



Enhancing of Heritage Awareness and  
Sustainability of Built Environment in  
Architectural and Urban Design Higher Education

# HANDBOOK

INTERNATIONAL HANDBOOK FOR STUDENTS ON RESEARCH AND DESIGN FOR  
THE SUSTAINABILITY OF HERITAGE



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# IO6 INTERNATIONAL HANDBOOK FOR STUDENTS ON RESEARCH AND DESIGN FOR THE SUSTAINABILITY OF HERITAGE

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*Note:*

*The manuscripts were prepared by individual author/group of authors in relation to their professional expertise and backgrounds and in relation to values, themes and framework defined on the consortium level.*

# INTRODUCTION

HERSUS IO6 - The International Handbook for Sustainable Heritage Management and Design: Notions, Methods and Techniques, is the last Intellectual Output of the European project HERSUS Enhancing of Heritage Awareness and Sustainability of Built Environment in Architectural and Urban Design Higher Education, an Erasmus+ project within the EU program for education, training, youth and sport, developed by a network of five universities. This last output has been designed and developed in a form of a publication in the field and it is expected to have an overall impact on different target groups in the academic environment, including the students, educators, and researchers, but also practitioners and institutional agents.

## 1. IO6 AIMS AND PURPOSE

The aim of this output is to develop didactic materials by professionals who are involved in the project, which should be used on new courses on master level. The International handbook for students on Research and Design for the Sustainability of Heritage aims to offer an innovative scope, combining global and holistic approach to heritage. International handbook for students is in English, and it is prepared in a digital version for dissemination.

IO6 main objectives deal with

- (1) the design and development of the learning material
- (2) the need to cooperate on Higher Education and to create research synergies across Europe in the specific field of sustainability and heritage.

Students are expected:

- to acquire skills in understanding the relevance of heritage as a pillar of sustainable urban development
- to acquire knowledge on concepts, types, methods, strategies and tools for the implementation of the Heritage and Sustainability approach at a professional level

In the case of educators and researchers, the handbook contributes in the broader context of HERSUS project:

- to enhance the cooperation between partner countries in the field of the scientific research
- to update their learning and teaching methodology and tool
- to deepen applied research within the Heritage and Sustainability approach
- to develop the academic curriculum where the approach to heritage and sustainability is encouraged.

Associated partner institutions are able:

- to seek synergies between European research groups for joint participation in research related work
- to promote the active participation of the Institutions working on heritage and sustainability research activities
- to create the proper channels so that the Institutions expertise can be transferred to university education and,
- to make the potential professional and research activity for architects more visible for students.

## WHO

This handbook is coordinated by the UNESCO Chair on Built urban heritage in the digital era CREhAR (Creative Research and Education on heritage assessment and regeneration), at the School of Architecture, University of Seville (USE), as a member of the consortium partner. Seville University, its School of Architecture, its research groups, and the UNESCO Chair CREhAR constitute a reference on projects focused on cultural heritage and sustainability. These projects deal specifically with innovation on heritage methodologies for the identification, characterization, valuation and intervention of heritage.

USE is the leading partner for completing this sixth and last Intellectual Output, since it is actively committed to regional economic

and social development, with more than 500 research groups. USE ranks in the first 500 universities in Shanghai ranking and among the Top 8 Spanish research universities in terms of publications. Therefore, USE Seville University and specifically its School of Architecture has been through the IO6 aim to improve the students' capacities on heritage assessment, sustainability, and characterization in their learning process, stimulating their interest through the different Master programs. The handbook has been conceptualized as a joint work of seniors, intermediates, and juniors, of inside and outside HERSUS project.

Seville University and its School of Architecture has a particular commitment to developing the students' capacities on heritage assessment and sustainability. Also, it is devoted to characterization in their learning process, stimulating their interest since their undergraduate program and running through the different Master programs.

This commitment and expertise on cultural heritage are canalized in international agencies rooted at USE, such as the UNESCO Chair CREhAR, an academic unit within the University. The Chair focuses on those categories of heritage that are most vulnerable due to their low protection and appreciation by society and institutions and therefore are at risk of disappearance. Specifically, CREhAR is the first UNESCO Chair that works on Architecture, City and Landscape of the 19th and 20th century, named by UNESCO Modern Heritage. Within the latest trends in heritage studies, it integrates this more modest heritage into the interdisciplinary and stratified complexity of the territory. We approach Modern Heritage as a critical component of diversity: the safeguarding of cultural diversity as a fundamental element of Sustainable Urban Development. Although there have been improvements in higher education regarding this fragile heritage, there is a long way to go. In essence, the cross-Europe Higher Education System is the proper tool to share knowledge and innovative teaching experiences in the field. Specifically, the UNESCO Chair works on intercultural dialogue and participation in gender equality

in the field of conservation of contemporary urban heritage, based on the use of ICT technologies and the exploration and implementation on creative methodologies in both research and higher education.

