

HEAT project

Heatwaves Awareness Education Through Online Learning

Work Package 5

Handbook for exploitation of project results and outputs

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Abstract and user's guide to the Handbook

The document here presented (henceforth, simply Handbook) is an official and formal results of the HEAT Project – Heatwaves Awareness Education Through Online Learning (henceforth, simply HEAT or project). Its content is developed by HEAT project's partners with the objective and concrete goals to help other professionals in the realm of education, teaching and training to:

1. Embed the education and training outputs of HEAT within their operational settings
2. Make use of project's resources relying on a consolidated and experience-based approach
3. Plan their own initiative(s) that is inspired by the methodology and outcomes of the project
4. Operationalise HEAT outputs in other similar education and training environments sharing similar ambitions to those of the project
5. Exploits the resources made available by partners to fit, match and address the education and training needs of their own cohorts

The content of this Handbook stems from partners' direct experience in implementation, and most notably, lessons learnt, key takeaways, good practices, etc. consolidated throughout project developed and further refined at quality assurance and evaluation stage.

With this document, partners make fully available to readers their first-hand experience so that project's results can be taken on by others, used in different operational settings of those addressed by partners and in different geographical areas. In a sense, this document represents a form of project's legacy and responds to partners' ambition to foster for all resources developed long-term impact, high-scale sustainability and wide-spread use among relevant stakeholders, groups of interest and peer professionals.

The impact of the project is measured indeed in the measure in which HEAT resources will keep on generating positive effects even after the official conclusion of the project, with and without the direct involvement of the organisations participating in the collaborative consortium. By compiling and providing for this document, partners contribute to make available key guidelines for the exploitation of project's results that are precisely conceived for the independent and autonomous use by other representatives of the school education ecosystem.

Readers are kindly recommended to use this document to better familiarise with the content of the project and navigate the many resources available.



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Basic introduction into the ambition and objectives of the HEAT project

HEAT is an Erasmus+ European project born out of the recognition of the importance of education in addressing climate change challenges. In collaboration with partners from various European countries, this project focuses on heatwaves and their impact on our planet. Through innovative educational approaches and multilingual resources, we aim to create tangible change in environmental education and awareness among young minds.

The fundamental assumption of HEAT is that education is a powerful tool for addressing climate change. We recognize the need to actively involve students, teachers, and other key stakeholders in environmental education. Our goal is to promote awareness of heatwaves and prepare the next generation to be agents of change for a more sustainable future. Specific objectives of the project are summed-up below. The results linked to them will be further elaborated in the following pages of this document:

Build a new climate education framework for online learning environments

Core objective of the project is to consolidate (then test and validate) a robust climate education framework designed for online learning environments. This framework will serve as a foundational structure, enabling educators and students to engage deeply with climate change topics, linked but not limited to the issue of heatwaves.

Design and create digital learning resource for secondary school students

Key target of the project is represented by secondary school students. Hence, A key focus of the project is the development of digital, accessible, and micro-credentials compliant learning resources specifically tailored for secondary school students. The learning objectives are linked to a comprehensive understanding among young learners of environmental causes and effects of heatwaves, and help them nurture sustainable, informed and green counter-practices.

Design and create digital learning resources for teachers on heatwaves awareness

In parallel, the project addressed specialized digital resources for teachers, so to equipping them with the knowledge and tools necessary to teach heatwave awareness and be more informed themselves on the topic. These resources will encompass lesson plans, teaching guides, and professional development materials that highlight effective instructional strategies.

Develop an online platform that supports teacher training and school teaching

To facilitate the dissemination and utilization of these resources, the project has developed a comprehensive and user-friendly eLearning Open Education Resource Platform. The platform is an official result of the project and serves as a centralized hub for teaching and education of HEAT content. The platform can be accessed via the official [HEAT project website](#) by clicking on [e-platform](#).

Set-up of educational game to ensure immersive and effective learning

Considering the specific target group addressed, and the need of creating engaging and appealing training and education content, the resources of the project are complemented by an [interactive educational game](#) accompanying students in the understanding process of the specific relations between urban design and heatwaves.

Report key developments and findings through articles and other publications

This is not only to inform key stakeholders and groups of interest about the development and progresses of the project, but also to inform the public about activities conducted, key experience, know how consolidated, additional informative and awareness building material on the topic addressed, new innovative practices and impactful outcomes contributing to the body of knowledge in this specific fields of education, teaching and training.



Building elements of the framework: data collection and needs analysis

From a very technical and project plan-oriented perspective, the HEAT initiative officially kickstarted with the implementation and development at project level of a very sound, robust, and scientifically accurate data collection of the following:

1. National and international bibliography sources, reports, other specialised literature material referring to good practices for teaching and education on climate change (preferably, in online environments)
2. Misconceptions and misunderstandings about the phenomenon of heatwaves, global warming and climate change – both at level of teachers and students
3. Heatwaves trends in EU and major EU urbanised areas
4. Key training topics of interest for teaching and education at secondary school level on heatwaves

Information, evidences and results stemming from this multi-disciplinary, national and pan-EU assessment contributed to inform the preliminary outline of the curriculum, and give partners a better sense on: **a)** what should be the concrete teaching focus of HEAT programme, **b)** good practices already available, **c)** recommended DOs and DON'Ts for heatwaves education with reference to the settings of interest (i.e., secondary school system), **d)** gaps and other fallacies in current heatwave education, **e)** other structural challenges for students and teachers engagement in this subject, **f)** opportunities for the upscaling of heatwaves-based teaching programmes, **g)** any other insights that could better inform the methodological approach adopted by partners in the future stages of implementation of the project.

In short, the objective of the data collection phase of HEAT was to gain a better understanding on the background of reference in the education and teaching landscape, the general starting point of reference for the development of the curriculum (based on what currently available or not), insights on how to proceed forward content wise.

Inventory Analysis: an assessment of current climate change education frameworks¹

With the Inventory Analysis, partners have assessed the state of art of climate change education and have extrapolated key common trends and dynamics defining existing teaching methodologies from scientific literature and bibliography².

The mapping and identification of these current practices serve to provide for partners inputs and references on the education and teaching roadmap of the HEAT project. The coordinates of this roadmap stand as defining features of the training and teaching, most notably in the sense of: **a)** education topics to be tackled, **b)** recommended structure and length, **c)** desired learning outcomes.

In total, partners have catalogued 79 publications that shed light on current climate change education framework. A summary of key results is available in the first section of the report. These pertains to: **a)** learning methodologies & practices, **b)** digitalisation techniques, **c)** national and international standards for climate change education.

¹ WP2 – Deliverable n. 2.1a, Analysis of Current Climate Change Education Frameworks: Inventory of literature, national and international standards, reports, and books, referring to teaching climate change focusing on online education. Available here (ENG): https://heatwaves-project.eu/results/Heatwaves%20Inventory/1.%20D2.1a_Heatwaves%20Inventory.pdf

² Evidences and key findings provided in the Inventory Analysis are complemented by results stemming from a national primary research conducted through surveys by all partners and targeting both students and teachers. The outline and content of the two surveys are presented in Annex 1 & 2 respectively, this will help readers to get a sense on the kind of questions that we have submitted to these two core target groups of the project.



