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The EcoMystery Project:

Interactive Escape Rooms for Climate Crisis Awareness and Civic Engagement in School Education

The Needs Discovery Report

Project partners

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1. Introduction

1.1 Background of the Eco Mystery Project

Summer 2023 shattered records across Europe (Copernicus 2024), only to be surpassed by 2024 (Copernicus 2025). Sweltering temperatures are bringing not only discomfort, but also an increasingly **growing sense of alarm**. Wildfires rage through forests, floods overwhelm cities, and communities watch as familiar landscapes are ravaged or disappear before their eyes. Local administrations scramble to respond, while scientists continue to confirm (Milman et al. 2021) what many already sense: the climate crisis is no longer a distant threat. It is arriving faster and hitting harder than we had imagined.

The goal of limiting global warming to 1.5°C is slipping further out of reach (UN News 2025), and the effects are intensifying: from severe droughts to devastating floods and ever-increasing storm intensity. Yet these impacts don't look the same in every region and neither should our response. In moments like this, it's easy to feel powerless. But the **EcoMystery project** was born from a different belief: that education can empower people to act, especially when it's creative, engaging, and community-driven. By helping young people understand the climate crisis in ways that are meaningful and hopeful, we're not just teaching facts – we're shaping a generation ready to protect their future.

Instead of lectures and long reports, EcoMystery brings the climate conversation into the classroom through creativity and play. By using **digital and physical Escape Rooms** as immersive, problem-solving adventures, we're turning complex environmental issues into engaging learning experiences. These activities don't just teach facts; they inspire curiosity, critical thinking, and teamwork.

The Escape Rooms form a key part of the project's **Teachers Advancement Program** (TAP) that will help teachers feel confident in guiding students through climate topics. This will also include an **"Escape the Climate Crisis" Coursework** with hands-on

activities that challenge students to think like citizens of tomorrow, as well as a digital **EcoMystery Platform** that offers students and teachers a fun, innovative way to explore and understand the many dimensions of the climate crisis through gamification methods.

EcoMystery is more than a project – it's a call to action. It's about giving young people the knowledge, tools, and most importantly, the belief that they can make a difference. Because if we want a future that's green, resilient, and fair, it starts with **empowered minds and hopeful hearts**.

1.2 Purpose of the Needs Discovery Report

Before we can motivate change, we must understand what's missing. That's why one of the first steps in the EcoMystery project is to listen closely to teachers, students, and families across five partner countries: Italy, Greece, Slovakia, Romania, and Portugal.

Through the **Needs Discovery Report (NDR)**, we're diving into classrooms and communities to explore how well young people are being prepared to face the realities of the climate crisis. What do students already know? What tools do teachers need? Where are the gaps? This report isn't just about collecting data – it's about hearing voices, capturing experiences, and uncovering the real challenges schools face when trying to teach such a complex and urgent topic.

We'll also explore how gamification – especially Escape Room methods – can help turn passive learning into active engagement. By identifying what is already working well and what could be improved based on the needs assessment, we can shape educational tools that don't just inform, but inspire.

The insights we gather will guide the entire EcoMystery journey – shaping the tools and materials we will create. Because these findings matter far beyond the project itself, they'll also form the basis of a **Policy Recommendations Booklet**: a practical guide designed to support those in a position to shape climate education. Aimed at

educators, policymakers, and educational institutions, both the NDR and the Policy Booklet will offer valuable direction for making climate-related learning more impactful, relevant, and accessible.

At its heart, this phase is about understanding where we stand, so we can move forward with clarity, creativity, and a shared sense of purpose.

1.3 Structure of the Report

National Desk Research

The Needs Discovery Report begins with the findings of the desk research conducted by each partner country (5 sections). This research offers a window into the current landscape of climate change education across some European countries. Each one begins by exploring how climate topics are addressed in schools today, outlining **both national and local policies and curriculum requirements**. From there, the research highlights inspiring examples of initiatives that are already making a difference in classrooms.

Cross-country Comparative Analysis

After establishing the state-of-the-art for each partner country, the report dives into the cross-country results of the **online surveys** conducted with teachers, students, and their families, as well as **focus group interviews** with teachers, all of which help to paint a clear picture of the **common threads and unique differences** that shape climate education in Europe today. It highlights the shared desire among educators to do more: to teach climate change not just as a scientific issue, but as a call for action, responsibility, and hope. A key focus is on gamification – how familiar teachers are with using it, particularly through digital tools like Escape Rooms, and how confident they feel incorporating them into their lessons.

The Needs Discovery Report concludes with a summary of the transnational findings that will formulate a **jointly-developed adaptive approach** to the real-world challenges educators face: gaps in training, limited access to resources, and a need for greater

support in teaching such a complex and urgent topic. This approach will be designed to help schools and policymakers facing similar issues across Europe empower their teachers to guide the next generation of global citizens as they learn to navigate, adapt to, and ultimately help mitigate the effects of the climate crisis.

1.4 Research Methodology

Desk Research

The first step of the research was to establish a common baseline on the current state of climate change education and best practices being implemented in Europe. For this, each partner conducted web research on the legal norms, challenges faced by educators, and contemporary initiatives that exist in their countries. The findings from the desk research were then combined with the survey and focus group interviews to determine a holistic approach for creating the training materials and teaching resources that the project will deliver.

Surveys with Teachers, Students, and Families

After establishing the transnational context, online surveys were conducted with teachers, students, and families from primary and middle schools in each partner country. These included 25 open and closed questions for teachers, 17 for students, and 8 for their parents and families. Each group of surveys was divided into question clusters:

- **For teachers**, the clusters identified what methods they currently utilize in their climate change curriculum and how effective they believe these methods are, which subject areas of climate change they feel most and least confident teaching, what challenges and barriers exist that prevent them from effectively teaching about climate change, how familiar they are with gamification methods and how often they utilize digital learning tools in the classroom, and what suggestions they have for improving climate change education;

- **For students**, the clusters identified their current knowledge about climate change, how concerned they are about the phenomenon and what actions they take to mitigate the effects of climate change, how effective they believe current teaching methods are and what methods they would like to use more of to learn about climate change, and what challenges they face in their learning experience and recommendations for improvement;
- **For parents and families**, the clusters identified their current awareness about climate change, how effective they perceive their children's schools are in teaching about climate change, and what challenges they face when discussing the topic at home and recommendations on how they could be better supported.

For each country, online Google Form surveys were collected from participating schools between April and May 2025, for a total of 195 responses from teachers, 444 from students, and 215 from the parents and families of students. Copies of the surveys are annexed at the end of the report.

Focus Groups with Teachers and School Leaders

After having gathered and analyzed all the survey responses, the results were discussed with teachers of the surveyed schools to provide further elaboration on the key trends. A number of teachers were selected in each partner country for the focus group meetings, with a total of 20 teachers interviewed and 6 meetings. The modality of the meetings was a mix of in-person and virtual exchanges according to local realities. These meetings helped to clarify the findings of the surveys and ensure that any additional insights were exploited for the conclusions.

2. National Desk Research

2.1 Italy's Research Findings

Italy has been at the forefront of integrating climate and environmental education into its school curricula in recent years, becoming one of the first countries to embed climate change education formally into its education law and national curriculum, signaling that environmental literacy is now considered an essential component of citizenship education.

A key milestone was **Law 20 August 2019, n. 92**, which made civic education – including environmental and sustainability topics – a mandatory cross-curricular subject in all grades starting from the 2020/2021 school year. This law ensures that *at least 33 hours per year* (roughly one hour per week) are devoted to education for sustainable development, climate change, and environmental protection, in line with Italy's commitment to UN Agenda 2030 goals (notably Target 4.7 on education for sustainable development and 13.3 on climate awareness).

To support this mandate, the Ministry of Education (MIUR) issued official **Guidelines for Civic Education** in June 2020 (MIM 2024), detailing how schools should update their curricula to include sustainability and climate change topics across various subjects.

In 2021, the Ministry of Education launched the **"RiGenerazione Scuola"** (MIM n.d.) strategy – a nationwide program to promote the ecological transition of schools, supported by public-private partnerships and aligned with Agenda 2030 and Italy's Recovery Plan (PNRR). The program created a "Green Community" network of institutions (including ISPRA, the national environmental research institute) to develop and share educational materials on climate and sustainability.

Current state of climate education in schools

Implementing these ambitious policies in everyday school practice has been an ongoing challenge. Since September 2020, schools have been required to incorporate the new cross-curricular civic education (with environmental sustainability as a core pillar) for all students. In theory, this means each school year includes dedicated lessons on climate change, sustainability, and environmental protection. In practice, however, the rollout has encountered variability and some gaps between the *theoretical framework* and *actual application*. The Ministry of Education itself recognized the need for support and evaluation – in 2022 it launched a nationwide **monitoring survey** (MIM 2022) on how schools introduced civic and climate education during the first two years of implementation. Based on this review, the Ministry planned to refine its guidelines by the 2022/2023 school year to address observed shortcomings and better assist schools. This indicates that while the mandate was in place, the *depth and consistency* of implementation needed improvement.

One discrepancy noted has been the **reliance on existing teacher expertise and initiative**. The law introduced climate change content, but did not create a new standalone subject – instead, it must be taught by existing teachers of various subjects (science, geography, physics, etc.) as part of an interdisciplinary approach. Many educators have embraced the spirit of the reform, incorporating climate topics into their lessons. However, **teachers often lack adequate training and resources** to teach climate change in a detailed and confident manner. A World Bank-supported study in 2023 (Sabarwal et al. 2024) highlighted that even when teachers attempt to cover climate issues, they may not have the "tools to do so accurately and effectively," calling for more teacher training and materials in climate science and pedagogy.

This mirrors feedback from Italian schools: some teachers report uncertainty about content, and time constraints in an already crowded curriculum. While the law mandates 33 hours per year, schools have flexibility in how to distribute these hours, leading to differences in implementation. Some schools created a dedicated weekly

hour for **"Educazione Civica"** focusing on sustainability; others integrate the content into science or geography classes. In cases where coordination or teacher preparedness is lacking, the climate education component can be superficial or left to the enthusiasm of individual teachers.

The COVID-19 pandemic, which struck just as the new curriculum was to start (2020–2021), also posed challenges. Shifting to remote learning and dealing with disruptions meant some planned training and activities were delayed. Nonetheless, many schools leveraged online tools and external resources to keep climate education on the agenda.

By 2021–2022, with schools back in person, implementation picked up speed. The government's monitoring (a voluntary survey of schools) and feedback from educators have been used to update the support given. For example, the Ministry's guidelines emphasize project-based learning and student engagement in sustainability, and these approaches have gradually taken root. Still, it's clear that **full practical adoption is a work in progress** – strong in some schools and nascent in others. The gap between the policy's ambitions and on-the-ground reality is mainly due to variability in teacher training, resource availability, and school prioritization. Addressing these will be key to ensuring that climate change education is not just a policy on paper but a lived experience for all Italian students.

Best Practices and Initiatives with a Focus on Veneto Region

Despite the challenges, numerous **successful initiatives and best practices** have emerged across Italy, often spearheaded by proactive schools, local authorities, or partnerships with environmental organizations.

In the Veneto region in particular, schools and institutions have been very active in innovating climate change education. A prominent example is the collaboration with **ARPAV (Agenzia Regionale per la Protezione Ambientale del Veneto)**, which for years has offered free educational programs on sustainability to schools. Each year ARPAV

provides a catalog of projects and learning pathways for all school levels – from kindergarten to high school – covering topics like climate science, waste reduction, air quality, and sustainable lifestyles. These include hands-on laboratories, quizzes, and contests that encourage students to adopt eco-friendly behaviors in line with the UN Agenda 2030 goals. For instance, in the 2023/24 school year ARPAV rolled out five interdisciplinary projects (such as *"La vita sott'acqua"* on marine protection and *"A scuola di stili di vita"* on sustainable habits) available to all schools in Veneto, with participation free of charge. Such programs have been well-received; many Veneto schools routinely join these initiatives, integrating them into their curriculum as practical extensions of classroom learning.

