditional classroom environment to various parties within the society, including students, teachers, practitioners and policy makers. Further, this centre ensures not only the feed-forward (information / knowledge from centre to the beneficiaries) but also feedback (from beneficiaries to the centre) to make sure the hosted contents is up to date and relevant to the requirement of the end users. Through this, it is expected that a spiral effect be created to continuous improvement of the centre, while ensuring that target groups are benefited all the times within and beyond the project duration. Four major components have been identified as the main elements of the centre; an intelligent library; an intelligent tutoring system; an intelligent student knowledge assessment system and a virtual research environment.

This paper focuses on the final element identified above (the virtual research environment - VRE) and establishes the technical details and requirements for the development of the same. The main purpose of the VRE was to ensure that the partners of the CENEAST can collaborate closely when conducting and disseminating their research activities without being affected by geographical barriers. CENEAST achieved this by creating a virtual space for researchers from all the partner institutions. Development of this centre addressed regional and national higher education priorities such as development of international relations, enhanced quality assurance, management of teaching and student services and triangulated knowledge creation and dissemination with education, innovation and research.

The VRE is effectively an interactive web 2.0 platform providing virtual infrastructure for collaborative research work for the CENEAST partners. The platform was based on an open source web application development framework. It was developed using a “modular” approach to ensure future additions and upgrades and also enhancements can easily be “plugged-in” to the framework. Further, the development was based on open source LAMP core technologies (e.g. Linux, Apache, MySQL and PHP) and the module-view-control (MVC) approach in application development. The development of the VRE began with a partner consultation through virtual meetings and web based questionnaires to identify partner specific / regional functional requirements for a virtual research environment. This was followed by the development of the functional requirements report and the risk assessment report through a resource / requirement mapping exercise. Based on these reports, data flow modelling and programme logic modelling was commenced. This development was based on “modularised software development” concepts to make sure easy integration with the virtual centre and future upgradability. Programming and testing commenced after releasing the BETA version for partner testing. User feedback and interactive developments were then undergone before the integration to the main virtual centre and public deployment.

Keywords: virtual research centre, lifelong learning

ID: 035

Bridge the gaps in the resilience management market

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Resilient management education in the higher education sector is vital to address the needs of the resilient management market. The key issue is the existing higher education in resilient management does not address the exact labour market needs. Therefore, in order to bridge this gap, the curriculum & the syllabuses of the existing resilient management courses should be upgraded.

Accordingly, one of the project deliverable of the EU funded RESINT project (<http://resint.eu/>) was to upgrade the curriculum & the syllabuses of the existing resilient management courses in the project partner universities. In order to upgrade the curriculum and the syllabuses, the labour market needs of resilience management were critically assessed in different sectors such as local governments, NGOs, and private sector in partner countries of the project which are Italy, Lithuania, Spain and the United Kingdom. Thereafter, an examination of relevant study programmes and modules currently offered by the academic partners of the project was conducted, followed by an extensive web search to identify the existing B.Sc, M.Sc and PhD programmes in resilience management related disciplines in the partner countries in general with the aim of establishing the existing supply of relevant competencies.

Based on the analysis, it was discovered main areas lacking in the current resilience management curricula in higher education institutions are linked to ICT, and management and leadership. During the study it was identified that introducing an entirely new curriculum in resilience management for BSc, MSc, or PhD student level is not feasible within the existing academic structures of the partner universities. Instead, it has been recommended to introduce specific modules or short training courses on requiring resilience related subjects to existing BSc, MSc and PhD programmes in the partner universities. Some of the proposed pilot modules & short courses are, Simulimpresa in resilience for cultural heritage, Open source in intelligent systems and augmented Reality for BSc & MSc Students, and Resilience and leadership for PhD students.

Keywords: resilience management, labour market needs, curriculum & syllabuses, higher education sector

ID: 036

Resilience and leadership: effective leadership as a critical factor in achieving disaster resilience

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The concept of Leadership is widely discussed in the discipline of business management since the evolution of the concept. Recently, it has been revealed that leadership plays a crucial role in disaster resilience & management.

As argued by researchers, effective leadership is the key for survival in immediate disaster response. In immediate disaster response, the leaders should have the ability to imagine and tackle the incidents within a shorter period of time. Accordingly, it is argued flexible leadership approach is required for the leaders who work on the ground level. It is said that the ground level leaders should have the authority to take quick decisions in immediate disaster response without going through the normal procedure of decision making through central agencies and authorities. The leadership is a crucial factor even in the post disaster reconstruction, Leadership and the ability to envision solutions are essential to manage all types of projects in post disaster reconstruction. As revealed by some research studies, public today increasingly expects better public sector leadership before, during, and after catastrophic disasters (emergencies) and extreme events (crises) than it has seen in the past.