The presentation of key results is anticipated by an important disclaimer addressing the methodology adopted for the mapping, identification and filtering of identified sources. This is to provide for comparability of evidences and standard processing of key findings extrapolated from each.

For external users, the availability of this document provides for several benefits and advantages:

1. Provides for a comprehensive understanding of existing educational strategies and methodologies in this specific field of teaching and education.

The literature review highlights effective approaches and current knowledge at systemic level. Readers can use this information to: **a)** benchmark the practices implemented by them with current standards, **b)** tailor and refine their programmes integrating the new information available and wealth of knowledge available.

2. Inspires new experience-based good practices that educators can embed within their teaching frameworks and tailor accordingly to fit the specific needs of their cohorts.

This can help educators and teachers to adapt and apply these practices within their own contexts, tailoring them to fit specific needs and challenges while learning from the experiences of others.

3. Lays down the basis for further research and studies by exploring new angles and new ways to tackle identified gaps.

In that sense, the literature review available is engine of positive change and innovation in the combined field of climate change and school education.

4. Discloses evidence-based recommendations for further action in the policy making aspect of education, teaching and training.

Policymakers and educational leaders can rely on these findings to advocate for and implement new actions and initiatives aimed at enhancing climate literacy and preparedness across educational systems, trigger new reforms consistent with the underlying needs, position themselves as true agents of change.

Misconceptions about climate change, global warming and heatwaves³

The aim of this deliverable is to present students' and teachers' misconceptions about climate change, global warming and heatwaves. The report is divided into two sections:

1. Definitions of the term "heat waves" and present their connection with climate change and global warming⁴.
2. Common misconceptions about the three meanings are presented.

The obvious benefit and advantage from the availability of this document, is linked to its capacity to settle and establish a glossary of reference and avoid common misinterpretation that would prejudice the pedagogical accuracy of the education and teaching framework. Other positive outcomes of this result are self-explanatory. For the sake of conciseness, here's other three:

³ WP2 – Deliverable n. 2.1b, Analysis of Current Climate Change Education Frameworks: Students' and Teachers' misconceptions about climate change, global warming and heatwaves. Available here (ENG): https://heatwaves-project.eu/results/Misconceptions%20about%20Heat%20waves/2.%20D2.1b_MISCONCEPTIOS%20HEATWAVES%20.pdf

⁴ This is an important part as the majority of misconceptions start when somebody tries to define a concept, a term or an idea.



1. Enhances general public's awareness and understanding of the very concept of heat waves.

By being aware of common misconceptions, teachers can better prepare their lessons and address their students. This enables them to provide for more scientifically accurate information on climate issues.

2. Strengthens the relevance and accuracy of climate change-based teaching and education material.

This review offers teachers valuable references to help students recognise and dismantle false information, and address the reasons why these persist.

3. Stimulates media & information literacy in the field of climate change.

Teachers can use this example to foster among their students a critical thinker-attitude, which they can later apply in every dimension of their life – even beyond studies and education.

Technical analysis of heat waves across European cities⁵

As the title implies, the content of this report is quite more technical and specific compared to others. Based on what available from specific literature, partners have assessed and identified the characteristics of the urban environment exposing the same to the effects of heatwaves. At the same time, the research includes also proposed and tentative solutions for fighting against heatwaves as found in urban design.

Despite the specificity of the topic addressed, the short summary of findings might be very useful for specific cohorts of individuals:

1. Practitioners and professionals in the engineering field (including architects, urban planners, etc).
2. Governance representatives with decision making and policy authority in the realm of urban planning and urban sustainability.

From a perspective of dissemination and spreading of project's results, this content of this report greatly contributes to:

1. Scale-up the widespread impact of the project beyond the cohorts and operational settings formally addressed (i.e., secondary school education).

Key evidences stemming from this scientifically accurate analysis are usable by academics and researches working closely with local policy makers to make EU cities greener, and also other categories of students (i.e., people enrolled in related VET and HE courses) aiming at job opportunities in this very specific area of expertise.

2. Mobilisation of community activists and other advocacy organisations for greener and more sustainable cities.

Strong of these new information, civil society' representatives are better positioned to make informed propositions to local government and push for sustainable development practices. Community-driven initiatives as such represent key distinctive feature of democratic societies and they manifest as engine at the forefront of social innovation.

⁵ WP2 – Deliverable n. 2.2a, Technical Research on Heatwaves and Urban Design: An Inventory of literature to identify a) characteristics of the urban environment that are more susceptible to the effects of heatwaves b) solutions for fighting against heatwaves as found in urban design. Available here (ENG): https://heatwaves-project.eu/results/Technical%20report/3.%20D2.2a_EN_Heatwaves%20Technical%20report.pdf



Outline of the heat waves teaching and education curriculum⁶

With all the wealth of knowledge consolidated by partners in implementation of the first three analysis, the next step was to systematise all inputs and come up with the new teaching and education framework on heat waves for secondary school students. The education of students and the capacity building of teachers to inform about heat waves (and climate change in general) contribute to prepare future citizens to adopt green and environmental aware practices and take appropriate actions to safeguard their communities.

The outline of the curriculum is a pivotal result of the project and will play a crucial role in: **a)** building among students and teachers environmental and “green” literacy, **b)** empowering individuals with the right skills, knowledge and attitudes that they need to make informed decisions, **c)** stimulating sustainable behaviours and comprehensive shifts in mentality.



Heatwaves are a complex phenomenon influenced by multiple factors, including atmospheric science, ecology, public health, urban planning, and social dynamics. A curriculum on heatwaves provides an opportunity for interdisciplinary learning, encouraging students to connect various fields of study, analyse data, and think critically about the interconnectedness of environmental and societal issues.

The final layout of the curriculum is informed by all results previously described and has been subject of in-depth discussion among all partners involved, plus other contributions from external experts involved informally by partners for validation and peer-assessment of preliminary drafts and inputs. By the end of this collegial discussion, partners consolidated six key topics informing the content of the curriculum:

Topic 1	Heat waves and climate change
Topic 2	Addressing heatwaves and climate misconceptions
Topic 3	Heat waves in urban environments
Topic 4	Climate resilience and responding to heat waves
Topic 5	Assessing the public discussion on heat waves & climate change
Topic 6	Personal and community action for sustainability

Each and every topic is complemented by the following descriptive features

Descriptor	Explanation
Main objectives	Main objectives outline the overarching aims and outcomes intended to be achieved through this training. It provides for a broader perspective on what participants should gain from being introduced to it.
Specific goals	Specific goals detail the measurable skills, knowledge, or competencies learners are expected to acquire upon completing this training. These goals serve as concrete learning outcomes that demonstrate the effectiveness of the teaching content provided.
Cross-Curricular Connections	Cross-curricular connections identify how the topic relates to other subjects or disciplines. This highlights the interdisciplinary nature of the topic and emphasizes its relevance across different educational domains.
Health, Environmental, STEM Education	This section explores the broader implications of the topic on health, environmental awareness, and its alignment with STEM (Science,