Schools in Veneto have also distinguished themselves in national and EU-funded projects. A notable project is **CleanAir@School** (ARPAV 2022), a citizen-science initiative coordinated by ISPRA at the national level, which involved schools in monitoring local air quality. In Veneto, ARPAV coordinated with the city of Treviso and three of its schools to have students measure air pollution around their campuses and learn about climate-related urban environmental issues. Projects like this serve a dual purpose: students contribute to real scientific data collection while gaining awareness of climate change impacts on their community. The region's education authorities (Ufficio Scolastico Regionale del Veneto) actively promote such best practices by disseminating calls for projects and teacher training opportunities. For example, in 2023 the Veneto school office advertised the **CLIMADEMY** program – an EU Erasmus+ teacher training project on climate change – inviting local teachers to participate and upgrade their skills in climate education methodologies.

Several **individual schools** have become showcases of climate education. Many secondary schools have set up "eco-committees" or clubs where students lead recycling campaigns, energy-saving measures, or even create vegetable gardens, applying what they learn in civics class to their school's operations. In 2023, a network of high schools called *Licei TRED* (for *Transizione Ecologica e Digitale*) was piloted in

partnership with a national foundation, aiming to integrate sustainability across all aspects of school life. Veneto schools like the Liceo "G.B. Quadri" of Vicenza have long histories of environmental education; as early as 2005 that school ran an interdisciplinary climate science project with ARPAV's meteorological center, and today they continue to be leaders in involving students in climate research and awareness projects.

At the **primary and middle-school level**, teachers in Veneto have embraced creative approaches – from storytelling about environmental issues for young children, to science projects measuring the school's carbon footprint for older students. Many of these efforts have been celebrated as best practices and shared at conferences or on online platforms so that other schools around Italy can replicate them.

Beyond the classroom, **community partnerships** amplify these successes. Veneto's municipalities and local NGOs often support school projects on climate change. Energy companies, environmental associations (like Legambiente Veneto), and even museums provide expertise and venues for students to experience sustainability in action. A successful example is the **"Energy – Agire a scuola per l'ambiente"** (6) project by NGO AVSI, which in its second edition (2023) operates in Veneto (along with a few other regions) to deepen climate change understanding in secondary schools. This project involves experts delivering modules on climate science for teachers and students, followed by student-led projects and field trips. The strength of such initiatives lies in making climate education interactive and empowering: students collaborate to propose solutions and even compete or share their work with peers from other schools.

In short, the Veneto region illustrates how a combination of government support, enthusiastic educators, and external partners can bring the climate curriculum to life.

Data and Case Studies: Impact and Insights

Several recent data points and testimonials shed light on the impact of climate change education in Italy since 2020. Surveys indicate that **young Italians are highly engaged and concerned** about climate issues: nearly 9 out of 10 Italian adolescents (86%) report being worried about the effects of climate change on their future (Green Economy Agency 2024). This high level of concern, sometimes termed *"eco-anxiety"*, underscores the importance of school education in channeling students' worries into knowledge and action. Indeed, programs like AVSI's *Energy* project explicitly aim to address these feelings – by increasing understanding and promoting practical responses, they help students and teachers feel more equipped to deal with climate anxiety. Early results from the *Energy* initiative illustrate strong participation: in its first year (2022–2023), it involved **110 teachers and over 1,000 students across 50 schools**, who collectively carried out lessons and projects on climate and environmental protection. According to the organizers, this approach of "conoscere per agire" ("know in order to act") made both youths and adults more aware and prepared to tackle climate challenges. Such quantitative outcomes suggest that when structured support is provided, schools enthusiastically engage a large number of students in climate education beyond the minimum curriculum.

Qualitative insights from educators and students further highlight both the benefits and ongoing needs in this field. *"What we want to change in our students is their way of acting... we want to go beyond concepts and instill in them the leadership to feel responsible for the planet around them,"* says Nicola Benvenuti, a primary school teacher who piloted a climate education project in his 4th grade class. Benvenuti's experience, part of the Teach For Italy fellowship program, serves as a case study in effective climate education (Quaderno TFI 2024). He started with simple, practical steps – like having students keep their classroom clean and measure their food choices' environmental impact – to build awareness. Initially, his students had little understanding of how their daily habits (e.g. diet, waste) related to global climate

issues. After a few months of hands-on activities and discussions, he observed a transformation: **students adopted sustainable habits** and even became influencers at home, teaching their parents about recycling and mindful consumption. *"From a fast-food culture, they became aware of the nutritional and environmental implications of their choices,"* he notes, explaining that his class's project evolved into a movement that involved the whole school community. This testimony exemplifies how climate change education, when delivered with passion and creativity, can empower students as change-makers. It also shows the ripple effect – informed students can influence peers and families, multiplying the impact.

Another insight comes from the distribution of efforts across schools. While many schools are doing well, not all have equal resources. Grassroots programs have tried to fill the gaps in under-resourced areas. In 2023, Teach For Italy reported that in the first year of its Climate Education initiative, **15 fellows brought climate-change lessons to around 300 students** in schools located in areas of high educational disadvantage. This indicates both progress and the need for continued support: targeted efforts are reaching students who might otherwise receive minimal exposure to sustainability topics. On the other hand, broader surveys (including a World Bank report and EU teacher polls) reinforce that **lack of teacher training and materials** remains the chief obstacle to fully realizing Italy's climate education goals.

Many teachers express a desire for more professional development on climate issues. The Italian government's ongoing investments – such as funding teacher training modules, creating online resource portals, and fostering school networks – are attempts to meet this need.

In summary, the period from 2020 onwards has seen Italian schools begin to transform climate change education from a legal mandate into lived reality. The **quantitative data** (hours mandated, teachers and students reached in special projects) and **qualitative experiences** (testimonials of increased student engagement and behavior change) both suggest a positive trend. Students are widely aware of the climate crisis, and

when given the opportunity, they respond with enthusiasm and creativity. Teachers who receive support and training are able to deliver impactful lessons that connect classroom learning with real-world action. However, the case studies also highlight that sustaining this momentum will require addressing gaps – ensuring all teachers have the necessary knowledge and tools, and that all schools, not just the most proactive, fully integrate climate change into their culture. The Italian example so far offers a hopeful model: strong legislation and policy commitment, combined with local innovation and passion, can make climate change education a cornerstone of the curriculum. With continuous improvement and support, Italian schools are poised to equip a generation of students with the skills and mindset to tackle the climate challenges of their future.

2.2 Portugal's Research Findings

In Portugal, environmental concerns emerged early on, as reflected in the country's participation in various conferences held under the auspices of the United Nations and in the implementation of the measures agreed upon at those events. Portugal's pioneering spirit in the field of environmental issues is worth highlighting, particularly through the creation of the **League for the Protection of Nature** (LPN), initiated by **Professor Carlos Baeta Neves in 1948**, and the establishment of a **Working Group on Air Pollution in 1966** (Portaria No. 22035 of 06/06/1966).

In 1986, the National Association for Nature Conservation (QUERCUS) was founded. That same year saw the publication of the **Basic Law of the Education System** (Law No. 46/86, of 14 October), which formally recognized **environmental education** as one of the new objectives in student training, covering all levels of education. It was also during this period that the **Coastwatch Program** (promoted by **GEOTA**) was implemented (Silveira & Teixeira, 2019).

Other legal and institutional developments helped integrate environmental education into the Portuguese education system:

- **1987**: Publication of the **Basic Environmental Law** (Law No. 11/87 of 7 April); the **Law on Environmental Protection Associations** (Law No. 10/87 of 4 April); and the creation of the **National Environment Institute** (INamb).
- **1990**: Creation of the **Ministry for the Environment and Natural Resources** and the founding of the **Portuguese Association for Environmental Education (ASPEA).**
- **1992**: Portugal participated in the **Rio Earth Summit**, and the **INamb** was replaced by the **Institute for Environmental Promotion** (IPAMB).
- **1995**: Publication of the **First National Environmental Policy Plan**.
- **1996**: Implementation of the **Eco-Schools Program** (run by ABAE) (Gonçalves et al., 2020).
- **1997**: Establishment of the **National Network of Ecotecas by IPAMB**.

In alignment with its commitments to the **European Union** and to **international forums**, Portugal has strengthened public action in the field of environmental education, promoting cooperation between the **Ministries of Environment and Education**. In **1996**, a **cooperation protocol** was signed between these two ministries, aiming to integrate environmental education into **pre-school, basic and secondary education**. Within the framework of this agreement, a **network of teachers** was created to develop and coordinate environmental projects in schools, in partnership with **Environmental NGOs (ONGA)** or **environmental education support centers** (Silveira & Teixeira, 2019; Sousa & Oliveira, 2019).

In **December 2005**, a new **Cooperation Protocol** was signed between these ministries, with the goal of reinforcing joint efforts in the field of environmental education. To monitor and implement the actions foreseen in this protocol, the **Environmental Education for Sustainability Working Group** (GTEAS) was established in **2009**. This group includes **two representatives from the Directorate-General for Education (DGE), two from the Portuguese Environment Agency (APA), one from the Institute for**

Nature Conservation and Forests (ICNF), and one from the Directorate-General for School Establishments (DGEstE) (Direção-Geral da Educação, n.d.).

Over the years, this collaboration between the Environment and Education ministries has led to the implementation of numerous environmental education projects in schools, targeting various levels of education. This cooperation has also taken on a significant role in the context of national programs and strategies related to the environment and sustainability. The two ministries have thus aligned their efforts in the development of **environmental education for sustainability projects**, supporting initiatives from schools and organizations – particularly NGOs – focused on carrying out **structured projects aimed at diverse educational communities** (Ramos et al., 2022).

Current State of Climate Change Education in Schools

Since the 1980s, Environmental Education in Portugal has evolved significantly, shifting from isolated initiatives to a more structured and integrated approach. In the 1980s, actions were mostly limited to individual projects developed by schools, local authorities, and civil society organizations, reflecting a growing environmental awareness, albeit without a consolidated national strategy (Sousa & Oliveira, 2019).

The 1989 Education System Reform, implemented by Decree-Law No. 286/89 of 29 August, established guidelines for the development of citizenship education in its various dimensions within the school curriculum. In the 1993/94 school year, the curricular plans introduced by this reform became widespread. Although environmental issues were present across all subjects in basic and secondary education – such as Environmental Studies, Personal and Social Education, Natural Sciences, Geography, History, Foreign Language, Philosophy, Chemistry, and Biology – this inclusion was not always explicit or integrated with the social, political, and economic aspects linked to the theme (Azenha, 2022).

In the **1990s**, the first steps toward the institutionalization of Environmental Education were taken. In 1996, a cooperation protocol was signed between the Ministries of Education and Environment, marking a turning point by promoting environmental education in pre-school, basic, and secondary education. As part of this protocol, a network of teachers engaged in environmental projects was established, in collaboration with Environmental Non-Governmental Organizations (ENGOs) and environmental education support centers (Silveira & Teixeira, 2019; Gonçalves et al., 2020).

In 1997, the **Curricular Guidelines for Pre-School Education** (OCEPE) were approved by Dispatch No. 5220 of 10 July, introducing the **Area of Knowledge of the World** as a content area. This document provided guidance for the promotion of educational activities with a scientific focus, including topics related to the environment (Direção-Geral da Educação, n.d.).

Despite the development of significant projects in the "School Area", the lack of dedicated teaching hours for this non-disciplinary curricular area limited widespread implementation in schools.

The autonomy granted to schools under Decree-Law No. 115-A/98 of 4 May accelerated the development of environmental education. The **Curricular Reorganization of Basic Education (2001)** and the **Secondary Education Reform (2004)** introduced a more systemic and integrated approach to citizenship education in all its dimensions.

By the 2000s, environmental education became more explicitly embedded in the **National Curriculum**, particularly through subjects like Natural Sciences and Geography. Structured programs such as Eco-Schools also emerged, mobilizing school communities towards sustainable practices (Gonçalves et al., 2020). National strategies were launched to guide environmental education efforts, such as the **National Strategy for Environmental Education (ENEA)** (Silveira & Teixeira, 2019).

