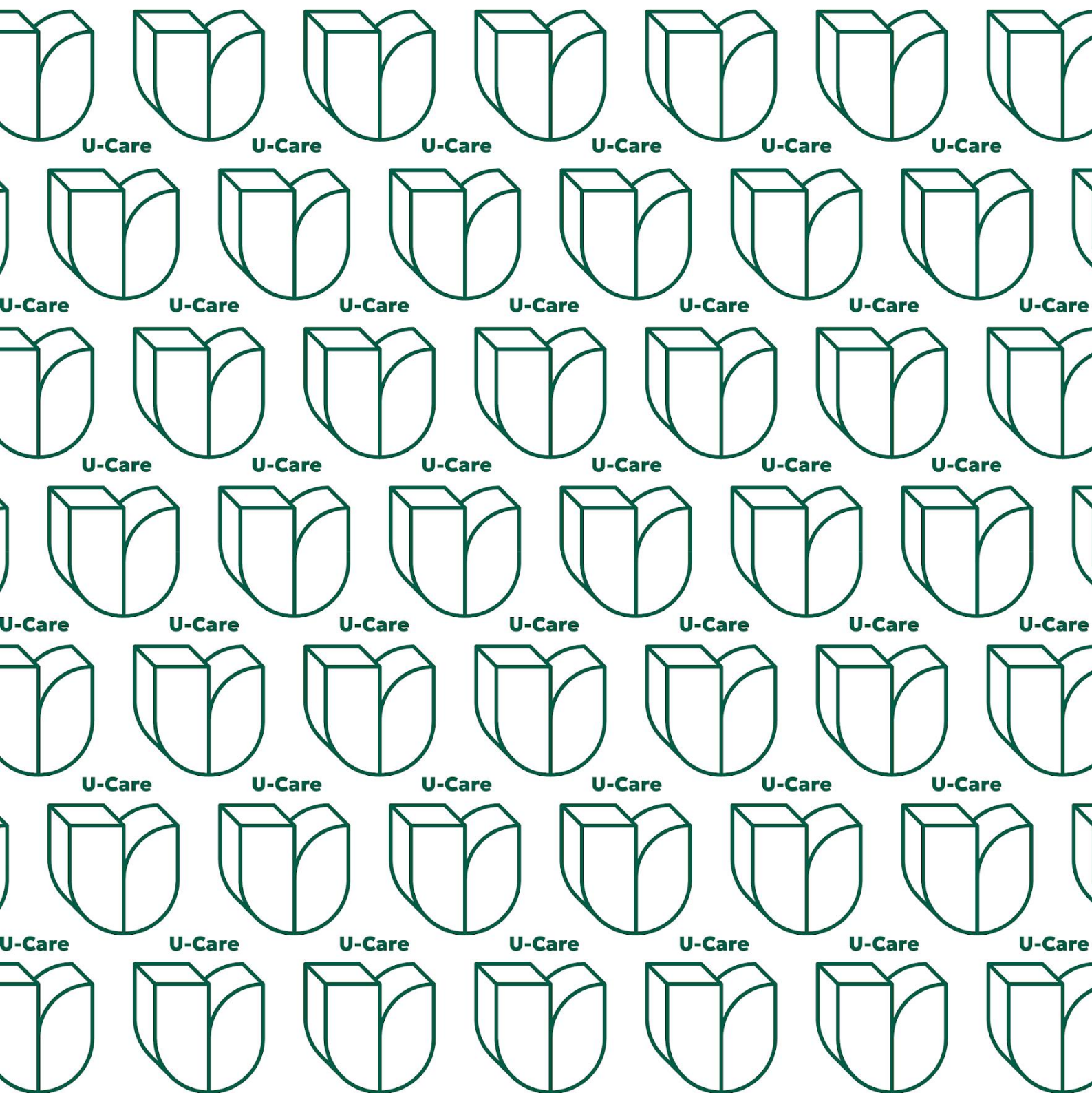




R4.2a U-CARE Teaching and training materials #1

Environmental & health impact assessments

WP4 U-CARE Learning Modules and the Academic Implementation

Partners: UNIFI

Authors: Rosa Romano, Antonia Sore

Date: 28/02/2025



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Document information

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Review process

Version	Authors	Reviewers	Assessment
V01	Antonia Sore, Rosa Romano	Ilaria Geddes, Frixos Petrou	Corrections, comments, suggestion to include conceptual diagram of course, learning outcomes and bibliography.
V02	Antonia Sore, Rosa Romano	Antonia Sore	Corrections and comments address, conceptual diagram included. Learning outcomes and bibliographies are included in lecture summaries. Lecturer indicated key reading to include in Notion.
V03	Antonia Sore, Rosa Romano	Philip Stilke	Approved



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Executive Summary

This document presents Result 4.2a, which includes the didactic material and open educational resources for teaching the first pilot course of the U-CARE project. According to the project timeline, the materials for the second and third pilot courses will be delivered in the summer of 2025, before the implementation of the related pilot courses at the University of Cyprus and Chalmers University of Technology, respectively.