Accordingly, effective leadership becomes a critical factor in achieving disaster resilience. Based on this some authors have argued, on-going training and exercises, competency build up, knowledge of disaster management, leadership development workshops are the key factors to build effective leaders in disaster management. And they have argued it was needed to build leaders prior to the disaster events.

Based on these circumstances, The EU funded project RESINT (resint.eu) has developed a pilot module in Leadership & Disaster management aiming to train professional who engage in activities related to disaster resilience & management.

Keywords: leadership, disaster resilience, training, education

ID:037

Resilience and leadership – potential teaching aid

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Disaster resilience is becoming a vital field of study, it is believed over the coming decades, both the frequency and intensity of disasters will continue to increase as a result of climate change, urban migration, population growth and increased scarcity of natural resources. Accordingly the need for disaster resilience education has been widely increased during the past years. Recently it is discovered, effective leadership as a critical factor in achieving disaster resilience. Therefore, integrating leadership development in the disaster resilience education has become a significant requirement in order develop the skills & competencies of the disaster resilience practitioners.

Understanding this requirement the EU funded project RESINT (resint.eu) has taken a substantial step to integrate leadership development in the disaster resilience education. Accordingly a pilot module has been developed on 'Resilience and leadership' as a training program for the PhD students who undertake PhDs in Disaster Resilience in the Built Environment at the University of Huddersfield, UK. The aim of the module is to provide opportunity for doctoral level students to critically examine existing theory and practice in strategic leadership for resilience management.

The teaching module consists three main session topics, which are Fundamentals of leadership, Leadership vs management & Leadership in disaster resilience. These series of topics are covered through formal lectures, activity sessions, self-directed studies and as well as through virtual learning. At each session topic the students will have the opportunity to participate in active sessions exploring real world case studies on leadership in resilience management. The assessments will be done through students' annual reviews of the PhD and finally via the thesis. This entails that a student who study a PhD in disaster resilience should have an adequate knowledge on leadership in disaster resilience.

This is a significant development in disaster resilience education & this pilot module can be used as a potential teaching aid.

Keywords: leadership, disaster resilience, teaching aid

ID: 038

Organisational models of teaching: the ways to optimise teaching resources, the educational offer and relationship with non-academic organisations

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Insufficient demand for resilient management topics is a critical issue in the higher education sector. In order to face for the upcoming challenges in disaster management and mitigation, the professionals in disaster management should have competent knowledge and they should be well trained. Based on the nature & the context of the subject and as well as due to the skill requirements, disaster resilience education cannot be merely focused only on classroom lectures. In most cases professionals who are already in the discipline needs further training, but undertaking full-time/part time typical classroom education is not feasible.

Therefore the research team of the EU funded project RESINT (resint.eu) has developed different teaching models to optimise teaching resources while building up a sound relationship with the non-academic organisations for student exchange and training. The researchers have integrated ICT with the disaster resilience education and have developed four ICT based teaching models, in addition the researchers have developed an e-learning methodology using augmented reality which seeks to superimpose digital contents into the real context.

The developed teaching models are Flipped Classroom, MOOC – massive open online course, Asynchronous e-learning and Synchronous e-learning. In addition, as stated above, the researchers introduced augmented reality e-learning methodology. Augmented reality offers an innovative learning space by creating active interactions with the real and virtual environments. This allows to train disaster resilient practitioners in a simulated real world disaster event, so they are well trained to take decisive decisions in actual disaster events. In addition, it was discovered that students who are in full time education should be trained in non-academic organisations in disaster resilience in order to build up effective future leaders in disaster management. Therefore the need of academic organisations to build-up sound relationship with the non-academic organisations were identified.