Following the Curricular Reorganization of Basic Education, citizenship education was established as a **mandatory cross-curricular area**, integrated across all subjects and embedded in the organization and rules of school life. Non-disciplinary curricular areas (Project Area, Accompanied Study, and Civic Education) were introduced as key spaces for addressing themes like environmental education for sustainability (Azenha, 2022).

Curricular programs in Geography, Natural Sciences, and Physics and Chemistry were replaced by curricular guidelines that strengthened the link between Science, Technology, Society, and Environment, encouraging a critical approach to economic and technological development. **The three pillars of sustainability – economic, social, and environmental – were integrated into the curriculum**, allowing environmental education to be addressed in a holistic way (Ramos et al., 2022).

In secondary education, as part of the curriculum development process established by Decree-Law No. 74/2004, **citizenship education was also adopted as a cross-cutting area** in all programs. Consequently, all subjects in the curriculum began to incorporate the development of **cross-disciplinary competencies** within the broader framework of citizenship education, including environmental education for sustainability.

From the 2010s onwards, Environmental Education adopted a broader perspective, evolving into **Education for Sustainability**, aligned with **the United Nations Sustainable Development Goals (SDGs)** (Silveira & Teixeira, 2019; Andrade, 2018). Sustainability became one of the mandatory domains of the National Strategy for Citizenship Education, reflecting a national commitment to nurturing informed and engaged citizens.

There was also a strengthened focus on continuous teacher training and networking among schools, local authorities, ENGOs, and other stakeholders.

The cross-curricular nature of **Environmental Education for Sustainability (EES)** within a broader framework of citizenship education continued to be supported by the

principles defined in Decree-Law No. 139/2012 of 5 July, which established a revised structure for basic and secondary education curricula.

In **Pre-School Education**, the **Area of Knowledge of the World** aims to foster awareness of both social and natural sciences, integrating and mobilizing learning from other areas expressed in the OCEPE. This area also promotes respect for the environment and cultural values, establishing a close relationship with the **Area of Personal and Social Development**.

By **Dispatch No. 6478/2017 of the 26th of July**, the **Student Profile upon Leaving Compulsory Education (PA)** was approved. This document serves as a reference for decision-making by education institutions and policymakers and functions as a common framework for all schools and educational offerings within compulsory education. In this profile, **one of the eight guiding principles is sustainability**, with **citizenship and participation** identified as one of five core values, and **well-being, health, and the environment** as one of ten areas of competence (Direção-Geral da Educação, n.d.).

As part of the priorities defined in the program of **the 21st Constitutional Government**, a pilot project was authorized for the **autonomy and curricular flexibility** of basic and secondary education, launched in the 2017–2018 school year (Dispatch No. 5908/2017 of 5 July). This legislation introduced the **Citizenship and Development** curriculum component across all school years of basic and secondary education. The various domains of Citizenship Education were organized into three groups with different levels of implementation. **The first group is mandatory for all education levels and cycles**, as it includes cross-cutting and longitudinal areas. Environmental Education is part of this group and follows the **Environmental Education for Sustainability Framework** as its guiding document (Direção-Geral da Educação, n.d.; Ramos et al., 2022).

In summary, Portugal has made a consistent and progressive journey in the field of Environmental Education, moving from a fragmented approach to full integration within the education system, promoting **active citizenship and sustainability** as key pillars in shaping future generations (Silveira & Teixeira, 2019; Azenha, 2022). The adoption of comprehensive curricular frameworks, teacher training, and institutional collaboration has contributed to raising **climate literacy** and environmental awareness among students (Ramos et al., 2022; Gonçalves et al., 2020). This development aligns with global goals, such as those set out in the **United Nations' Agenda 2030 and the Sustainable Development Goals** (SDGs), reinforcing the country's commitment to Education for Sustainability (Andrade, 2018).

2.3 Slovakia's Research Findings

Legislation and Policy Framework

Slovakia's approach to climate change is guided by a structured and evolving legislative and policy framework, developed in alignment with European Union directives and international climate commitments such as the Paris Agreement. The Ministry of Environment of the Slovak Republic is the central body responsible for coordinating the nation's climate strategy. It works in cooperation with other governmental agencies to implement policies that support both mitigation of and adaptation to climate change (UNFCCC, 2024).

One of the core documents in this area is the *Strategy for Adaptation to Climate Change of the Slovak Republic (2018–2025)*, which outlines the country's strategic response to the increasing risks posed by climate change. This strategy highlights the importance of strengthening institutional capacities and enhancing public awareness, including through formal education. It sets out priorities across multiple sectors such as water management, agriculture, forestry, health, and urban development (Ministry of Environment 2018, Klima-Adapt, 2024).

To ensure practical implementation of these strategic goals, the Slovak government approved the Action Plan for the Implementation of the Climate Change Adaptation Strategy (2021–2027). This plan introduces specific measures, responsibilities, and timelines for various institutions. Importantly, it acknowledges education as a critical sector for fostering long-term resilience by promoting environmental literacy and sustainable behavior among young people (Klima-Adapt, 2024).

These targeted climate strategies are complemented by broader environmental policies, including the *Greener Slovakia – Environmental Policy Strategy until 2030*. This policy outlines Slovakia's long-term sustainability goals, which include enhancing biodiversity, transitioning to a circular economy, and integrating environmental and climate themes into all levels of education (Ministry of Environment, 2019; Klima-Adapt, 2024).

At the international level, Slovakia's environmental and climate efforts are influenced by global human rights frameworks. The United Nations Human Rights Council has recognized the right to a clean, healthy, and sustainable environment as a fundamental human right. Slovakia's alignment with this principle reflects a growing awareness of the intersection between environmental policy, public health, and human dignity (UN Human Rights Office, 2022).

From an educational perspective, the Ministry of Education, Science, Research and Sport has taken specific steps to embed environmental and sustainability themes into formal curricula. An important development came in August 2022, when the Ministry announced that environmental education would become a mandatory part of the national curriculum starting in the 2026/27 academic year. In 2023, revised state educational programs for both primary and lower secondary schools were approved, developed by the Štátny pedagogický ústav (State Pedagogical Institute). These updated programs emphasize sustainability, ecological literacy, and interdisciplinary learning. Climate and environmental issues are not only addressed in science education, but also in geography, civic education, and language and literature classes

(Ministry of Education, 2023a; ŠPÚ, 2023a). This reform is designed to equip students with the competencies needed to face global climate challenges. It emphasizes experiential learning – including outdoor activities, community engagement, and student-led environmental projects – and aligns with Slovakia's national recovery and resilience plan (Eurydice, 2023).

These legislative and curricular frameworks reflect Slovakia's growing recognition that education plays a key role in meeting the country's climate neutrality target for 2050. Through a whole-system approach, Slovakia aims to prepare its young citizens not just to understand the science of climate change but also to become engaged actors in building a sustainable future.

Current state of climate change education in schools

Climate change education in Slovakia is increasingly being integrated into the formal education system, primarily through cross-curricular approaches integrated into several subjects within the national curriculum for both primary and lower secondary levels rather than as a standalone subject. The interdisciplinary approach is designed to provide students with a broad understanding of climate-related issues while developing critical thinking and environmental responsibility.

Primary Education

In primary education, Nature studies play a leading role in introducing pupils to climate-related concepts. Students explore the composition and functioning of the atmosphere, global climate zones, and the causes and consequences of global warming. Lessons also emphasize the human impact on nature and provide space for discussions on how individuals and communities can contribute to climate change mitigation (Ministry of Education, 2023a, p. 83).

Slovak Language and Literature also includes environmental and climate topics in reading comprehension and oral communication tasks. Students engage with texts focused on topics such as pollution, sustainability, and nature protection. These

lessons are designed not only to improve language skills but also to encourage students to express their personal opinions and values related to the environment (Ministry of Education, 2023a, pp. 30–32).

Foreign language education, particularly in English, also includes environmental themes. Pupils encounter vocabulary and topics related to environmentally friendly housing, different modes of transportation and their environmental impact, and broader themes like climate protection and sustainable lifestyles (Ministry of Education, 2023a, p. 397). These lessons help students build both language proficiency and environmental awareness.

A strong environmental perspective is also present in the educational area called "Man and Nature." This cross-cutting topic emphasizes students' active interest in the natural world and encourages a responsible and engaged attitude toward natural resources, environmental protection, climate issues, and human health. The curriculum fosters the idea that students' actions matter – that they can influence environmental systems and contribute positively through informed decisions and behavior. It also supports their curiosity and interest in science and research activities (Ministry of Education, 2023a, p. 468).

The revised national curriculum for the second stage of primary education (lower secondary) recommends that environmental and climate topics be addressed across subjects, promoting cross-disciplinary learning and more practical applications (ŠPÚ, 2023a).

In addition to subject-specific content, environmental issues are incorporated through the cross-curricular literacy called environmental literacy, which aims to develop pupils' understanding of the relationship between humans and nature, support responsible behavior, and encourage active engagement in societal challenges. Pupils learn to identify components of the environment and understand the relationships between them, while developing a positive attitude toward nature and reflecting on

which human values and needs do – or do not – contribute to environmental protection and sustainability. They gain knowledge about the causes and consequences of environmental problems and analyze possible solutions, including those related to their own actions. Environmental literacy also includes an understanding of society and the economy's dependence on natural resources and encourages pupils to take responsibility, get involved, and collaborate in promoting sustainability.

On the attitudinal level, emphasis is placed on perceiving the value of nature and public space, and on reflecting on the consequences of one's actions in relation to fairness, equality, and intergenerational responsibility. The content dimension of environmental literacy includes understanding how natural systems work – from the local to the global level – and being able to identify environmental issues and propose age-appropriate solutions. The process dimension fosters skills for responsible behavior in nature, environmentally conscious decision-making, and active engagement in environmental protection through individual and group initiatives.

Secondary Education

At the secondary school level in Slovakia, climate change education becomes more detailed and in-depth, building on the foundations introduced in primary education. The national curriculum continues to promote an interdisciplinary approach, integrating environmental and climate topics across multiple subjects to ensure students develop a well-rounded understanding of both science and the societal implications of climate change

Geography remains one of the core subjects for climate education. In secondary classrooms, students delve deeper into global climate systems, analyze the causes and impacts of global warming, and explore strategies for environmental protection. These lessons support the development of analytical and systemic thinking, helping students understand complex global interconnections and the challenges of climate governance (ŠPÚ, 2023b).

Biology, Chemistry and Physics expand on these themes by providing a solid scientific foundation. Students study ecosystems, biodiversity, the role of carbon cycle and greenhouse gases in the climate system, laws of conservation, energy transformations, and energy sources including renewable. These subjects not only explain the science behind environmental changes but also underline the importance of evidence-based reasoning and scientific inquiry.

In Civic Education, climate change is explored through the lens of ethics, society, and policy. Students discuss sustainable development, national and international environmental legislation, and the political dimensions of climate action. These lessons aim to link scientific knowledge with real-world issues, encouraging students to reflect on their role as informed and active citizens.

Language and Literature classes, particularly in Slovak, incorporate climate and environmental themes through selected texts, discussions, and creative writing tasks. This approach promotes personal engagement and emotional connection with environmental issues, allowing students to process the topic in a reflective and expressive way.

Throughout secondary education, environmental literacy continues to be developed as a key cross-curricular competence. It guides students to understand the complex relationships between natural ecosystems, society, and the economy. Learners are encouraged to evaluate the consequences of their actions, recognize the value of natural resources, and think critically about long-term solutions to environmental challenges.

This environmental literacy framework supports the development of knowledge, values, attitudes, and skills needed for active and responsible participation in a sustainable future. Students learn to identify and analyze environmental problems, understand their root causes, consider the impact on future generations, and take

informed and meaningful action – whether individually or collectively, on a local or global scale.

Efforts to strengthen environmental education in secondary schools are also supported by institutions such as the State Institute of Vocational Education (SIOV). SIOV has developed various educational materials focusing on sustainable agriculture and environmental practices, such as "Technológie trvalo udržateľného poľnohospodárstva" ("Sustainable agriculture technologies") and "Arboristické štandardy" ("Arboricultural standards"). These resources indicate efforts to enhance environmental education. However, the availability and integration of such materials across all schools may vary, leading to inconsistencies in the quality and comprehensiveness of climate change education (SIOV, 2024).

