

RENOVATE UNIVERSITIES' EDUCATIONAL OFFERINGS ON CLIMATE ADAPTATION IN PARTNERSHIP WITH COMMUNITIES AND STAKEHOLDERS

ABSTRACT

The topic of climate change is highly relevant to university education, yet current educational methodologies lack action-oriented, practical approaches. The Erasmus+ Cli-CC.HE Project aims to establish a partnership among the university sector, citizens, local stakeholders, practitioners, and public administration to develop a new educational methodology focused on climate adaptation and population well-being in cities. The methodology is based on three main aspects: direct confrontation with the experience of the population and local stakeholders; training of students and citizens and local stakeholders to become informed and active interlocutors of adaptation proposals affecting their territory; and application of unconventional educational tools that facilitate sharing of knowledge and elaboration of design solutions for adaptation. The methodology was developed based on the insights gained from university workshops conducted with the Project partner universities and local workshops held in each of the four cities involved in the project. This paper focuses on the experience gained in the San Benedetto del Tronto (Italy) workshop, which brought together a significant community of students, citizens, and local stakeholders to develop climate-proof urban regeneration proposals that prioritise the health and well-being of inhabitants.

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1. INTRODUCTION

Finding answers to current crises, such as climate change, poses great challenges to contemporary society and educational systems (Reid et al., 2021). Universities are in an ideal position to explore concepts related to climate change, to engage a wide range of disciplinary knowledge (Washington-Ottombre et al., 2018; Molthan-Hill et al., 2021), to disseminate knowledge, methods, and tools to enable holistic governance and planning (Huitema et al., 2016), and make a concrete contribution to the necessary paradigm shift towards the regeneration of contemporary cities (De Gregorio, 2021; Palazzo et al., 2017). Nevertheless, climate change education remains an understudied topic. Only a handful of studies have attempted to conceptualise and define the skills, knowledge, and competencies associated with it (Mochizuki et al., 2015; Hindley et al., 2018; Molthan-Hill et al., 2019). Experiences and innovations from university research are not easily transferred into the teaching programs of universities. The latter mainly focus on the general concepts of “climate literacy” and risk description (Clary et al., 2012; Ellwein et al. 2014; Huxster et al. 2015; Ratinen et al., 2020; Veron et al. 2016; Asshoff et al., 2021) while often leaving out the aspects related to action and practice (McKenzie, 2021). Simply teaching students “facts” about climate change produces knowledge, but not commitment to addressing it (Singer-Brodowski et al., 2018; Wals et al., 2016; Reimers, 2024). In contrast, students should be trained for action (Di Giusto et al., 2018) and the University should cultivate their ability to be agents of change, rather than spectators (Reimers, 2020a), encouraging them to seek possible and shared solutions to problems. To overcome this gap, some advocate the need for a multidimensional approach that can capture the multiple cultural, psychological, professional, and institutional perspectives of climate change (Reimers, 2020b) and to strengthen in students the ability to think systemically in order to empower them to contribute to the resolution of real problems (Brundiers et al., 2021).

To promote this change of pace, scholars propose, on the one hand, the creation of a new framework of collaboration between scientific, technological, engineering and humanistic disciplines (Olazabal et al., 2024), to achieve as complete an understanding of the phenomena as possible (Dilling et al., 2019) and develop sustainable (Morales et al., 2023; Leal Filho et al., 2021) and concrete solutions; on the other hand, the integration between scientific knowledge and the knowledge of local actors and communities (Katiliūtė et al., 2019; Leal Filho et al., 2019). Indeed, numerous studies have shown that climate adaptation is highly dependent on communication and interaction between different actors and organisations in a way that encourages learning processes that create flexibility and balance between different types of knowledge (Lidskog et al., 2019); others suggest shifting the focus to community contexts, which require interdisciplinary and place-based approaches (Leichenko et al., 2020). The literature suggests that confrontation between universities and local actors (Gruber, 2017; López et al., 2022) could be facilitated by building networks and partnerships:

Students and universities to develop field experiences that encourage them to understand the needs and priorities of local communities for climate adaptation (Bodolica et al., 2021; Karpudewan et al., 2017; UNESCO, 2017). In this collaborative effort, universities would assume the role of “anchor institution” (O’Farrell et al., 2022), and could develop a more comprehensive role in place-based policy making;

local communities and stakeholders to become aware of their responsibility to protect their living environment, using the University’s experience and knowledge (Goldner et al., 2018).