The five university partners of the consortium actively worked on the design dialogue and development of this handbook. Specifically, the team members have contributed to the first part of the handbook. They have also promoted the collaboration of expert lecturers, who have participated in the second part of the handbook.

## **FOR WHOM. Contribution**

The primary audience are the students of the school of architecture, but the handbook is developed as a guide for educators, researchers, institutions and practitioners on heritage and sustainability in the field of architecture. The publication includes both more conceptual and also specific didactic contents and materials.

Regarding its contribution to the literature in the field, this publication offers an international handbook in the field of heritage and sustainability. It looks for quality proceedings to project integrated actions on heritage assets, from a transdisciplinary perspective. This handbook promotes decision making on expert knowledge and cultural values; the proper use of methods, strategies and tools, and reaches agreements through participation of the different agents involved. The central innovation of this contribution rests on combining the processes and methods of the heritage studies with those of the project within the field of Architecture and Urban Planning.

## **2. IO6 METHODOLOGICAL OUTLINE**

### **HOW**

In order to so, it integrates on the one hand a more conceptual foundational knowledge on heritage notions, types, values and methods, with design strategies, actions and tools. It has a point of departure the previous results in the following intellectual outputs: IO3 Statements for Teaching through design for Sustainability of the Built Environment and



Heritage Awareness; and IO5 Book of courses  
The shared conceptualization process on the definition of the IO3 Statements, lead by Belgrade University resulted in a matrix where all the terms were grouped and organized. The CREhAR USE Team has reflected on these sections from a process perspective, reorganizing the preexistent ones and incorporating new sections: in this sense the five sections intend to follow the general intervention heritage methodology from the sustainable point of view, identifying the main steps to follow the process:

- >The conceptualization of the field of heritage: notion and heritage types
- >The relevance of the specific methodologies
- >The knowledge and decisions making based on values
- >The development of project: design strategies and actions
- >The tools: technologies as sustainable tools for advancing knowledge and heritage management

These five process-based sections are put in dialogue with the three transversal perspectives which run through the university mission, specifically in the field of architecture: EDUCATION, PRACTICE AND RESEARCH.

On the other hand, the handbook incorporates the contributions of guest experts along the development of the project, taking advantage of the international networks of the five partners.

Specifically, their contributions were firstly integrated lectures series, in each of the three workshops, offered to the students of the five partners project: they were lead by IUAV, Cyprus and Thessaloniki Universities within the Learning, Training and Teaching Activities LTT. These LTT activities were preceded by a Seminar for Teachers lead by Belgrade University, to reflect on innovative methods for heritage and sustainable training. In order to offer their contributions to a wider and international audience, the present International Handbook revisited them and asked the project collaborators to work on them in the framework of this publication.

In this case, the expert contributions maintained the chapters of the central themes proposed within the LTT Activities: Teaching through design for sustainability of the built environment and heritage awareness; Sustainable reconstruction in urban areas; Adaptive reuse; and resilience and climate change. The HERSUS learning and teaching activities have been a valuable source of empirical data that is used in the different chapters included IO6.

The topics of the workshops were also structuring the fifth intellectual output IO5 Book of courses, becoming the framework of the proposed master semesters: REconstruction; REuse; REsilience. Finally, the last LTT Activity, lead by CREhAR Seville University, also assumed structure in expert group discussion groups in dialogue with the IO3 Statements.

In this way the 'International handbook for Sustainable heritage management and design is conceptualized in the form of learning material that integrated both (1) texts written by consortium leading professionals (teaching stuff) dealing with relevant topics, with (2) selected texts/papers of the world's leading experts on observed topics.

## **THE STRUCTURE OF THE HANDBOOK / TABLE OF CONTENTS**

The publication entitled INTERNATIONAL HANDBOOK FOR SUSTAINABLE HERITAGE MANAGEMENT AND DESIGN: NOTIONS, METHODS AND TECHNIQUES, offers therefore an integral set of contents on the complex field of Heritage management and design from a sustainable approach.