However, challenges remain. The quality and availability of materials can differ across schools, and not all teachers may feel equally prepared to deliver interdisciplinary climate content. The weakness of teaching climate change as a cross-cutting theme is that there are no comprehensive teaching materials or textbooks. They are replaced by topic-based activities shared among teachers and educational materials outside the guarantee of the Ministry of Education. These are produced i.e. by the Slovak Environmental Agency, non-governmental organizations and institutions of non-formal education. This uneven implementation can lead to disparities in students' learning experiences and outcomes.

Despite these challenges, Slovakia's curriculum reforms and ongoing support for environmental education signal a strong and growing commitment to preparing young people for the realities of climate change. The focus on critical thinking, scientific understanding, ethical reflection, and active citizenship equips students not only to understand the climate crisis but to take part in shaping a sustainable future.

Yet, as with many curriculum reforms, the success of climate education in practice depends on consistent support for teachers, access to high-quality materials, and

opportunities for professional development. Bridging the gap between policy and classroom implementation will be essential to ensure that all students, regardless of region or school type, can engage meaningfully with climate-related content.

The following section presents the voices and perspectives of those at the heart of this effort - teachers, pupils, and families - who participated in surveys and focus groups as part of the EcoMystery project. Their experiences provide valuable insight into how these curricular intentions translate into classroom realities and offer guidance for the future development of climate education in Slovakia and beyond.

Informal Education and Experiential Programs

In addition to formal education, extracurricular activities and informal educational programs play an important role in fostering environmental awareness and strengthening children's connection to nature through direct experience. A good example of such practice is the educational work of the Bratislava City Museum, which, alongside its cultural and historical mission, is also engaged in environmental education.

As part of the Sutok festival, the Bratislava City Museum organized an experiential activity titled *Ecological Mission* – an escape room located in the grounds of Devín Castle. Festival participants could take part in the game in small groups of two to five players. The game combined environmental themes related to the natural surroundings of the castle with logic-based tasks and critical thinking about the proposals of fictional politicians from the perspective of their environmental impact. The aim was to support teamwork, analytical reasoning, and conscious evaluation of societal decisions in the context of the climate crisis.

In addition, the Bratislava City Forests operate the **Environmental Education Center at Kamzík**, which offers experiential learning programs for both schools and the public. Children here engage in topics such as biodiversity, the sustainable use of natural resources, forest protection, and the water cycle in a playful and interactive manner.

These activities contribute to the development of environmental literacy, motivate active interest in environmental protection, and complement formal school education with practical experience in real-world settings. They also support the integration of formal and non-formal education in line with the principles of a whole-institution approach to sustainability.

2.4 Greece's Research Findings

Legal Frameworks

Until recently, the subject of ***Climate Change*** was only marginally addressed in Greek education - if at all - mainly through supplementary programs rather than as part of a structured curriculum. While Environmental Education was formally institutionalized since **1990** through **Law 1892/1990**, this did not extend to the specific and pressing issue of Climate Change.

This began to change in **2022**, as Greece has started incorporating Climate Change into education through updated legal frameworks. Specifically, **Law 4936/2022** - known as the **National Climate Law** - serves as the key institutional framework for the country's climate adaptation efforts. According to Article 9, all central government bodies, including the Ministry of Education, Religious Affairs and Sports, are required to incorporate climate adaptation measures and actions into their strategic and operational planning.

In addition, **Ministerial Decision 66152/4** *(Υπ. Απόφαση 66152/ΓΔ4/2022 Πρόγραμμα Σπουδών "Περιβάλλον και Εκπαίδευση για την Αειφόρο Ανάπτυξη" του Νηπιαγωγείου, των Α' - ΣΤ' τάξεων Δημοτικού και των Α', Β' και Γ' τάξεων Γυμνασίου)* - ***Environment and Education for Sustainable Development*** - introduces the concept of education for sustainable development into the Greek educational system, providing guidelines for integrating environmental and sustainability issues into all subjects.

Current state of climate education in schools

In Greece, the integration of climate change education into the national curriculum has gained new momentum with the development of updated curricula across all school levels in **2023**. As part of the broader **Education for Sustainable Development** (Εκπαίδευση για την Αειφόρο Ανάπτυξη) framework, the new curricula provide explicit guidelines for embedding climate change topics across all grades, from preschool to upper secondary education.

Moreover, the ***Active Citizen Actions*** curriculum, starting in academic year **2024-2025** for all levels of compulsory education in Greece, integrates climate change as a central theme in civic education (MERS 2024). It promotes environmental responsibility and sustainability through experiential and collaborative learning; Students are encouraged to understand the social impacts of the climate crisis and to engage in collective, democratic action aimed at environmental protection, thereby linking climate change education with active citizenship. This approach is further reinforced through initiatives such as ***Climate Ambassadors for the Prevention of Heatwaves, Wildfires, Floods, and Earthquakes*** where students actively participate in community-based projects to identify and address climate-related challenges. Additionally, actions like ***Trees: Precious Guardians of the Climate*** involve students in tree-planting activities in their schoolyard and local community, fostering a deeper understanding of the role of trees in climate adaptation (Active Citizen Actions n.d.).

Climate change is addressed also within the context of the interdisciplinary **Skills Labs,** an innovative action in schools that fosters competencies such as environmental awareness, systems thinking, and active citizenship. The purpose is to make students better understand the world they live in, particularly the environmental challenges posed by anthropogenic climate change, and to encourage critical engagement and civic responsibility. Also, there are cross-curricula objectives set, for example that students, as responsible citizens, should be aware of the consequences of human activities on the environment. Project-based learning for more than 3 months

is possible, e.g. on the **Sustainable house** or the **Sustainable school** (European Commission Education and Training Monitor 2024).

Teachers also receive support in teaching learning for sustainability through the **Skill Labs** program. Teachers are provided with tailored educational resources and are supported by both the Institute for Educational Policy and regional environmental education centers, which organize seminars and assist in the planning and execution of school-based climate education activities.

However, academic research indicates that there is still a long way to go in effectively incorporating the topic of Climate Change into school education, even under the newly designed curricula[1]. For example, the report ***Climate Change in the New Curricula of Greek School*** indicates that the new curriculum mandates the inclusion of climate change topics across existing subjects, but *does not introduce it as a stand-alone subject*. Furthermore, references to climate change are often sparse or appear within courses that are not directly related to environmental science. Interestingly, while one might expect significant references to climate change in Science or Language / Literature subjects, this is not consistently the case. Instead, Climate Change is more prominently featured in less expected subject areas such as Arts, Home Economics, and Foreign Languages. In the latter two, this emphasis is due to dedicated curriculum units focused specifically on Climate Change, with learning objectives centered on that theme (Rorris et al. 2025).

Educational Initiatives

Beyond legislative frameworks, several educational initiatives have been implemented in Greece in order to integrate climate change awareness and action into school curricula.

[1] The 14th Panhellenic Conference on Science Education and New Technologies in Education, held in April 2025, engaged extensively with the issue of climate change in Greek schools, addressing both curricular approaches and the training needs of teachers in this domain.

The Ministry of Environment and Energy, through its Directorate of Climate Change and Air Quality, offers free educational materials under the ***LIFE-IP AdaptInGR*** project. These resources are designed to support environmental education programs and can be integrated into existing school subjects, thus providing teachers with tools to educate students about climate adaptation strategies.

The ***Eco-Schools network***, recognized by the Ministry of Education, Religious Affairs and Sports, promotes sustainable practices within schools. Participating schools undertake projects on topics like energy conservation, waste reduction, and climate change, fostering a culture of environmental responsibility among students and staff.

The WWF Greece's ***Students in Action for the Climate*** program, approved by the Ministry of Education, Religious Affairs and Sports, engaged 42 schools across the country. Students formed teams to assess their school's carbon footprint and develop practical solutions to reduce it. The program emphasizes experiential learning and critical thinking and therefore encourages students to become proactive in addressing climate issues.

Additionally, the ***Schools for Climate*** platform advocates for a holistic approach to climate education. Local Environmental Education Networks, such as those in Athens, support schools in implementing programs that build resilience and promote sustainable practices, aiming to transform schools into hubs of climate awareness and action.

Gaps and Misconceptions

Research on Greek prospective teachers reveals significant gaps and misconceptions regarding climate change, which likely reflect the broader challenges faced in climate education within Greek schools (Moshou and Drinia 2023). Studies involving university students in departments of primary and early childhood education show that, although students often recognize the importance and global scope of climate change, their understanding is fragmented and frequently inaccurate. Common misconceptions

include conflating climate change with ozone depletion or acid rain and misinterpreting the greenhouse effect. Moreover, students tend to lack concrete knowledge of mitigation strategies or specific actions to address the issue, despite acknowledging the general importance of citizen engagement. These findings suggest that climate change education in Greece remains limited in depth and effectiveness, underscoring the need for more structured, accurate, and action-oriented instruction in both teacher training and school curricula.

In conclusion, Greece has made significant progress in incorporating climate change into its education system through laws and specific programs. However, for it to be fully effective, more support is needed for teachers. Strengthening the focus on climate change in the curriculum, along with proper teacher training and resources, will be essential for equipping students with the necessary knowledge and skills to tackle this critical global challenge.

2.5 Romania's Research Findings

Legal Frameworks

Romania has recently taken significant steps to integrate climate change education into its national educational framework. In January 2023, the Romanian government approved the "National Strategy on Environmental Education and Climate Change 2023 – 2030" (Ministry of Education 2023). This marks the first time Romania has adopted a national strategy dedicated to environmental and climate change education.

Current state of climate education in schools

Romania developed a national program introducing a "Green Week" in each school year.

Educational Initiatives

The strategy outlines clear actions to enhance environmental education and awareness among children and young people, focusing on sustainable development

and environmental responsibility. It encompasses both formal and non-formal education and emphasizes the following key areas:

- **Implementation of a National Educational Program for Environment and Climate:** This includes introducing a "Green Week" dedicated to environmental and climate change topics within the national curriculum. Additionally, schools are encouraged to offer elective courses focused on climate adaptation and environmental protection.
- **Development and Utilization of Educational Resources:** The strategy advocates for the creation of digital ecosystems for climate and environmental education, providing diverse extracurricular activities in collaboration with NGOs and other relevant institutions.
- **Infrastructure for Sustainable Schools:** There is a strategic objective to support and develop a network of "Green Schools," aiming to align school infrastructures with European and global sustainable development standards.
- **Training of Human Resources:** The strategy emphasizes the need for training educators and other stakeholders involved in environmental and climate change education to promote a culture of sustainability within educational institutions.

Gaps and Misconceptions

These developments indicate Romania's commitment to equipping its younger generations with the knowledge and skills necessary to address environmental challenges and to fostering a culture of sustainability through comprehensive educational reforms.

Also, Climate education in Romania, while improving in recent years, still faces several **gaps and misconceptions** that limit its effectiveness. These issues appear at different levels – curricular, institutional, teacher preparedness, and public perception. We can notice several gaps:

1. **Curriculum gaps**
   - Climate change is **not consistently integrated** across subjects. It may be briefly touched upon in geography, biology, or civic education, but there's no dedicated climate change curriculum.
   - Content is often **theoretical**, lacking interdisciplinary, real-world applications or connection to daily life.
   - Environmental and climate topics are **not introduced early enough**. Primary education rarely includes structured content about climate or sustainability.
2. **Insufficient Teacher Training**
   - Many teachers **lack formal training** in climate science or in how to teach it in an engaging, age-appropriate way.
   - Continuing education programs often **do not include up-to-date environmental topics.**
   - Teachers may avoid discussing climate change due to **fear of controversy**, political sensitivity, or perceived complexity of the subject.
   - Lessons tend to focus on **physical aspects** (greenhouse gases, global warming, etc.) but **underplay socio-economic and ethical dimensions**, such as environmental justice, policy, and activism.
3. **Political and Media Influence**
   - Climate topics may be influenced by media disinformation, political narratives, or economic concerns (e.g., coal industry, energy policy), which affect how students and teachers perceive climate action.
4. **Action plan details are still delayed; monitoring frameworks is incomplete**

In conclusion, some opportunities for improvement could include:

- **Invest in teacher training**, including interdisciplinary teaching strategies.
- **Foster partnerships** with NGOs, universities, and the private sector to bring real-world projects into schools.