The document is divided into three sections:

1. Introduction
2. Syllabus
3. Annex

The Introduction provides an overview of the document and its contents. The Syllabus lists the educational resources included in Result 4.2a in relation to each session of the first pilot U-CARE course, hosted by the University of Florence, Department of Architecture (DIdA), and provides links to the relevant resources in the project's shared online working environment. The Annex includes all one-page summaries of the lectures.



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1. Introduction

This document provides a structured overview and access to didactic material and educational open resources for UNIFI's Pilot Course LEVEL 1a. The 1st U-CARE Pilot course translates UrbanCare's core research topics and five application areas (developed as part of the project's WP2) into practical training modules. The course syllabus and didactic material, including lectures (presentations and videos, glossary, exercises, real-life case studies) and other material needed to deliver the U-CARE's 1st Pilot Course, were developed as part of the project's work package 4, activity 4.2.

Starting from the knowledge acquired in the WP2 (dedicated to the knowledge transfer of UrbanCare's Methodology to HEI partners and applying it to four real case studies in different European cities) the pilot course aims to create an evidence-based design research and practice learning modules that tackle 'real-world' impacts in the fight against the global climate and health crises effectively by equipping students with practical skills in urban health design, environmental assessment, and data management, bridging the gap between research and real-world impact in urban health and climate resilience.

The course responds to the following challenges evidenced by project partners in the first phase of WP4:

- absence of key topics like healthy urban design and using digital tools to fill the gap;
- absence of a unified framework linking environmental data with health outcomes;
- absence of quantifiable tools to measure design impacts, seeing U-CARE as an opportunity to better engage students with real-world urban care issues.

Based on the above considerations, the U-CARE consortium integrated the Urban Care core themes (Walkability, Urban Heat, Stormwater Runoff, and Biotope Loss) into the pilot courses in a way that is sensitive to each university's unique interests and expertise, while upskilling students across all the HEIs to a more advanced level of knowledge and understanding of urban health.

Pilot 1, developed by UNIFI, delves into more detail into quantitative and qualitative indicators of urban heat and stormwater runoff and qualitative indicators of biotope loss. Concerning the evidence-based solutions approach, the UNIFI pilot course will focus on different perspectives.

- **Walkability-Climate:** Evaluating the impact of climate change, specifically urban heat and stormwater run-off, on the pedestrian mobility and accessibility of vulnerable groups



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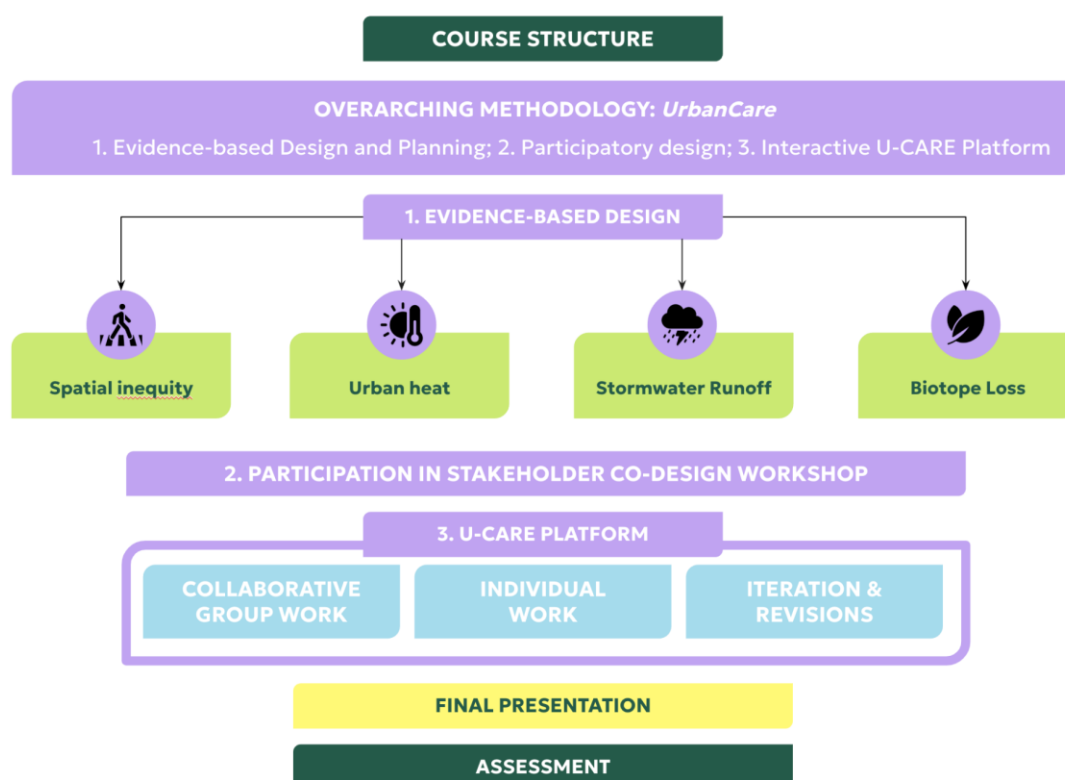
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- **Urban Heat-Climate:** Addressing urban heat as part of climate resilience strategies.
- **Stormwater Runoff-Climate:** Addressing stormwater as part of broader water-sensitive urban design.
- **Biotope Loss-Climate:** balancing climate mitigation strategies with biodiversity conservation.