Keywords: teaching models, augmented reality, ICT integration, higher education sector

ID: 039

A professional doctorate to the construction industry in increasing societal resilience to disasters

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Higher Education Institutes (HEIs) are expected to contribute to both theory and practice in the development of societal resilience to disasters through the development of curricular and modules to update the knowledge and skills that employees have obtained in the past. Doctoral education is identified as one of the methods in upgrading the knowledge of the construction professionals in this regard. Due to the shortcomings of the traditional doctoral programmes in addressing the needs of the industry and professionals, professional doctorates (DProfs) have become increasingly recognised. Accordingly, a EU funded project, CADRE (Collaborative Action towards Disaster Resilience Education), aims to develop and test an innovative professional doctoral programme that integrates professional and academic knowledge in the construction industry to develop societal resilience to disasters. By developing a professional doctorate, it is expected that challenges such as, complexity and multi-disciplinary nature of the subject; lack of industry involvement; and lack of research and development activities on disaster management by built environment professionals, could tackle successfully. Moreover, a DProf is intended to be a form of in-service professional development and much significant at a time when “continuing professional development” and “lifelong learning” have had an important influence on the policy climate, and when the intellectual climate of curriculum development has shifted from the development of initial skills and competencies to critical reflection, reflective practice and continuous professional development and is concerned with making a research-based contribution to practice within the context of upselling construction professionals with disaster resilience expertise.

As part of this project, the paper aims to analyse the applicability of professional doctorates to the construction industry in developing societal resilience. Based on an extensive review of literature, paper introduces the concept of professional doctoral programmes and its applicability to the construction industry in developing societal resilience. Some of the salient features identified through the study were, contribute to theory and practice; provide opportunity to work with cross-institutional supervisory teams and working environments; serve career needs of practicing professionals; facilitate flexible attendance modes; enable collaboration; and support lifelong learning and continuous professional development.

Keywords: disaster resilience, professional doctorate, built environment, construction, professionals

ID: 040

Re-establishing the social values in post disaster reconstruction

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The paper is written based on the findings revealed from an EU funded project called CADRE (Collaborative Action towards Disaster Research Education). The project aimed to address current and emerging labour market demands in the construction industry to increase societal resilience to disasters. As a part of the project, competency requirements of different stakeholders were assessed who are engaged in disaster management. Since NGOs' play a significant role in the disaster management, the competencies required by NGOs' were assessed in order to deliver successful post disaster reconstruction projects. Accordingly it was exposed that NGOs' face with many challenges in rebuilding the social values in post disaster reconstruction and certain competencies are required to overcome the challenges.

Understanding the complex social factors becomes extremely difficult in post disaster reconstruction as the physical and social settings are widely disrupted by the disaster incident. Further, the community themselves are undergoing with an extreme situation where their psychological health can be extremely worst. Beyond all these obstacles, NGOs' themselves are strangers to the affected environment in many post disaster reconstruction projects. As such, understanding the complex social factors becomes far more difficult. Many post disaster reconstruction projects have been failed, as the project partners could not re-establish these broken social values. Therefore understanding and re-establishing these socio factors in post disaster reconstruction has become a challenge and this paper particularly discusses about these challenges in rebuilding the social values and the competencies required by the NGOs' in order to overcome the challenges.

Keywords: NGOs, socio factors, post disaster reconstruction, competencies

ID: 041

An Industry, Community and University (ICU) framework to address societal resilience to disasters

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There are wide-ranging origins and causes to the many disasters that have affected communities across Europe and globally with ever-greater frequency. If construction researchers and practitioners are to be able to contribute for reduced risks through resilient buildings, spaces and places, it is important that capacity is developed for modern design, planning, construction and maintenance that are inclusive, inter-disciplinary, and integrative. In order to address this challenge, EU funded CADRE (Collaborative Action towards Disaster Resilience Education) project will develop an innovative professional doctoral programme that addresses the requirements for lifelong learning and actively promotes collaboration between European HEIs, industry and the community. It will require candidates to establish the research problems from the viewpoint of industry and the community, thus encouraging healthy communication channels between Industry, Community and University (ICU) and establishing a strong platform for through life learning.

As part of this exercise, a framework is developed to identify how ICU integration can take place and how the effectiveness of such integration can be measured. Accordingly, a key component of the proposed professional doctoral programme is the identification of the relevant parameters, which will help to establish a framework that defines the integration of ICU within the context of the construction industry to increase societal resilience to disasters. Accordingly, the aim of this paper is to present the initial Industry, Community and University (ICU) framework developed as part of the CADRE project. The framework was developed based on the outcomes of several brainstorming exercises conducted by the project partners. Accordingly, a number of mechanisms have been identified to strengthen the ICU integration, some of which include, collaborative teaching and research; industry placement opportunities for academics; guest lectures from industry practitioners; capacity development of community; research projects to increase societal resilience to disasters; capturing local knowledge; and investment to increase societal resilience to disasters.

Keywords: disasters, professional doctorate, built environment, construction, ICU framework

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