Based on the method outline explained previously, the Handbook is organized in two PARTS:

The first part of the handbook, PART I, integrates the five HERSUS partners contributions in three chapters from the perspective of EDUCATION, the PRACTICE and the RESEARCH. Each of these chapters is structured in the five identified sections, insisting on the relevance the main steps of

the heritage process: (1) notion and heritage types, (2) methodologies, (3) values, (4) design strategies and actions and (5) tools.

The first one, the chapter related to EDUCATION, addresses the definition of historical sites and settlements from the sustainable point of view; the methodologies focusing on the intersection in between architectural heritage and ecological history; the innovative teaching methods in order to identify and reveal values; teaching experience on designing for heritage tourism; and finally, it addresses the development of teaching environmental aspects of built vernacular heritage.

The second one, from the perspective of PRACTICE, addresses the typification of Modernist rural landscape as heritage; the architectural competitions as one way of work for bioclimatic design in historic open space; the relevance of urban morphology for the identification of values; the environmental planification in archaeological sites (with an example in a World Heritage site in Greece); and the necessity to development Building technologies towards achieving sustainable heritage.

And the last one, RESEARCH, includes a reflection on Less-Represented Heritage Categories; the management methodologies;

the definition of criteria related to the content specified in the international chapters and texts of reference; the concept of unfinished to approach heritage intervention; and it closes with mapping as a tool to manage through cartographic narratives.

To organize the contents, a matrix was developed to define the 15 contributions, 3 for each partner.

The second part, PART II, develops the guest experts' contributions along the development of the project, offering their valuable knowledge in the context of HERSUS in this publication. These contributions are organized in four chapters:

The first one TEACHING THROUGH DESIGN FOR SUSTAINABILITY OF THE BUILT ENVIRONMENT AND HERITAGE AWARENESS was the title given to the Seminar for Teachers led by Belgrade University. It integrates a reflection of a strategy shaping dilemma in a historic site to open the discussion in between Heritage and Sustainability. Also integrates a conceptual review of reconstruction, which has been one of the most controversial terms throughout the HERSUS project. The chapter ends with some study cases related to the so-called emerging heritages: vernacular architecture and Modern Heritage.



Figure 1. IO6 matrix

The second one, SUSTAINABLE RECONSTRUCTION IN URBAN AREAS, addresses the contributions presented in the workshop led by the IUAV University: a genealogical reading from the “Recupero to Reurbanism” through “Regeneration Urban Heritage” and the checking of the restoration project as a tool to intervene in a sustainable context. At the same time, the contributions implement the consideration of new technologies applied introducing, for example, the idea of a cyborg society. Finally, the chapter integrates alternative approaches focused on “Creative Heritage City”.

The third chapter titled ADAPTATIVE REUSE, collects the contents of a workshop led by Cyprus University, is focused on an issue considered one of the most sustainable responses on heritage conservation. This approach is development as a process, applying a methodology of work from an interdisciplinary perspective with different examples: a district in Kavala (Greece) and the case of deconsecrated churches.

The fourth and last chapter focuses on resilience understood as the way to act against climate change: RESILIENCE AND CLIMATE CHANGE, was the title of the workshop led by Thessaloniki University. It integrates a reflection on the effects of climate change on the cultural heritage of Greece thinking about the future. Also includes references to the new tools and proceedings which are required to manage heritage at the present: governance, the importance of associative urban resilience and the significance of the resilience strategies for the intervention on heritage.

# PART 1.2

# PRACTICE

## **P01-NT**

Modernist Rural Landscape as Heritage:  
Challenging Value-based and Multiscale  
Approach within Design Studio.



## **P02-M**

Bioclimatic design in historic open space  
architectural competitions: Microclimate  
simulations and critique through the  
educational perspective.



## **P03-V**

Urban Morphology for Identification of In  
Situ Values: Observation, Documentation and  
Characterization.



## **P04-SA**

Archaeological Sites and Environmental  
Planning: Sustainable conservation, protection  
and enhancement of the natural setting of Aigai  
World Heritage site, Macedonia, Greece.



## **P05-T**

Building technologies towards achieving  
sustainable heritage.