Course structure: The course follows UrbanCare's step methodology. The lectures give the theoretical base for the qualitative and quantitative analysis of the case study, while the U-CARE platform provides the materials for investigating the case study. At the same time, materials developed within the course are uploaded to enrich the platform further. The course integrates the co-design workshop, giving the students first-hand experience in co-design practices and an opportunity to gather input from case study stakeholders and implement it in their design proposals.

2. Syllabus

The course integrates four *UrbanCare* research themes (Spatial Inequity, Stormwater Runoff, Urban Heat, and Biotope Loss) and expands in particular on the topic of Climate Resilient Urban Design.

The 1st U-CARE pilot course organised by UNIFI aims to equip students with the skills needed to address the intricate challenges of urban design and public health, particularly focusing on climate change mitigation and adaptation. By bridging academic theory and practical application, the course utilizes case studies developed within the project to confront environmental challenges effectively.

#	Date	Lecture title	Lecturers
1	12/03/2025	Opening day Presentation of the Seminar's operational program and presentation of case studies	Prof. R. Romano, Prof. P. Gallo, Prof. N. Setola, Prof. L. Marzi, Arch. A. Sore (DidA, UNIFI)
2	19/03/2025	International seminar U-CARE: Urban Environmental & Urban Health Research	
		Design Approach to Urban Health	Arch. J. van Rijs (MVRDV, TU Berlin)
		UrbanCare: A Methodology for Integrating Science, Participation, and Creativity in Urban Health	Prof. A.V. Sosa (BHL, TU Berlin)
		The impact of urban design and planning on health outcomes	Dr.I. Geddes (University of Cyprus)
		Urban Regeneration and Climate Change: Research experiences	Prof. R.Romano (UNIFI, DidA)
		Urban Health and Value Creation	Prof. G. Lindahl (Chalmers University)
		U-CARE Case studies: Berlin , Nicosia , Gothenburg , Florence	



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3	22/03/202	U-CARE Florence Co-Design Workshop	
4	26/03/2025	<u>Applying the UrbanCare Framework: Structuring Urban Health Cases</u> Laboratory and Revisions	Prof. A.V. Sosa (BHL, TU Berlin) Prof. R. Romano Arch. A. Sore (DidA, UNIFI)
5	02/04/2025	<u>Quartieri Sani HUB: Healthy and Inclusive Neighbourhoods for the Communities of the Metropolitan City of Florence</u> <u>The U-Care Platform: A Tool for Developing Urban Health Cases</u> Laboratory and Revisions	Prof. N. Settola (DidA, UNIFI) Prof. A.V. Sosa (BHL, TU Berlin) Prof. R. Romano Arch. A. Sore (DidA, UNIFI)
6	09/04/2025	<u>Spatial Inequity: A Critical Mitigation Target in Urban Health</u> <u>Walkability and Accessibility</u> Laboratory and Revisions	Prof. A.V. Sosa (BHL, TU Berlin) Prof. L. Marzi (DidA, UNIFI) Prof. R. Romano Arch. A. Sore (DidA, UNIFI)
7	16/04/2025	<u>Analysis and evaluation of the Urban Microclimate</u> <u>Urban Heat: understanding its causes, mitigating health impacts, and advancing Climate-Resilient Design</u> Laboratory and Revisions	Ing. A. Donato (DidA, UNIFI) Arch. A. Sore (DidA, UNIFI) Prof. R. Romano Arch. A. Sore (DidA, UNIFI)
8	07/05/2025	<u>Stormwater Runoff: addressing stormwater as part of broader water-sensitive urban design</u> Laboratory and Revisions	Arch. A. Sore (DidA, UNIFI) Prof. R. Romano Arch. A. Sore (DidA, UNIFI)



