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"The state of affairs regarding the embedment of climate change and digital teaching skills into TPD schemes and secondary education"

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Table of Contents

Executive summary

The Erasmus+ project entitled "Towards a new model of Teachers' Professional Competence Development on Climate Change" (ClimaTePD) aims at helping in-service secondary teachers in developing digital literacy and climate change teaching skills as means for enabling their students to build awareness about the global threat of climate change. In meeting its objective, ClimaTePD proceeds to the development of synchronous and asynchronous training workshops, as well as the design of digital training scenarios that aim to guide teachers in developing their own activities in online, face-to-face or blended classroom environments.

The project's objectives are oriented towards the: 1) Development of an open access online platform for in-service teachers' professional development programme, 2) Development of a Guideline Handbook for teachers' good practices on climate change education, 3) Development of a digital repository on climate change education consisting of digital scenarios and other educational activities and resources and 4) Development of a set of policy proposals related to policy and curricula design.

The present report which is the outcome of the Intellectual Output 1 (IO1) aims at highlighting the state of affairs relating to the embedment of climate change and digital teaching skills into Teachers' Professional Competence Development (TPD) schemes in Europe and, especially in the five participating countries of the Consortium (Greece, Turkey, Spain, Germany and Bulgaria). It describes a literature overview which aims at investigating and analysing the policy actions and the initiatives that have been taken at European and at national levels regarding the inclusion of climate change in the target population.

The current report is structured in three main sections (part A, B and C) and two annexes (Annex 1 and 2). Part A includes a review of international policy documents, discovering key concepts and strategic initiatives in the field of climate change and climate change education as well as the need of TPD schemes related to climate change. Part B outlines the summary reports of the partners' findings on national level regarding climate change policies and programmes (analytically presented in Annex 1) and Part C makes a conclusion of the main section of IO1, outlining up-to-date data and covering the deficiencies, weaknesses and best practices. Annex 1 is dedicated to the extended versions of the climate change policies and programmes in Greece, Turkey, Spain, Germany and Bulgaria including brief summary reports both in English and in the respective language of each partner-country. The brief summary reports have the role of a guide describing the state of affairs of CCESD and TPD schemes in each of the member countries. These guides are a helpful tool for the participants of the Multiplier Events (E1-E5) in order to get a general idea about the current situation of climate change education in the countries. Annex 2 presents the state of affairs in Europe and beyond about climate change education providing data about climate change programmes, networks and associations as well as TPD practices and schemes in most of the European countries and beyond.

This report comes to map some of the gaps in climate change education in Europe and especially in the consortium countries. The report will support the implementation of the Multiplier Events in the subsequent Intellectual Output of the ClimaTePD Erasmus+ project guiding the educational scenarios' development for the online teachers' professional

development programme and addressing some of the challenges that in-service secondary teachers may face, in terms of competence development for climate change and digital skills. Apart from the Multiplier Events and the development of the educational scenarios, the IO1 report aims at supporting the whole ClimaTePD project and its Intellectual Outputs, by providing a framework orientation for the training platform development, the implementation of the teachers' online training and the development of the Guideline Handbook as well as the set of the policy proposals.

Introduction

Motivation

According to UNESCO, education is a key factor of the global response to climate change because it can increase knowledge, enable informed decision-making and encourage behavioural changes for adopting sustainable lifestyles. The global climate change has a huge impact on the environment (i.e. extreme weather conditions, forest fires, typhoons, hurricanes etc.), increasing the risk and the resilience around the globe, the risk of the financial and political stability, the environmental degradation and the social tensions (European Commission, 2018).

The UN "2030 Agenda for Sustainable Development", highlights the necessity to prevent planet's degradation focusing on the thoughtful management of natural resources such as land, water, soil, plants and animals, with a particular focus on how management affects the quality of life for both present and future generations (United Nations, 2015). Within this framework, the 13rd Sustainable Development Goal (SDG), out of the 17 SDGs of the UN "2030 Agenda for Sustainable Development", refers to the climate action and the measures that need to be integrated into national policies and strategies in order to combat climate change and its impact on the planet and the citizens (United Nations, 2020). More specifically, the 13.3 Target focuses on the improvement of "education, awareness-raising and human and institutional capacities on climate change mitigation, adaptation, impact reduction and early warning" (United Nations, 2020).

The European Commission and 'The European Green Deal' highlight Europe's new growth strategy aiming to transform the economy and society in order to put them on a more sustainable path. The Green Deal strategy further supports the transition to an environmentally sustainable and climate-neutral economy with significant employment and social impacts (European Commission, 2019). The threat of climate change and the ongoing pandemic have underlined the need for the digital transformation of education and further efforts of up-skilling and reskilling.

It is recognised that teachers and the educational system play a crucial role in developing climate change awareness. As outlined in the documents, schools, training institutions and universities are well placed to engage pupils, parents, businesses and the wider community on the changes needed for a successful transition (European Commission, 2019).

Aims and Objectives

The present report aims to investigate, analyse and describe the policy actions and initiatives that have been taken at European and at national levels regarding the inclusion of climate change and digital teaching skills both into Teachers' Professional Competence Development (TPD) schemes and in the secondary schools teaching practices.

Although climate change constitutes an extremely high priority topic, it seems that it has not been integrated yet in practice and in schools' curricula of many European countries. In these terms, the present report IO1 strives to highlight the state of affairs relating on the embedment of climate change and digital teaching skills based on IBL and gamification principles

into TPD secondary education schemes in Europe and, especially in the five participating countries of the consortium (Greece, Turkey, Spain, Germany and Bulgaria). Considering climate change education, teachers face a number of barriers: some of them are related to the multidisciplinary nature of climate change, the students' misconceptions, but arguably the most important barriers stem from the lack in teachers' professional development programme for developing the necessary skills when delivering instructions for climate change. Recognising these barriers, IO1 aims to describe and analyse the current situation and consequently to identify deficiencies, weaknesses and best practices in the field.

Preparing the literature review, the project partners investigated, described and analysed the state of affairs focusing on:

1. The implementation of Climate Change Education for Sustainable Development (CCESD) across Europe and the five partner-countries (Greece, Bulgaria, Spain Germany, Turkey),
2. The embedment of the climate change dimension in secondary school curricula in the five-partner-countries,
3. The inclusion of climate change and digital teaching skills in TPD schemes across the five partner-countries and in Europe.

Methodology

The consortium partners performed desktop research, including investigation of policy documents and research, description and curriculum analysis, considering the inclusion of climate change and digital teaching skills into the TPD schemes and the secondary education. This "mapping" of the state of affairs not only helped to discover deficiencies and weaknesses in the five partner-countries but also to identify the best practices within the European context. The literature review is based on the analysis of: (i) data from policy documents and reports by International and European Organisations (such as UNESCO, UN, European Commission, Eurostat etc.) and (ii) data from European and national policies, initiatives and strategies related to CCESD, the embedment of climate change education in secondary schools' curricula, and the inclusion of climate change and digital teaching skills into TPD schemes.

Structure

The IO1 report is structured in three main sections (part A, B and C) and two annexes. Part A is based on a review of international policy documents, discovering key concepts and strategic initiatives in the field of climate change and climate change education. It first explores the climate crisis, placing it in the context of sustainable development goals and in particular the UN SDG 13. Then, it investigates the EU Green Deal strategy and main EU policy efforts to support and to promote climate actions and initiatives in member states. Next, an emphasis is made on the role of Climate Change Education for Sustainable Development (CCESD) and the adoption of digital technologies and ICT tools in school's environmental education as well as the significance of the TPD schemes and the teachers' digital skills development. More specifically, the term of digital competency and how it is integrated into teachers' professional development schemes is further

analysed. The pedagogical approaches in TPD schemes are mentioned including Inquiry Based Learning (IBL) and gamification methodologies. At the end of Part A, organisations and networks in the EU related to climate change and environment are briefly described.

Part B outlines the summary reports of the consortium partners' findings on a national level. In a structured way, Part B provides a synopsis of the key data and conclusions about climate education policies and programmes as well as information about TPD schemes, provided in detail within the national reports.

Part C makes a conclusion of the main section of IO1, outlining up-to-date data and covering the deficiencies, weaknesses and best practices.

Annex 1 is dedicated to the detailed versions of the partner countries' reports regarding climate change policies and programmes, as well as to the brief national summary reports both in English and in the respective language of each partner-country.

Annex 2 presents the state of affairs in Europe and beyond, providing data about climate change education and TPD schemes in some European countries, listed in alphabetical order.

The outcomes from IO1 aim to support project partners in the implementation of IO2 (Multiplier Events), proposing the context and outlining some of the challenges that in-service secondary teachers may face, in terms of competence development for climate change and digital skills. Based on the IO1 report and in order to bridge the gaps reported in this literature review, educational scenarios will be developed in IO3. The scenarios will be uploaded on the digital training platform developed in IO4. The online platform will be specifically designed focusing more on the teachers' needs and the requirements of the participants. Teachers' learning activities are structured in the educational scenarios reflecting not only the needs but more importantly the interests of the teachers. The project's approach to secondary teachers' TPD will be based on IBL and gamification methodologies as it is analytically presented in the current report.

Based on the evaluation of the outcomes coming from the mapping and the analysis of the state of affairs on climate change dimension into TPD secondary education schemes in the five participating countries provided by the current IO1 report will lead to the development of the Guideline Handbook and the development of a set of policy proposals. The Guideline Handbook will include best practices and possible deficiencies and weaknesses that may exist, identified in this IO1 report. A set of policy proposals will be developed for policy makers and stakeholders related to the curricula design and the embedment of climate change dimension in teaching learning practices and applied didactics in secondary education.

Part A: A Literature Overview

1. Climate crisis

Environmental pollution which is mainly classified in air pollution, water pollution and land pollution, lately expanded also in specifying the type of pollutants (noise pollution, light pollution, plastic pollution, etc.), is a global concern in all the countries around the globe. Climate crisis is not a new phenomenon, but it remains one of the world's greatest problems, which has negative effects on the environment and the wildlife as well as the human health and people's well-being. (https://www.britannica.com/science/pollution-environment) Many environmental problems are firmly connected with urbanisation, industrialisation, mining and exploration although recently some efforts have been made to improve and reduce these man's actions as well as the degradation or depreciation of the environment (Ukaogo, 2020). It is common that people face pollution in their everyday life without even realising it and this is a clear fact that people don't react against a condition that seems normal (Muralikrishna & Manickam, 2017).

The problems and the damage caused to the environment are the reasons for this severe change in climate and its effects that become more and more present in our daily lives. Global warming is one of these major environmental issues that need immediate measures taken to a) limit the climate crisis and b) protect the quality of the natural environment. The use of conventional energy sources, such as the fossil fuels and the high consumption of the natural resources, have resulted in increasing greenhouse gas emissions, increasing the ozone depletion and the ozone hole as well as multiplying the impact and the long-term effects on the environment and on humans' lives. Although, climate crisis is a broad term and it is perceived from various angles by people, it is commonly agreed to stop the hazardous outcomes of this urban-industrial and technological revolution and the consumption of the natural capital reversing the harsh long-term consequences in the environment (Rai, 2016).