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P05-T

**practice**

handbook for students

# BUILDING TECHNOLOGIES TOWARDS ACHIEVING SUSTAINABLE HERITAGE

## Keywords

**Building technology,  
design strategies,  
design tools,  
building assessment**

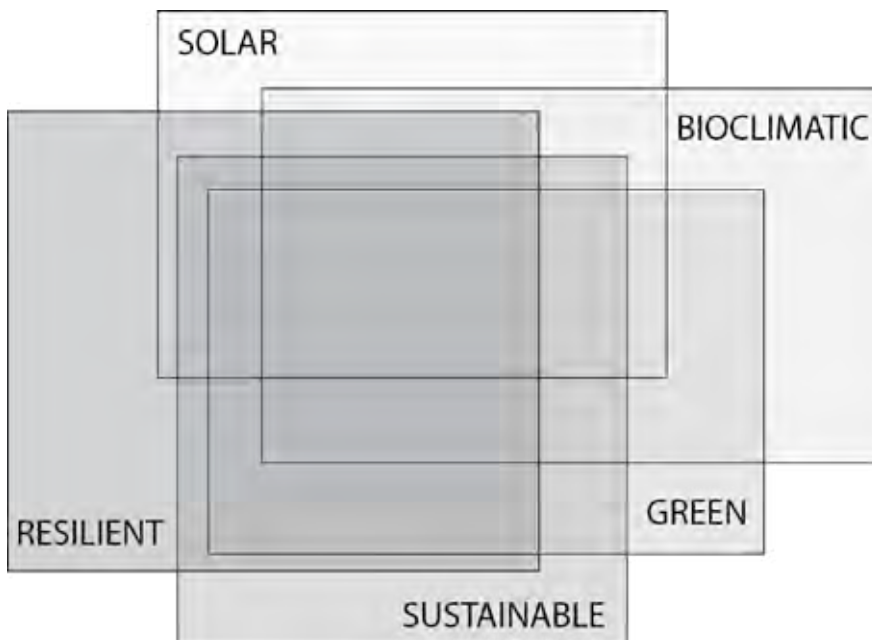


## Introduction

Various aspects of building technologies are integrated into contemporary design approaches in sustainable heritage treatment. From the basic analysis of buildings, starting from applied materials and structural characteristics to the complex design interventions and their impact on future building performance, strategies, and tools related to technological issues are constantly being developed. These tools are used throughout the design process and serve for testing and validation of various concepts. On the other hand, many strategies and approaches integrate technological issues in the core steps of building design, starting from the initial concepts. Usually used as an adjective for the word design (environmentally responsive, energy conscious, climate-sensitive, carbon neutral, etc.) these numerous concepts carry an added value, which contributes to the qualities of environmental protection and/or comfort issues. While these diverse tendencies should be encouraged, there is also a raising need for all those values to become integral to the design process. This approach is being encouraged by legislation, and to a larger extent by market uptake (through labelling), but still, all the mentioned values are too often being regarded as an added feature, relying on technological solutions. **Mapping the overlaps** in the different approaches and actions which all have a similar technological background is the first step in defining a common methodology for sustainable heritage treatment.

## Concepts

Originating concepts dating from the mid-20th century have evolved from pioneering days of solar architecture all the way to contemporary ecological imperatives. The main theoretical approaches include **solar**, **bioclimatic**, **green**, **sustainable**, and **resilient** architecture (Figure 1). As professional knowledge and general awareness grew, the postulates become more complex: bioclimatic has added the climate and interaction with the environment to the basis of solar architecture (Olgyay, 1963; Herzog 1996); green architecture has expanded to the environmental issues in the wider sense as well as to human health and comfort (Klaus, 1997). Notion of sustainability has introduced socio-economic factors, while the ever-growing uncertainty has put the spotlight on the issues of resilience (Szokolay, 2008). Since the 1970s, growing energy demand has fostered resources depletion, excessive CO2 emissions, and many geopolitical turbulences on a global and local scale, reflecting the environmental and social relevance of energy, so a few concepts that are focusing on the energy performance of buildings became dominant and continue to shape the current architectural practice (Hegger et al., 2008). Starting from energy-efficient through passive, nearly-zero, net-zero to energy positive, these energy-related concepts are becoming an integral part of contemporary practice, and buildings' energy performance is perceived as an important feature by legislation, the public, and consequently the real estate market.



**Figure 1.** Evolution and overlaps of design concepts (source: authors)



## Design strategies

Design strategies can be defined as paths that transfer concepts into tangible design features and technologies. Some are more relevant in the early design stages, as the consequences of design choices often cannot be reverted or remediation requires excessive amounts of time, money, and resources. Basic strategies in the preliminary design of new buildings refer to placement, orientation, and thermal zoning. When dealing with the existing buildings, this means that the initial site assessments and deep understanding of the relevant potentials and shortcomings present crucial input for the design basis. Aside from their cultural and historical values, the existing buildings are also a significant resource, considering the embedded materials, energy, and work, so preservation and refurbishment are imminent to the viable sustainable approach (Giebler et al., 2009). The thorough understanding of building as a resource is best reflected in the schematic design phase introducing the postulates of (re)shaping and (re)materialization, followed by modernization and optimization of technical systems. In the last step, a building may even generate a positive environmental impact. Figure 2 presents design strategies for new and existing buildings.