The reflection developed in this article raises the following questions:

1. How direct confrontation with the experience of local people and stakeholders can help build a multidisciplinary educational model focused on climate adaptation, aimed at university students;
2. How local communities and stakeholders can benefit from this confrontation and thus become informed and active stakeholders to support adaptation projects affecting their territory;
3. What are the educational tools that most facilitate knowledge sharing in the field of climate change governance, planning and resilient design that engage local authorities, stakeholders and communities to represent their needs and priorities?

The reflections in this article refer to the Erasmus+ Project Cli-CC.HE “- Climate change, cities, communities and Equity in health” and its application within one of the four local laboratories, that of San Benedetto del Tronto (Italy). The latter were activated during the project and involved a large community of students, citizens and local stakeholders. The scope of consideration was developed within an existing neighbourhood, where the local government is willing to begin discussions with the population on urban regeneration actions involving the city’s public spaces.

2. MATERIALS AND METHODS

Cli-CC.HE is an Erasmus+ KA220-HED - Cooperation Partnerships in Higher Education project, bringing together the multidisciplinary expertise of four universities (University of Camerino, Univerzitet u Beogradu, The Cyprus Institute , Iscte - Instituto Universitario de Lisboa) and a research center (IFT- CNR) from Europe. The challenge of the project is to develop an educational framework for urban regeneration based on integrated knowledge across disciplines that are rarely collaborative. This approach aims to improve understanding of the root causes of current and future environmental and health crises. In addition to this challenge, there is that of equipping university students in technical disciplines (engineering and architecture) with the knowledge and tools to develop informed and realistic design proposals for climate change adaptation, in synergy with local communities, stakeholders and local governments, to facilitate the planning and design of sustainable and effective urban regeneration interventions, capable of positively impacting the quality of life and well-being of residents.

The project develops an interdisciplinary methodological framework centred on four “core documents,” characterised into seven main educational activities, and an educational toolkit. The four “core documents” deal with the organisation of prior knowledge in the field of climate change and adaptation (R1); the definition of the main aspects of the methodology (R2); the selection of tools that enable its application (R3); and the dissemination of results within universities and to local communities (R4). The main contents of the seven teaching activities, shown in Tab.1, have been detailed in sheets describing their: educational objectives, main theoretical references, expected learning outcomes, skills needed by teachers, etc.

The seven educational activities find their specific place within 4 s of articulation of the methodological pathway. In each of them, the involvement of students and local stakeholders is planned, albeit for different purposes.

A1 Integrated vision of “Urban health” regeneration
Building an integrated view of urban regeneration to enable students to acquire basic knowledge about 'climate change adaptation and the risks of climate impacts to urban health; potentials, obstacles, threats that adaptation actions offer to city regeneration
A2 Local inquiry and mapping: get to know the neighborhood from above and from within
Development of local surveys and mapping of the neighborhoods being tested using a top-down and insider approach. This is a “layering” activity that allows the selection and combination of information that comes from expert knowledge and the experience of those living in the places.
A3 Health and climate profile
Construction of a climate and health profile to identify health risks in the urban environment today and in the future based on scientific knowledge and field surveys and comparison with city residents' perceptions of climate change.
A4 Evaluation framework
Construction of an overview of the main critical issues and potentials of the different study areas, which will be the reference for the development of subsequent urban strategies in the different local contexts.
A5 Project scenarios
Construction of future visions (BAU Scenario and “Shared and Sustainable Scenario”) to structure reflections on the possible evolutions of the environmental, urban and social context of the study neighborhood under the test of climate change.
A6 Project proposals selection
Selection of project proposals configured as detailed concepts and solutions, with reference to benefits for different health/climate change sectors and different stakeholders and social groups.
A 7 Results communication and dissemination
Communication and dissemination of results in order to help students understand the importance of project “visibility” and the importance of conveying the significance and benefits of the project to both the general public and stakeholders involved in the regeneration project, etc.

Table 1. The 7 activities of the “Cli.CC.HE” Methodology.

The first phase, “Background & problem specification”, concerns the theoretical construction of the background and specification of the problems of climate adaptation and urban health within the scientific debate and through comparison with current practices in Europe. It is mainly reserved for students, with support from teachers and experts from different disciplinary fields who facilitate the in-depth study of the main issues of the climate challenge in cities. The second phase, “Mapping”, concerns the construction of knowledge of the study areas (the neighbourhoods of the four cities associated with the project: San Benedetto del Tronto, Strevolos, Valjevo and Lisbon), according to a “top-down” and “inside-out” look. The aim is to develop fruitful synergies between the technical knowledge supported by the cultural backgrounds of the different disciplines involved in urban regeneration processes and the knowledge that comes from the experience of those who inhabit, operate, and administer the places under study. The third phase, “Design Development & Selection”, focused on adaptation design by constructing climate scenarios and their potential impacts on citizens’ health, and by selecting alternative design solutions for adaptation. This phase saw the activation of local co-design workshops, through which urban regeneration proposals were developed and shared through the exchange of information and ideas among students, citizens, stakeholders, and experts.