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9	14/05/2025	<u>Biotope Loss: balancing climate mitigation strategies with biodiversity conservation (Nature-based Solutions)</u>	PhD G. Hasanaj (DIdA, UNIFI)
		Laboratory and Revisions	Prof. R. Romano Arch. A. Sore (DIdA, UNIFI)
10	21/05/2025	Laboratory and Revisions	Prof. R. Romano Arch. A. Sore (DIdA, UNIFI)
11	28/05/2025	Final presentations / Exam	Prof. R. Romano, Prof. P. Gallo, Prof. N. Setola, Prof. L. Marzi, Arch. A. Sore (DIdA, UNIFI)

Pilot course organization

The course will be organized as a Thematic Seminar at Florence's Department of Architecture (DIdA). It accredits 8 CFU to UNIFI students. Unfortunately, due to administrative issues, UNIFI cannot issue CFU to external students but can provide a certificate of participation upon completion of the course.

The course remains open to the students from other HEIs and will be organized in hybrid mode as follows:

- UNIFI's students will be participating in person.
- Other HEI students can follow the course in parallel (in a self-paced mode) via the U-CARE Platform, where all the learning material will be uploaded and available. At the end of each lecture, there will be a weekly assignment and a five-question quiz. At the end of the course, the students will get a certificate of participation.

Assessment criteria

Participation (30%): This component evaluates students' engagement in lectures, group work, field trips, and workshops.

Final Presentation (40%): This group work project allows various presentation formats, including posters, PowerPoint presentations, videos, sketches, or models. The assessment will consider the presentation's content and quality, with individual contributions evaluated separately. Each group member is expected to participate verbally. Criteria for assessing the final presentation include:

- Understanding of the selected thematic area based on a literature review
- Addressing relevant questions and challenges



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- Describing, analysing, and discussing outcomes of the project, whether through detailed small-scale studies or macro-scale desk-based investigations
- Drawing inferences from the analysis
- Drafting design recommendations

Individual Essay (30%): Students must write an essay based on their case study analysis of the chosen thematic area and pilot case study.

3. ANNEX: Lectures' Summaries

3.1. Learning module outline

This part outlines the sessions included in the U-CARE UNIFI Pilot Course. The lecture, which includes lecture summaries in section 3.2, is **highlighted in bold**; the remaining activities are practical or purely informational (e.g., course introduction).

1. Course introduction
2. International seminar U-Care: Urban Environmental & Health Research
 - 2.1. Urban health in practice: Examples of design solutions and projects
 - 2.2. UrbanCare: A Methodology for Integrating Science, Participation, and Creativity in Urban Health**
 - 2.3. The impact of urban design and planning on health outcomes**
 - 2.4. Urban regeneration and Climate Change: Research experiences**
 - 2.5. Urban Health and Value Creation**
 - 2.6. Presentation of the U-Care case studies: Gutenberg Case Study (SE), Berlin Case Study (DE), Florence Case Study (IT), Nicosia Case Study (CY)
- 3. Applying the UrbanCare Framework: Structuring Urban Health Cases**
4. Urban Health Cases
 - 4.1. Quartieri Sani HUB: Healthy and Inclusive Neighbourhoods for the Communities of the Metropolitan City of Florence**
 - 4.2. The U-Care Platform: A Tool for Developing Urban Health Cases**
5. Spatial Inequity
 - 5.1. Spatial Inequity: A Critical Mitigation Target in Urban Health**
 - 5.2. Walkability and Accessibility**
6. Urban Heat and Advancing Climate-Resilient Design
 - 6.1. Analysis and valuation of urban microclimate**
 - 6.2. Urban Heat: understanding its causes, mitigating health impacts, and advancing Climate-Resilient Design.**



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7. **Stormwater Runoff: addressing stormwater as part of broader Water-Sensitive Design**
8. **Biotope Loss: balancing climate mitigation strategies with biodiversity conservation (Nature-based Solutions)**
9. Group work and Revisions
10. Final presentations / Exam

3.2. Lecture summaries

This part provides an English summary of all the lectures.