Global challenges, including climate change, COVID-19 pandemic and the biodiversity crisis, require a strong international collaboration and global action. Progress in the world for each Sustainable Development Goal (SDG) since 2015 increased 0.4 in percentage points (Sachs et al., 2021, p.19).

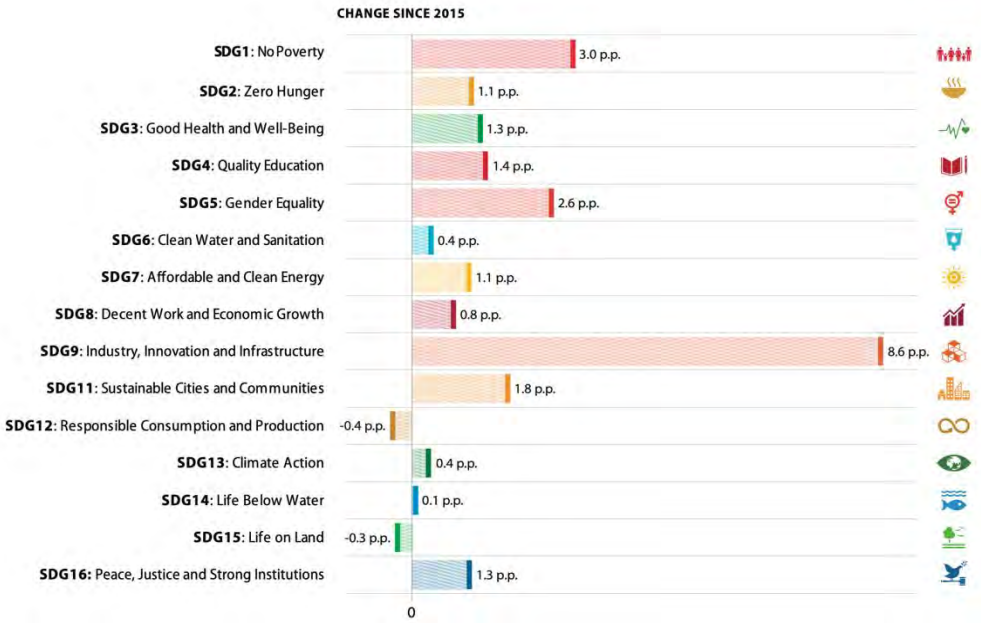

Figure 1: Progress in the world for each SDG since 2015 in percentage points. Population-weighted averages. Insufficient data for SDG 10 (Reduced Inequalities) and SDG 17 (Partnerships for the Goals). Time series data for SDG 12 (Responsible Consumption and Production) is only based on the indicator "Electronic waste (kg/capita)". (https://dashboards.sdgindex.org/chapters/part-2-the-sdg-index-and-dashboards).

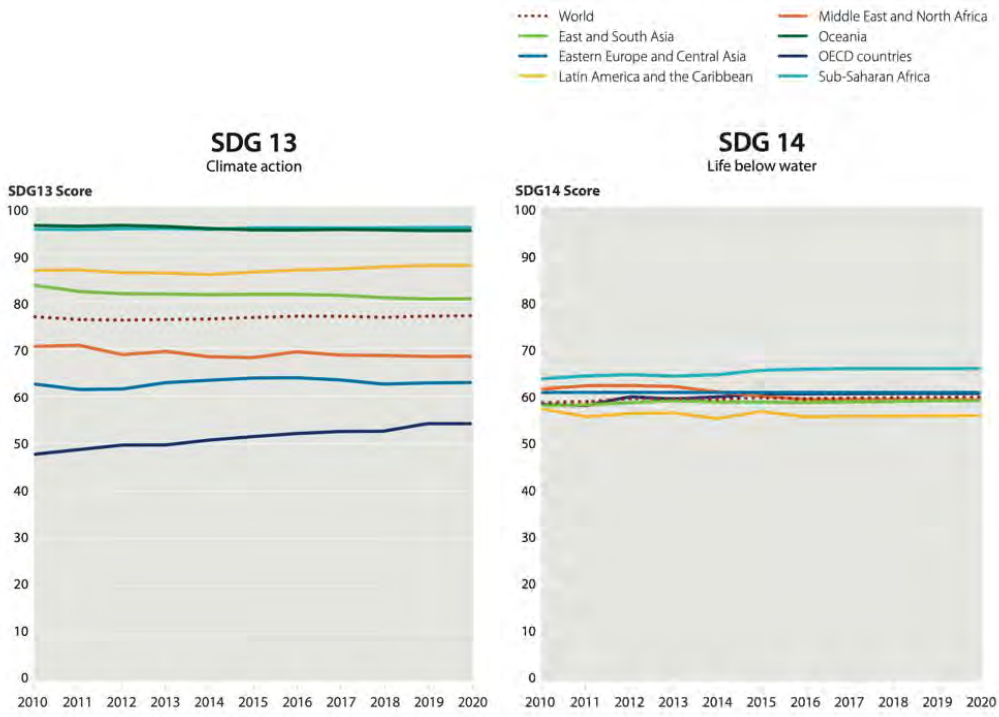

Figure 2: Progress by SDGs and regions (https://dashboards.sdgindex.org/chapters/part-2-the-sdg-index-and-dashboards).

During the pandemic the CO_2 emissions decreased but in major economies the levels came back to their pre-pandemic levels (Sachs et al., 2021, p.24).

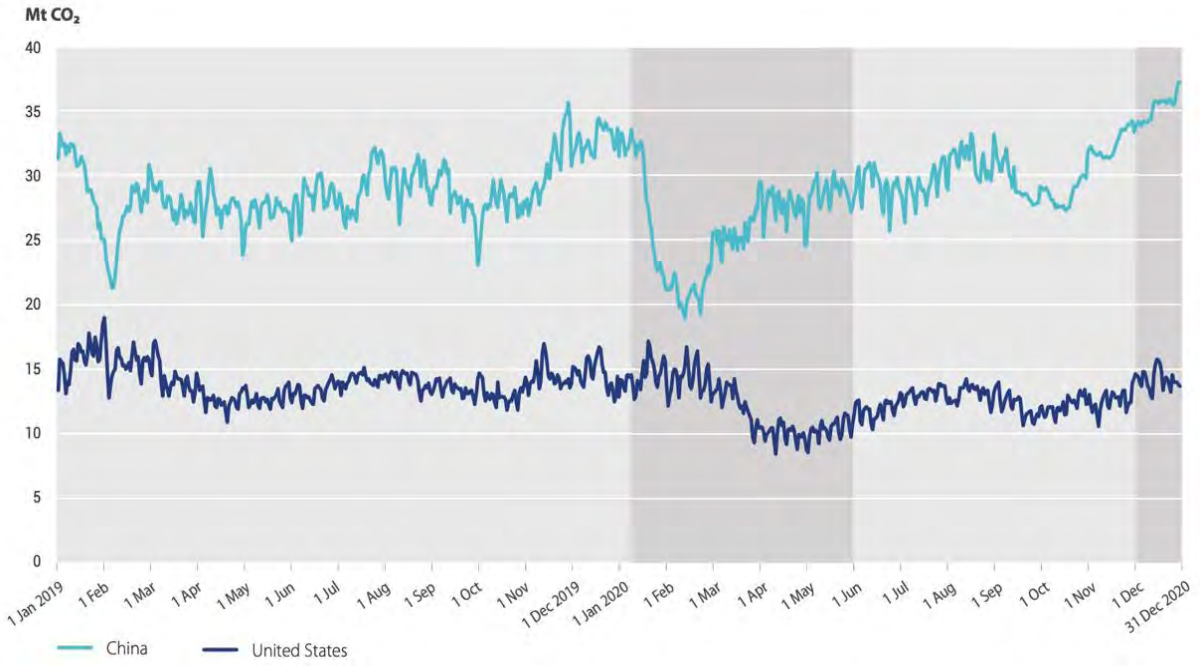

Figure 3: Daily CO_2 emissions (Mt CO_2) (https://dashboards.sdgindex.org/chapters/part-2-the-sdg-index-and-dashboards).

1.1 Sustainable Development

Sustainable development is a term that refers to the development of new strategies for the protection of the environment and the planet as a whole (Gerasimou & Alexidi, 2016). Searching in the literature, sustainable development is characterised as the development in which the overall "prosperity" is not decreased over time and its main goal is not to reduce the total capital (economic, human, social and environmental) (Pop, et al., 2011, Leontaris, 2021).

The United Nations (UN) has established a Sustainable Development operational policy framework to improve the economy and the sustainable development. This framework was adopted by all the member states in 2015 and the main goal was to achieve constructive results and significant progress between the economy and the environment. This action is also known as the "17 Sustainable Development Goals" (SDGs), which are at the heart of this framework and are an urgent call for action by all countries (United Nations, https://sdgs.un.org/goals).

These 17 Sustainable Development Goals (SDGs) are targeted at key areas, such as diminishing poverty and adopting strategies to improve health and well-being, reducing inequalities, promoting education, while at the same time addressing climate change and contributing to the protection of the natural environment (United Nations, https://sdgs.un.org/goals) (Fig. 4).

Figure 4: The 17 Sustainable Development Goals (SDGs) of the United Nations (https://www.un.org/development/desa/disabilities/about-us/sustainable-development-goals-sdgs-and-disability.html).

Sustainable development implies fundamental changes in the society starting from the use of resources and goods consumption, new technologies and their use as well as human behaviour and policy plans adapted both locally and globally. These changes should follow a novel strategy different from the older structural transformations, in which rural societies were urbanised and industrialised without considering the high environmental cost. Moreover, all these transformations and challenges should focus on a "green society" minimising the climate crisis and having as the main pillars, education and citizens' environmental awareness and responsibility (Fig. 5).

Looking at the sustainable development and the climate change through a social prism it is important to recognise that the ability of individuals, individually and collectively, could respond to challenges and policies, such as their conventional behaviour in relation to the environment and towards other people, which are always shaped by their socio-economic and cognitive background (Cook, et al., 2012).

A few examples of such policies that lead to mutual benefit between people, environment and society are presented below:

• development of a firm connection between climate and employment for more green-job opportunities by providing education and skills for the establishment of this transition,

• increasing motivation towards green consumption and green energy production, such as green energy discounts etc.,

• promotion of energy efficient housing design for social welfare, ecological and low energy cost housing,

• promotion of investments in infrastructure (such as public transport) that mainly benefit low-income social groups (Cook, et al., 2012).