Finally, the fourth phase, “Communication & Dissemination,” involved dissemination, through the activation of the project website ([https:// Cli-CC. HE .org/](https://Cli-CC.HE.org/)) and the realisation of multiplier events, which involved students, researchers, citizens and local stakeholders in multiple activities aimed at disseminating the project results in unconventional and engaging ways, such as: exhibitions, public art performances, video mapping, etc. Each of the four phases the methodological path articulation was characterised with reference to: the general objectives and topics and answers to the question “Why?”; the participating target groups (Teachers, Students, Tutors, citizens, community, stakeholders) Who?; the place of performance (in the classroom or in the neighborhood) Where?; the expected results (What?); and the timing (When?) (Tab.2).

Table 2. Articulation 3rd Phase: “Design development and selection”.

Why? General objective and topic	1. Main environmental and social vulnerabilities and threats 2. Adaptation options	3. Project Concept 4. Project proposal selection
Who? Target group participant	Students/ Teachers/ Tutors/ Local Stakeholders	
Teachers' activities	Scenario analysis Selecting project proposals (checklist through public participation)	Examples of adaptation measures and best practices
Classroom students' activity	Preparation and coordination of the Workshop Scenario	
Where? The extension and delimitation of the territory under scrutiny	In class Laboratory Lectures/ Seminars	In the neighborhood Scenario Workshop EASW Results of the Urban Games Immersive reality /Interactive tool
What? The Expected outcomes of the activity	-Ability to recognize and assess the risks of climate change for health and living spaces in the neighborhood under study -Understanding the importance of comparing different skills and needs in the selection of actions and projects for adaptation to climate change Development of an ethics of responsibility towards the risks of climate change	-Ability to focus on different future scenarios and to choose the most suitable one -Understanding the role of the community and different stakeholders participation in decision making
When? Timing of the activities	Total amount of 12 hours	
Outputs / deliverables	Report: summary test about the result of the EASW Scenario Workshop Project Concept Map Oral and design presentation scenario workshop results	
Tools proposed	1- Project proposal Selection Checklist Healthy Urban Planning Checklist Cities Generator Selecting Project Proposal through public participation 2- Decision-Making Process Scenario Building	

A1 Integrated vision of “Urban health” regeneration	Debate (CYI); Expert Panel (CYI); Flipped classroom (CYI); Self-Study activity (CYI)
A2 Local inquiry and mapping: get to know the neighborhood from above and from within	Data Collection and best practices examples (UNICAM); Walking as a research method (ISCTE); Recording fieldnotes (ISCTE); Interviewing (ISCTE); Photo Elicitation (ISCTE)
A3 Health and climate profile	Climate profile LadyBug Suite (UNICAM)
A4 Evaluation framework	SWOT analysis (UNICAM); Place Standard with climate lens (UNICAM); 15 minutes proximity (ISCTE); RETEACH Questionnaire (CNR)
A5 Project scenarios	Stone Soup Urban Game (ISCTE); REBUS Renovation of public Building and Urban Spaces, version for Cli-CC.HE Urban game (UNICAM); Immersive reality software (CYI); EASW Scenario Building (UNICAM)
A6 Project proposals selection	Check-list: Healthy urban planning (UBFA); Check-list: Healthy Cities Genrator (UBFA); Selecting Project Proposal through public participation (UBFA); Debate (CYI)
A 7 Results communication and dissemination	Audio /Oral presentation (UBFA); Printed presentation: posters ad leaflets (UBFA); Public art presentation (UBFA)

Table 3. Methodological activities and tools associated with the seven methodology activities.

Finally, the Cli-CC.HE methodology uses an “Educational Toolkit” comprising lectures, seminars, workshops, video tutorials, and about 20 other educational tools, as shown in Tab. 3.

The variety and articulation of these tools, which are also accessible on the project website, are the result of the diverse disciplinary expertise of the researchers involved, including architects, urban planners, physicists, technologists, engineers, public art experts, urban planners, anthropologists, and computer scientists. The provided tools facilitate investigation of the neighbourhoods under study from various perspectives and in a malleable manner. A singular tool may be utilised in multiple activities, though with varying connotations; similarly, certain activities may alternately pertain to more than one tool. Some of these tools are inherently disciplinary, enabling a more profound comprehension of the settlement, environmental, social, and demographic attributes of the neighbourhood to be regenerated, in established ways specific to the disciplines of architecture, urban planning, and technology (e.g., classroom debate, group assignment, data collection LadyBug Suite-Tutorial; etc, etc.). Other tools encourage confrontation with the experiences

of local people and stakeholders in non-traditional ways for technical faculties (e.g., immersive reality and interactive tools; urban games; Place Standard Tool; Scenario Workshop EASW; public art; visual surveys, etc.).