2.1. Urban health in practice: Examples of design solutions and projects

Lecturer: Jacob van Rijs
Affiliation: MVRD, TU Berlin

Expected Learning Outcomes

1. Understand the synergy between urban design and public health.
2. Identify strategies for sustainable and healthy urban environments.
3. Recognize the role of creativity in urban planning.
4. Analyze real-world applications of urban health concepts.

Lecture Summary

The lecture explores the intersection of urban design, public health, and sustainability through various case studies developed by the renowned architectural office MVRDV. Key projects include Almere Oosterwold, which focuses on creative urban agriculture, Seoulo 7017 Skygarden, which transforms a highway into a green space, and Matrix One, which emphasizes circular and healthy workspaces. These examples demonstrate practical implementations enhancing environmental health and community well-being, aiming to inspire innovative approaches to architecture and urban design.

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MVRDV. (2023) [Matrix One at Amsterdam Science Park.](#)

MVRDV. (2023) [Shenzhen Women & Children's Centre.](#)



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2.2. UrbanCare: A Methodology for Integrating Science, Participation, and Creativity in Urban Health

Lecturer: Alvaro Valera Sosa
Affiliation: Building Health Lab

Expected Learning Outcomes

1. Understand the Foundations of Urban Health and explain its interdisciplinary nature.
2. Examine how the lack of coordinated management and integrated design approaches leads to fragmented solutions.
3. Evaluate the role of spatial inequity, climate stressors, and ecological degradation in shaping urban health outcomes.
4. Explain how the UrbanCare framework supports evidence-based project development by integrating scientific research, stakeholder participation, and creative urban design.
5. Describe the five key components of UrbanCare and their relationship with the four mitigation targets.

Lecture Summary

This lecture explores urban health as an interdisciplinary field, emphasising how spatial inequity, climate stressors, and ecological degradation shape population health and well-being. It addresses the lack of coordinated management and integrated design approaches, which leads to fragmented collaboration among professionals working in silos and economic waste resulting from a lack of vision and goal alignment. In response to these challenges, the session introduces the UrbanCare framework. This structured methodology integrates scientific research, stakeholder participation, and creative urban design to provide a systematic, data-driven approach to urban health. UrbanCare helps overcome siloed practices and inefficient resource allocation by fostering interdisciplinary collaboration and goal-oriented planning. Participants will explore UrbanCare's five key components: Population Health, Urban Dynamics at the neighborhood and street scale, and Urban Structures at the neighborhood and street scale. They will also examine how these components interact with four mitigation targets: spatial inequity, stormwater runoff, urban heat, and biotope loss. The session highlights how evidence-based planning, participatory engagement, and spatial analytics enable cities to develop coordinated, scalable urban health and climate resilience solutions.

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2.3. The impact of urban design and planning on health outcomes

Lecturer: Ilaria Geddes
Affiliation: University of Cyprus

Expected Learning Outcomes

1. Describe key factors of the built environment which influence health
2. Comprehend the type of relationship between spatial inequalities and health outcomes
3. Describe the historical evolution of the field of urban health
4. Name factors influencing health over which urban designers and planners can have an impact
5. Hypothesise whether a design and planning choice will have a positive or negative impact on population health

Lecture Summary

The lecture introduces the field of urban health through its historical development with a specific focus on planning theories and frameworks. Key built environment and spatial factors influencing health are outlined, highlighting the complexity of interactions between multiple factors determining health outcomes.

Specific factors which can be influenced by planning and urban design are discussed in more detail, indicating methods through which they can be measured and highlighting the evidence of their impact on health, wellbeing and quality of life. How the design of cities in terms of urban form and housing typologies leads to different outcomes is discussed. Particular attention is given to the evidence about the impact of green space on health. Examples of urban design interventions towards healthier environments are showcased, leading to a discussion about the most recent approaches and the role of politics in achieving change in cities.

Finally, a current urban development case study (Ebbsfleet Garden City) is presented to encourage students to reflect on and hypothesise on its potential long-term outcomes.

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2.4. Urban regeneration and Climate Change: Research experiences

Lecturer: Rosa Romano

Affiliation: Department of Architecture (DIdA), University of Florence

Expected Learning Outcomes

1. Understand the impact of climate change on urban environments and health
2. Recognise vulnerable populations to heat stress in cities
3. Learn about the role of design in mitigating heat effects
4. Explore solutions for climate adaptation of urban spaces
5. Gain insights from various case studies, illustrating practical applications and outcomes of urban design strategies across different contexts and age groups

Lecture Summary

The lecture explores the negative effects of climate change on urban areas and on human health. Focusing on the urban heat island effect, it explores the increased vulnerability of cities to climate change and outlines strategies for creating healthier and more sustainable urban environments. The lecture includes the presentation of the various case studies developed within ongoing research, Re-Active City which explores and creates design strategies and solutions that simultaneously address the effects of climate change on public space and promote a healthy and active environment.

