

Foreword

The COST Action C25 "Sustainability of Constructions - Integrated Approach to Life-time Structural Engineering" is a network of scientists and researchers from 28 European countries and the EU Joint Research Centre in Ispra. It was established to promote science-based developments in sustainable construction in Europe through research on life-time structural engineering. The Action is in its fourth year of activity.

The Action concentrates on R&D issues that are fundamental for sustainable construction processes and technologies. These include methods to assess environmental, social and economic impacts of construction activities; methods to analyse eco-efficiency of materials, components, buildings and infrastructures; methods to integrate research approaches from various disciplines; and methods of structural design that incorporate holistic understanding of safety, eco-efficiency and sustainability.

The Action has organised three major events, an event every year, where the findings of joint efforts of the Members have been discussed and published:

- 1st Workshop in Lisbon, Portugal, on 13, 14 and 15 September 2007;
- the Midterm Seminar in Dresden, Germany, on 6-7 October 2008;
- International Workshop in Timisoara, Romania, on 23-24 October 2009.

Some of the Action results were already applied through the dissemination of the life-time engineering approach to the sustainability issues in tasks carried out by C25 members. However, a short investigation of university syllabuses, completed by an add-hoc C25 group on educational issues, has shown clearly the need for a new approach in teaching structural engineers on sustainability issues. One of the important aspects in filling this gap is the training of young research students. So far, two very successful Training Schools were organised:

- The first Training School was "The LCA Training School" and was organised for 16 participants in Eindhoven, Netherlands, on 13-15 February 2008. The participants were mainly Early Stage Researchers from C25 who could learn and deepen their knowledge on the use of Life Cycle Analysis theories and tools;
- The second Training School "Sustainability in structures and structural interventions: Improving the contemporary and historical urban habitat constructions within a sustainability and risk assessment framework" was held in Thessaloniki, Greece, on 17-24 May 2009. It was jointly organised by C25 and C26 and the number of Early Stage Researchers was 40, from these two Actions.

The third C25 Training School, organised under the theme "Sustainable Construction: A Life Cycle Approach in Structural Engineering", aims at providing C25 and non-C25 Early Stage Researchers and PhD students with theories, tools and assignments to address sustainability in engineering and the life-cycle approach in structural engineering.

The Training School is hosted by the Department of Building and Civil Engineering, Faculty for the Built Environment of the University of Malta and offers excellent opportunities for collaboration among the researchers.

The whole event consists of two complementary activities:

- The International Early Stage Researchers Symposium, from the 23rd of July till the 25th of July 2010;
- The International Training School, from the 26th of July till the 1st of August 2010.

The programme and the scientific content of the Malta Training School were prepared with the support of an international group of experts and were approved by the Management Committee of the COST Action C25. The group of experienced lecturers were selected to teach and supervise the group work during the school.

The Training School has two main objectives:

- First objective; the Training School is a project oriented school. This means that students will work in a group to solve assignments prepared to illustrate various aspects of design for sustainable construction. The work performed will be evaluated and then disseminated to the participants as the school outcome.
- Second objective; The Training School will also serve as an important forum for the development of new ideas in the emerging field of Life Cycle Analysis in construction.

This book of Lecture Notes includes most of the presentations of the Malta Training School lectures and is intended to assist the participating Early Stage Researchers in following the lectures. This is also an inspiration for the development of new ideas in the field of the life-cycle approach in structural engineering and construction. The lectures cover a number of emerging topics where new knowledge has already been achieved but also where further research is still needed, such as in the following areas:

- Sustainable Construction and the Integrated Life Cycle Approach;
- Criteria for Sustainable Building, Infrastructure and Bridges;
- Eco-Efficiency & Sustainable Construction;
- Life Cycle Analysis Methodologies and Tools;
- Life Cycle Inventory Analysis of Structures;
- Environment Product Declarations;
- Durability Assessment of Materials and Structures;
- Life-Time Structural Engineering;
- Sustainable Technologies and Maintenance of Structures;
- Design for Deconstruction, Demolition and Recycling;
- Life Cycle Design Methodologies.

This publication represents one more important milestone in the fulfilment of the main aims of the COST Action C25. The organisers of the Training School hope that this initiative will promote further the sustainability of construction industry and of the built environment.

The Organisers would like to thank all the participants who have contributed with their time, efforts, commitment and dedication to COST Action C25 and who made it possible to turn the Malta Training School into another outstanding event in the field of Sustainable Construction.

The contribution of the Core Group of the C25 Management Committee in the preparation for the Training School is gratefully acknowledged:

- Luís Bragança & Heli Koukkari (COST Action C25 Chair & Vice-chair)
- Rijk Blok & Helena Gervásio (WG1 Chair & Vice-chair)
- Milan Veljkovic & Zbigniew Plewako (WG2 Chair & Vice-chair)
- Raffaele Landolfo & Viorel Ungureanu (WG3 Chair & Vice-chair)

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The Chair of the Organising Committee,

Ruben Paul Borg

The Editorial Board,

Ruben Paul Borg (University of Malta, Malta)

Milan Veljkovic (Luleå University of Technology, Sweden)

Heli Koukkari (VTT Technical Research Centre of Finland, Finland)

Luís Bragança (University of Minho, Portugal)