With reference to the general questions posed as the basis for this article, the Cli-CC.HE Project provides:

- Direct involvement of the local community and stakeholders at all stages of applying the methodology. It uses a multidisciplinary and multiscale approach that facilitates the discussion and reception of ideas and suggestions from local communities and stakeholders involved in the workshops, local co-design workshops, and Multiplier events.
- Skills enhancement by the local community, stakeholders, and municipal representatives through collaborative mapping and codesign activities. The aim is to use the lessons learned to improve their own lifestyles (in the case of the community) and, for stakeholders and municipalities, to foster the application of climate-proof design solutions and techniques in the planning and design of cities to be regenerated.
- The use, within each phase of the methodological path, of a very diverse range of survey, evaluation, and design tools, selected and used as needed to meet the needs of the study area and the characteristics of the local communities and actors involved. These include unconventional tools such as urban games, augmented reality, video mapping, neighbourhood walks, interviews, and questionnaires to facilitate discussion and incorporate ideas and suggestions from all actors within co-design tables and multiplier events.

The methodology and educational toolkit were evaluated at the four local laboratories, one in each city associated with the project. This paper presents the findings of one of the local workshops: San Benedetto del Tronto, a city of 45,000 inhabitants situated on the Adriatic coast of the Marche Region, which is a prominent tourist destination. The workshop, coordinated by the School of Architecture and Design of the University of Camerino, was held in the Sant'Antonio neighbourhood, one of the city's most densely populated areas, with approximately 7,000 inhabitants. The neighbourhood is experiencing significant climate-related challenges, including rising temperatures and heat-island formation in the densest areas, as well as frequent flooding from extreme weather events. The area is also affected by heavy traffic congestion and air pollution. The availability of green areas is limited and dispersed.

3. RESULTS

The training course of the San Benedetto del Tronto- Sant’Antonio Neighbourhood Workshop ran from February to November 2023. It involved 78 students from the School of Architecture of the University of Camerino, 3 representatives of the public administration, 2 technicians from the urban planning and public works offices, 3 stakeholders representing trade associations, 10 economic operators in the neighbourhood, 60 citizens, 3 teachers and 5 doctoral students. The workshop was held in both university classrooms and neighbourhood spaces, as well as in the Oratory of St. Anthony’s Church within the neighbourhood. In consideration of the general objectives outlined in the Introduction, with respect to Objective 1, the instruments used to execute the diverse array of project activities facilitated a comprehensive and nuanced understanding of the neighbourhood and its inhabitants. This understanding was shaped by the interactions and confrontations among the various subjects engaged in the experimentation. Table 4 presents the number of tools utilised across the distinct phases of the project and the subjects involved.

Table 4. Distribution of tools in the project phases.

Activities		Tools and actors involved
Phase 1	A1 Integrated vision of “Urban health” regeneration	Audio /Oral Presentation (Students and Teachers) Debate (Students) Self-Study (Students) Expert Panel (Stakeholders and Students)
	A2 Local inquiry and mapping	Data Collection and best practices examples (Students and Teachers); Walking as a research method (Students and citizens); Interviewing (Stakeholders and Students)
Phase 2	A3 Health and climate profile	LadyBug Suite (Students and Teachers)
	A4 Evaluation framework	Place Standard with climate lens Stakeholders and Students) 15 minutes proximity (Students, Stakeholders and Citizens)
	A5 Project scenarios	EASW Click Scenario Building (Students, Stakeholders and Citizens) Rebus Urban Games (Students, Stakeholders and Citizens)
Phase 3	A6 Project proposals selection	Check-list: Healthy urban planning (Students, Stakeholders and Citizens) Selecting Project Proposal through public participation (Students, Stakeholders and Citizens)
	A 7 Results communication and dissemination	Audio /Oral presentation (Students) Printed presentation: posters ad leaflets (Students); Exhibition (Students, Citizens) Videomapping (Students)

The activities of the first phase, which took place on the University's campus, focused on building, through discussion between faculty and students, a knowledge base on urban regeneration, climate impacts, and risks to human health. External experts from various disciplines (agronomists, historians, urban planners) also contributed to this phase to provide a comprehensive view of the impacts of climate change on territories and people, through ex cathedra lectures and a "public debate." The "debate" format integrated the concepts of topics "prepared" by students with the assistance of the lecturers with "extemporaneous" topics, prompting students to focus on particular issues rather than theoretical or procedural elements. The results of this initial phase were presented by students in the form of reports and posters. The topic under discussion was: Are European cities and communities prepared to address the impacts of climate change? A comparative analysis of hypotheses. This highly interactive style of debate required effective teamwork and a comprehensive, well-reasoned argument.