- **Empower students** through project-based learning, civic participation, and local environmental actions.
- **Use digital tools** (e.g., simulations, GIS, climate data apps) to make learning dynamic and relevant.

3. Findings of the Online Questionnaires

A key part of the NDR research was conducted using a series of online questionnaires that gathered the perceptions of teachers, students and families regarding climate change education. The purpose of the surveys was to identify the how well the current climate education system is working in the surveyed schools, what changes to teaching methods and educational opportunities should be proposed, and whether the different target groups shared similar opinions on these matters, especially across the different partner countries.

The following sections break down the key findings of each target group and question cluster.

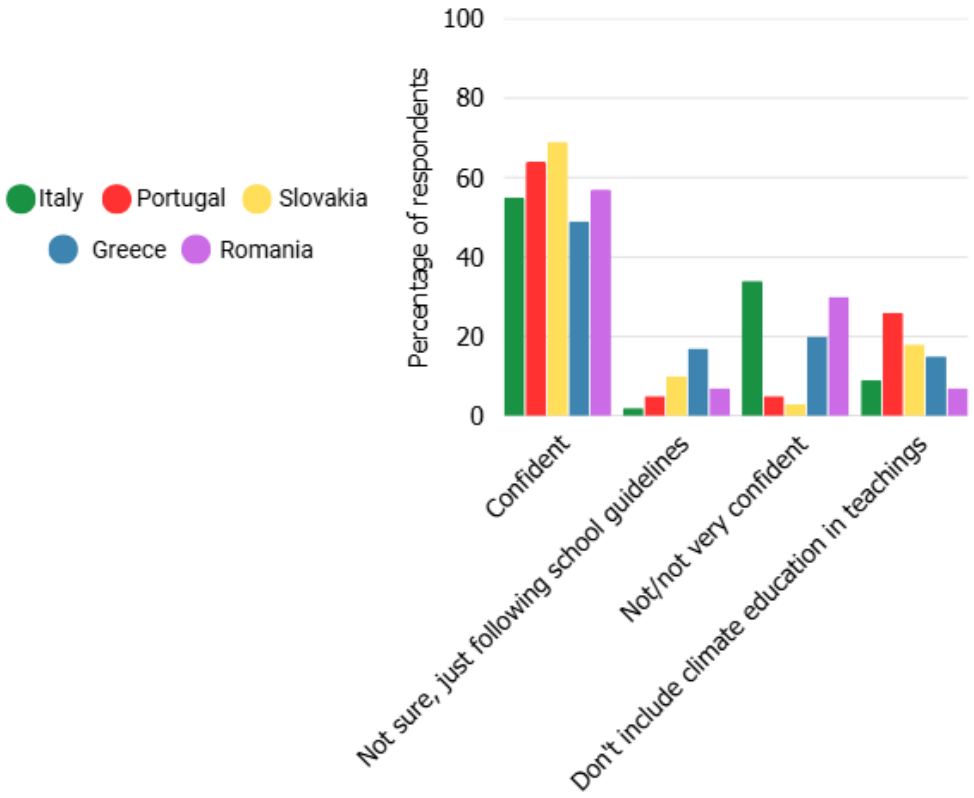
3.1 Teacher Findings

Current methods and efficacy

The first part of the teachers' questionnaire focused on what methods they currently use in the classroom to teach about climate change and how effective they believe their methods are. Broadly, respondents indicated that they use a variety of teaching methods, including classroom lectures and discussions, group projects, games, and videos and other digital instruments. Some Italian teachers also noted that they use fieldwork activities, while Slovak and Greek teachers also emphasize an interdisciplinary approach – incorporating climate change into multiple subjects (i.e. human rights and civic education). Additionally, Slovak teachers utilize real-life case studies and Greeks adapt their methods and curriculum to guidelines provided by local (national?) and European programs like Erasmus+.

Identified need: When asked about their opinions of the effectiveness of their teaching methods, most teachers believed their methods to be effective, with the highest among Slovak and Portuguese respondents (69% and 64% respectively), while the Greeks had the lowest majority (48.8%). In the middle are the Italian and Romanian teachers, where 54.5% and 55.2% expressed confidence in their teaching efficacy. This shows that, despite most teachers having sufficient confidence in how they educate their students, **many would still benefit from additional opportunities that could improve their pedagogical skills**.

Teachers' confidence in the effectiveness of their climate education methods



Knowledge gaps and teaching confidence

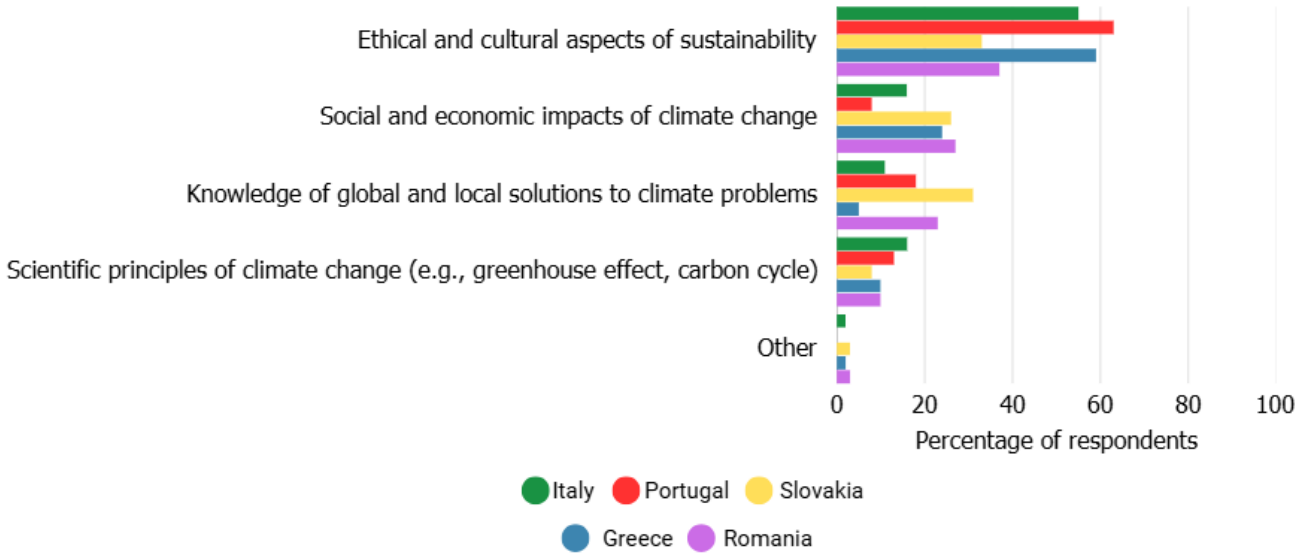
In the next section, teachers gave a self-assessment of their understanding of the scientific principles behind climate change, which subtopics they believe are most important for students to learn, and which of these they are most confident in teaching. **Most teachers** across all partner countries **have at least a general understanding of climate change science**, such as the carbon cycle and the greenhouse effect, and noted that the **most important subtopics to teach are the ethical and cultural aspects of sustainability**. The second and third most important were ranked among the remaining categories, including the **social and economic impacts of climate change** (second choice for Italy, Greece, and Romania, third for Slovakia), **knowledge of global and local solutions** to climate problems (second choice for Portugal and Slovakia, third for Romania), and the **scientific principles of climate change** (third for Italy, Portugal,

and Greece). The table below summarizes the percentage of each country's respondents who selected each category.

However, when asked about their **confidence in teaching** these subjects, **most teachers indicated that they were not sufficiently confident**. The most confident teachers were the Italians (42%) while the least confident were the Romanians (27.6%). Teachers were then asked to identify the skills they consider most important for their students to develop through climate education. Across all participating countries, the **top two priorities** emerged as the ability to design and deliver **hands-on, practical activities**, and the capacity to **foster critical thinking and problem-solving**.

Identified need: Schools and policymakers should **support teachers in designing activities that meaningfully involve students** in actively learning and critically thinking about climate change, **while also continuously improving teachers' awareness** of the scientific and socio-economic aspects of climate change.

"Which of the following knowledge areas do you think is most important for explaining the impacts of climate change to students?"



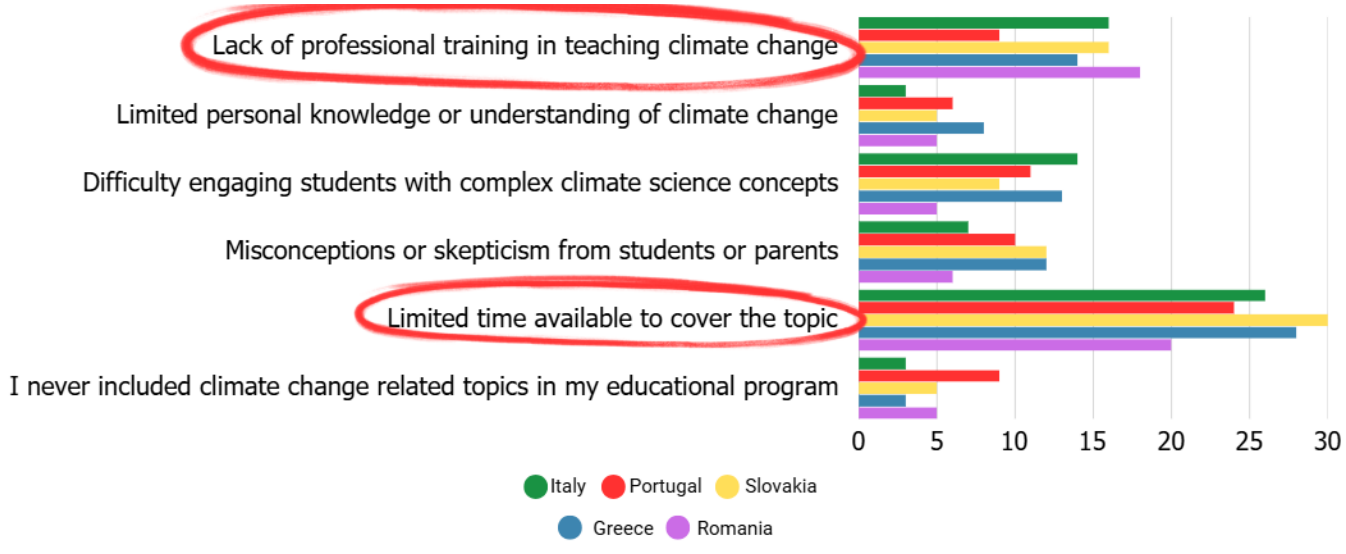
Note: Data shown are aggregate responses, not individual respondents, due to multi-choice format

Challenges and barriers

The surveys also measured the **challenges and barriers** that teachers face when teaching climate change. The two challenges that stood out the most were the **limited time available to cover the topic** and the **lack of pedagogical training opportunities** made available to teachers that help improve their abilities to teach climate change. Some teachers also noted that it is difficult to engage the students on the topic due to the many complexities involved and that some students and/or their parents express skepticism and doubts about climate issues.

As for the barriers, most teachers across all participating countries noted that the two most common ones are **inadequate teaching materials** available to them and the **tightly packed curriculum schedule** that doesn't allow them to fully and effectively cover the many important issues related to climate change. Another significant barrier noted by the Italians and Portuguese is the difficulty in adapting their teaching methods to account for many diverse needs and learning styles of students, whereas Slovakian, Greek, and Romanian teachers highlighted again the lack of adequate professional development opportunities to improve their teaching methods.

Teacher challenges



Note: Data shown are aggregate responses, not individual respondents, due to multi-choice format

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Identified need: These responses show the need for **increasing access to educational resources and training opportunities** for teachers that can help improve their climate education teaching methods while also **ensuring that they are not overburdened** by new topics that must be included **in their already crowded curriculum**.