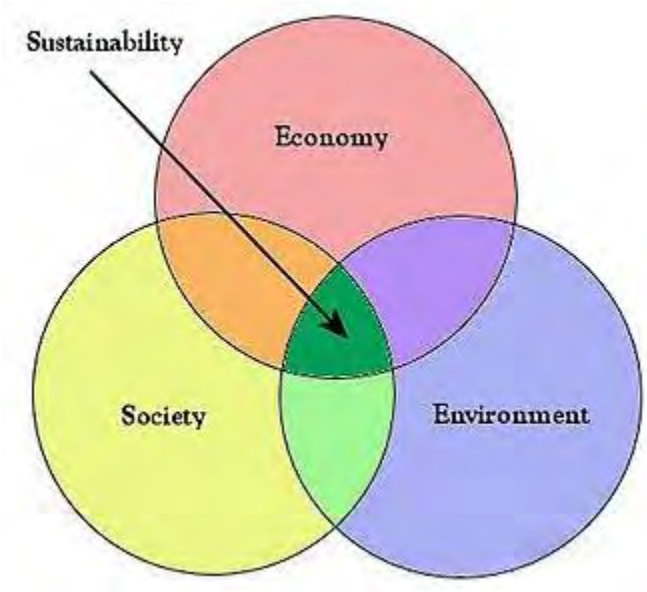

Figure 5: Sustainability is based on three main pillars: society, environment and economy (https://en.wikipedia.org/wiki/Sustainability).

1.1.1 SDG 13: Climate action

United Nations Environment Programme (UNEP, n.d.) is a programme created to promote the environmental protection and the green economy in the frame of sustainable development and it is part of the SDG13: the Climate action (Fig. 6). Climate action is redefining the relationship between people and nature in the pre-existing neoliberal system. This is done by redefining corporate social responsibility and presenting a call for an "ecological modernisation where economic development and environmental protection work together" within a fair social and ethical framework (Fairhead, et al., 2012; Knight, 2017). At the same time, it aims and seeks benefits in the field of health, for the achievement of social equality and for the future of people in general, within the outlines of a finite and fragile planet. (UN environment programme, «What is an "Inclusive Green Economy"?» (https://www.unep.org/explore-topics/green-economy/why-does-green-economy-matter/what-inclusive-green-economy)

Sustainable development is based on education and inclusion and improves the well-being of people's daily lives, while at the same time minimises the destruction of the environment. This seems to be the only way to decrease inequality, decrease the irrational exploitation of natural resources, diminish the waste and ban the widespread threat to the environment and human health.

Over the past decade, many governments have emerged as a strategy and a priority to meet the great challenges of the 21st century, from urbanisation and resource scarcity to climate change and economic instability. In 2008, UNEP launched the Green Economy Initiative (GEI), a

global research programme designed to motivate country leaders to support environmental investment in the context of Sustainable Development (UNEP, 2015).

UNEP is the world's leading environmental authority. This programme sets the global environmental agenda, promotes the coherent implementation of the environmental dimension of Sustainable Development, within the United Nations, and serves as the main advocate for global environmental protection. UNEP's mission is to encourage all to work together to protect and preserve the environment, to inspire, inform and motivate citizens to improve their life quality without compromising future generations (UNEP, n.d.).

As the climate crisis is, and remains, one of the main problems for our and the next generations, five main targets are highly linked with the environment and they are developed to create action and protect the planet. One of the following targets, "Build knowledge and capacity to meet climate change" attracts special interest for the ClimaTePD project implementation as it aims at improving education, awareness-raising, human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning.

- Strengthen resilience and adaptive capacity to climate related disasters
- Integrate climate change measures into policies and planning
- Build knowledge and capacity to meet climate change
- Implement the UN framework convention on climate change
- Promote mechanisms to raise capacity for planning and management (https://www.globalgoals.org/13-climate-action)

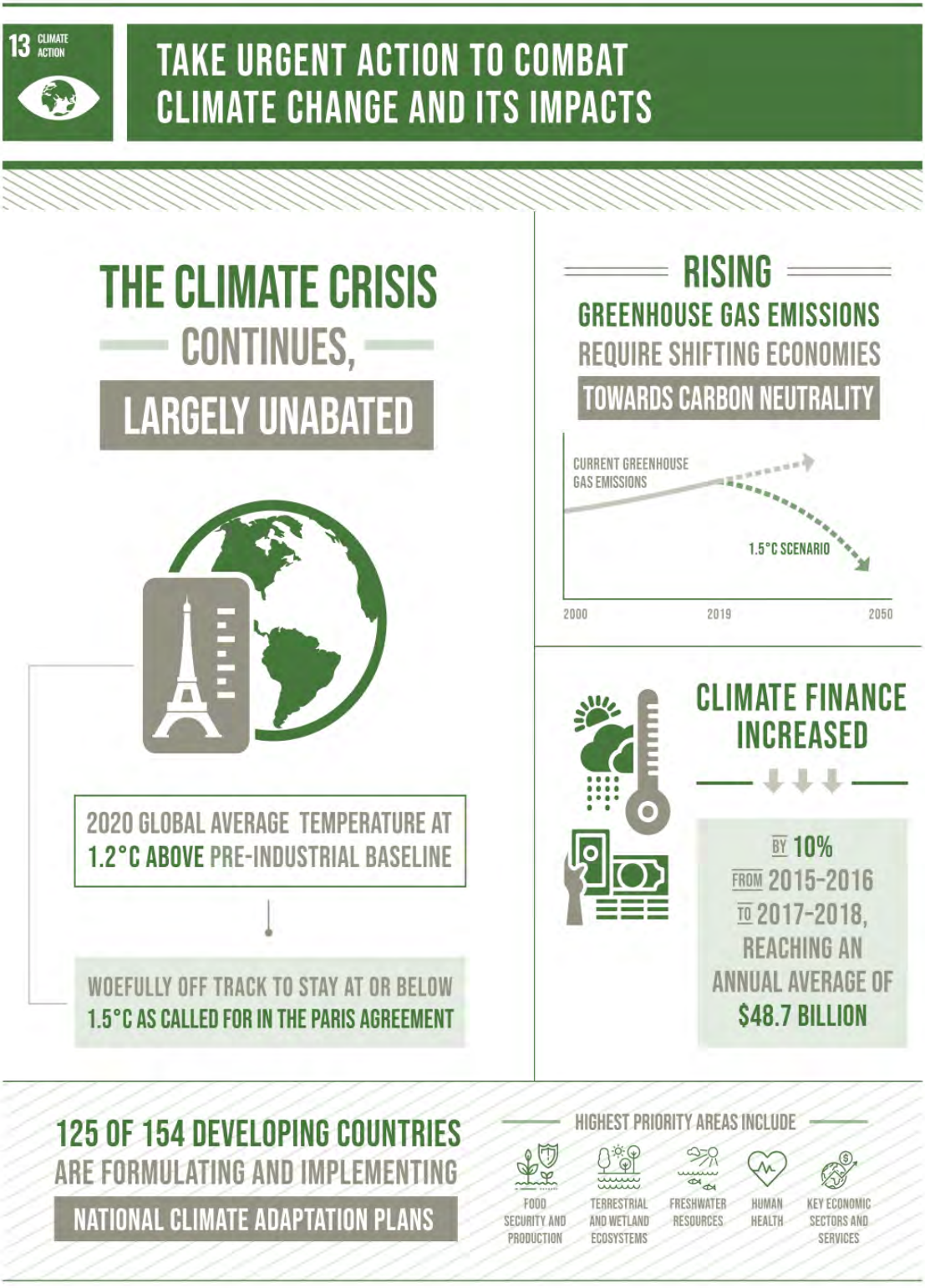

Figure 6: Goal 13 infographic (source: https://unstats.un.org/sdgs/report/2021/)

1.2 DG CLIMA - DG for Climate Action

The Commission's Directorate-General for Climate Action (DG CLIMA) leads the European Commission's efforts to fight climate change at EU and international level. DG CLIMA plays a leading role in developing and facilitating the implementation of cost-efficient policies and legislation to deliver the European Green Deal (see below). The DG CLIMA aims at ensuring prosperity and wellbeing, instilling a new climate culture in Europe, changing behaviours across our society. It maintains an ambitious global leadership in climate action, protecting the ozone layer, enhancing the international and domestic carbon market. It contributes to greening finance, ensuring the mainstreaming of climate action into the EU budget, into EU and member states policies.

Its key mission is to formulate and implement EU climate policies and strategies, so that the EU can turn into the first climate-neutral and climate-resilient continent by 2050. https://ec.europa.eu/info/departments/climate-action_en

The main tasks of this DG are:

- to participate in international negotiations on climate change
- to explore and set up policies that might deal with the consequences of climate change
- the development and implementation of the EU Emissions Trading System
- to promote low carbon and similar clean technologies
- to monitor and aid member states in implementing their national strategies to combat climate change.
  (https://www.eumonitor.eu/9353000/1/j9vvik7m1c3gyxp/vicun06rwsza)

DG CLIMA in collaboration with JRC produces the "Global Energy and Climate Outlook" which is an annual publication about a global view of decarbonisation scenarios as well as a regional view for G20 countries, which have accounted for more than 75% of global GHG emissions since 1990. For each of the G20 countries, the outlook assesses emissions under current policies. It highlights the abatement options to bring emissions in line with ambitious climate policy targets and it also provides an in-depth analysis of global energy and greenhouse gases (GHG) emission trends. https://ec.europa.eu/jrc/en/geco

1.3 European Green Deal

At a European level, a whole strategy dedicated to the climate crisis and the environmental protection and sustainability was developed under the name "European Green Deal" (Fig. 7). The European Green Deal is a development strategy, paving the way for a climate-neutral EU by the year 2050. This means in practice, that the way is open for a fundamental transformation in economy and society having as the main goal the climate neutrality (Haines, Scheelbeek, 2020). The European Green Deal was announced by the EC in December 2019 with the vision to change into a "fair and prosperous society, in a modern, cost-effective and competitive economy", by 2050 (Sikora, 2021).

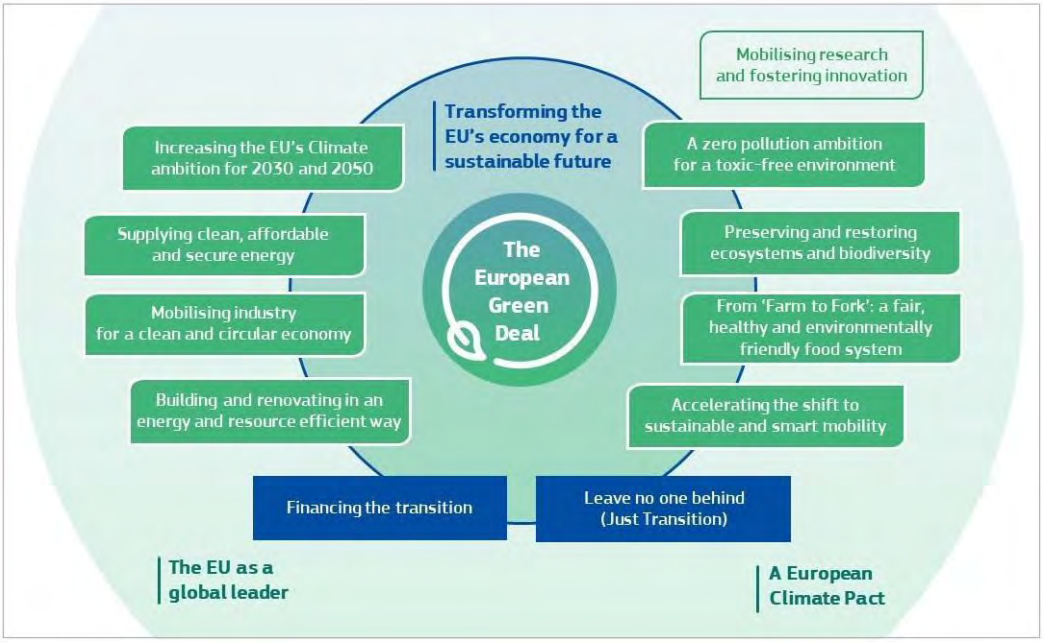

Figure 7: The European Green Deal (European Commission, 2019).