⁶ WP2 – Deliverable n. 2.2b, Curriculum for lower secondary school students on Heat Waves Available here (ENG): https://heatwaves-project.eu/results/Curriculum%20for%20lower%20secondary%20school%20students/4.%20D2.2b_EN_Curriculum%20for%20lower%20secondary%20school%20students%20on%20Heat%20Waves.pdf



	Technology, Engineering, and Mathematics) education. It underscores how the topic intersects with various educational disciplines and societal issues.
Key Concepts of the topic:	Key concepts (e.g., key words) provide for a foundational understanding of the core ideas and principles central to the topic. They serve as essential elements that participants need to grasp in order to engage effectively with the curriculum content.
Proposed activities	Proposed activities are structured learning experiences designed to reinforce learning objectives. They are categorized by the type of activity, such as experimental learning or socio-scientific reasoning practices, and include a description detailing how each activity is conducted and its educational purpose.
Learning mode	Learning mode refers to the overall format in which the curriculum is delivered, such as: <ol style="list-style-type: none"> 1. Online 2. Blended (combination of online and face-to-face) 3. Face-to-face
Interaction format	Interaction format specifies how participants engage with the content and each other, distinguishing between: <ol style="list-style-type: none"> 1. asynchronous (self-paced) 2. synchronous (real-time)
Resources	Resources include supplementary materials, readings, and tools intended to support teachers in their delivery of the curriculum. These resources provide additional context, examples, and ideas to enhance teaching effectiveness and engagement.
Ideas for using of Online Heatwave Game	Ideas for using an online heatwave game explore how gamification can be leveraged to engage learners and illustrate concepts related to heatwaves. This section suggests specific game mechanics, challenges, or scenarios that align with the curriculum content to enhance learning through interactive and immersive experiences.

For a full breakdown of the teaching and education curriculum, readers are invited to refer to foot note no.6 (WP2 – Deliverable n.2.2b)

More about the Heatwaves City interactive game: concept and functionalities

Heatwave City is an engaging educational game designed to educate and empower school children about the impact of human decisions on urban design and heatwaves in urban areas. Through an interactive experience, players will explore a city, identify hot zones related to urban design elements, and make informed decisions to mitigate the effects of heatwaves.

By understanding the importance of sustainable urban design, the goal of the game is to keep the temperature within a specific degree and earn stars for every hot zone as they successfully manage the city's climate.

Key features	Details
Heatwave City	The game presents an isometric city, showcasing a typical European city with vibrant colours and animated graphics that aims to catch the attention of young learners.
Interactive Hot Zones	Players will discover various hot zones within the city, representing different aspects of urban design such as green surfaces, cladding materials and building heights. These aspects will be expanded



	according to the findings of the technical analysis. Clicking on these zones will transport players to dedicated scenes where they can delve deeper into the primary cause-effect of heatwaves.
Real-time Action	The game incorporates real-time action, allowing players to observe the immediate impact of their decisions on the city's temperature. By triggering objects and making changes to urban design elements, players witness the consequences of their choices thus creating a deeper understanding of cause-and-effect relationships between urban design and heatwaves.
Problem-solving and Decision-making	Heatwave City encourages critical thinking and problem-solving skills. Players must analyse the characteristics of hot zones, explore various options, and strategize to achieve sustainable temperatures.
Achievement System	The game features a star-based achievement system, motivating players to continuously improve their urban design decisions. Players are awarded with stars/badges as they can keep the temperature of hot zones below a specific degree.

The game is designed based on a multi-steps framework where the completion of each step lead learners to the following:

Step 1	The student launches the game on their device and is presented with the main menu, offering options to insert their name and start the game.
Step 2	Upon starting the game, the student is greeted with an introductory scene that explains the purpose and goals of the game. A brief tutorial guides them through the basic controls and mechanics, ensuring they understand how to interact with the cityscape and identify hot zones.
Step 3	Once the tutorial is complete, the student finds themselves in the city. While exploring the city, the student notices specific areas marked as hot zones ⁷ , indicating aspects of urban design that contribute to heatwaves. By clicking on these hot zones, they trigger a transition to dedicated scenes for further exploration.
Step 4	Within the hot zone scene, the student has the opportunity to experiment with different design choices and observe their effects on temperature in real time. The scene may include interactive elements, information cards, and real-world examples to enhance their learning experience. By interacting with these, selecting alternative materials or design solutions, and making informed decisions, they can see how their choices impact the temperature of the city.
Step 5	The primary objective for the student is to keep the temperature within a specific degree range to mitigate heatwaves. By successfully managing the temperature

⁷ The hot zones are the following:

- 1. Hot Pavements:** a slider activity where students can adjust the reflectiveness of the pavement material. The slider will change the percentage of sunlight absorbed. Different materials like light (coloured concrete, permeable pavers with greenery, cool coloured asphalt and porous concrete) will be provided as options to show the different materials' reflectiveness. Each choice will have an effect on the temperature.
- 2. Dark Roofs:** a drag-and-drop activity with a selection of roof materials (metal, adobe, green roof, asphalt and porous material + maybe solar panels) that students can choose from, then drag and drop onto the buildings. A real-time temperature change in the thermometer as they make different choices.
- 3. Concrete Jungle:** students will create a scene where they can click on buildings to adjust their heights. Shorter buildings are color-coded as cooler, while taller ones are warmer. Animated images to show the increase and decrease in wind flow might teach the students how different heights can orient the wind better and help in cooling.
- 4. Park Oasis:** creating an interactive park design scene. Students can select different types of trees, water features, and grassy areas to place in their park. Each addition could decrease the temperature, represented by a thermometer. The more diverse their choices, the more the temperature decreases.



	and making sustainable design choices, they earn stars as a measure of their achievement.
Step 6	In the game, the student is encouraged to think critically, analyse information, and make decisions to create sustainable city design. They can go back to places they've already visited to make better choices and aim for even better results. This lets them find new things about urban design and learn more about how it affects heatwaves.
Step 7	Upon successfully managing the temperature and earning stars in various hot zones, the game acknowledges students' achievements by visual cues, and issuing a certificate in their name.

Heatwave City is an educational game that combines fun, interactivity, and learning to teach school children about the impact of urban design decisions on heatwaves. By immersing students in an interactive cityscape, allowing them to explore and experiment with sustainable design elements, and rewarding their achievements, the game offers an engaging educational experience.

This concept has the potential to be a valuable learning tool that promotes environmental awareness and fosters the development of critical thinking skills among young learners.

As for all other major project's results, the Heatwave City game is available from the official [eLearning platform of the project](#).



A deep dive into the teaching and education content for students

All training and education materials are accessible via the official eLearning platform of the project. Resources are available in multilanguage version⁸, open access format, free to use and ready to be downloaded.

The section of the eLearning platform dedicated to secondary school students opens with a welcome page where users can find available very short, concise but comprehensive presentation of the curriculum.