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2.5. Urban Health and Value Creation

Lecturer: Göran Lindahl
Affiliation: Chalmers University

Expected Learning Outcomes

1. Learn about the service management perspective on the built environment
2. Understand the built environment's role in value creation
3. Be able to discuss the built environment from a resource-based perspective
4. Learn how to consider the built environment's role in the concept of service-scape

Lecture Summary

The lecture addresses the built environment from a service logic perspective and its implications for value creation. It incorporates the value creation approach and relates this to a resource-based perspective. The main argument in the lecture is that value creation from the user perspective, real estate owner, and what the artefact itself offers all need to be considered.

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3. Applying the UrbanCare Framework: Structuring Urban Health Cases

Lecturer: Alvaro Valera Sosa
Affiliation: Building Health Lab

Expected Learning Outcomes

1. Describe the research, planning, and design phases in structuring urban health cases.
2. Explain how a systematic and data-driven approach improves urban health interventions.
3. Evaluate how different data collection methods contribute to assessing spatial inequity, stormwater runoff, urban heat, and biotope loss.
4. Assess the role of community dialogues and stakeholder workshops in aligning urban interventions with local needs.
5. Explain the importance of before-and-after scenario analyses in evaluating intervention impacts.
6. Draw insights from U-Care case studies to understand how urban health challenges vary across different climate zones.

Lecture Summary

This lecture demonstrates how the UrbanCare framework structures urban health cases through a systematic research, planning, and design project cycle. Using the four U-Care real-world case studies, the session examines the methods and tools used in each phase.

In the research phase, case studies illustrate how spatial inequity is analyzed using LiDAR and 360° photography, stormwater runoff is evaluated through surface analyses, urban heat is mapped with thermographic imaging, and biotope loss is assessed using remote sensing. The planning phase explores how community dialogues and stakeholder workshops align interventions with local needs and ensure participatory decision-making. In the design phase, the session reviews how various representation techniques help visualize interventions, leading to before-and-after scenario analyses that assess spatial and health outcomes.

The session highlights how data-driven methods, participatory engagement, and spatial modeling contribute to context-specific and scalable urban health solutions.

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4.1. Quartieri Sani HUB: Healthy and Inclusive Neighbourhoods for the Communities of the Metropolitan City of Florence

Lecturer: Nicoletta Setola

Affiliation: Università di Firenze, Dipartimento di Architettura, Centro TESIS

Expected Learning Outcomes

1. Knowledge in the field of urban health
2. Knowledge about the integration between health and built environment
3. Knowledge about tools for the analysis of urban space
4. Knowledge about the design of public spaces

Lecture Summary

The lesson intends to introduce students to the knowledge of the Healthy Neighbourhood theme through the presentation of an action-research carried out in the city of Florence and which involved the Municipality of Florence, the Health Society of Florence, the AUSL Toscana Centro and Metalco group as partners of Unifi. The lecture deals with the following topics: the relationship between health and the built environment, the urban health approach, methods for co-creation processes, tools for analysing the built environment, and tools to support the design of public spaces.

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4.2. The U-Care Platform: A Tool for Developing Urban Health Cases

Lecturer: Alvaro Valera Sosa
Affiliation: Building Health Lab

Expected Learning Outcomes

1. Describe how the U-Care platform facilitates transdisciplinary collaboration in structuring urban health cases across the research, planning, and design phases.
2. Assess the strengths and limitations of online urban spatial databases and public health records in representing site-specific urban data and health assessments.
3. Analyze how local field surveys and context-specific data enhance the accuracy of urban health assessments when combined with aggregated urban spatial databases and public health records.
4. Evaluate the role of interactive visualizations in participatory decision-making and their impact on urban planning and stakeholder engagement.
5. Apply before-and-after scenario analysis to assess intervention effectiveness and its contribution to improving urban health and economic outcomes.

Lecture Summary

This lecture explores how the U-Care platform facilitates collaborative, transdisciplinary problem-solving in the development of urban health projects. It showcases how the platform enhances efficiency, scalability, and impact by streamlining data integration, scenario analysis, and collaborative research.

