

DEVELOPING SUSTAINABLE BUILT ENVIRONMENTS: A ROLE OF HVAC ENGINEERS ?

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ABSTRACT

Environmental problems and energy efficiency require solutions which cross the traditional subject boundaries, requiring an understanding of social, political and economic issues, as well as scientific and technological principles. National and European legislation and even global agreements will affect how industry manages its affairs. This paper comments on objectives of EU funded GLOBE Project (Good Practice **G**uidelines and **L**egislation Reform **O**n Interdisciplinary Postgraduate Studies in **B**uilt Environment **E**ngineering) aimed to set targets for comprehensive reforms of postgraduate programmes related to all subjects crossing borders between mechanical, architectural and civil engineering. Strategic reform of existing capacities is laying down foundation for more meaningful cooperation between academia and the local/regional industry making transfer of the latest ISO and EU standards to industry much easier. A perspective role of HVAC engineers is discussed.

INTRODUCTION

One of the main actions of the European policies and measures is promotion of close links with the local and regional economy through technology and knowledge transfer. Current MSc/PhD courses in EU aim to improve the energy, health and environmental performance of new and existing buildings, through the co-education of people who are, or will become, building industry professionals involved in the design, construction and operation of buildings. The courses are interdisciplinary in all their aspects (aims and objectives, content, teachers and students, coursework, etc.) and this is considered a major strength reflecting the nature of the field. These MSc courses are recognized by professional bodies such as CIBSE [1], the British equivalent of American ASHRAE association [2].

However, in Serbia and Montenegro the postgraduate programmes in built environment engineering are still delivered in traditional way without meeting needs of the local/regional economy. Although well established in their specific area of research, the current postgraduate programmes are not interdisciplinary, and therefore do not meet the needs of industry for professionals with much broader knowledge which crosses boundaries between mechanical, architectural and civil engineering. Graduates in one branch of engineering are facing a number of statutory difficulties to pursue their postgraduate education in another branch of engineering. Consequently, the universities in Serbia and Montenegro are not educating specialists in interdisciplinary fields such as Building Services Engineering, Energy and Buildings, and Building and Environment, which are all well established and well recognized subject areas in the EU. Furthermore, the local/regional economy is unable to employ graduates in interdisciplinary subjects related to the built environment, simply because the existing faculties' bylaws do not recognize the term 'built environment', and consequently making it very difficult to obtain a fully recognized professional status.

PROJECT QUESTIONS

Although some changes are taking place, the necessary experience both in linking academia and industry, and in creating the interdisciplinary postgraduate/research programmes in cooperation with industry, is not sufficient. However, defining a modern, high quality curriculum, for example, in building services engineering in cooperation with the local/regional industry is not the only problem. In order to establish and promote close links with the local/regional economy, other significant issues have to be resolved:

- *Legislative/Bylaws*: How to satisfy the legislative requirements set up by the Government, and quality bylaws set up by the Institution of Engineers and Technicians, a body which awards a chartered engineering status in Serbia and Montenegro, which is of essential importance for engineering companies? This would require a constructive dialogue between the governing bodies, academia and local/regional industry, enhanced by programmes like the UK-style Knowledge Transfer Partnership [3] to promote closer links with the local/regional economy through technology and knowledge transfer.
- *Educational/Academic*: What is the minimum acceptable knowledge required from an applicant from industry to be enrolled on a postgraduate course? How to create a balance in the postgraduate curriculum between a need for problem solving approach required by industry while achieving high standards in specific research subject?
- *Organisational/Administrative*: How to implement and promote a lifelong learning strategy [4] which is of paramount importance in developing and maintaining a flexible and educated workforce?

It is inevitable that all necessary changes will greatly affected the role of HVAC engineers, therefore the educational institutions in Serbia and Montenegro have responsibility to adapt their curriculums and response to these challenges.