Familiarity with gamification and other digital tools

Another objective of our teacher surveys was to assess how familiar they are with gamification methods and other digital tools that can be used in climate education. There was a **fairly even split** among teachers in all participant countries that were familiar with digital tools generally and were either also familiar with the concept of gamification, or else knew nothing about it. This could be that the word "gamification" is not commonly known or used, but using games – physical or digital – as learning methods is widely implemented by teachers. **Most of the respondents noted using gamification methods at least a few times during the school year**, while Slovakia held the largest group of non-users (23.7%), followed by Italy (22.7%), Portugal (15.4%), and Greece (12.2%); Romania instead had the highest user rate, with only 6.9% of respondents saying they never used gaming methods in the classroom. However, frequent and very frequent use responses were generally low: 43.6% PT, 43.2% IT,

34.4% RO, 34.1% GR, and15.8% SK. This signals the potential for increasing gamification usage in schools, especially for climate change education.

"How familiar are you with digital tools and the concept of gamification?"

Identified need: Teachers are mostly adept at incorporating gamification in their classrooms but may not be sure if they are **using them effectively**. This pushes the EcoMystery team to ensure the Teachers Advancement Program is used to increase the efficacy of teaching climate change topics through interactive games, in addition to training them on how to use digital and physical Escape Rooms.

Recommendations for improving climate change education

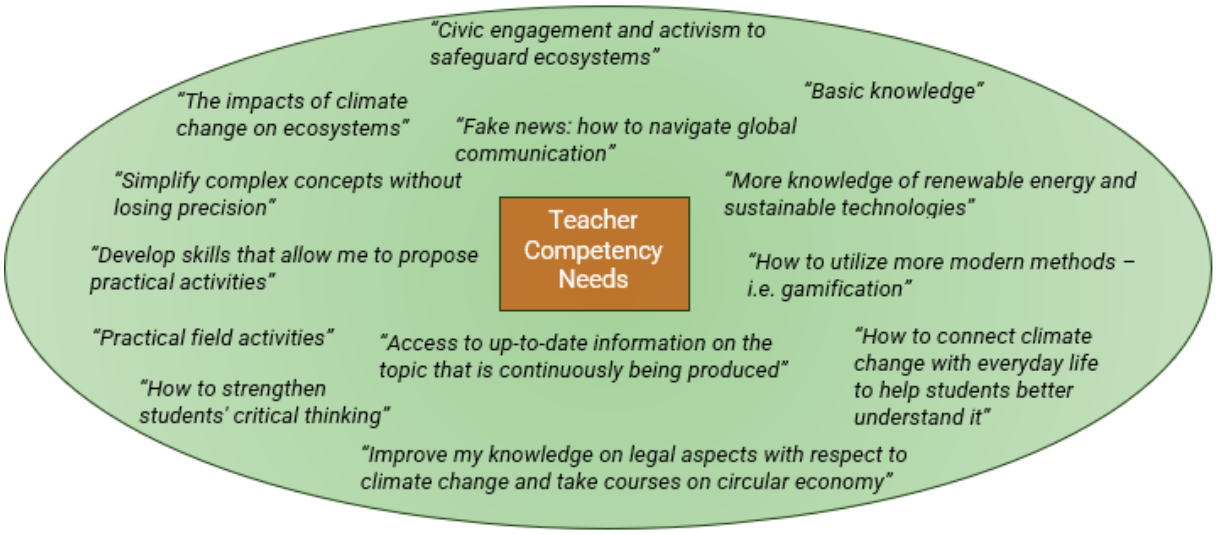
The final part of the teachers' survey focused on recommendations for improving the climate education curriculum in their schools. Teachers were asked to rank 5 recommendations presented in the survey on a 1-5 scale (5 being most important), followed by an open response question for further suggestions. The table below summarizes the average scores for each option chosen by the teachers. For each country group, the most important recommendation was to have **more engaging materials adapted to the age group** of the students. For the Romanian teachers, this was tied equally with **more professional development opportunities**, followed closely by **more interdisciplinary approaches** to teaching climate change and increasing collaborations with local organizations and experts on these issues. These sentiments

were also shared by the Portuguese respondents. The Greek, Italian, and Slovak respondents also emphasized the need for **more time and resources** dedicated to climate education without creating additional time constraints to their schedules.

Teacher recommendations for improving climate change education

Improvement area	Average score (out of 5)				
	IT	PT	SK	GR	RO
More engaging, age-appropriate materials	4.10	4.25	4.18	4.27	4.63
More interdisciplinary approaches	4	4.05	3.77	3.95	4.57
More collaborations with external experts/local organizations	3.71	4.15	3.59	4.24	4.5
More teacher training and professional development	3.71	3.93	3.62	4.17	4.63
More time and resources allocated within the school schedule	3.78	3.78	3.79	4.24	4.33

Teacher competency needs



Identified needs: To become more effective educators on climate change topics, teachers desire:

More relevant content relatable to the interest and age levels of their students

More training to increase **knowledge and skills** on climate issues

More time and resources dedicated to climate education **within current school schedule**, without making it longer

More interdisciplinary approaches, ensuring that their

Conclusions and key takeaways

The findings from the teachers' survey show that teachers have a general familiarity with the scientific principles of climate change and are able to recognize its impacts in their neighborhoods and cities, but still **lack confidence in teaching these principles**, as well as global and local solutions to the crisis and the socio-economic, cultural, and ethical repercussions. To better prepare teachers for these tasks, they **desire more training to improve their knowledge** about climate change and sustainable solutions,

as well as how to **create more interactive and engaging activities** to get students actively involved in learning about these issues.

Teachers also feel overwhelmed trying to squeeze lessons about climate change into an **already full curriculum schedule** and that their **schools do not provide them with adequate teaching materials** – especially for teaching students with various learning styles and needs. It is therefore important to ensure that an increase in pedagogical training opportunities, both to increase teachers' knowledge about climate change science and issues and improve their teaching methods on these topics, does not become an extra burden on teachers, and that they are able to **incorporate these trainings and new methods easily into their busy schedules** without requiring additional time commitments.

When it comes to digital tools and gamification, most teachers are familiar with the former, though **sparingly use games** to teach their students. Additionally, among their recommendations for improving their school's approach to teaching about climate change was **increasing collaborations with local organizations** and other experts in the field, **allowing students to see real-life examples of climate issues through hands-on activities.** These could be solutions to the aforementioned desire to utilize more interactive teaching methods in their climate education curriculum, which is what the EcoMystery platform hopes to achieve.

Key takeaways

Teachers are **generally familiar** with climate change and its main ideas but **lack confidence in explaining more specific themes** like:

- scientific principles that are involved (i.e. the greenhouse effect and carbon cycle)
- social and economic impacts that result
- (especially) ethical and cultural aspects of sustainability.

However, they are mostly confident in the efficacy of their current teaching methods (traditional lecture approaches, some interactive games and teamwork activities), though they **would like to utilize more engaging and participatory learning approaches**

- digital escape rooms could be a more readily available and adaptable solution
- collaborations with local organizations are also highly favorable

Main challenges:

- lack of time
- missing training
- lack of resources that enable them to adapt their teachings to a variety of student learning styles

3.2 Student Findings

Awareness, concern, and action on climate change

The student surveys began with two sections that assessed their knowledge about the causes and effects of climate change, how concerned they are about these issues, what actions they do to mitigate the effects of climate change, and whether they feel these actions can make a difference.

The opening question gave students an opportunity to describe climate change in their own words. Many students gave vague and **tautological/circular responses,** for example “the climate is changing.” Many others also managed to describe some aspects of climate change, like temperature changes and extreme weather events that result, while **very few managed to give holistic responses** that connected the pieces together: knowing that climate change is a natural phenomenon that involves changes in temperatures and climate conditions over long periods of time, but these changes have been exponentially accelerated due to human activity and have led to an increase in temperature rises and extreme weather events. Below are some quotes from some of the students.

At first glance, this suggests that students may lack basic writing and critical thinking skills, which inhibits them from analyzing and understanding the whole concept; however, other survey questions asked students to identify the **causes and consequences of climate change**, where **most students identified at least 2 for each**. This shows that students seem to have a general understanding of the issue as an anthropological crisis, even if they have difficulty putting it in their own words.

Quotes from students' open responses describing climate change

"Climate change is the alteration of weather and climate conditions, often caused by human actions or natural factors"– A Portuguese student

"Climate change for me means an emergency because man is destroying our planet, and one of the many consequences is precisely climate change, that is, that the planet's climate is exceeding its limits and every year the average temperature of the planet increases, endangering many species of animals, but not only, also for man for various reasons." – An Italian student

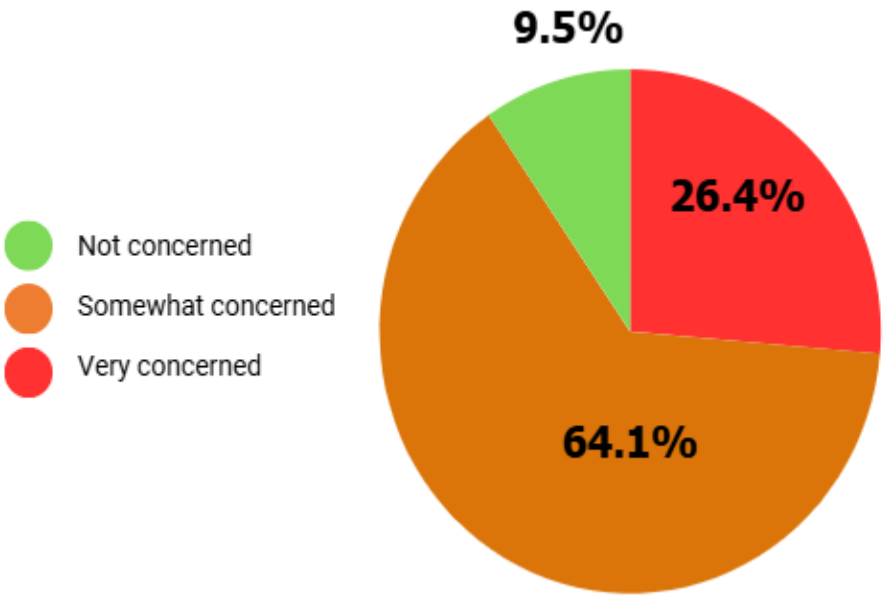
"Global warming, the potential extinction of some species on Earth" – A Romanian student

"Changes in the overall natural climate of our planet and therefore also the threat and disruption of the natural functioning of all the principles of nature, mainly due to

"The climate we know as long as we live will no longer be the same and because of this, the entire ecosystem is disturbed." – A Greek student

Despite their knowledge of the harmful impacts of climate change, **most students expressed only mild concern for climate change**. However, there was a slight variation among the respondent countries: most of the Portuguese and Greek students responded feeling "very concerned." This variation could be due to various levels of intensity of climate events experienced by students in their communities – perhaps the Greek and Portuguese respondents have seen first-hand more extreme weather events than the others. Still, the vast **majority of students take part in at least one activity** that promotes climate change awareness and reduces environmental pollution, such as community cleanup events, planting trees, recycling, reducing water and energy use, and walking, cycling, or using public transport. Most students also feel that these individual actions make a difference in reducing the harmful impacts of climate change, **though there were also many who expressed doubts**.