The second phase focused on the construction of technical knowledge of the neighbourhood's anthropic, environmental, and social features. The getting to know the neighbourhood "from above" activity involved the collection of data and examples of best practices covering both examples of cataloguing socio-demographic data on the neighbourhood and interpretive maps of environmental, urban planning, infrastructural aspects, etc., as well as documents covering: the history and events of the neighbourhood, projects, plans and programs of the Municipality. These documents were discussed by students, researchers, and teachers at the local workshop to understand the neighbourhood, its distinctive places and functions, its inhabitants and visitors, the expectations of citizens, actors, and the municipal administration, and the physical and environmental constraints of the area. The results of this analysis enabled students to interpret the quantitative and qualitative data characterising the neighbourhood, thereby developing interpretive maps and knowledge of the neighbourhood. This technical knowledge was enriched with the knowledge of local actors, according to the "from within" approach through the use of unconventional tools such as "walking as research method" and "15 minutes proximity" questionnaires to passersby and commercial operators.

These methods allow us to consider realities and scales that are not usually observed and can be discovered by visiting the neighbourhood and walking with those who know the area well, capturing people's experiences. The results of this second phase involved students' construction of maps, which were discussed with citizens, stakeholders, and administrators at local workshops (Fig. 1).



Fig. 1 - Local Workshop activities in the Sant'Antonio neighborhood.

Knowledge refinement also covered present and future climate risks and health impacts. This again integrated technical knowledge by applying technical tools such as the “Ladybug” Suite and existing climate studies with people’s perceptions of risk. Through the construction of the “Risk pErception and willingnEss to pAy on Climate cHange (RETEACH) questionnaire, an attempt was made to investigate citizens’ knowledge and perception of the impacts of climate change in their everyday lives. The low awareness of climate risks that emerged during the questionnaire administration was addressed through the application of the Tool “Place Standard with climate lens” (Hasler, 2018) and the construction of climate scenarios, with support from the Tool “Scenario Building Guidelines” (Duinker et al., 2007). Through the application of the latter, the third phase allowed the working tables to understand climate emergencies and evaluate possible choices between two possible scenarios: the BAU_“Business-as-usual” scenario and the S&S_Shared and sustainable scenario. The first maintains the current “status” of places, and leaves everything as is, taking responsibility for assessing the consequences, dealing with an expected climate framework that will evolve in a certain way. The second scenario can address the major climate change issues raised in the assessment phase, including hopes, expectations, threats, and the expected risks and negative repercussions of careless decisions on the health and well-



Fig. 2 - Scenario construction by students (Baffi, Crocetti, Falcioni), citizens and stakeholders.

being of populations. Scenario construction took place through discussions among local people, public administration, engineers, local professionals, and stakeholders, and formed the basis for the development of adaptation design proposals (Fig. 2).

The latter made use of the “REBUS ® - RENovation of Public Buildings and Urban Spaces” Urban Game” tool. This is a game/simulation for the planning and design of urban areas aimed at improving the comfort of public spaces for heat island mitigation (Farné, 2017) through artificial and NBS (Nature Based Solutions). The design phase concluded with validation of the project proposals (Fig. 3) using checklists that weighed the performance of the design solutions. The last phase of the project involved dissemination. Complete dissemination of the results of the local workshops was conducted in conjunction with the multiplier event “Water for a friend.” Dissemination activities included a workshop on water protection as a resource and the opening of two exhibitions (Fig. 4). The exhibitions’ content sparked intense debate among students, educators, administrators, and the public on the future of San Benedetto del Tronto. The dissemination activity involved 86 students, 10 professors, 4 academic institutions, 2 representatives of public governance, and about 30 citizens and technical experts.



Fig. 3. Example of project proposal (Baffi, Crocetti, Falcioni).



Fig. 4. Exhibition of workshop work at the "Water for a Friend" Multiplier Event.