Educational content is breakdown into “Modules”, with each and every Module catching a specific dimension of the new teaching and training framework developed by partners:

<p>MODULE 1 Heat waves and climate change</p> <p><i>Gain a foundational understanding of key terms related to heatwaves and their connection to climate change.</i></p>
<p>MODULE 2 Heatwaves in urban environments</p> <p><i>Explore how cities are affected by heatwaves. We'll delve into the Urban Heat Island (UHI) effect, its causes, and examine different Urban Heat Island patterns across Europe using interactive maps.</i></p>
<p>MODULE 3 Climate resilience – responding to heatwaves</p> <p><i>Take action! This module focuses on strategic responses to heatwaves, offering mitigation strategies at both city-level and individual levels. Engage in a fun and interactive game to reinforce your learning.</i></p>
<p>MODULE 4 Media literacy and addressing misconceptions about heatwaves</p> <p><i>Enhance your media literacy skills to navigate and correct misconceptions about heatwaves. Learn to critically analyse media representations of heatwaves, identify misinformation, debunk misconceptions using scientific facts, and promote accurate understanding through the creation of informative posters.</i></p>
<p>MODULE 5 Personal and community action for sustainability</p> <p><i>In our final module, discover actionable steps for personal and collective sustainability. Drawing from knowledge gained in earlier modules, explore methods for effecting meaningful changes, starting with tracking our carbon footprint. Additionally, delve into understanding the EU's Green Competency Framework, known as GreenComp.</i></p>

Then, for each module there is a further breakdown of specific objectives and expected learning outcomes. The language used to present these preliminary information to student is as lean, accessible and easy as it can be. This is to help them familiarising immediately with the kind of content that they can expect:

⁸ In all languages represented in the partnership: EN, EL, IT, RO (no FR)



<p>MODULE 1 Heatwaves and climate change</p> <ul style="list-style-type: none"> • <i>Explain fundamental scientific concepts behind Climate Change and Heat Waves.</i> • <i>Understand and interpret heatwaves using real data and scientific principles.</i> • <i>Recognize how human activities contribute to climate change.</i>
<p>MODULE 2 Heatwaves in urban environments</p> <ul style="list-style-type: none"> • <i>Understand and explain the Urban Heat Island Effect using real data and scientific concepts.</i> • <i>Identify characteristics of the urban environment contributing to the Urban Heat Island Effect.</i>
<p>MODULE 3 Climate resilience – responding to heatwaves</p> <ul style="list-style-type: none"> • <i>Explore solutions to mitigate the effects of urban elements on heatwaves.</i> • <i>Acquire tools to raise awareness and advocate for better climate change policies.</i>
<p>MODULE 4 Media literacy and addressing misconceptions about heatwaves</p> <ul style="list-style-type: none"> • <i>Identify common misconceptions about heatwaves and climate change.</i> • <i>Develop skills to evaluate and debunk these misconceptions.</i> • <i>Analyse the influence of media and political beliefs on public opinion regarding climate change</i>
<p>MODULE 5 Personal and community action for sustainability</p> <ul style="list-style-type: none"> • <i>Advocate for climate action within the context of heatwaves and climate change.</i> • <i>Identify and assess individual and community carbon footprints.</i> • <i>Develop personalized action plans for carbon footprint reduction and propose community action plans promoting sustainability and heatwave awareness.</i> • <i>Understand and define the European Sustainability Competence Framework (GreenComp).</i>

By the end of the training, thanks also the extensive use of self-assessment quizzes students will be better equipped with the right knowledge that they need to trigger a positive change and sustain impactful actions for them and their peers.

In the next following pages readers will find available a very short and concise recap of the main content from each Module.

Module 1: Heatwaves and climate change

The training course begins by defining climate change as the long-term alteration of Earth's usual weather patterns, driven largely by human activities such as greenhouse gas emissions. It emphasizes the distinction between weather and climate, using a video to clarify these concepts. After watching, learners are prompted to pause and reflect on different global climates and the factors contributing to climate changes mentioned in the video.



Historically, natural climate shifts occurred over millennia, but the past century has seen accelerated changes due to increased greenhouse gases from burning fossil fuels. The course explains that greenhouse gases, including carbon dioxide, methane, and water vapor, trap heat in the atmosphere, intensifying global warming. Water vapor, although short-lived, amplifies the warming effects of other gases.

Learners will be equipped with a deeper understanding of climate change mechanisms and human impacts. They will be asked to discuss the consequences of drastic climate changes using a temperature anomalies chart from the European Environment Agency, exploring the various environmental problems that arise from significant climate shifts.

The course follows then with a new section titled *What Problems Does Climate Change Cause?*. This section begins by explaining how climate change disrupts weather patterns, making hot areas hotter and drier, leading to more frequent heatwaves, droughts, and forest fires. Conversely, increased evaporation from oceans causes wet areas to become wetter, resulting in more storms, hurricanes, and floods.

It then addresses the impact of rising temperatures on ice, with warmer ocean waters and air causing ice to melt. This contributes to rising sea levels, threatening animals like polar bears and penguins that depend on ice. Melting glaciers and ice sheets further exacerbate sea-level rise, affecting coastal regions worldwide.

The section also highlights the dangers of heatwaves – intense heat periods lasting two to three days, posing significant health risks. Heatwaves are localized, mainly affecting urban areas which are hotter than rural ones. Understanding heatwaves involves analysing factors like daytime and nighttime temperatures and humidity, with thresholds based on historical data on heat-related deaths and hospital admissions.

A data analysis activity at the end of the module encourages learners to explore their region's average temperatures and precipitation levels using a resource from the Technical University of Dresden. The section concludes with a pause and reflect activity, prompting learners to consider the local impacts of climate change and the immediate concerns it raises for their communities.

Module 2: Heatwaves in urban environment

The second module, “Impacts of Heatwaves on Human Health” begins by highlighting the serious health risks posed by heatwaves. These extreme heat events can cause chronic illnesses and even death, with conditions such as heat exhaustion, kidney damage, and heart attacks becoming more prevalent. Understanding the health impacts of rising temperatures and heatwaves is crucial, along with exploring strategies to mitigate their effects on individuals and communities.

Heatwaves can lead to increased mortality, as seen during the 2003 European heatwave, which resulted in up to 70,000 additional deaths. People with respiratory and heart conditions are particularly vulnerable. Morbidity also rises during heatwaves, with dehydration and heat-related illnesses affecting more people, especially the elderly and those with chronic diseases.

The module emphasizes individual actions to protect against health risks during extreme heat. Key measures include minimizing exposure to high temperatures, maintaining proper hydration while avoiding alcohol and caffeine, and recognizing symptoms of heat-related illnesses to seek timely help. Detailed information is provided also in on common heat-related conditions⁹.

⁹**1. Heat rash:** red, itchy bumps from sweat in hot, humid weather, alleviated by keeping cool and using creams. **2. Oedema:** swollen ankles that usually subside naturally, with avoidance of alcohol and caffeine advised. **3. Syncope:** dizziness or fainting due to heat, managed by lying down, raising legs, and drinking water. **4. Cramps:** painful muscle spasms treated by resting, stretching, and drinking sports drinks with electrolytes. **5. Exhaustion:** symptoms include thirst, weakness, and dizziness from dehydration, requiring rest and hydration. **6. Tachycardia:** rapid body temperature increase causing hot, dry skin, nausea, hypotension, and rapid heart and breathing rates.