Designed as an educational and research tool, the platform enables students, researchers, planners, and policymakers to assess urban conditions, analyze environmental and health risks, and develop evidence-based interventions for sustainable city planning. Participants will learn how the platform leverages online databases and spatial resources to enhance site-specific urban health assessments at both city and street levels, focusing on the four UrbanCare mitigation targets: spatial inequity, stormwater runoff, urban heat, and biotope loss.

The platform is structured around the research, planning, and design phases of urban health projects to support these assessments. The research phase benefits from structured data collection and interactive visualization, displaying indicators through maps, infographics, and overlays. The planning phase integrates stakeholder inputs and scenario modeling tools, fostering participatory decision-making. In the design phase, users can analyze before-and-after scenarios, assess intervention impacts, and forecast potential outcomes.

The session highlights how the U-Care platform supports multi-institutional collaboration and provides research-backed insights for urban planning decisions.



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5.1. Spatial Inequity: A Critical Mitigation Target in Urban Health

Lecturer: Alvaro Valera Sosa
Affiliation: Building Health Lab

Expected Learning Outcomes

1. Define spatial inequity and explain why it is a critical mitigation target in urban health despite not being a direct climate-related challenge.
2. Analyze how spatial inequity amplifies exposure to environmental and health risks for vulnerable groups, including children, women, and people with disabilities.
3. Apply the systematic observation method to assess spatial inequities in urban environments based on convenience, safety and security, comfort, and visual appeal.
4. Identify planning and design barriers that limit equitable access to green space, mobility infrastructure, and healthcare.
5. Using examples from U-Care case studies, propose targeted interventions that promote walkability, accessibility, and resilience in underserved communities.

Lecture Summary

Despite not being a direct climate-related challenge like stormwater runoff, urban heat, or biotope loss, spatial inequity worsens environmental and health vulnerabilities. Marginalized communities often face greater exposure to climate risks, limited access to green spaces, mobility infrastructure, and healthcare, and fewer resources to cope with these challenges.

Participants will explore how equitable urban planning and design can mitigate these disparities by reducing exposure to environmental hazards, ensuring communities have the resources to adapt, and strengthening public health systems to withstand crises and disruptions better. The session highlights strategies such as spatial redistribution of resources, enhanced walkability, and inclusive public space design to create safer, more accessible, well-connected urban environments for slower-paced vulnerable groups, including children, women, and people with different disabilities.

To assess spatial inequities in the built environment, the session introduces the systematic observation method, a tool for evaluating urban spaces based on four key aspects:

Convenience: Accessibility of essential services, transit, and walkable routes.

Safety and Security: Perceived and actual risks in public spaces.

Comfort: Presence of shading, seating, and overall usability of spaces.

Visual Appeal: Aesthetic quality, maintenance, and identity of urban environments.

By applying these observational methods and analyzing real-world examples from U-Care case studies, participants will learn to identify spatial inequities and develop targeted interventions that promote urban health and climate resilience.



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5.2. Walkability and Accessibility

Lecturer: Luca Marzi

Affiliation: University of Florence, Department of Architecture (DIdA)

Expected Learning Outcomes

1. Define spatial inequity
2. Analyse how spatial inequity amplifies exposure to physical risks for vulnerable groups, in particular for people with disabilities.
3. Apply the systematic observation method to assess spatial inequities in urban environments based on convenience, safety and security, comfort, and visual appeal.
4. Identify planning and design barriers that limit equitable access to green space, mobility infrastructure, and healthcare.
5. Using examples from U-Care case studies, propose targeted interventions that promote walkability and accessibility, using examples from U-Care case studies.

Lecture Summary

The lecture topic will be focused on investigating, with innovative approaches and tools, the topic of accessibility in the fruition of the built environment, with particular attention to categories of weak users and, therefore, to the themes of Design for All. In this research field, methodologies and tools of environments afferent to ITC systems will be used to support design processes. Furthermore, the students will be involved in the learning process of investigating the use of digital design tools concerning the themes of communication, simulation and management of the built environment at the scale of the building and urban agglomeration.

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6.1. Analysis and valuation of urban microclimate

Lecturer: Alessandra Donato

Affiliation: University of Florence, Department of Architecture

Expected Learning Outcomes

1. Understand urban microclimate and its effects on well-being
2. Analyze UHI and mitigation strategies
3. Assess outdoor thermal comfort with indices
4. Explore ENVI-Met for microclimate modeling
5. Identify sustainable solutions for urban resilience

Lecture Summary

The lecture explores the **analysis and evaluation of the urban microclimate**, highlighting its impact on **environmental quality and public health**. It examines key factors such as **land use, materials, and human activities**, focusing on the **Urban Heat Island (UHI) effect**, its causes, consequences, and mitigation strategies.