The following are the main results of the project with reference to the objectives stated in the introduction:

- With reference to Objective 1 explicated in the introduction, the confrontation with the different actors of urban regeneration allowed students to experience the need and, at the same time, the difficulty of dialogue with the end users of their design activities and the opportunity to use tools that are sometimes outside their technical and cultural background to foster understanding and confrontation with local actors. At the same time, it made them understand that some steps in the methodology require a level of knowledge and depth that is difficult to transfer to everyone, and that the role of each disciplinary knowledge will still have to be claimed.
- With reference to Objective No. 2, we can certainly say that the various participants in the working tables have shown in the face of an initial lack of knowledge and awareness of climate phenomena and health impacts in the initial phase, as evidenced by the questionnaire "RETEACH, 'a growing interest, verified in the activities of the application of the tools ' Place Standards 'and' Scenario Building ". We are unable to date the practical effects of this growth on citizens and local stakeholders. On the contrary, it is already possible today to verify the legacies of this project for the Municipality. It had the opportunity to acquire the knowledge and tools of the project and transfer them into its own plans and programs. This possibility was incentivised by the provision to the Administration of "Urban Guidelines oriented to health and climate change mitigation practices," which contain the typological adaptation solutions outcome of the local workshop activities, resulting in interest by the Technical Offices in evaluating the effects of climate change within the new Local Urban Plan.
- To answer the third question about which tools facilitated the sharing of knowledge between students and the local community more than others, it is useful to refer to the questionnaire administered to students, citizens, and teachers at the end of the project. During the "joint intensive course," which spanned all four local workshops of the Cli-CC.HE project, and all project partners, teachers, and students were invited to offer brief commentary on the methodology and the critical elements addressed during the "application in local workshops." The reflection that developed, which was summarised through the administration of a questionnaire (Fig.5), highlighted how within Activity 1 "Integrated vision of "Urban Health" Regeneration,"

there is a need to increase the basic knowledge of climate change at the beginning of the educational journey due to the difficulty on the part of students, especially those at the beginning of their careers to confront such complex issues. Activity 2, “Local inquiry and mapping: get to know the neighborhood from above and from within,” was highly appreciated and proved particularly meaningful. Therefore, it was proposed to consider it a flexible, modular tool to be applied according to the characteristics and timing of university courses. For Activity 3. “Health and climate profile,” the need to pay more attention to the health effects of climate change was highlighted. The questionnaire administered cannot be the only tool for constructing a neighbourhood’s climate profile. Possible improvements include greater involvement of local health agencies and greater availability of health data, both of which are often difficult to obtain. For Activity 5 “Project Scenario”. It was noted that scenario building should be simplified to avoid replication of problems already solved with other tools. To this end, the toolkit’s bulletin board and web tutorial have been simplified to improve understanding among students, citizens and local stakeholders. No particular problems were highlighted for activities 4 “Evaluation framework”, 6” Project proposals selection” and 7 “Results communication and dissemination”. In view of these evaluations, the assessment of the application regarding the methodology and tools used for educational provision is undoubtedly positive. Possibilities for improvement mainly concern basic preparation on climate change impacts and the use of simplified tools for climate risk identification and scenario building. The methodology needs to be made more user-friendly because it is new to students in architecture schools. Interest, however, in unconventional tools, such as urban games, questionnaires and the Place Standards tool, is a good example for future implementation of the methodology. Refinement of it is taking place in other experiments, such as within the Urban Design Laboratories of the School of Architecture and Design at the University of Camerino.

4. DISCUSSION

The existing literature indicates that the prevailing higher education models for climate change are inadequate. This is because they are overly focused on theoretical teaching and teacher professionalism, and are reluctant to engage with the various dimensions of change (cultural, psychological, professional,

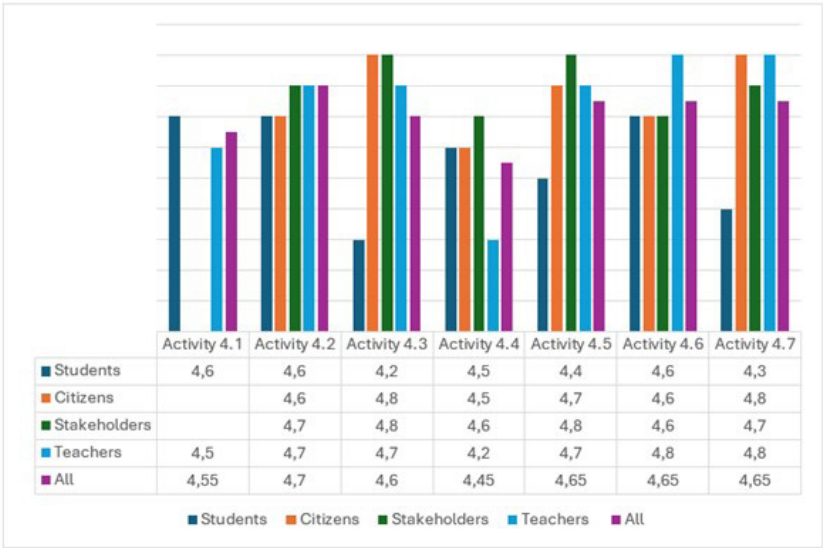


Fig. 5 - Evaluation of the Activities carried out in the local workshop by students, citizens, stakeholders, teachers.