A specific section of this module is focused on the Urban Heat Island Effect and explored the difference in temperature between rural and urban areas using an interactive map from NASA. Learners are prompted to observe and reflect on surface temperature disparities and the relationship between vegetation levels and urban heat.

The concept of urban micro-climates is introduced, highlighting localized climate variations within cities influenced by urban design and environmental factors. Urban micro-climates are significantly warmer than rural areas due to urbanization processes that intensify heat retention.

Key factors contributing to Urban Heat Islands are discussed, including but not limited to:

1. Deforestation and reduced vegetation in cities reduce shade and cooling effects.
2. The use of materials like concrete and asphalt in urban infrastructure absorbs and retains heat.
3. Dense urban layouts create heat-trapping environments known as urban canyons, limiting air circulation.
4. Factors such as waste management practices and vehicular traffic further exacerbate heat retention in urban areas.

Toward the concluding section, learners explore climate data maps and heat intensity assessments across Europe, observing how urban heat islands affect different regions. They reflect on the impacts of human activities on local temperature levels and consider strategies to mitigate heat in cities, setting the stage for the next module on climate resilience.

Module 3: Climate resilience – responding to heatwaves

The module on Urban Planning and Urban Design for Heat Resilient Cities begins with an immersive outdoor activity known as Heat Island Detectives. Students are tasked with exploring their school grounds on a sunny day, armed with thermometers to measure surface temperatures. Their mission: to identify urban design elements that either exacerbate or alleviate the heat island effect. From asphalt parking lots to shaded playgrounds and grassy fields, each observation is meticulously recorded for later discussion in the classroom.

Back in the classroom, students engage in reflective dialogue:

- They pinpoint areas of significant heat accumulation and dissect the urban features contributing to these hotspots.
- Discussions revolve around the impact of different surface materials—such as dark asphalt versus grass or shaded areas—on local temperatures and overall comfort.

The module then briefly articulates into urban design and urban planning features playing a pivotal role for heat resilient cities. With reference to urban design specifically, the module guide students through all key elements (i.e., green and blue spaces, materials, etc.) contributing to cooling effects of cities.

Strong of this newfound understanding, students embark on the part 2 of the game and they start conducting comprehensive assessments of their school environments, identifying potential strategies – such as installing cool pavements or increasing green spaces – to mitigate heat island effects.

The module empathizes also Individual strategies to combat heatwaves are emphasized:

- Recommendations include staying hydrated, seeking shade during peak heat hours, and recognizing symptoms of heat-related illnesses.
- The importance of supporting vulnerable groups, such as the elderly and chronically ill, in adhering to these strategies is underscored.



All knowledge is then put together and used to navigate the interactive game, Heatwave City, where students apply their skills to simulate and strategize urban heat resilience measures.

Through this narrative approach, students not only learn about the complexities of urban heat management but also engage actively in proposing solutions to build more resilient and liveable cities in the face of rising temperatures.

Module 4: Media literacy and addressing misconceptions about heatwaves

The content of this module is very comprehensive and focuses on addressing widespread misunderstandings that can hinder effective climate action. The session begins by highlighting diverse opinions on the causes of climate change, ranging from natural cycles to human activities like fossil fuel burning and deforestation. It emphasizes the need to dispel these misconceptions to ensure accurate understanding and informed decision-making in policy and action.

The module categorizes common misconceptions into four groups:

1. Causes of global warming, such as “global warming caused by depletion of the ozone layer” or confusion between carbon dioxide (CO₂) and other gases.
2. Effects of global warming, such as the idea that “global warming can be reduced by limiting chemical waste released into rivers” or linking unrelated phenomena like acid rain to global warming.
3. Climate change as a natural phenomenon, such as “climate change is just part of the natural cycle” or attributing warming to sunspots rather than greenhouse gases.
4. Scientific consensus and data manipulation, such as “there is no scientific consensus on global climate change” or historical inaccuracies about past scientific predictions.

Reflective questions prompt learners to consider how these misconceptions influence public perception and the importance of critically evaluating media information.

The module then transitions into:

1. Enhancing media literacy skills, teaching participants how to distinguish between factual information and opinions. Practical exercises like distinguishing fact from opinion and using the CRAAP test are included to sharpen these skills:
 - Currency
 - Relevance
 - Authority
 - Accuracy
 - Purpose
2. Engaging learners in designing their own climate awareness campaign through stickers, emphasizing the power of visual communication in spreading messages about climate change and heatwaves effectively. It encourages research-based content creation, thoughtful design choices, and sharing these stickers responsibly within communities to raise awareness without contributing to visual pollution.

This very systemic approach equips participants not only with factual knowledge about climate change but also with critical thinking skills necessary to navigate and contribute meaningfully to discussions and actions around sustainability and climate resilience.

Module 5: Personal and community action for sustainability

The last module emphasizes that an individual’s carbon footprint is a measure of the greenhouse gases released due to their actions, encompassing energy use, food choices, and consumer habits. It underscores how activities like food consumption, transportation, and waste generation significantly contribute to emissions.



Understanding one's carbon footprint is crucial as it enables targeted actions to reduce emissions and mitigate climate change impacts, fostering individual and organizational accountability.

The module categorizes carbon emissions into three types:

1. Direct emissions (from operations and energy use)
2. Indirect emissions (from purchased energy)
3. Other indirect emissions (related to business travel and products).

It acknowledges the complexities involved in calculating precise carbon footprints but encourages engagement through tools like the Worldwide Fund for Nature's questionnaire. Reflective exercises prompt individuals to assess their carbon footprint results and strategize on reducing emissions across food, home energy use, travel, and shopping. Strategies include adopting renewable energy providers, leveraging smart technologies for energy efficiency, and making sustainable food choices like eating seasonal and reducing meat consumption.

Moreover, the module discusses global green policies like the Sustainable Development Goals (SDGs), UN Framework Convention on Climate Change (UNFCCC), Paris Agreement, and GreenComp. These policies aim to address poverty, inequality, and environmental protection while stabilizing greenhouse gas concentrations. GreenComp, specifically, defines competencies for sustainability education, emphasizing values, critical thinking, environmental action, and envisioning sustainable futures.

The fifth and last module integrates practical strategies with global policy perspectives to empower secondary school students in understanding and addressing their carbon footprint, promoting sustainable lifestyles and global environmental stewardship.



Ten key lessons learnt from the piloting stage with teachers and targets

In the spirit of fostering widespread adoption and meaningful impact, this Handbook offers actionable insights derived from the experiences of educators and trainers who have successfully employed HEAT resources.

These tips are designed not merely as a guide but as a catalyst for innovation, adaptation, and transformative learning. The following recommendations represent a synthesis of good practices and teacher-driven strategies that maximize the potential of these resources. The embedment of these approaches into educational practices can empower learners, enrich curricula, and contribute to the broader goals of climate resilience and sustainability.