To achieve this goal requires action, collaboration and coherence among different sectors, such as investing in environmentally friendly technologies, supporting education and training, developing cleaner and cheaper forms of private and public transport, investing in research, etc. (European Commission, a European Green Deal).

Education as well as research and innovation will definitely play a central role in accelerating and guiding the necessary transitions for the development and demonstration of risk-free solutions and will seek to strengthen citizens' participation in social innovation (European Commission, Research and Innovation for the European Green Deal). Mariya Gabriel, the European Commissioner for Innovation, Research, Culture, Education and Youth, mentioned that "*Education has a key role to play for inspiring sustainable behaviour and helping citizens move from awareness to action. Schools, higher education institutions, training centres should be empowered to provide quality education for environmental sustainability*" (European Commision, 2021).

A particular aspect of an environmentally oriented education could be illustrated in the concept of climate change education. This concept is enshrined in the climate change transformation strategy and it is intended to engage more people, especially the youngsters and educate them on how to be greener in their everyday habits, raise awareness of climate crisis and cultivate green minds and the new generation of green professionals (Generation Climate Europe, n.d.).

Education, as part of the European Green Deal, aims at engaging more students in climate crisis presenting not only the science behind the problem but also the economic and social effects, the inspiration for activism for a green and just globe and the promotion of social equality and inclusion against any kind of racism (Rethinking Schools, n.d.).

2. Climate Change Education for Sustainable Development (CCESD)

Education plays a key role in dealing with the climate crisis and contributes in inspiring the new generation to adopt a more sustainable lifestyle and environmental awareness. According to UNESCO, education is crucial in helping people understand and cope with the effects of climate change and encourage changes in attitudes and behaviours to tackle the causes of this threat.

In other words we could say that there is a firm connection between climate change education and citizens' "climate literacy". UNESCO has already paved the way towards the citizens' climate literacy by publishing guidelines on how to promote climate change education. It also suggests that it is governments' responsibility to integrate climate change into all levels and aspects of each country's educational system. Educational stakeholders and professionals can play a major role in this strategic transition and participate actively in developing curricula and teaching methods to integrate climate change education in their schools. Furthermore, UNESCO suggests that an ongoing teachers' training should be included in the Teachers' Professional Development (TPD) programmes to help teachers acquire necessary knowledge and improve their skills in climate change education.

Climate change is treated as a difficult topic by teachers especially when they are called to design a subject related to scientific results. Climate change education is not only science-based, but it is also based on social behaviour and activism. It is strongly related to the environment and the economy, and it is connected with equality and social organisation. It is important to mention that climate change education promotes the future citizenship profile which is environmentally and socially responsible at a global level (Maki & Crosier, 2019) (Fig. 8).

Figure 8: Education per the UNFCCC, Paris Agreement, 2015, Article 12. (https://sepn.ca/the-research/ccec/)

In 2010, UNESCO launched Climate Change Education for Sustainable Development (CCESD) as a flagship programme in the holistic approach of Education for Sustainable Development (ESD). Main objective was to embrace areas such as environmental disasters elimination and risk mitigation plans and their correlation with impacts, ethics, adaptation, gender, health, migration and lifestyle. UNESCO's primary goal was to make a connection between education, social participation and action at a community level which are clearly seen as key points in sustainable development due to CCESD (Becker, 2018).

Through the CCESD programme, UNESCO was planning to give a more central and visible role in the international response to climate education and climate change. Acting as a global advocate and aiming to strengthen capacities of governments to provide quality Climate Change Education, UNESCO address the needs of the most vulnerable populations, produces and shares knowledge, provides policy guidance and encourage rethinking of the current model of progress and empower people to act and ameliorate the effects of the climate crisis (i.e. Mailumo, et al., 2018; Mochizuki & Bryan, 2015; Unesco, n.d.).

CCESD seeks to highlight the connection between six different dimensions or aspects (ecological, social, educational, economic, political participatory as well cultural dimensions), laying the first stone for the development of local educational landscapes or learning cities (Fig. 9). It should be underlined that CCESD and the climate crisis' frame promote participatory and socio-affective learning through their interdisciplinary nature. The subject of climate change may encompass topics such as living / buildings, consumption / raw materials, mobility / traffic systems, nutrition / health, water courses / water, biological diversity / nature of city, and so on that affect people's day-to-day lives at a local level (Becker, 2018).

Figure 9: Six-dimensional model of Sustainable Development and Climate protection (Becker, 2018).

CCESD programme as part of the SDG 13: Climate action could be included in all levels of the educational system (primary, secondary, tertiary, adult and vocational education) in every country and promote all the areas of knowledge and skills. This programme could act as a robust educational response that could critically engage learners with the scientific, technical, behavioural, ethical, affective and practical dimensions of climate crisis (Mochizuki & Bryan, 2015).

Recognising the significant value of climate change education as a much higher priority, UN and UNESCO decided and announced their future plans and actions in two global conferences, Agenda 2030 and the UN Climate Conference in Paris in 2015 (Becker, 2018).

Although Climate action is decided to be one of the key thematic priorities of ESD for 2030, there were many actions in the frame of the CCESD programme before 2015. In June 2011, F. Kagawa and D. Selby developed a six-day training course for in-service teachers on CCESD. The programme was dedicated to secondary education teachers with different scientific backgrounds. The scope of this TPD scheme was to help teachers to integrate climate change as a concept in their subjects promoting CCESD and its multidisciplinary framework. The pilot implementation of the programme took place in the teachers' training institutions in Barbados, China, Jamaica, Lesotho, Maldives, Philippines, South Africa, Sweden, Vietnam and Zambia in 2012 (the PDF version of the programme is accessible through the following link: http://unesdoc.unesco.org/images/0021/002197/219752e.pdf) (Selby & Kagawa, 2013; Unesco, n.d.).

2.1 CCESD in schools

Climate mitigating actions, in both global and local levels, can create a culture of awareness and provide young generations with a lifelong foundation for informed decision making on climate-related topics, that lead to a climate literate society (Foss & Ko, 2019). Experts in climate change education believe that it is impossible for people to understand climate change and build environmental and energy behaviour initiatives without decreasing the educational gap between science and society.

Schools could easily become the social vehicles that inform and engage citizens in environmental topics bringing together school students, teachers, researchers and the general public. Peoples' environmental awareness at the end of the 20th century showcases the role that Environmental Education could play in a more humanistic approach of the modern world, where the responsible citizens can actively contribute in building a knowledge society (Karamanou, 2018). To improve climate education and better integrate the subject and research into schools is important to adopt a more interdisciplinary and interactive approach between academic researchers, real world energy and climate problem-solvers (Siegner, 2018).

Many organisations, networks, communities and other key stakeholders work in this direction. In the global education community, several stakeholders, such as UNESCO, UNEP and UNICEF, help schools to integrate climate change education into their curricula and organisations such as, Plan, Save the Children and ActionAid, focus on the communities' skills development to

adapt to climate change through integrating risk reduction in education. Other networks, such as the Asia Preparedness Disaster Centre, the Global Coalition for School Safety and Disaster Prevention Education, the IASC Education Cluster, the Children in a Changing Environment coalition, and the ISDR Thematic Platform on Knowledge and Education, focus on sharing lessons learned and programming tools based on risk reduction through education (Anderson, 2010).

The Intergovernmental Panel on Climate Change (IPCC), which is the United Nations' body for assessing science related to climate change (https://www.ipcc.ch/), identifies a range of educational options to deal with climate change, including ways of climate change education integration in schools' curricula, gender equality in education, various forms of vocational, adult and informal education, sharing indigenous, traditional and local knowledge, participatory democracy in social learning, knowledge-sharing and learning platforms and disseminating information on hazards and vulnerability (IPCC 2014, p.27) (Reimers, 2021).

CCESD has contributed in increasing climate change literacy and fostering behavioural changes as it represents a holistic and learner-centred approach to education which is participatory, action-oriented and potentially transformative (Robbins, et al., 2020). CCESD represents a drastic reoriented form of education based on values and general principles of sustainable development in all areas of social life, having as a main goal the promotion of active citizenship highlighting the holistic dimension of the environment as a part of peoples' everyday life (e.g. Dimitriou, 2009) (as detailed in Annex 1 and Annex 2 of this report).

CCESD can follow a bottom-up approach promoting creativity and joint involvement in activities allowing the circulation of specialised knowledge and experiences contributed by experts and other key stakeholders, rather than following the more traditional form of education which is based on a top-down approach of knowledge, information and theories' presentation. The reorientation of education towards sustainability is more than crucial, facilitating the collaboration among all educational stakeholders, students and society as a whole promoting peer-learning, infusing the diversity of perspectives and modelling a whole-of systems approach (Reimers, 2021).

The best way to teach climate change is following an action-oriented, and trans-disciplinary, incorporating experiential process compatible with the school's curricular programme. In the frame of a school "open" to the society and based on the democratic education, which advocates and supports its social transformative role, CCESC forms its orientations, main goals and objectives established in nature and its principles. To sum up, CCESC:

- considers the environment as a whole, natural and man-made, technological and social (economic, political, technological, historical-cultural, etc.)
- is a continuous and lifelong process, which starts from preschool education and continues at all school levels and also the extracurricular education
- adopts an interdisciplinary approach, using the knowledge of each scientific field to enable a holistic and balanced perspective and examine the main environmental issues from local, national, regional and international level and in other geographical areas
- focuses on current and future environmental issues

- insists on the necessity of local, national and international cooperation in order to prevent and solve environmental problems
- facilitates the involvement of people exchanging their learning experiences and enables them to make decisions for environmental issues
- relates environmental awareness and problem-solving skills addressed to all ages, with particular emphasis on young people
- helps people to solve real environmental problems
- emphasises the complexity of environmental problems and therefore the need to develop critical thinking and problem-solving skills
- uses the various educational environments and a wide variety of educational approaches in teaching and learning, with an appropriate emphasis on practical activities and personal experiences (Karamanou, 2018).

But what about following a digital teaching approach as a novel and more effective intervention to achieve this? Students could acquire and develop digital skills through best practices of learning theory and handling scientific data, engaging and reflecting around a global issue of great interest (Siegner, 2018).

3. Digital technologies in education

We live in a society that is changing rapidly. The classroom, which is a miniature of the society, should accompany each other and offer children of all grades education that is up to date and compatible with the people's needs. Today, the need of developing digital skills and the role of digital technologies in all forms of education are widely recognised both on European and on national level among the member-states.

As highlighted in the EU Council Resolution on further developing the European Education Area to support future-oriented education and training systems (OJ C 389, 2019), vocational education and training programmes need to be learner centred, offering access to face-to-face and digital or blended learning, flexible and modular pathways based on the recognition of the outcomes of non-formal and informal learning, and open up career and learning progression.