Level of concern about climate change (all countries, combined data)



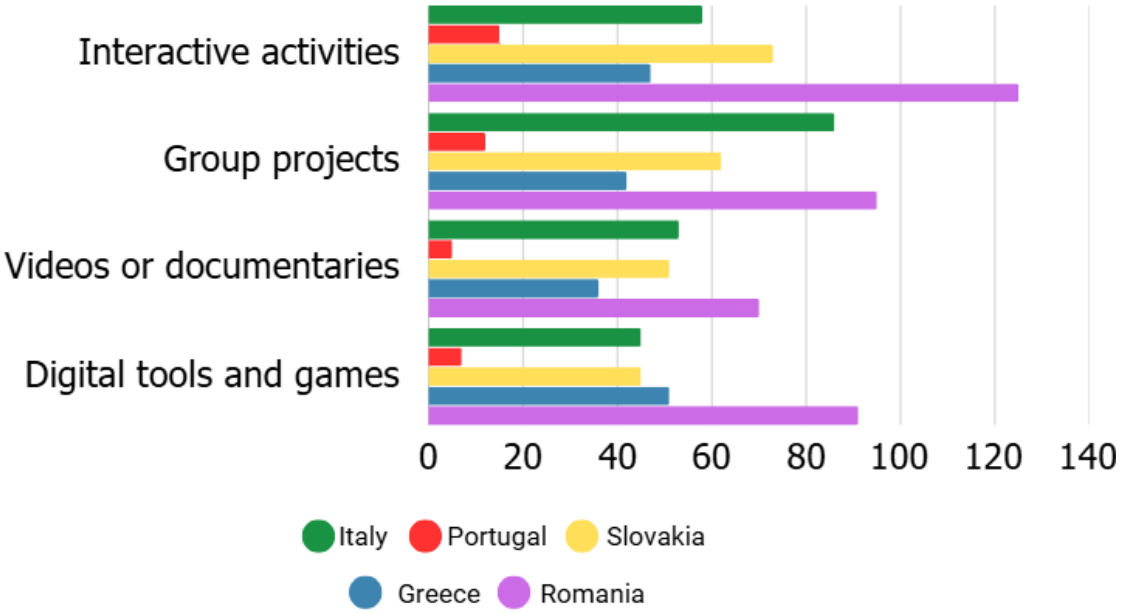
Identified needs: Many students struggled to provide a holistic and complete answer when asked to describe climate change. This could indicate a **lack of critical thinking and/or writing skills**, which – while for this age level could be justified – **shows the importance of integrating climate change topics in all subjects** in order to ensure that students can develop a holistic understanding of climate issues and analyze them in different contexts.

Additionally, many students were unsure whether their individual actions that help preserve the environment can contribute to mitigating climate change, showing the need for teachers to **emphasize the role that both individual and collective actions play in creating positive change.**

Efficacy of current teaching methods

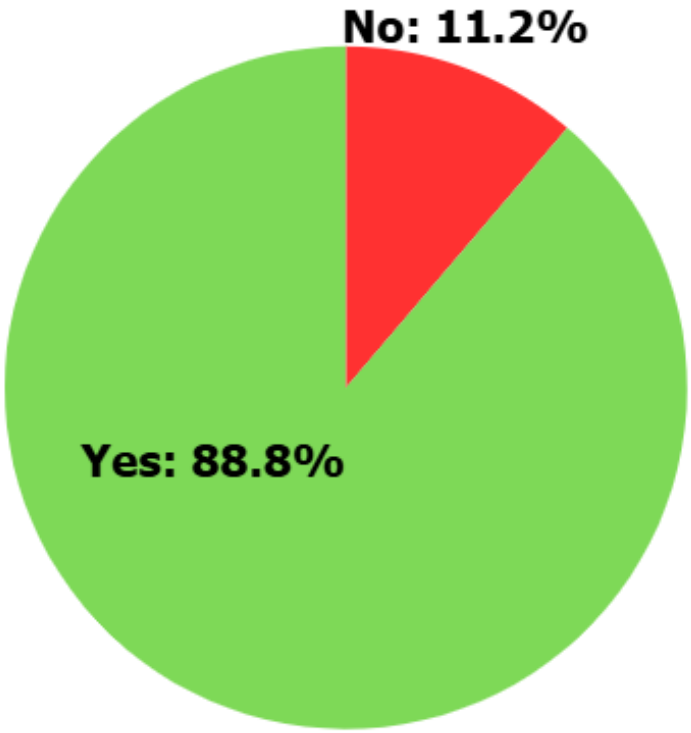
In the next section of the survey, students shared their views on the effectiveness of their schools' climate education methods**. Most students agreed that these methods are somewhat effective** (55.3%), with a sizeable number even saying they are very effective (30.2%) and only a small number believing them to be ineffective (14.4%). The approaches that students find **most effective are interactive activities and group projects**, showing stronger preferences for engaging activities that involve cooperating with peers. Among students in Italy and Slovakia, learning through digital tools and games received the lowest scores, possibly because the games they associated with this method were primarily individual rather than collaborative. Still, **when asked if they would enjoy learning about climate change through gamified means, the vast majority responded in the affirmative** – though there was a sizeable dissent among Slovak students, where nearly 30% said they would not.

Most effective teaching methods



Note: Data shown are aggregate responses, not individual respondents, due to multi-choice format

"Would you like to learn more about climate change if it was taught through gamified methods?" (all countries, combined data)

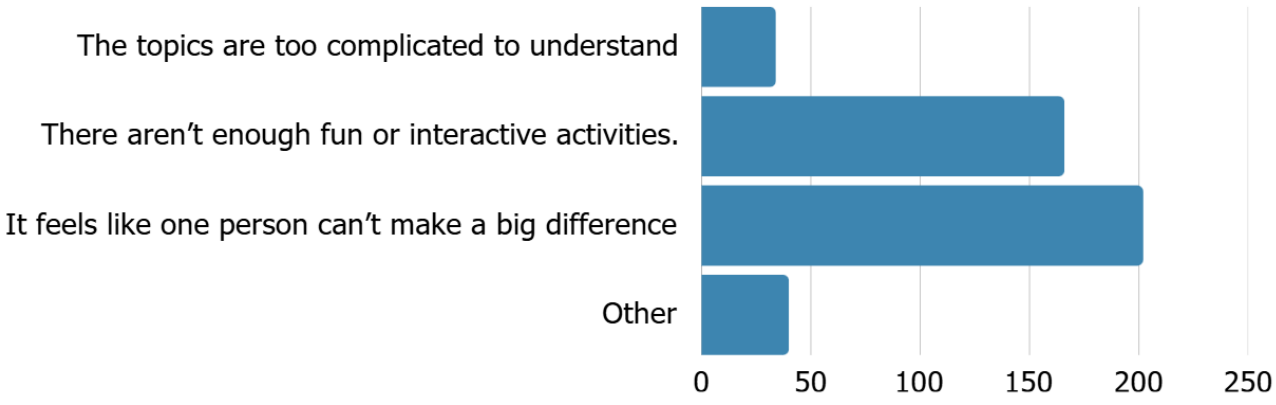


Identified need: Echoing the teachers' responses, students believe that the **most effective way to learn about climate change is through cooperative activities** that involve engaging with their peers. This supports the core idea of the EcoMystery project, which aims to encourage learning through a cooperative – not competitive – gaming experience. This will not only help students learn about climate issues in a fun and engaging way, it will also **build essential teamwork skills** that will enable them to succeed in their journey **to become active citizens of tomorrow**.

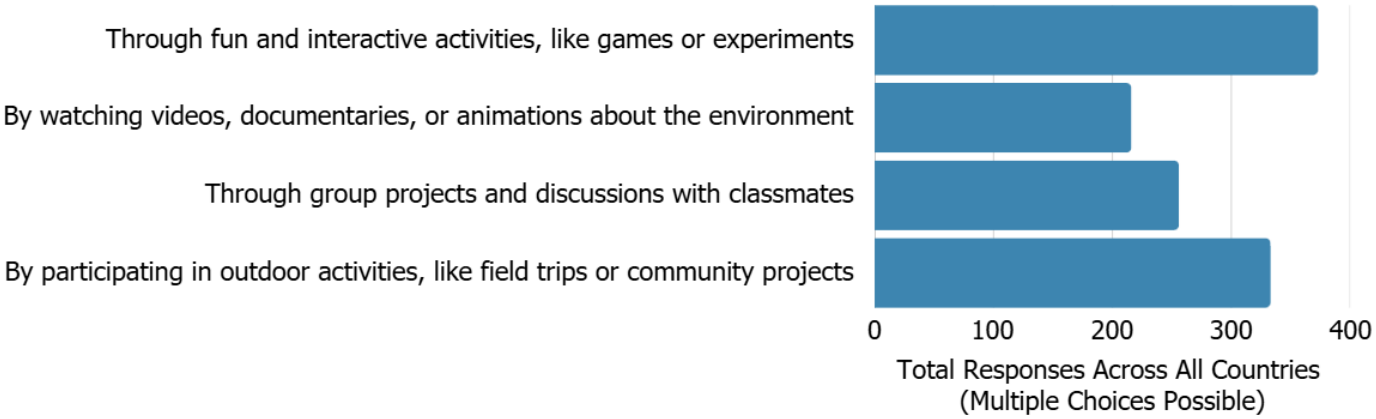
Challenges and recommendations for improving curriculum

The last section of the student survey sheds light on the challenges students face when learning about climate change and which teaching approaches they would prefer to learn with. For each group of respondents, the two most critical challenges were the **feeling that individual actions are not able to contribute to making a larger difference** and that, in the classroom, **there are not enough interesting and engaging activities**. They subsequently suggested that they would like to have more interactive activities like games and experiments, field trips, and opportunities to volunteer in their communities in order to improve their climate education in and out of the classroom.

"What challenges do you face in understanding or engaging with climate change education?" (all countries, combined data)



Preferred methods for learning about climate change



Note: Data shown are aggregate responses, not individual respondents, due to multi-choice format

Identified need: Students struggle with climate change not because the topic is too complicated, but because they feel that a single individual cannot make much of a difference. To ensure a more effective climate education, teachers should include activities that **emphasize the connection between individual actions and global changes through fun, participatory learning approaches**, actively involving students in climate education and enabling them to create co-designed solutions to the crisis.

Conclusions and key takeaways

Our findings from the student surveys show that climate education should underline the anthropological connection to extreme weather events and biodiversity loss in order to enable a holistic understanding of climate change. It should also demonstrate how individual actions that promote sustainability in all areas can have ripple effects and create collective initiatives that can eventually lead to positive change. To achieve this, **schools must implement more innovative pedagogical approaches that include interactive group activities and community excursions** to gain exposure to real-world case studies and discover the solutions that contribute to mitigating and remedying the planetary crises. The EcoMystery project is a critical opportunity for teachers to learn how **digital tools can empower students** who question their ability to make a

significant positive impact in the fight against climate change, guiding them **to be responsible and active citizens of tomorrow**.

Key takeaways

Students may find it **difficult to summarize the main ideas of climate change**, but **they do recognize the causes and impacts** of climate change

Many are only **mildly concerned about climate change**, which could be due to their age level and current priorities (i.e. school, sports, friends, having fun).

Students believe that **current teaching methods are mostly effective**, however:

- they would like to have **more interactive and group work activities**, especially involving field visits and participating in community projects
- they also expressed **strong interest in learning through gamified means** and experiments

Schools must promote a stronger connection between human society and the planet's biosphere in order to enable students to have a solid understanding of the climate crisis

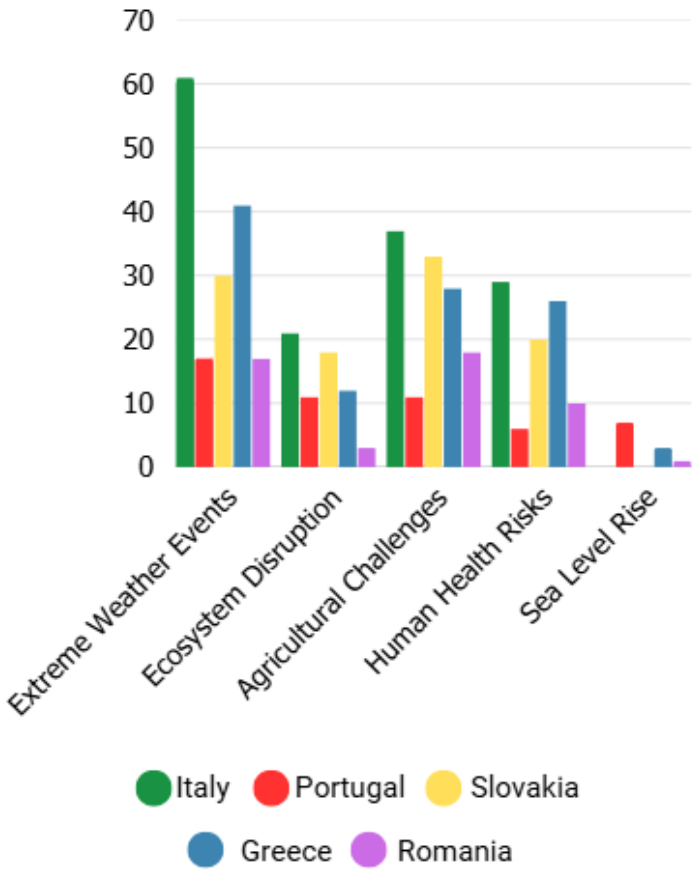
- This should be done through the introduction of more interactive activities, like games, group projects, and field trips.