PROJECT TASKS AND METHODOLOGY

The **GLOBE** project [5], funded by EU under TEMPUS framework [6], is responding to these challenges. This project, designed as Complementary Measures, is responding to short-terms needs for knowledge transfer to the institutions in Serbia and Montenegro in developing, promoting and recognising the interdisciplinary MSc/PhD programmes in cooperation with the industry in the range of subjects concerning engineering and the built environment. Members of the Consortium from the EU countries would transfer their experience in the education and training of students, decision-makers, researches, lecturers and engineering professionals to incorporate the ideas of sustainability, environmental awareness and industry needs in engineering curricula. This project aims to transfer this know-how to the colleagues from in Serbia and Montenegro in order to achieve the specific objectives of this project presented in the next section of this paper.

GLOBE partners from Serbia and Montenegro include: University of Belgrade (Faculty of Mechanical Engineering [7], Faculty of Architecture [8]), University of Nis (Faculty of Mechanical Engineering [9], Faculty of Civil Engineering and Architecture[10]) and VINCA Institute of Nuclear Sciences [11]. The major strength of **GLOBE** is not only the support, but direct involvement, of the Ministry of Sciences and Environmental Protection [12]. Ministry of Science and Environmental Protection is responsible for strategic issues concerning science that cut across the responsibilities of individual government departments. The paramount objective of the Ministry is to enhance research in higher education sector and to encourage cooperation between industry and academia. Furthermore, the Ministry supports all efforts aimed to develop an innovative modern structure in higher education sector which would help harmonization of the existing programmes with the EU standards.

GLOBE partners from EU include universities from England (University College London [13]), Scotland (Glasgow Caledonian University [14]), Italy (Politecnico di Torino [15]) and Portugal (Instituto Politecnico do Porto [16]). All named institutions are currently running distinguished taught and research postgraduate programmes in relation to built environment sustainability issues.

The main outcome of the project will be formation of a group of fully trained academics and education related professionals in Serbia's institutions, who will be able to disseminate the acquired knowledge and to pursue further implementations associated with interdisciplinary postgraduate programmes, not just in their own institutions but in all universities in Serbia and Montenegro. Furthermore, the group will be of invaluable help to the Ministry of Sciences and Environmental Protection in preparing new legislation which will back up reforms in the higher education sector in relation to development of interdisciplinary studies at the MSc and PhD level. Specific objectives of the **GLOBE** which will be achieved in cooperation with the local and regional industry by the end of the grant agreement could be summarized as follows:

1. To provide guidelines on methods, procedures and other auxiliary activities required to assess the economic and educational sustainability of newly developed courses emphasising the role of industry and cooperation on the new postgraduate courses (SO1)

2. To provide guidelines on the development of project-based interdisciplinary courses, to suit the needs of the local and regional construction industry (SO2)
3. To provide guidelines on the suitability of experienced professionals from local/regional industry, to be appointed as visiting lecturers on interdisciplinary postgraduate engineering courses (SO3)
4. To provide guidelines on the accreditation of postgraduate interdisciplinary courses with appropriate professional bodies and the Government (SO4)
5. To provide guidelines on the adoption of lifelong learning strategy in all universities, i.e. to promote the links between academia and local/regional industry by means of lifelong knowledge transfer (SO5)
6. To provide guidelines on the management of interdisciplinary research consortia consist of the professionals from both the industry and academia (SO6)
7. To develop a draft regulation on the reform of interdisciplinary postgraduate studies in Serbia and Montenegro in relation to engineering studies (SO7)
8. To provide a draft proposal that will be added in the Strategy of Scientific and Technology Sustainable Development of Serbia and Montenegro; this would officially establish the need for closer links between the academia and the local/regional economy (SO8).