Even more, vocational education and training programmes have to be delivered through an appropriate mix of open, digital and participative learning environments, including learning conducive workplaces and are supported by the state-of-the-art and the accessible infrastructure, equipment and technology, and versatile pedagogies and tools, for example Information and Communication Technologies' (ICT) based simulators, virtual and augmented reality which increase the accessibility and efficiency of training provision, including for small enterprises (OJ C 389, 2019).

In this context, it stipulates that teachers, trainers and other staff in educational system and training have to undertake initial and continuing professional development in order to: deliver high quality training; foster technical and digital skills and effective innovative training methods, including teaching in virtual environment; be in line with the vocational and digital

pedagogy; and work with digital learning tools as well as in diverse and multicultural environments.

Information and Communication Technologies (ICT) integrated internationally in education from 1970 (Baron, 1994). Since the 2010s, ICT is considered as a very innovative subject and after almost three decades of public investment and implementation integrated into schools (Chaidatouri, 2010). For example in Greece, in 2001, the Pedagogical Institute suggested the integration of New Technologies in primary education, while at the same time the introduction of Information and Communication Technologies in early childhood school education was raised (further information are included in Annex 1- chapter 1. Greece). In 2019, the term digital education is universally recognised with the arrival of the COVID-19 pandemic. With the spread of COVID-19 countries have implemented emergency plans to slow and limit the spread of the virus and face a possible long-term disruption of school and university attendance (OECD, 2020).

The integration of ICT in schools is a very important change in the educational system. ICT tools not only came to improve the quality of the teaching but also to develop students' skills and new knowledge (Tsitopoulou, 2021). ICT tools make the learning process more fun offering to the students a new experience of learning in a digital environment, and it is considered as an intellectual partner to the learning process through its cognitive functions (Najjar, 2015). As of 2011, it is well known that, the unlimited possibilities offered by ICT enable the teachers to adapt their teaching to the needs and the dynamics of each class (Sánchez et al., 2011). The way of teaching acquires a student-centred character redefining the traditional teacher-student relationship, while new social and learning interactions are developed (Tsitopoulou, 2021).

In general, digital technologies can bridge the gap between high technology and everyday human perception. In detail, the use of digital tools can be used in the teaching process to succeed in a more interactive and engaging way of learning inside the classroom. As students are already familiar with the new technologies from a very early age, they can easily learn and develop new digital skills within the school modules. The use of digital technologies highly contributes in the effective teaching of all the subjects as well as environmental education with the use of appropriate up to date digital tools (Buchanan, 2018). These technologies give students valuable opportunities to interact with nature without having to affect the environment itself (Mpelitou, 2020).

3.1 Digital Technologies and ICT tools in Environmental Education

The innovative nature of the Environmental Education and the areas covered by CCESD leaves space for the ICT integration in the educational process modernising the content offered by the current educational system. The use of ICT can highly benefit the teaching process as it is proven to enhance the engagement of all students in the educational activities and improves the communication between the participants (Tsitopoulou, 2021). ICT is an essential and at the same time an integral part of the implementation of Distance Learning. They also play an important role especially in the education of sensitive societal groups such as people with disabilities, prisoners, etc. Furthermore, ICT seems to have a positive effect on students facing learning disabilities (Najjar, 2015) and stimulate student engagement and to manage class heterogeneity (Epstein,

2016). Technology can enhance the quality of education and give to students and teachers flexibility, without space-time limits (e.g., Poulios, 2020).

The students' active participation is something that is highly encouraged in environmental education, as it is based on the views, experiences and discussions between them. Thus, ICT learning fosters environmental education as is learner-centered, allowing the learner to interact with the tutor and with peers (e.g., Djebara & Dubrac, 2015). Moreover, ICT can promote mutual *learning* where students help each other regardless of their level and work collaboratively, as opposed *to simultaneous learning* where students at the same level simply listen (Epstein, 2016). In addition, the participation of students with special needs is facilitated since the digital tools used can and do overcome many difficulties and may be considered as a tool leading to the democratization of education (Riegert, 2015; Vrillon, 2017; Ministère de l'Education Nationale et de la Jeunesse, 2019).

The engaging role of all students in the educational process is based on active learning, which is one of the principles of the CCESD. Students through activities and round tables improve the educational process leaving behind the traditional teacher-centered education, which gives students a more passive role. ICT inspires students to actively participate in the learning process, while increasing their ability to acquire new knowledge. This happens because students, via group discussions and using various technological tools, utilise multiple emotions and develop new skills during learning (Tsitopoulou, 2021).

As of 2008, it is well established that ICT offers unlimited possibilities in terms of open access educational materials and other resources (Paas & Creech, 2008). This is obviously very helpful, as it is very easy to understand the dimension and the consequences of a global problem such as climate change in just one "click". The students quickly get a broad understanding of the current state of the environment and the planet and draw an overall picture which is so easily provided by the use of ICT. New technologies have improved teaching and learning experience by adding new features to the educational process (e.g., Lionarakis et al., 2018).

The interdisciplinary and multidisciplinary nature of environmental education and CCESD combine many research fields (social, moral, mathematical, linguistic, technological, etc.) and when merged with ICT lead to the students' emotional, cognitive and social development (e.g., Liarakou & Flogaiti, 2007). Advanced technologies, such as GIS systems[1], for example, can facilitate teachers to combine digital media and digital maps in complex story-boards, in order to design interactive and inclusive lessons. Other digital tools enable learners to gradually cultivate their skills, such as searching, synthesising and evaluating information on environmental-related topics, as well as cultivate their critical thinking and the development of reasoning with arguments[2]. Based on Bloom taxonomy, which is a convenient way to describe the degree to which students understand and use concepts, demonstrate particular skills, and have their interests affected, the mastery of the new digital tools allows students to become creators of original artefacts, reaching the highest level in the Bloom taxonomy and facilitating their expression and involvement in the CCESD.

[1] For example: https://storymaps-classic.arcgis.com/en/

[2] Examples: https://www.kialo-edu.com; https://www.socrative.com/

Collaborative learning and project-based learning are other examples, where the principle of environmental education and CCESD can flourish via ICT integration in the teaching process (Paschali, 2018). Smaller or larger groups provide an excellent environment for a more meaningful approach to each issue explored. The benefits of this educational method are very essential for the students as they learn to work in a group, listening to the views and the experiences of their peers, respecting the different opinions and learning how to properly behave in a miniature of the society. ICT tools, such as the digital platforms where students can discuss, express their ideas and views, circulate resources and information and present their arguments, can catalyse the collaboration between the group members and help them to implement their ideas (Tsitopoulou, 2021).

ICT has been systematically used in the implementation of environmental education programmes the last few years, either as means of information or in relation to interactive multimedia environments. ICT enhances students' motivation, contributes to their environmental awareness and helps to explore open access information and relevant educational material, cultivate the interdisciplinarity and creativity of students and contribute to the achievement of the Education for Sustainability's goals (e.g., Poulios, 2020).

In fact, digital tools offer unlimited possibilities for empirical research both in formal, non-formal and informal educational environments. All these educational projects are based on problems or issues of today which seek for a solution. **Students become researchers actively engaged in problem solving and they are asked to express ideas and make decisions on the issue discussed.** Digital tools upgrade the learning outcome, make the teaching process more interactive and interesting and reach a greater understanding of the environmental issue presented. ICT can break the "boundaries of the classroom" showing students something they could never have access to (Tsitopoulou, 2021).

In a survey conducted back to 2014, in the USA, it is highlighted that preschool teachers, using ICT tools in their educational practices, upgraded the content of the environmental education, which was much more than just remarks about animals and plants (Willis et al., 2014). In another study in South Africa, early childhood teachers stated that ICT improved their environmental education teaching, due to the many opportunities for exploration they offer in a very attractive educational environment (Adu & Mireku, 2016).

However, **it is clarified that teachers' beliefs regarding ICT are often an obstacle to its smooth integration into environmental education and CCESD.** The same conclusion is reached by a study in Spain, where the majority seems to be in favour of the integration of ICT in environmental education, with the basic premise of exploring new teaching methods, in order to meet the needs and expectations of new generations (De Sousa et al., 2012). Finally, in a survey conducted in Sweden, the majority of early childhood teachers are positive about the use of ICT in environmental education, however, it emphasises the need to explore the variety of tools and applications that ICT offers today, in terms of their use in early childhood education (Fauville et al., 2014).

ICT constantly offers new aspects for the approach of many issues raised in CCESD. These proposals, on the other hand, can be easily adopted by environmental education and CCESD, as the principles governing both of these educational areas are based on common ground. The

students themselves are at the helm of the educational process and ICT tools help children become more involved in environmental issues and prepare them as responsible and environmentally literate citizens of tomorrow (Tsitopoulou, 2021).

4. Pedagogies for digital competences for the teachers' profession

Teachers today need to develop a range of different skills such as critical thinking and problem-solving, as well as social-emotional skills, keeping up with technological change, or dealing with individual needs of increasingly heterogeneous groups of students. Moreover, it is challenging to collaborate with colleagues and other professionals, to establish partnerships, and participate in leadership and management duties. To respond to all these expectations, teachers' professional competence needs to be understood as a complex concept. Digital skills development will definitely help teachers acquire professional competences, such as analyse and evaluate specific contexts, draw on their knowledge and competences and make decisions about teaching approaches and instruction following the technological and digital integration in education (Fig. 10) (OECD, 2019).

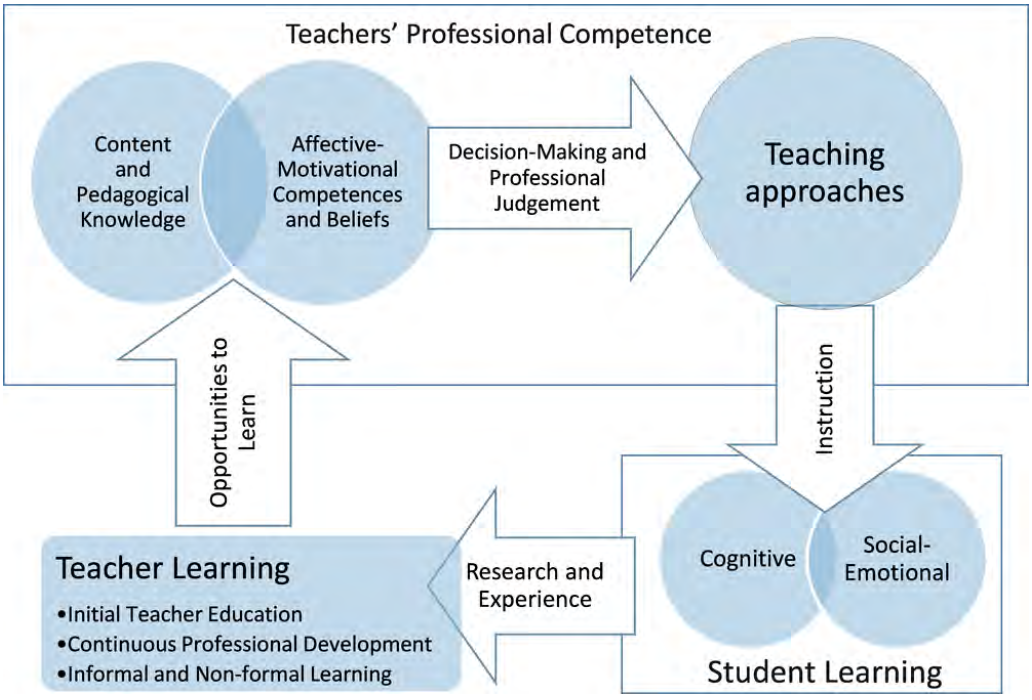

Figure 10: OECD's conceptual framework models teachers' professional competence as a multi-dimensional construct (Guerriero and Révai, 2017).