1. Integrate heatwave awareness into existing curricula

Heatwave education becomes most powerful when it is not treated as an isolated subject but instead woven seamlessly into existing curricular frameworks. This integrative approach situates heatwave awareness within familiar contexts, reinforcing its relevance and helping students see its interconnectedness with other areas of knowledge:

- A science class might explore the physical principles of heat transfer and their implications for rising global temperatures, while a health education session could focus on the physiological effects of heat stress and strategies for prevention.
- Teachers in literature classes might assign creative writing tasks where students imagine life in a future climate-impacted world, sparking both imagination and empathy.
- Etc.

A key strength of HEAT resources lies in their versatility. They can seamlessly integrate into existing curricula and teachers can find indeed great benefits in embedding heatwave education into broader topics such as climate change, environmental science, or public health:

- Linking heatwave preparedness with geography lessons on climate zones or biology topics on human and ecological health.
- Using statistics lessons to analyse temperature trends or storytelling exercises to explore personal narratives of extreme weather events.
- *As many others as the imagination can offer*

2. Adapt resources for local contexts

Every community experiences heatwaves differently, and educators have a unique opportunity to make HEAT resources resonate with their learners by grounding them in the local context. Adding local case studies – such as recent heatwave events or specific regional vulnerabilities – further personalizes the learning experience.

A powerful example could involve inviting community members who have firsthand experience with heatwaves to share their stories, creating a bridge between the theoretical and the tangible. Education thrives when it resonates with learners' lived experiences: localizing content not only boosts engagement but also helps learners connect knowledge with solutions that are relevant to their own environments.

3. Leverage interactive learning tools

The digital tools provided by HEAT can transform a traditional classroom into a hub of interactive exploration. Imagine students working through an online simulation where they must respond to heatwaves gamified scenarios as the one provided by the project.

Such activities engage learners on multiple levels, combining intellectual challenge with a sense of responsibility and urgency. Pairing digital tools with hands-on activities, such as monitoring local



temperatures or designing heatwave preparedness plans, bridges the gap between virtual learning and real-world application.

4. Encourage collaborative learning

Collaboration not only enhances comprehension but also cultivates essential social and teamwork skills, deeper understanding and creative problem-solving.

Teachers can generate great impact by using HEAT resources to foster group projects where learners work together to propose community-wide solutions for heat mitigation. The resulting discussions encourage diverse perspectives and creative solutions, mirroring real-world decision-making processes.

Beyond the classroom, students can collaborate on outreach efforts, such as designing and distributing heatwave safety pamphlets to their communities. Collaborative learning can also extend to cross-class or cross-school projects, where students and teachers from different settings share insights and strategies.

5. Promote critical thinking and problem-solving

To truly prepare learners for the challenges posed by heatwaves, it is crucial to cultivate critical thinking skills. HEAT resources provide an ideal platform for exercises in analysis and decision-making. Role-playing scenarios add a dynamic layer. These activities transform abstract concepts into engaging problem-solving exercises.

Teachers are recommended to incorporate activities that require analysis of real-world scenarios, this can place learners in decision-making roles that enhance their capacity to generate creative ideas to pressing climate issues

6. Design professional development workshops

For educators to fully exploit the potential of HEAT resources, professional development is key. Teachers are at the forefront of disseminating HEAT's message, but their effectiveness depends on familiarity and comfort with the tools at their disposal.

Professional development workshops provide a structured environment for educators to explore HEAT resources and learn from peers. Workshops could include live demonstrations of digital tools, brainstorming sessions on local adaptations, and discussions of how to integrate the materials into various subjects.

Beyond skill-building, these workshops foster a community of practice among educators, creating networks of support and collaboration that extend far beyond the initial training.

7. Tailor resources for diverse learning levels

Another strength of the HEAT project is its adaptability, which allows teachers to customize resources for a wide range of learners:

- For young children, the focus might be on playful learning and a gamified version of the teaching approach
- For high school students, more complex discussions about global warming, urban planning, or social equity in disaster response could be explored.
- Adult learners, such as community leaders or emergency responders, might benefit from targeted workshops emphasizing practical application of any of the training resources provided.
- Etc.



In other words, Teachers are suggested to simplifying materials for younger students by focusing on visual aids, storytelling, and hands-on activities. For older or more advanced learners, educators can delve deeper into complex topics such as the socioeconomic implications of heatwaves or the science behind heat adaptation strategies.

8. Involve stakeholders in resource implementation

Education does not occur in isolation, and teachers can find great success for their training initiative by involving stakeholders such as parents, local authorities, and other community organizations (i.e., museums, libraries, etc.). Such collaborations create a sense of shared purpose and ensure that the learning extends beyond the formal teaching settings.

Education is most impactful when it extends beyond the classroom, and involving stakeholders enriches the learning experience:

- Teachers can work with parents to reinforce heatwave safety practices at home, such as keeping hydrated and recognizing signs of heat stress.
- Collaboration with local authorities could involve organizing school-wide climate and environmental awareness info days.
- Community partnerships – such as with health organizations or environmental groups – can provide additional expertise and resources, giving learners exposure to real-world applications of their lessons.
- Etc.

These collaborations not only enhance the educational experience but also build stronger, more resilient communities.

9. Combine digital and traditional learning formats

A blended approach to education is often the most effective, and HEAT resources lend themselves beautifully to this strategy. Teachers might start with a digital simulation to introduce the concept of heatwaves, followed by hands-on activities like designing urban gardens for cooler cities.

Similarly, a theoretical lesson on the science of heat transfer could culminate in a practical experiment where students measure the cooling effects of shade or different building materials.

The alternating of digital and traditional formats gives educators the opportunity to cater diverse learning styles and create a dynamic, engaging environment. Worthy of consideration is also the fact that this blended approach ensures inclusivity, accommodating learners with varying levels of access to technology while keeping the lessons dynamic and engaging.

10. Foster a culture of sustainability

Heatwave education is a gateway to a broader discussion about sustainability and climate resilience. Teachers can inspire students by framing their learning within the larger context of global environmental stewardship.

Students could participate for instance in a school-wide initiative to plant trees, understanding how this action not only mitigates heat but also supports biodiversity and combats climate change. These efforts instill a sense of agency in learners, showing them that their actions, no matter how small, contribute to meaningful change.



Embracing GreenComp in heatwaves & climate change-based curricula

GreenComp, the European sustainability competence framework¹⁰, was developed by the European Commission to guide and promote sustainability learning, helping individuals and organizations develop the knowledge, skills, and attitudes needed to act for environmental sustainability. It aligns with broader EU policies like the European Green Deal and aims to support education and training systems in fostering sustainable behaviours.

GreenComp is structured around four interconnected competence areas that address sustainability in a comprehensive way:

1. **Embracing Complexity in Sustainability:** Understanding interconnections and recognizing the complexities of sustainability challenges.
2. **Future-Oriented Thinking:** Envisioning sustainable futures and exploring how actions today shape tomorrow.
3. **Sustainability Values:** Acknowledging and adopting values that promote sustainable development and responsible behaviour.
4. **Acting for Sustainability:** Translating sustainability knowledge into actions that bring about environmental, social, and economic improvements.