All objectives of **GLOBE** have been carefully formulated and are specific, measurable, and realistic in relation to the relatively short duration of the project (11 months). Knowledge transfer by means of seminars, specialised courses, and presentations of results by means of a web-site, conferences and printed publications will ensure that the Training Group in cooperation with their EU colleagues will be fully capable of delivering all specific objectives listed above. The following outcomes/outputs are planned:

1. Seminar 1 (S1): Assessing the economic and academic sustainability of newly proposed postgraduate courses in relation to Built Environment Engineering in cooperation with the local/regional industry (Civil Engineering, Mechanical Engineering, Architecture and Building Services Engineering) covering the specific objectives SO1, SO4, SO5, and SO6.
2. Seminar 2 (S2): Development of the project based interdisciplinary courses which will suit the needs of the local and regional construction industry (Civil Engineering, Mechanical Engineering, Architecture and Building Services Engineering) covering the specific objectives SO2 and SO3.
3. Consultation with Industry (CI): Getting industry involved by arranging local meetings with 20 leading private and public building engineering companies in Serbia and Montenegro, to introduce the ideas of Knowledge Transfer Partnership, Lifelong Learning, Interdisciplinary Studies, and research collaboration.
4. Work Meeting 1 (WM1): Work meetings with the University administration (University of Belgrade, University of Nis on development of a draft on university reform of interdisciplinary postgraduate engineering studies covering the specific objective SO7.
5. Work Meeting 2 (WM2): Work meetings with the Government's representatives on the development of a draft law on university reform of interdisciplinary postgraduate studies in Serbia and Montenegro in relation to engineering studies covering the specific objective SO7.
6. Work Meeting 3 (WM3): Work meetings with the Government's representatives on the development of a draft proposal that will be added in the Strategy of Scientific and Technology Sustainable Development of Serbia and Montenegro covering the specific objective SO8.

7. Work Meeting 4 (WM4): The partners on the project from both EU Members Universities and Partner Country Institutions will draft a guidelines on the specific objectives SO1- SO6 and will prepare a final document covering the specific objectives SO7- SO8. The meeting will address all technical details concerning further dissemination of the results including web-site development and printed material.
8. **GLOBE** Conferences (GC): To present the outcomes of the project to academics, research staff, industry, the Government, professional bodies and the university administration. Two workshops will be held hosted by the University in Belgrade and the University of Nis.

A ROLE OF HVAC ENGINEERS

HVAC engineers can play a crucial role in sustainable design of built environments. Despite their sound technical knowledge, currently they are not well placed to be a driving force in development and design of more sustainable buildings. To make difference, the HVAC engineers educated in Serbia and Montenegro have to broaden their horizons, to start appreciating complexity of sustainable design, and more importantly to adopt a concept of life long learning. Changes which will be recommended by **GLOBE** aim to place HVAC engineers in the centre of building life cycle, which would enable them to influence construction of buildings more significantly at an early stage in the process by insisting on hygrothermally adequate building envelopes, and at the late stage by educating building owners/managers on benefits of sustainable design.

For successful sustainable built environments a proactive effort among team members (HVAC engineers, civil engineers, architects, project managers, construction engineers, building developers) is required and that is possibly only if all team members fully appreciate importance of causal links which may be caused by changing one aspect of building design. What does this mean? There is one straightforward example. The latest UK Building Regulations in relation to air infiltration, known as Part L [17], came into effect in April 2002 and introduced lower U values. In support of Part L, the guidance on reducing thermal bridging has been improved and new guidance has been produced on reducing unwanted air leakage. A consequence of higher insulation values and reduced air infiltration could be to increase the risk of interstitial and surface condensation in some circumstances. However, Part C [18] of UK Building Regulations covers the resistance to damage from interstitial and surface condensation of floors, walls and roofs. Therefore, it is important to ensure that improvements within Part L do not have any significant negative impacts on the moisture performance of buildings, and to enable the project team to balance different elements of Building Regulations.

Therefore, HVAC engineers must be experts in understanding technical characteristics and performance of architectural components, construction practices and facility management in terms of indoor air quality, energy use and environmental impact. Furthermore, HVAC engineers must reexamine basic engineering principles in order to develop appropriate system design in support of sustainable building environments. They have to be able to rethink the design and construction process in terms of improving building performance. It is strongly believed, that **GLOBE** project will lay down 'a way forward' guidelines and enable participating institutions to start educating more environmentally aware HVAC engineers.

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