Teachers' professional development schemes and coaching become, in these circumstances, essential, and even represent a necessary condition for the pedagogical and digital implementation (Dulbecco, 2018). First, any new technology gives rise to pedagogical discussions and recommendations. The success of the transformation would indeed rely on the ability of

schools to mobilise the teaching community. Then, the teacher must learn to master the use of ICT tools and devices in order to introduce them to its class, and the student must master the operation of the tool in order to focus on learning (Perriault, 2012). Garcia suggests that in ICT teachers should move from the role of *author-composer-performer* to the status of *script writer-producer*, i.e., multimedia producer (Garcia, 2003).

According to Luc, the teacher's role is a key one; when developing a pedagogical practice the teacher is doing social work, whether he or she is aware of it or not (Luc, 1983). As for Nawaz & Kundi*, digitalisation is the new title of education*. Teachers and students have no choice but to become digitally literate and to catch up with the rapidly growing digital societies. Governments and education institutions are making every effort to provide online learning environments to achieve a certain level of digital literacy for the general public and schools (Nawaz, 2010).

With regard to teachers' skills, three main areas are identified: tools expertise, subject-specific uses and teaching methods, and literacy on digital culture and media (Aillerie, 2017). Training is essential to provide teachers with the tools to acquire a methodological and technical expertise in the face of transformations resulting from digital technology (Djebara & Dubrac, 2015). In 2009, the European Commission's report, about a third of secondary school teachers said they were not convinced of the benefits of using ICT. The same percentage of teachers said that the subject they teach does not lend itself to the use of ICT. This situation is particularly surprising given that these teachers are all *ICT users on a personal basis or for administrative tasks or lesson preparation* and recognize, like their European counterparts, the effects on student motivation. While 90% of teachers say they are satisfied with the digital tools, only three out of ten see the computer as *helping students learn during their schooling* (Chaptal, 2009).

It is true that not all types of knowledge and know-how to be acquired lend themselves to technical instrumentation and mediatisation, and that certain types of knowledge and know-how can only be acquired with substantial human support, in quality and volume (Alberto, 2011). Our education, our school, is embarked in the digital transition. This vast and complex project is stakeholders' responsibility to carry it out collectively (Pène, 2014).

4.1 Teachers' digital competencies

In building an overview of the themes pertaining to teachers' digital competencies, three areas of the literature were examined: EU policy recommendations highlighting the importance of equipping learners with the necessary digital competences; articles surveying the various interpretations of the courses designed to help teachers in developing their digital competences and; articles mapping the state of affairs in relation to the pedagogical approaches used in such courses. It is important at this point to briefly present what is usually meant by the term "digital competencies".

4.2 What do we mean by the term "digital competency"?

In our literature review, two main themes were identified; the first relates to the terms used in referring to or describing digital competences whereas the second pertains to the different connotations of the term "digital competence". With regards to the first, our feeling of

the landscape aligns with comments from many scholars who highlight that a number of different terms are associated with or used in tandem when referring to digital competencies. Some of them include the term digital competence itself (e.g., Ferrari, 2012), while others employ variants of the term "literacy" accompanied with different collocates such as digital literacy (e.g., Lankshear & Knobel, 2006), computer literacy (e.g., Nawaz & Kundi, 2010) or media literacy (e.g., Potter, 2014). However, these concepts seem to have different meanings in different academic, cultural, historical, social or educational contexts (Røkenes & Krumsvik, 2014).

In relation to the definitions used, it seems that there is no unanimous agreement of what is meant by the term digital competencies. For example, the European Commission (2021), treats digital competences as the knowledge, skills and attitudes "to live, work, learn and thrive in a world increasingly mediated by digital technologies". This interpretation seems to be in alignment with other definitions used in the literature. For example, Erstad et al. (2005, cited in Røkenes & Krumsvik, 2014) define digital competences as the "skills, knowledge, creativity, and attitudes that everybody needs in order to use digital media for learning and functioning in the knowledge society" (p. 8).

In education, Maderick et al. (2016) define digital competences as the skills, abilities and knowledge "to successfully use computers, their related applications, and software in the practice of teaching and education" (p. 329). Other definitions expand the notion of digital competencies by incorporating pedagogical aspects of using digital technologies. For example, Krumsvik (2011) defines digital competence as a teacher's "proficiency in using ICT in a professional context with good pedagogic-didactic judgment and his or her awareness of its implications for learning strategies and the digital Bildung (education) of pupils and students'' (pp. 44–45). Thus, the term digital competence is frequently used across the literature, however it is not clearly defined and no universal definition exists (Starkey, 2020). The variability of definitions/interpretations in the literature will be addressed in a more detailed manner at the following sections because as we are going to see, it is closely related to the approaches adopted when creating courses for developing teachers' digital competencies.

4.3 Guiding principles and strategic priorities for Europe's digital transformation

In the Digital Education Action Plan 2021-2027, the European Commission listed a number of guiding principles that are essential in ensuring that "education and training adjust to the digital transformation and further improve the quality and inclusiveness of education in Europe" (p.8). These highlight (1) the importance of providing high quality and inclusive digital education, which respects the protection of personal data and ethics; (2) the need for investing in connectivity, equipment and organisational capacity and skills which will ensure that everybody has access to digital education; (3) the necessity for including basic digital skills as part of the core transferable skills that any citizen should have to be able to develop personally; (4) digital education's pivotal role in increasing equality and inclusiveness; (5) the need for incorporating digital competences as a core skill for all educators and training staff and their embedment in all areas of teacher professional development, including initial teacher education and; (6) the key role the education leaders have in digital education.

These guiding principles support two strategic priorities that the European Commission has decided to be taken at the EU level: (1) fostering the development of a high-performance digital education ecosystem and (2) enhancing digital skills and competences for the digital transformation. With regards to the first priority, the EU accepts that effective digital capacity planning and development is vital for education and training systems and that training in digital skills (including digital teaching methods) will be essential for staff. In relation to the second, the European Commission supports that the transition to a green and digital economy requires solid digital competences. This means that digital literacy will become essential for everyday life, especially in an economy which has high demands for advanced digital skills (e.g., data analysts, cybersecurity analysts, software developers).

4.4 Interpretations of digital competences in teachers' education

As we have already seen, the term digital competence has multiple meanings in the literature. Of particular interest to us is Starkey's (2020) work which offers an overview of the different approaches found in the literature. Starkey identified three different interpretations of what digital competences encompass: generic digital competencies; digital teaching competencies and; professional digital competencies. Each of these interpretations is tight to the aim that a digital competencies training or course aims at (Table 1).

Table 1: A summary of the different interpretations of the term "digital competence" and the associated teacher education programmes. Adapted from Starkey (2020).

	Generic digital competences	**Digital teaching competencies**	**Professional digital competences**
Competencies	Use presentation, creative, collaborative and communication software Use hardware such as cameras and printers.	Teach using digital technologies. Evaluate teaching decisions critically. Teach students who are using digital technology.	Teach using digital technologies Manage digital learning environments Use systems and tools in the professional work as a teacher.
Teacher education programme	Technical knowledge to use technologies for teaching. Course on how to use digital technologies	Knowledge of how to apply digital technologies to replace or enhance established teaching practices Course on how to teach with digital technologies	Knowledge of how to be a teacher in a digitally infused schooling system Digital technology use infused across the programme

Educational context	Introduction of digital technologies.	Integration of digital technologies into teaching programmes	Infusion of digital technologies across the work of a teacher.

Generic digital competencies **refer to the skills that are not specific to teaching per se but can be applied to the teaching practice.** Training courses in this category are usually placed in a context which assumes that teachers have low or no experience in using digital technologies and aim at increasing teachers' abilities in using presentation, creative, collaborative and communication software (e.g., for video editing, online drawing, blogs, wikis) as well as hardware technologies (e.g., cell phones, laptops, cameras, printers). Thus, courses built around the theme of generic digital competences aim at training teachers in acquiring the technical knowledge for using certain technologies in their teaching practice.

Digital teaching competencies refer to the integration of digital technologies as a way of enhancing or replacing existing teaching practices. Three different types of competencies are associated with this category: (a) the ability to use particular digital tools as a teacher (e.g., blogs, social media, podcasts and digital assessments); (b) the ability to critically select which technology to use for a specific teaching purpose and; (c) the ability to teach students who are learning through and with digital tools.

Finally, ***professional digital competencies*** include all the previously mentioned skills that can be applied/are necessary in digitally infused education systems where digital technologies are embedded across everyday aspects of a teacher's work. More specifically, professional digital competences refer to a range of competencies such as being able to teach in a digitally infused context (e.g., critically evaluating teaching decisions; teach students who are using digital tools), manage digital learning environments and carry out the broader professional work of being a teacher (e.g., using student management systems and data analysis tools; participating in professional learning networks).

Starkey (2020) notes that these interpretations seem to align across three different phases of integrating digital technologies: the introduction of digital tools to schooling contexts (generic), the integration into existing systems and practices (teaching) and the infusion across the work of the teacher (professional). Of course, there is an overlap between the competencies; generic digital competencies include skills needed to integrate digital technologies into teaching practice and professional digital competence includes the ability to integrate digital technologies into practice.

4.5 Pedagogical approaches in teachers' professional development programmes

The second dimension that is of interest to us is the pedagogical approaches used when training teachers' digital competencies. Røkenes and Krumsvik (2014) identified 8 different pedagogies used in education programmes for prospective/pre-service teachers: collaboration, metacognition, blended learning, modelling, authentic learning, student-active learning, assessment and bridging theory-practice gap.

Collaboration approaches, also termed as cooperative learning, refer to training situations where two or more teachers work together as a way to maximise their own and each other's learning. Several synchronous and asynchronous collaborative knowledge-building technologies have been used within this approach, including online forums, discussion boards, and learning networks, social networking sites and other interactive Web 2.0 applications, blogs and collaborative software.

Metacognition approaches also termed as reflective practice, usually involves reflection-on-action (Schön, 1983), where teachers analyse and document their thoughts, reactions, and/or consequences of their actions surrounding a situation involving the use of digital tools. This is usually done by using online bulletin-boards, forums, blogs or discussion groups as a way to stimulate teachers' reflection and learning as well as have them to critically assess classroom uses afforded by websites and software appropriate for the secondary school grade level.

Blended learning approaches (or multimedia instruction approaches) entails teachers' professional development programme through the use and combination of both face-to-face and online teaching, as well as the combination of different modes to create meaning through electronic mediums (e.g., video, animations, diagrams, photos, illustrations, written and spoken text).