institutional, and political) (Reimers et al., 2020). These different dimensions require an interdisciplinary and multi-actor approach. This project confirms the thesis of some scholars that the creation of a multi-actor network coordinated by the University improves students’ awareness, facilitates their understanding of future scenarios, and stimulates them to engage in action through place-based learning (Leininger-Frézal et al., 2023). Student participation in these networks could provide an ‘opportunity to acquire specialised action-oriented climate knowledge that is very difficult to build through more traditional modes of learning (Fraser et al.,v2006; Wu et al., 2019).

This approach breaks with established patterns of top-down education by fostering innovative, multilateral relationships among teachers, students, local communities, and stakeholders (Brundiars et al., 2020). It promotes the values of a participatory democracy in which everyone is involved and held accountable to the climate (Fadeeva et al., 2014). Although there is widespread recognition of the value of a multi-actor learning network approach in fostering education in the context of climate change (Boyd et al., 2010; Sol et al. 2018), experiences in the field are rather lacking (Jrogenson et al., 2019). There

persists reticence “toward collective social action” even though it is deemed necessary (Reimers, 2021). Among the few projects that aim to overcome existing gaps in the field of climate change education by seeking to create multi-actor networks to improve climate knowledge and action are some European projects, such as the Erasmus+ Project, “UCCRN Education: Climate Resilient Urban Design, Planning and Governance & Capacity Building”(<https://www.uccrn.education/>) which aims to establish synergies between leading research and educational institutions, with governments and local communities to simplify climate action in cities; and the European Union’s Horizon Europe “AGORA project”. This project involves a partnership of citizens, civil society organisations, academics, experts, policy makers, entrepreneurs and other actors engaged in the co-design and co-creation of innovative climate adaptation-oriented solutions (<https://www.cmcc.it/projects/agora-a-gathering-place-to-co-design-and-co-create-adaptation>). With respect to these projects, the proposal of the Cli-CC.HE Project , realises an original approach, because it links the innovations that may be created by the establishment of networks to the renewal of the University’s educational programs, promoting training across the board, of students in the first place, but also of citizens, stakeholders and local governments, called upon to become change-makers for the climate. To this end, Cli-CC.HE has developed an interdisciplinary training and knowledge co-production approach that integrates research and participatory analysis. This approach facilitated the examination of the nexus between academic methods, local knowledge, and place management practices. This has enabled understanding of the cultural and social determinants of climate change and of the monitoring and addressing of the challenges (Irahola et al., 2021) in the areas under study. Cli-CC.HE identified ways to assess conditions and develop adaptation proposals using a variety of tools, including unconventional ones such as augmented reality, public art, and urban games. Some of these tools were found to be more effective or easier to use, and were therefore preferred in discussions with local communities within the working tables. This long and rather complex path had its strongest element in the activation of co-design workshops with local communities, stakeholders and public administration. The activation of the workshops was easier in cities where the University had a long-standing relationship with the local area and public administration, and where established relationships could therefore be leveraged. The establishment of mixed working tables, including students, administrators, citizens and stakeholders, facilitated discussions. As for the workshop in San Benedetto del Tronto, it proved to be an engaging and convivial experience that provided a valuable learning opportunity for all participants. In response to the questions posed at the beginning of this article, we can extend the reflections on the results of this project accrued in the San

Benedetto del Tronto workshop to a reasonable degree of approximation to the other local workshops as well:

1. The activities conducted in the local workshops, which brought together students, citizens, stakeholders, professionals, administrators, and municipal officials, were a moment of collective reflection on the critical issues facing cities and the need to prepare for climate change. The workshop results were transmitted to local governments through the formulation of guidelines for urban regeneration. In addition, some universities (Unicam and University of Belgrade) were offered the opportunity to initiate or strengthen collaboration with municipalities through the signing of agreements to integrate the results of these experiences into urban plans and projects. This collaboration is characterised by a high level of commitment and is further strengthened by other initiatives, including the establishment of a partnership to prepare the Program Document for the New General Urban Plan. Consequently, within the context of a “Collaborative Alignment Framework” (Walker et al., 2023), the involvement of the local community is a crucial safeguard for the future.
2. The role of students in facilitating community engagement with issues of climate change and adaptation, and their impact on daily life, has been crucial in fostering a closer relationship between the community and the University. The activation of the co-design tables facilitated direct contact with students, fostering dialogue and enabling confrontation without bias and limitations. In this confrontation, students learned to reconcile people’s needs with technicians’ knowledge, and to fully understand the reasons for any conflicts that may arise. The implementation of specialised tools for confrontation facilitated the emergence of disparate perspectives while emphasising the need for conflict resolution to identify optimal adaptation scenarios. In addition, confronting communities enabled students to gain a comprehensive understanding of the importance of a culture of adaptation and of their role as future technicians in educating citizens and local governments.
3. In terms of available tools, Cli-CC.HE allowed the different stages of the methodology to be approached with a variety of them, thus allowing their relative effectiveness to be assessed both in terms of training students and training citizens and administrators. It was found that students experienced difficulties in approaching technical tools for assessing climate impacts, such as Ladybug). These difficulties are likely attributable to the fact that for many students Cli-CC.HE

represented their first experience with climate adaptation. In contrast, both students and citizens expressed general satisfaction with more accessible tools, including urban games, public art, video mapping, virtual reality, exhibitions, and neighbourhood walks (Thoma et al., 2023).

4. In terms of risk, the most significant that has emerged from these experiences is the fear, expressed informally by citizens, that the chosen educational path will not have practical consequences and that, that is, the administration will not fulfil its commitments in the regeneration of the city. Among students, the main concern is the risk of discontinuity in an interdisciplinary educational pathway addressing the climate challenge. Among faculty, there is a commitment to integrating climate change as a structural element of university curricula, rather than treating it as an isolated topic.

5. CONCLUSIONS

Climate-proof urban regeneration projects need to originate from collective and collaborative action that requires the stimulation of diverse and unconventional tools that can transcend disciplinary boundaries, overcome difficulties and resistance, and encourage students to identify and describe problems and potential solutions for adaptation and health in cities, thus facilitating a true integration of approaches and ideas. Students must be offered opportunities to engage in experiential learning through internships and educational pathways that facilitate their interaction with issues arising from climate change in their real-world contexts (Bodolica et al., 2021). This educational opportunity should include establishing collaborative relationships with government departments, local communities, NGOs, and local stakeholders (Tang, 2019) to instil a sense of urgency and responsibility in students and to help the same communities and local stakeholders become aware of these issues and enact appropriate behaviours towards their living spaces. The Cli-CC.HE project has developed an educational methodology that:

1. builds on interdisciplinary and multi-actor knowledge networks to address the complexity of climate change and, through co-design, develop possible and shared solutions to real problems in cities. The direct confrontation with local stakeholders allowed students to understand the different points of view and expectations of local

actors, which were articulated through the use of participatory tools that advanced the confrontation by reconciling different positions and sensitivities.

2. makes local communities more aware of the risks of climate change to their living places and to their own health. Bottom-up approaches based on community experiences are also promoted to break down mistrust of top-down-imposed knowledge models. Co-design tables, in this case, play a key role in bringing people together, broadening the discussion from the city's physical spaces to everyday lifestyles and behaviours, thereby also constituting a moment of reflection on personal commitments to adaptation.
3. uses traditional tools to interpret urban contexts, in synergy with more user-friendly tools that, through the experience of gaming, augmented reality, video mapping, questionnaires, etc., bring people into contact with problems and possible solutions.

The limitations of this methodology relate to its limited ability to affect students' education when applied occasionally in training workshops, as was the case with the CliCCHE Project. It should be used in regular university courses with longer learning sessions than in workshops. This would allow a better transmission of basic interdisciplinary knowledge and some benchmark best practices, which are essential to strengthen students' awareness of such a complex subject. This need emerged in the same questionnaires administered to faculty and students at the end of the project. Another important limitation could relate to the expectations of local communities and actors, who may see their demands betrayed if the public administrations do not follow up on the proposals resulting from the co-design pathways. In this case, the construction of Adaptation Design Guidelines, as an outcome of the participatory pathways, is a valuable tool to facilitate the transfer of knowledge gained into the plans and projects of the public administrations involved. Finally, a further limitation of the methodology is represented by the non-provision of a monitoring phase, i.e., of evaluation at a distance in time of the outcomes achieved with reference to the objectives of the project and the possible positive effects on the educational profiles of students and on the expectations of local communities and stakeholders. The provision of a monitoring phase could be useful to make changes and or updates to the methodology and tools in order to improve their effectiveness.

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