3.3 Parents and Families Findings

Climate change awareness and thoughts on school's climate education

The first two sections of the parents and families survey provided insights into their general understanding of climate change and how it affects their communities. Most of the respondents believe they are **somewhat familiar with the causes and effects of climate change** and some even responded as being very familiar. Each country group noted that **extreme weather events and agricultural challenges are the most relevant impacts** of the climate crisis in their communities. Very few of the respondents showed concern for rising sea levels, as most of them do not reside in coastal communities that would see more immediate impacts.

Most relevant impacts of climate change for parents and families



Note: Data shown are aggregate responses, not individual respondents, due to multi-choice format

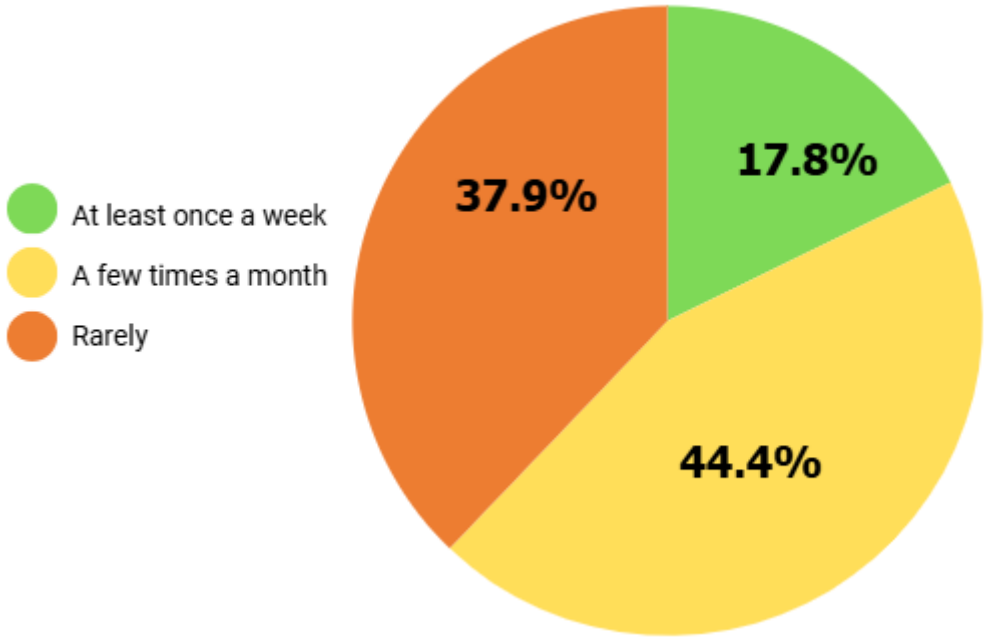
When asked about the effectiveness of their child's **climate education** provided by their schools, most parents and families responded that this education **was sufficiently effective**, though a significant number of respondents were unsure whether climate change was taught at their school – particularly in Slovakia (37.5%), Greece (23.9%), and Portugal (22.2%). They also stated that the most important topics that should be addressed include the causes and consequences of climate change, biodiversity conservation, and community-based solutions.

How to support families in discussing climate change at home

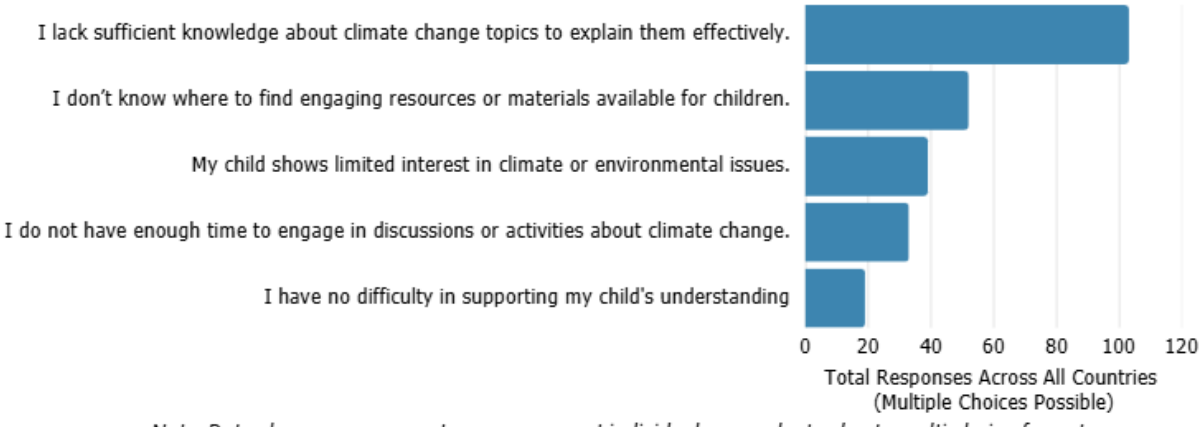
The last section of the parents and families survey asked respondents how frequently they discuss climate change with their children and the challenges they face when doing so. For most countries, the **majority claimed that issue is discussed at least a few times a month** – with the exceptions of Greece and Romania, where the majority noted that it is rarely discussed. The reason seems to be that **families lack confidence in their ability to explain climate change effectively** to their children due to their lack of adequate knowledge on the subject.

Identified need: Parents and families suggest that having **access to more engaging, simplified material and better guidance from schools – in addition to more opportunities for engaging in climate action activities within their communities** – would significantly enhance their ability to effectively engage with their children on climate topics.

How often climate change is discussed at home (all countries, combined data)



"What challenges do you face in supporting your child's understanding of climate change?"



Note: Data shown are aggregate responses, not individual respondents, due to multi-choice format

Conclusions and key takeaways

The main findings from the **parents and families** show that – like teachers – they **lack confidence in discussing climate change with their children**, as they do not feel they have sufficient knowledge about specific topics. They also think that they **lack engaging resources to help them be more confident** in these discussions. In order to

empower families in discussing climate issues with their children at home, they believe that **schools should guide them to the resources** that can equip them with the knowledge they need to have meaningful conversations. This should be coupled with **raising awareness about opportunities for students and families to engage in community initiatives** that promote climate action and actively participate in creating positive change.

Key takeaways

Main findings from the parents and family surveys concur with those of teachers and students

They believe they have a **good understanding of climate change**, though they would also be **interested in increasing their knowledge** so they can engage more effectively with their kids at home

Efficacy of the current climate change curriculum is mostly satisfactory, though using **more participatory learning methods and physically exploring a local environmental problem** by collaborating with community organizations could enhance the educational experience outside of the classroom

These findings underline the **importance of including familial perspectives** and feedback to ensure the project adopts a well-rounded approach to the “Escape the Climate Crisis” Coursework and the learning platform

4. Focus Group Findings

As a follow-up to the results of the national surveys conducted with teachers, students, and parents and families, each partner conducted one or more focus group sessions with teachers of the surveyed schools to discuss the findings of the questionnaire responses. These discussions revealed common challenges across European contexts, including student feelings of helplessness, teacher uncertainty in teaching climate justice, and the need for innovative, interactive tools such as Escape Rooms.

Student Reactions to Climate Education

Teachers from each partner country reported that students show **strong interest in climate issues, but often feel powerless** when confronted with the scale of the crisis. Slovak teachers observed **two types of attitudes:** some **highly engaged**, others **apathetic and fatigued** by the topic. Italian teachers confirmed that practical group activities, within and outside the classroom, play an important role in reducing the sense of helplessness. Greek teachers noted that anxiety often follows local extreme weather events (i.e. wildfires and floods), but **students feel empowered most during outdoor or hands-on activities** when they can see the immediate impacts of their actions.

This is why students consistently prefer interactive methods (debates, projects, documentaries, gamification) when learning about the climate crisis. Escape rooms, although not yet used, were seen as particularly promising. One Greek teacher noted that “students love challenges and games, so if climate education could take that form, it would be an unforgettable experience.” Slovak teachers added that students value discussions and documentaries, but stressed that **teaching climate education effectively requires connecting content to emotions and lived experiences**.

Teacher Perspectives and Challenges

Many teachers feel **ill-prepared to address the social and economic aspects** of climate change. In Italy, teachers said these topics are vital but difficult to teach – and,

though some colleagues try to link them to the Agenda 2030 goals, which are required to be taught, they noted that some colleagues avoid diving deeper into specific subjects due to lack of expertise in topics like climate justice and activism. In Greece, one teacher explained: “It’s not enough to teach facts — students need to see that they can fight for fairness”. Slovak teachers also highlighted the gap between recognizing these topics as important and lacking the preparation to address them.

Teachers in all three countries agreed on **the interdisciplinary barriers** that hinder the successful integration of climate education across multiple subjects due to their **heavy workload, lack of time, and limited collaboration opportunities** with their colleagues. Slovak teachers emphasized the need for subject-specific materials (i.e. linking climate content with mathematics), while Italian teachers reported increased efforts in interdisciplinary collaboration (teachers working together to syncronize their climate education curricula), but are limited by structural issues such as few shared planning hours. Many teachers also expressed **discontent about outdated, limited, or scattered resources** and how it makes it more difficult for teachers to create engaging and effective lesson plans for their students. Greek teachers often rely on NGOs and external partners to supply materials, as they often find **the resources provided by their institutions to be inadequate**. Italian teachers expressed interest in the teachers’ self-training handbook that will be developed as part of the EcoMystery project, which will include practical resources – even in their national language – that teachers can use to help plan and implement learning activities.

Student Empowerment and Self-Efficacy

Teachers stressed the **need to help students believe that individual and local actions matter**. Slovak teachers worried that many students see individual efforts as ineffective, with one noting that students need to be made more aware that small actions are important and effective. In Italy, examples such as ecological walks and urban regeneration projects were used to show students the tangible effects of small-

scale initiatives. Greek teachers emphasized **connecting home eco-habits with school activities** (i.e. diaries of sustainable actions, family energy-saving challenges, etc.).

Innovative Methods: Gamification & Escape Rooms

Teachers in both Greek focus groups showed **high enthusiasm for Escape Rooms**, seeing them as a way to combine collaboration, critical thinking, and subject content. Italian and Slovak teachers agreed that **interactive and game-based methods could overcome passivity and foster motivation**. The educators also suggested escape rooms could also bridge home and school practices, linking familiar eco-friendly actions with classroom problem-solving.

5. Final conclusions

Teachers, students, and the families of students all agree that, while the current approaches to teaching climate education are mostly effective, there is still **room for improvement**. Each of these stakeholder groups advocate for **more interactive and engaging learning activities** – both in and out of the classroom through games, experiments, and field excursions in the community – though teachers and parents need the most support in these efforts. Both would like to **improve their knowledge** about climate change in order to be more effective when discussing the multidimensional issues of the crisis and believe that schools should support them by providing training opportunities, further learning materials, and partnering with local actors in their communities to **localize and visualize the issues first-hand**. Additionally, teachers emphasize the need to integrate an **interdisciplinary approach** to teaching climate change, as it affects all aspects of our lives, and also includes closer **cooperation with parents and families**.

Based on these findings, **the need for our flagship outcome – the EcoMystery Platform – is clearer than ever.** This platform will feature a digital escape room experience built around three immersive scenarios, each addressing a different dimension of the climate crisis. These scenarios are designed to **reinforce key**

concepts while offering practical examples of mitigation strategies. The EcoMystery project directly responds to the challenges identified in the Needs Discovery Report, providing a meaningful solution by strengthening teachers' digital competencies and promoting the use of gamification in the classroom. Through this interactive, multidisciplinary tool, educators will be better equipped to enrich their climate change curriculum and actively engage students in complex environmental issues on their path to becoming **responsible, global citizens of tomorrow**.

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