The session also introduces **thermal comfort indices** used to assess outdoor microclimatic conditions, such as **the Universal Thermal Climate Index (UTCI)**, **the Physiological Equivalent Temperature (PET)**, and **the Predicted Mean Vote (PMV)**. These indices help evaluate human thermal perception and guide climate-responsive urban planning.

Additionally, the lecture presents **simulation tools for urban microclimate analysis**, focusing on **ENVI-Met**, a widely used software for modeling **thermal comfort, wind flow, radiation balance, and vegetation impact** in urban environments.

The session concludes by addressing the **interaction between microclimate, urban morphology, and climate adaptation policies**, offering a comprehensive understanding of the **critical role of microclimate in urban sustainability**.

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6.2. Urban Heat: understanding its causes, mitigating health impacts, and advancing Climate-Resilient Design.

Lecturer: Antonia Sore

Affiliation: University of Florence, Department of Architecture (DIdA)

Expected Learning Outcomes

1. Identify key factors contributing to urban heat islands.
2. Understand health risks associated with urban heat.
3. Explore mitigation strategies for urban heat effects.
4. Apply concepts of climate-resilient design in urban settings.

Lecture Summary

The lecture explores the causes of Urban Heat Islands (UHI), exploring their implications for public health and strategies for mitigation and adaptation. Students will learn about the role of urban design, architecture, and materials in aggravating heat, the associated health risks, particularly for vulnerable groups, and the application of climate-resilient design principles to reduce heat effects. The lecture includes presentation of innovative solutions and case studies to provide practical insights into successful strategies for cooling urban environments, aiming to equip students with the knowledge to implement effective climate adaptation measures. Furthermore, the lecture aims to provide input and inspiration for developing project proposals during the pilot course.

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7. Stormwater Runoff: addressing stormwater as part of broader Water-Sensitive Design

Lecturer: Antonia Sore

Affiliation: University of Florence, Department of Architecture (DIdA)

Expected Learning Outcomes

1. Explain the concept of stormwater runoff and its environmental impact.
2. Describe water-sensitive urban design principles.
3. Identify design and planning strategies to manage stormwater.
4. Analyze and calculate the runoff index.

Lecture Summary

The lecture focuses on stormwater runoff and water-sensitive urban design. The lecture introduces water-sensitive design principles that enhance urban resilience and sustainability through innovative management practices, such as permeable pavements, rain gardens, and green roofs. Key case studies highlighting successful stormwater management projects will be analyzed to provide practical insights and applications and showcase the innovation in architecture and urban design. Furthermore, students will learn how to calculate the runoff index, a critical tool for assessing stormwater impact and management effectiveness. The lecture aims to equip students with tools to analyse and calculate the stormwater index and to adopt water-sensitive design in their case studies.

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8. Biotope Loss: balancing climate mitigation strategies with biodiversity conservation (Nature-based Solutions)

Lecturer: Giulio Hasanaj

Affiliation: Department of Architecture, University of Florence

Expected Learning Outcomes

1. Comprehend the importance of nature in addressing the multiple challenges facing urban contexts.
2. Understand the causal relationships that exist between hazard, vulnerability, exposure and adaptive response and how these contribute to the definition of risk.
3. Know the status of the presence of natural green areas in European cities and the main recommendations provided by the WHO
4. Learn about the main European strategies and legislation on nature-based solutions for climate resilience and urban biodiversity.
5. Know some significant case studies that show how NbS is integrated into technological and environmental design.

Lecture Summary

The lesson aims to highlight the importance of using Nature-based Solutions (NbS) to mitigate the effects of climate change and enhance biodiversity in urban environments. It is structured into three main sections: the impacts of climate change in urban areas, the current state of knowledge on the role of NbS in cities, and key examples of technological and environmental design practices that integrate NbS.

Cities today are highly functionalised spaces where nature is scarce (Mancuso, 2024). Many scientists attribute the loss of nature as a key factor behind numerous modern challenges (Ghosh, 2022). A potential solution to these issues lies in *responsiveness*—the ability of a system to adapt to reduce potential damage, seize opportunities, or cope with consequences (IPCC, 2023).

The lesson outlines key strategies to consider when designing with NbS and presents case studies illustrating their integration in urban regeneration projects. This confirms that NbS are essential for guiding the sustainable planning, design, and management of future cities (UN-Habitat, 2022).

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