GreenComp provides a clear framework for developing sustainability competences across different age groups and contexts, enabling educators to adapt its principles to various learning environments. The framework emphasizes critical thinking, systems thinking, and collaborative problem-solving, equipping learners with the tools to navigate and address real-world sustainability challenges.

This official EU resource is designed to be integrated across diverse fields of education and training, encouraging educators to weave sustainability into subjects like science, economics, and citizenship education.

How GreenComp aligns with HEAT project and resources

GreenComp aligns closely with the objectives of the HEAT project, as both aim to empower individuals and communities to act for sustainability in response to climate challenges. The HEAT initiative's emphasis on education for heatwave preparedness and resilience can naturally incorporate GreenComp principles.

- **GreenComp advocates for embedding sustainability across subjects, a principle that aligns with HEAT's multidisciplinary nature.** Both GreenComp and HEAT recognize the importance of balancing global sustainability challenges with local action. By linking global phenomena, HEAT can help learners develop a dual perspective, understanding how their actions contribute to global goals like the UN's Sustainable Development Goals (SDGs).
- **GreenComp emphasizes that sustainability competences are not confined to formal education but should extend to lifelong learning and community engagement.** HEAT's resources, designed for diverse stakeholders, naturally support this, offering tools for teachers, trainers, and community leaders alike. By promoting GreenComp's ethos of lifelong learning, HEAT ensures that its impact extends beyond classrooms to influence entire communities.

1. Embracing Complexity in Sustainability

GreenComp emphasizes understanding the interconnections between environmental, social, and economic systems, which is a fundamental aspect of the HEAT project's focus on heatwaves.

¹⁰ European Commission: Joint Research Centre, GreenComp, the European sustainability competence framework, Publications Office of the European Union, 2022, <https://data.europa.eu/doi/10.2760/13286>



Heatwaves are not standalone phenomena; they are influenced by and influence multiple factors: urbanization, climate change, public health, and energy consumption.

The HEAT project provides an opportunity to teach learners to approach heatwave preparedness through systems and promotes a mindset that embraces complexity, helping learners see how their actions in one area—such as increasing green spaces—can have cascading benefits across multiple systems.

2. Future-Oriented Thinking

GreenComp encourages learners to think ahead, imagining and shaping sustainable futures. The HEAT project directly aligns with this through its focus on proactive preparedness and long-term resilience to heatwaves.

HEAT can use GreenComp to foster foresight skills by:

- Encouraging learners to explore “What if?” scenarios about future heatwave intensity, frequency, and societal impacts due to climate change.
- Challenging them to design sustainable solutions for heatwave adaptation, such as energy-efficient cooling systems, urban greening initiatives, or community heatwave response plans.
- Linking heatwave awareness to broader climate resilience goals, like reducing greenhouse gas emissions and increasing renewable energy use.

3. Sustainability Values

GreenComp places significant emphasis on nurturing values such as responsibility, empathy, and equity, which are essential in addressing sustainability challenges like heatwaves.

The HEAT project acknowledges that vulnerable groups such as the elderly, children, and low-income populations, are disproportionately affected by heatwaves. GreenComp principles can guide educators to emphasize equity by discussing the social dimensions of climate resilience and help learners internalize sustainability as a shared responsibility, creating a foundation for ethical action.

4. Acting for Sustainability

GreenComp’s ultimate goal is to inspire learners to translate knowledge into action, making sustainability an integral part of their daily lives and decisions. HEAT’s emphasis on operationalizing resources and fostering practical skills directly supports this outcome.

HEAT resources can be used to design real-world projects that allow learners to apply their knowledge, encourages both individual and collective action, inspire learners to adopt simple behaviours that contribute to heatwave resilience and sustainability (i.e, conserving water, using energy-efficient cooling methods, or advocating for community green spaces).



Annex 1: Primary research: survey conducted with students

Below is the outline and content of the survey submitted to students as part of the national primary research. This survey was conducted to gather comprehensive data on how heatwaves are taught in schools, alongside various aspects of student life and learning experiences.

Have you ever heard about heatwaves?

Dear students, this survey is conducted by professors from Belgium, Greece, Italy and Romania and is supported by the EU. By completing this survey, you will help us gather useful information about whether and how heatwaves are taught in schools. The completion of this survey is completely anonymous. Please, be as more sincere as possible. Any data you provide us will be used solely for the purpose of this research. You can stop answering and abandon this survey whenever you like.

Thank you in advance!

A. Participant's profile

A1. Your age is (in years): _____

A2. Where do you live?

- Belgium
- Greece
- Italy
- Romania

A3. In which grade of secondary school are you studying?

- Grade 5
- Grade 6
- Grade 7
- Grade 8

A4. Your gender is

- Male
- Female
- Other

A5. Regarding your environmental awareness how would you see yourself?

1	2	3	4	5
---	---	---	---	---

1 = Not at all environmentally aware

5 = Absolutely environmentally aware

A6. Have you ever taught about heatwaves?

- Yes
- No



B. Please, state your degree of agreement/disagreement to the following sentences

1 = Totally disagree

2 = Totally agree

B1. Climate change is making heatwaves less frequent and less intense

1	2	3	4	5
---	---	---	---	---

B2. Climate change is making heatwaves more frequent but less intense

1	2	3	4	5
---	---	---	---	---

B3. Climate change is making heatwaves more frequent and more intense

1	2	3	4	5
---	---	---	---	---

B4. Climate change is making heatwaves less frequent but more intense

1	2	3	4	5
---	---	---	---	---

B5. Climate change has no connection to heatwaves

1	2	3	4	5
---	---	---	---	---

B6. Heatwaves do not affect European cities differently from other regions

1	2	3	4	5
---	---	---	---	---

B7. Heatwaves can lead to an increase in air pollution in European cities

1	2	3	4	5
---	---	---	---	---

B8. Heatwaves can cause an increase in energy demand and strain on the power grid in European cities

1	2	3	4	5
---	---	---	---	---

B9. Heatwaves can cause negative health impacts for vulnerable populations in European cities

1	2	3	4	5
---	---	---	---	---

B10. Heatwaves can lead to economic impacts such as decreased productivity and tourism in European cities

1	2	3	4	5
---	---	---	---	---

B11. Heatwaves can exacerbate the urban heat island effect in European cities



1	2	3	4	5
---	---	---	---	---

B12. Heatwaves affect cities the same way across Europe

1	2	3	4	5
---	---	---	---	---

B13. Which of the following are key to making cities more resilient to heatwaves?