Modelling involves the promotion of particular practices and views of learning by teacher educators or in-service teachers. This is usually done by intentionally displaying a specific behaviour which could play an important role in shaping a prospective teacher's professional learning.

Authentic learning refers to the pedagogical approach that situates learning tasks in the context of real-world situations or the context of future use. This is usually done by assigning prospective teachers to explore, create, and assess digital technologies for use in their future classrooms.

The ***student-active learning*** approach involves a shift of the pedagogical control from the teacher educator to the prospective teacher. In such courses, prospective teachers learn to integrate technology for their future teaching by actively engaging in learning and meaning-making processes through experiencing, interacting with, and creating classroom-related digital resources.

The ***assessment approach*** refers to a pedagogy in which prospective teachers are engaged in activities that enable them to assess themselves and provide information to be used as feedback to modify their behaviour. Most of the courses employing this pedagogy evolve around the theme of creating digital portfolios.

Finally, the ***bridging theory-practice gap*** approach refers to the efforts aimed at decreasing the disconnect teachers experience between the content taught in the university and the realities faced during their teaching. Such courses do so by aligning theoretical and practical knowledge, while at the same time exposing teachers to various ways of integrating technology in their teaching.

Table 2: Summary of the pedagogical approaches used in digital competencies courses.

Pedagogical Approach	
Collaboration	Learn by working collaboratively.
Metacognition	Learn by self-reflecting on didactical actions and their consequences.
Blended learning	Learn by engaging in face-to-face and online activities.
Modelling	Learn by modelling the behaviours of a teacher educator or an in-service teacher.
Authentic learning	Learn by exploring, creating and assessing digital technologies.
Student-active learning	Learn by experiencing, interacting with, and creating classroom-related digital resources.
Assessment	Learn by engaging in activities that allow to assess your behaviour e.g., by building digital portfolios.
Bridging the theory-practice gap	Learn by aligning theoretical knowledge (gained at the university) and practical knowledge (what is actually needed during teaching).

4.6 Contemporary Pedagogical Approaches

Inquiry Based Learning (IBL)

Almost thirty years of empirical studies investigating the impact of IBL approaches, have led to a comprehensive body of both empirical research and meta-analysis studies that provide evidence on the effectiveness of inquiry pedagogies in the development of science learning and the improvement of students' inquiry skills.

Apart from students' learning and recognising the qualities of IBL as a means to promote skills development, it is also essential to consider the potential of its effectiveness in secondary teachers' professional learning. During the last decade there has been an increasing interest in IBL as an instructional approach in STEM disciplines. IBL should be seen as a means for facilitating

teachers to develop new skills or improve their skills, needed in their professional life under their roles as learners themselves, as facilitators of students' learning and as members of educational communities (Chaimala & Kikis-Papadakis, 2019).

IBL is briefly described as a form of active learning where learners develop their own questions to examine, engage in self-directed inquiry (diagnosing problems - formulating hypotheses - identifying variables - collecting data - documenting their work - interpreting and communicating results), and working individually or in groups. It follows a constructivist student-centred pedagogy using inquiry as a main vehicle for teaching and learning. The main goal of IBL is to stimulate learners to adopt a critical inquiring mind, critical thinking and problem solving skills (www.igi-global.com/dictionary/inquiry-based-learning-ibl/14744; Silm et al., 2017).
IBL:

- Reflects on the purpose and makes plans for inquiry learning;
- Plans for each learner to be actively involved;
- Encourages/Enables learner to take increasing responsibility for his learning;
- Facilitates classroom learning;
- Accepts that teaching is a learning experience;
- Is constantly alert to learning obstacles;
- Asks key types of questions – Why? How do you know? What is the evidence?
- Student assessment made an ongoing part of the facilitation of the learning process;
- Learners in the process of learning;
- Accept an "Invitation to learn" and willingly engage in exploration process;
- Raise questions, propose explanations, and use observations;
- Plan and carry out learning activities;
- Communicate using a variety of methods;
- Critique their learning practice;
- IBL Nurtures Questions and Reflections (https://thalys.gr/mod/book/view.php?id=3282&chapterid=1460).

Secondary teachers' training via IBL supports the development of teacher competences. This usually happens as the teachers' professional development courses are conducted in a traditional way via lectures. IBL can greatly contribute to teachers' skills development through online training as it has a very poor explored potential as an effective teachers' training method, which can contribute for effective STEM teachers' competence development (Chaimala & Kikis-Papadakis, 2019).

Figure 11: The key dimensions of the IBL competence framework (Stefanova et al., 2019).

Teachers take the position of lifelong learners and at the same time they should 'learn how to teach' and 'teach how to learn'. IBL has long been recognised in science learning as a successful and promising approach for achieving science education goals, as well as a means of promoting better engagement and motivation in STEM subjects and beyond. It is also very important to highlight its effectiveness in teachers' professional development and its contribution in teachers' skills development (Chaimala & Kikis-Papadakis, 2019).

Focusing on the ClimaTePD project, the skills, related to IBL, that teachers should develop during the online training provided by the project, are mainly: analytical skills, science skills (to break down a complex scientific system into smaller parts, recognise cause and effect relationships, and defend opinions using facts), experimentation skills (to know different methodologies and processes required), comprehension and communication skills (to read and understand scientific and technical materials, to communicate effectively and behave with patience, as well as to have technical skills regarding different presentation media), cooperation and creative skills (to listen to others needs or interact with project partners, to solve problems and develop new ideas) as well as organisation (to keep track of lots of different information) and metacognitive skills (related to IBL and the ClimaTePD training).

Gamification

Apart from IBL, creative pedagogies also encourage exchanges, solidarity and cooperative learning methods which draw special attention to collaborative and improvisational practices in ways that help learners externalise their understandings and foster metacognition. In a model of creative pedagogies applied to game-based learning, Frossard, Barajas and Trifonova (2015) emphasise approaches which connect to learner's life and interests (to make learning meaningful and engaging), create a bridge between different disciplines (to facilitate the interrelation across domains and place knowledge in a wider context), propose flexible evaluation strategies (which

value student progress and provide tools for reflection), and enhance self-learning (i.e. encouraging student ownership, autonomy, and active participation in the production of meaning) (Barajas, Frossard & Alcaraz Domínguez, 2018).

Gamification refers to the use of games to motivate learners and enhance their learning process, maintaining a balance between content and gaming and its application in the real world. Having its roots back to the sixties when Piaget underlined that games could not only help children to master their environments but also to create the worlds of their imagination, gamification could engage learners in promoting active, experiential and problem-based learning (Majuria et al., 2018).

As an innovative and engaging methodology it promotes:

- skills for problem solving,
- socialisation and cooperative work,
- concentration,
- self-efficacy and productivity,
- personal autonomy,
- the ability to interact,
- the assimilation and the interconnection of content,
- the development of values,
- curricular, cognitive and social competences,
- feeling of empowerment in learners' way of working to achieve tasks,
- the simulation of situations and
- decision-making skills (Manzano-León et al., 2021; Cózar-Gutiérrez & Sáez-López, 2016; Hanaysha, 2016).

While, the 12 common dimensions of what can motivate a person in the different models of gamification are: (1) Purpose and meaning; (2) Challenge and Competence; (3) Completeness and Mastery; (4) Autonomy and Creativity; (5) Relatedness; (6) Immersion; (7) Ownership and Rewards; (8) Unpredictability; (9) Scarcity; (10) Loss avoidance; (11) Feedback; (12) Change and Disruption (Araujo, 2017).

With the development of technologies and the integration of ICT in education, gamification has been applied in different disciplines in all the educational levels, from preschool, via secondary and high school as well as in higher education increasing the learners' motivation in activities and fun (Swacha, 2021).

Focusing on STEM subjects and environmental education, gamification can be a valuable strategy to motivate students to carry out sustainable practices and work on their civic competence in a playful way with the aim of acquiring more ecologically responsible behaviours and respect for the environment. The use of gamification for sustainable learning and self-determination in education reports that people learned through online gamification had better results in the knowledge of sustainability, pro-environmental behaviour and performance (Manzano-León et al., 2021; Araujo, 2017).

Furthermore recently, the use of gamification in the field of e-learning is growing and gaining in popularity. Properly developed e-learning which uses gamification can increase

satisfaction, engagement, effectiveness and efficiency of students. Right combination of e-learning, gamification and balanced tasks and skills can lead students into the so-called state of flow (Urh et al., 2015).

Focusing on the ClimaTePD project, the skills, related to gamification, that teachers could develop during the online training, in order to further transfer them to their students, are mainly: collaboration and teamwork, creativity, critical thinking and problem-solving skills, socialisation and cooperation, increased concentration, improved decision-making, personal autonomy, multi-area and multi tasking skills, the development of values, etc.

The above come to guide and be integrated into the development of the project's subsequent activities, namely the training scheme and the functionalities of the learning platform. Part B below focuses on the state of affairs in the participating countries.

Part B: Short summary of the partners' country reports

An extended version of the partners' country reports, where the state of affairs of climate change education, climate change policies and TPD schemes in Greece, Spain, Germany, Bulgaria and Turkey, are analytically presented in Annex 1 of the current report.

1. Recommended literature and sources to be used in the teachers' professional development programme in the consortium countries

In Bulgaria as well as in Greece, lack specific best-cases literature and research in Climate change issues in TPD. In Bulgaria good practices can be found in the materials of National Trust Eco Fund- Sofia and Bulgarian Environmental Partnership Foundation.

In Greece there are a few studies on environmental education such as the one of Malandrakis, et al., 2020 (Malandrakis G., Dimitriou A. & Georgopoulos A., (2020). "Characteristics of Environmental Education Programmes in Primary Education: A 7-years experience at panhellenic level", Environmental Education for Sustainability, v. 2(1), pp. 29 – 41, https://doi.org/10.12681/ees.19743) and the publication of Petkou, et al., 2021 (Petkou D., Andrea V. & Anthrakopoulou K., (2021). "The Impact of Training Environmental Educators: Environmental Perceptions and Attitudes of Pre-Primary and Primary School Teachers in Greece" Education Sciences, v. 11, pp. 274. https://doi.org/10.3390/educsci11060274).

In Germany, De Haan has identified 12 competences that students should develop in terms of ESD (Haan, Gerhard de (2008). *Gestaltungskompetenz als Kompetenzkonzept der Bildung für nachhaltige Entwicklung.* In: Bormann, Inka / De Haan, Gerhard (Hrsg.): Kompetenzen der Bildung für nachhaltige Entwicklung. Operationalisierung, Messung, Rahmenbedingungen. Wiesbaden: Verlag für Sozialwissenschaften. http://www.transfer-21.de/indexb4c1.html?p=222), the international group of authors presents competences for teachers of ESD (Corres, Andrea / Rieckmann, Marco / Espasa, Anna / Ruiz-Mallén, Isabel (2020). *Educator Competences in Sustainability Education: A Systematic Review of Frameworks*. In: Sustanability 2020, 12. doi:10.3390/su12239858 https://de.aroundersenseofpurpose.eu/) and in a Delphi study, a model was developed for competences that learners in higher education should develop in the sense of ESD (Brundiers, Katja / Barth, Matthias / Cebrián, Gisela et al (2021). *Key competencies in sustainability in higher education – toward an agreed-upon reference framework*. In: Sustainability Science 16. S. 13-29. Download: doi.org/10.1007/s11625-020-00838-2).