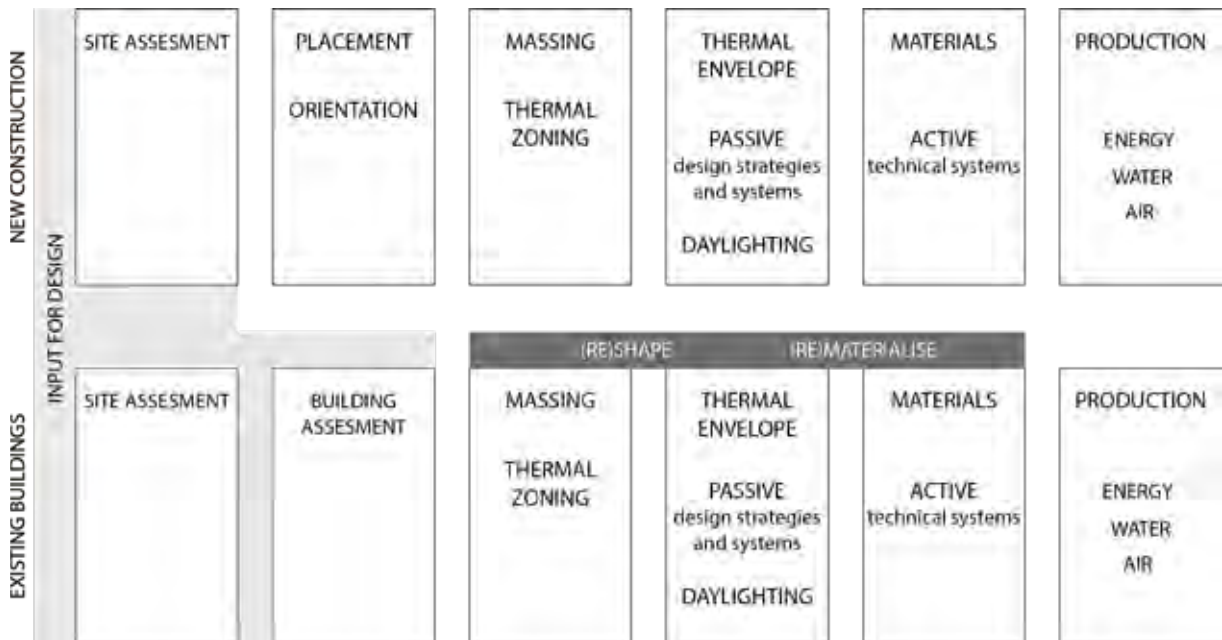


Figure 2. Design strategies for new and existing buildings (source: authors)

## Design tools

Technological tools for assessment of the achieved design qualities are being developed in parallel with the emergence of new concepts, and range from simple tools to complex systems. Those that could be considered appropriate from the building technology perspective are: building life cycle analysis, rating systems for green building assessment, building energy performance simulation, and in-situ measurements of building performance.

**Building life cycle analysis** can answer numerous questions and help reduce the impact building has on the environment during the various stages of a building's life: design, construction, operation, as well as demolition and disposal processes. This process identifies the flow of materials, energy, and waste originating from material or a building during its entire life cycle so that the impact on the environment can be predicted in advance. **The rating systems for green building assessment** aim to quantify various aspects of a green building. They consider a comprehensive set of relevant building performance indicators (e.g., energy consumption, CO2 emission, waste reduction, application of green materials, indoor air quality, etc.). **Building energy performance** simulation primarily takes place during the building design process and can be a valuable method of control of different building characteristics and their expected performance. Enormous potential for this type of analysis has been recognized due to the development and increasing application of BIM technologies. **In-situ measurements of building performance** are quantitative indicators that examine and verify different building characteristics. Different measurement tools can be used in different situations: a) after the building construction to make sure that intended performances are achieved, b) during the exploitation of the facility to determine whether the facility functions adequately, and c) during a renovation to determine whether and to what extent the conditions have improved.

Based on the type and characteristics of specific architectural heritage building appropriate design strategies should be considered and different available design tools applied in order to achieve a more sustainable and resilient design solution.

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