- 1. Redesigning urban landscapes with more vegetation and water
- 2. Implementing passive cooling strategies to improve thermal performance
- 3. Reduce energy consumption in buildings
- 4. None of the above
- 5. OTHER

B14. Sprinklers in open grounds and fans can play a role in cooling

1	2	3	4	5
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B15. Creating forests within cities and green corridors are an effective way to shift air mass to cool large areas within a city

1	2	3	4	5
---	---	---	---	---

B16. If you wear dark clothes you feel cool in summer

1	2	3	4	5
---	---	---	---	---

B17. Windows and doors should be opened at noon on hot days

1	2	3	4	5
---	---	---	---	---

B18. Fever, fatigue, and chest tightness common symptoms of heat stroke

1	2	3	4	5
---	---	---	---	---

B19. Some medicines can increase the risk of heatstroke

1	2	3	4	5
---	---	---	---	---

B20. High environmental temperature can cause death

1	2	3	4	5
---	---	---	---	---

B21. Heat waves are caused by high temperature and low rainfall

1	2	3	4	5
---	---	---	---	---

B22. Extreme heat exposure is responsible for heat-related illnesses

1	2	3	4	5
---	---	---	---	---



B23. Excess sweating during a heat wave can be a sign of heat stress

1	2	3	4	5
---	---	---	---	---

B24. Individuals suffering from heart problems are highly vulnerable during a heatwave

1	2	3	4	5
---	---	---	---	---

B25. The elderly and young ones are more vulnerable during a heat wave

1	2	3	4	5
---	---	---	---	---

B26. The greenhouse effect is mainly caused by the depletion of the ozone layer

1	2	3	4	5
---	---	---	---	---

B27. I take sunstroke prevention measures if a temperature warning is released

1	2	3	4	5
---	---	---	---	---

B28. During a heatwave I drink water only when I am thirsty

1	2	3	4	5
---	---	---	---	---

B29. During a heatwave I do not change my plans for outdoor activities

1	2	3	4	5
---	---	---	---	---

B30. When I go out, I implement good sunstroke prevention measures during a heatwave

1	2	3	4	5
---	---	---	---	---

B31. I pay more attention to the elderly, children, or weaker family members during a heatwave

1	2	3	4	5
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Annex 2: Primary research: survey conducted with teachers

Below is the structure and content of the survey submitted to teachers as part of the national primary research. This survey aimed to gather detailed information and data on whether and how heatwaves are taught in schools.

Teaching about heatwaves

Dear teachers, this survey is conducted by professors from Belgium, Greece, Italy and Romania and is supported by the EU. By completing this survey, you will help us gather useful information about whether and how heatwaves are taught in schools. The completion of this survey is completely anonymous. Please, be as more sincere as possible. Any data you provide us will be used solely for the purpose of this research. You can stop answering and abandon this survey whenever you like.

Thank you in advance!

A. Participant's profile

A1. Your age is (in years): _____

A2. You are from which of the following countries?

- Belgium
- Greece
- Italy
- Romania

A3. Your gender is

- Male
- Female
- Other

A4. Which is your highest degree?

- Graduate degree
- Masters degree
- PhD

A5. Regarding your teaching experience how would you consider yourself?

1	2	3	4	5
---	---	---	---	---

1 = Not experienced at all

5 = Very experienced

A6. Regarding your environmental awareness where would you see yourself

1	2	3	4	5
---	---	---	---	---

1 = Not at all environmentally aware

5 = Absolutely environmentally aware



A7. Have you ever taught your students about heatwaves?

- Yes
- No

B. Teaching about Heatwaves

B1. In which subject have you taught about heatwaves: _____

B2. Where there any available resources to help you teach about heatwaves?

- Yes
- No

B3. Are heatwaves part of the curriculum you are supposed to teach?

- Yes
- No

B. Teaching about Heatwaves

B1. In which subject have you taught about heatwaves: _____

B2. Where there any available resources to help you teach about heatwaves?

- Yes
- No

B3. Are heatwaves part of the curriculum you are supposed to teach?

- Yes
- No

C. Please, state your degree of agreement/disagreement to the following sentences

1 = Totally disagree

2 = Totally agree

C1. Climate change is making heatwaves less frequent and less intense

1	2	3	4	5
---	---	---	---	---

C2. Climate change is making heatwaves more frequent but less intense

1	2	3	4	5
---	---	---	---	---

C3. Climate change is making heatwaves more frequent and more intense

1	2	3	4	5
---	---	---	---	---

C4. Climate change is making heatwaves less frequent but more intense

1	2	3	4	5
---	---	---	---	---



C5. Climate change has no connection to heatwaves

1	2	3	4	5
---	---	---	---	---

C6. Heatwaves do not affect European cities differently from other regions

1	2	3	4	5
---	---	---	---	---

C7. Heatwaves can lead to an increase in air pollution in European cities

1	2	3	4	5
---	---	---	---	---

C8. Heatwaves can cause an increase in energy demand and strain on the power grid in European cities

1	2	3	4	5
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C9. Heatwaves can cause negative health impacts for vulnerable populations in European cities

1	2	3	4	5
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C10. Heatwaves can lead to economic impacts such as decreased productivity and tourism in European cities

1	2	3	4	5
---	---	---	---	---

C11. Heatwaves can exacerbate the urban heat island effect in European cities

1	2	3	4	5
---	---	---	---	---

C12. Heatwaves affect cities the same way across Europe

1	2	3	4	5
---	---	---	---	---

C13. Which of the following are key to making cities more resilient to heatwaves?

- Redesigning urban landscapes with more vegetation and water
- Implementing passive cooling strategies to improve thermal performance
- Reduce energy consumption in buildings
- None of the above

C14. Sprinklers in open grounds and fans can play a role in cooling

1	2	3	4	5
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C15. Creating forests within cities and green corridors are an effective way to shift air mass to cool large areas within a city

1	2	3	4	5
---	---	---	---	---



C16. If you wear dark clothes you feel cool in summer

1	2	3	4	5
---	---	---	---	---

C17. Windows and doors should be opened at noon on hot days

1	2	3	4	5
---	---	---	---	---

C18. Fever, fatigue, and chest tightness common symptoms of heat stroke

1	2	3	4	5
---	---	---	---	---

C19. Some medicines can increase the risk of heatstroke

1	2	3	4	5
---	---	---	---	---

C20. High environmental temperature can cause death

1	2	3	4	5
---	---	---	---	---

C21. Heat waves are caused by high temperature and low rainfall

1	2	3	4	5
---	---	---	---	---

C22. Extreme heat exposure is responsible for heat-related illnesses

1	2	3	4	5
---	---	---	---	---

C23. Excess sweating during a heat wave can be a sign of heat stress

1	2	3	4	5
---	---	---	---	---

C24. Individuals suffering from heart problems are highly vulnerable during a heatwave

1	2	3	4	5
---	---	---	---	---

C25. The elderly and young ones are more vulnerable during a heat wave

1	2	3	4	5
---	---	---	---	---

C26. The greenhouse effect is mainly caused by the depletion of the ozone layer

1	2	3	4	5
---	---	---	---	---

C27. I take sunstroke prevention measures if a temperature warning is released

1	2	3	4	5
---	---	---	---	---

C28. During a heatwave I drink water only when I am thirsty



1	2	3	4	5
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C29. During a heatwave I do not change my plans for outdoor activities

1	2	3	4	5
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C30. When I go out, I implement good sunstroke prevention measures during a heatwave

1	2	3	4	5
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C31. I pay more attention to the elderly, children, or weaker family members during a heatwave

1	2	3	4	5
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