In Turkey, Caymaz (2020) has carried out a meta-analysis on studies conducted in Turkey on global warming. Main findings of the studies are summarised on page 24, Table 4 (Caymaz, 2000, pp. 24-25). The results of several studies revealed that students in different educational levels have incomplete/superficial information and alternative concepts about the causes/effects of global warming and measures to be taken. Most of these studies suggest there should be more emphasis in the media and curricula related to climate change. (Caymaz, B. (2020). Thematic review of some studies about global warming in Turkey. *International Electronic Journal of Environmental Education, 10*(1), 16-31.)

2. To what extent does climate change education have adequate space in school teaching and teachers' professional development programmes in the country?

Climate change is not a priority area in Bulgaria, even if the country adopted all necessary legal documents in the field. In education, the topics discussing climate change are scattered

among various subjects within the secondary school curriculum (Biology, Geography, Physics, Chemistry, etc.), without making connections or providing additional interdisciplinary links. As a positive example, few NGOs actively work to engage teachers and to introduce practice-oriented experiments and hands-on activities in class, focusing on climate change issues. Furthermore, in many schools new STEM teaching centres and maker spaces have been built in recent years, discovering new opportunities for developing interdisciplinary and collaborative projects.

Following the same path, Greece has a couple of main core subjects in the school's curriculum where environmental education is present. Physics and mainly Chemistry have only a few references on general environmental issues such as the acid rain, the ozone hole, the greenhouse effect and the CO_2 emissions. Two years ago, there was also a subject in high school entitled "Management of natural resources" which was dedicated to the environment and the natural resources.

In Germany, there is quite a lot of material on ESD for many educational fields of action. Depending on the federal state, there are also more or less elaborate strategies for implementing ESD in schools. There are numerous opportunities for teachers to further educate themselves in in-service training. At the same time, however, it has to be said that climate education in schools is carried out to far too limited an extent. Often it is only geography lessons. Integration into everyday school life is very dependent on individuals.

Climate education in a deeper understanding and as a whole institutional approach is still the exception. In the summer of 2021 in Turkey, a series of more than two hundred wildfires burnt 1,700 square kilometres of forest in Turkey's Mediterranean Region in the worst-ever wildfire season in the country's history. Just after these huge wildfires, in October 2021, the name of "the Ministry of Environment and Urbanisation" was changed as "the Ministry of Environment, Urbanisation and Climate Change'' and issues related to climate change were emphasised among the ministry's policies.

Therefore, considering the current situation, we believe the ClimaTePD project and its resources will be of interest to teachers, students, policy makers and other stakeholders. The ClimaTePD workshops will be an avenue to discuss issues and possible collaboration opportunities among different actors in climate change (education).

3. Climate change policies and programmes in Greece, Spain, Germany, Bulgaria and Turkey

3.1 Greece

Climate change policies and programmes in Greece

Policies, national strategic plans	In Greece, the Articles 42-45 of the Law 4414/2016 (A' 149), instituted the preparation and approval of the National Climate Change Adaptation Strategy as well as the Regional Plans in the context of Adaptation to Climate Change. Furthermore, the 1st National Climate Change Adaptation Strategy was approved and the National Council for Adaptation to Climate Change was established. (https://ypen.gov.gr/perivallon/klimatiki-allagi/prosarmogi-stin-klimatiki-allagi/) Environmental Education appeared in the Greek school in 1990 with the Law of 1892 proposed by the Ministry of Education and Religious Affairs. The main goal of the Environmental Education was to make students aware of the relationship between people and their physical and social environment, to raise awareness of the environmental problems and inspire them to be active and deal with them" (Law 1892/90, article 111, § 13) ((Karamanou, 2018, Tigkas & Flogaiti, 2019).
K-12 Curricula	Lately, the Ministry of Education and Religious Affairs in collaboration with the Institute of Educational Policy (IEP) introduced the "Skills Workshops", in all levels of Greek school (kindergarten, primary and secondary education) for the year 2021-2022. As a dynamic and educational action, the "Skills Workshops" include modern and innovative learning methods with a special reference and a whole section on environment (Ecology - World and local Natural heritage - Climate change - Natural disasters, Civil protection - World and local cultural heritage). The aim of these workshops is to enhance the cultivation of mild skills, life and technology skills as well as science skills in all students, in the frame of a new and up to date curriculum framework (http://www.iep.edu.gr/el/psifiako-apothetirio/skill-labs).
Teachers' professional development programmes	Training in environmental education issues has played a positive role in changing educators' attitudes, enhancing their cognitive frame and developing their meta-cognitive skills. This was expressed by their nature-based interests, and their creativity in teaching and implementing environmental programmes. Thus, environmental education should be at the top of the agenda in the development of new school curricula—as possible scenarios after COVID-19 demonstrate that human societies will suffer new pandemics in the future (Petkou, et al., 2021). Environmental Education Centers (EECs) belong to a network of decentralised public educational structures of the Ministry of Education and Religious Affairs and they deal with Environmental Education and Sustainability. EECs conduct training programmes and seminars for both primary and secondary school teachers' training. The seminars and programmes are implemented in collaboration with Heads of Environmental

	Education Departments in Universities, Research Centres and other Institutions (Katsakiori et al., 2008).
Informal learning settings (Museums, etc.)	EECs plan to strengthen the formal education through its connection with informal and non-formal educational environments, which are more participatory, learner-oriented and promote lifelong learning based on the strategy of "Education for Sustainable Development: 2005-2014" (UNECE, 2005) (Katsakiori et al., 2008). Arcturos is a non-profit, non-governmental, environmental organisation (NGO) that has successfully carried out activities about environmental education in institutions of primary and secondary education, with the approval of the Ministry of Education and Religious Affairs. (https://www.arcturos.gr/en/activities/environmental-education/) The Greek Association of Teachers for Environmental Education (P.E.K.P.E.) organise activities towards supporting the sustainability education programmes, which are implemented in schools. (https://dspeekpe.wixsite.com/peekpe) We4all is a non-profit environmental organisation that develops seminars and lectures in schools and other organisations to raise environmental awareness. (https://we4all.com/blog/category/actions)
Citizen Science actions, Initiatives about Climate Change	Environmental Education Centers (EECs) (https://kpe.inedivim.gr/) play a critical role in promoting environmental issues and shaping citizens' participation by informing and raising awareness about issues of environmental protection through workshops, events, as well as the production of printed and electronic publications (CDs, videos, etc.) (Katsakiori et al., 2008). We4all organises public engagement activities. (https://we4all.com/blog/category/actions)

3.2 Spain

Climate change policies and programmes in Spain	
Policies, national strategic plans	In the new Law on Climate Change and Energy Transition, very recently approved, there is a full section devoted to climate change, education and research. The Law states that the Government shall review the treatment of climate change and sustainability in the basic curriculum of the teachings that form part of the Education System in a cross-cutting manner, including the necessary elements to make education for sustainable development a reality. Likewise, the Government shall promote actions to guarantee adequate teachers' training in this area.
K-12 Curricula	The basic curriculum for Primary Education as well as the basic curriculum for Compulsory Secondary Education and Baccalaureate expressly mention climate change in three core subjects (Sciences Applied to Professional Activity, Geography and Geology) and in as many specific subjects (Ethical Values, Scientific Culture and Earth and Environmental Sciences). There are also some programmes for introducing contents related to climate change and sustainable development, but none are fully incorporated. There is a current discussion about including a new subject or selecting climate change contents across the STEM curricula.
Teachers' professional development programmes	Official university teacher education programmes do not include this area as a priority. However there are many in-service teachers' training initiatives, many times linked to NGOs, companies that promote teachers' professional development programmes.
Informal learning settings (Museums etc.)	Exhibitions at Science Museums about climate change are common in the 17 Spanish sciences museums, very much successful.
Citizen Science actions, Initiatives about Climate Change	Climate change and environmental issues are of much interest for citizens, especially youngsters, as recognised by many surveys. There are many NGO working in the field of climate change awareness and in educational programmes devoted to citizens and schools. Interesting are initiatives promoted by big energy companies tackling citizenship in this area. The National Center for Environmental Education (CENEAM) promotes information, training, dissemination, awareness, environmental education, and public participation in order to improve the training of professionals and promote the responsibility of citizens in relation to the environment.

3.3 Germany

Climate change policies and programmes in Germany	
Policies, national strategic plans	Germany has a Federal Climate Protection Act (KSG), which, however, has been criticized for not achieving the goals of the Paris Climate Agreement. In a Climate Protection Plan 2050, measures were named that are to be taken to protect the climate.
K-12 Curricula	In several federal states, Education for Sustainable Development, and in particular climate education, plays a role in school, especially in geography lessons. In Bavaria, Education for Sustainable Development is a general educational goal. However, this should not hide the fact that ESD and also climate education are not given the relevance they would need in everyday school life.
Teachers' professional development programmes	There are several federal states where appropriate trainings are offered at universities, centres for teacher education or teachers' training institutions.
Informal learning settings (Museums etc.)	Climate change is addressed in many exhibitions and activities in science museums in Germany, also in Youth Work and cooperative projects.
Citizen Science actions, Initiatives about Climate Change	In Germany, there are many civil society actors who arrange climate education (under the umbrella of Education for Sustainable Development and Global Learning). For example Greenpeace e.V., BUND Naturschutz e.V., Numerous for Future movements (including Fridays for Future, Scientists for Future) campaign for the political implementation of climate protection goals. Climate change is addressed in many exhibitions and activities in science museums in Germany, also in Youth Work and cooperative projects.

3.4 Bulgaria

Climate change policies and programmes in Bulgaria	
Policies, national strategic plans	National Climate Change Adaptation Strategy and the Action Plan for the Republic of Bulgaria (NAS), approved by the Council of Ministers on the 25th November 2019, is a reference document, which sets the framework for climate change adaptation (CCA) action and national priorities up to 2030
K-12 Curricula	Mainly covered in several school subjects (in pre-school education, in primary school education - the subjects "Man and the Nature" and "Man and the Society", and in secondary school level -STEM subjects: biology, chemistry, physics, geography.
Teachers' professional development programmes	The subject of climate change and energy efficiency does not exist as standalone topic in the educational curriculum; a lack of educational materials on a resource-efficient, low-carbon and climate-resilient economy;
Informal learning settings (Museums etc.)	Muzeiko – children's museum, offering specially designed games, including related to climate change Earth Hour – gaining more support and popularity each year
Citizen Science actions, Initiatives about Climate Change	Among the most active NGOs, supporting initiatives and projects, targeting climate change actions in schools and educational institutions in Bulgaria: National Trust Eco Fund- Sofia and Bulgarian Environmental Partnership Foundation

3.5 Turkey

Climate change policies and programmes in Turkey	
Policies, national strategic plans	"Turkey's National Climate Change: Adaptation Strategy and Action Plan" was prepared in coordination with the Ministry of Environment and Urbanisation, and approved by the Prime Minister's High Planning Council (CSB, 2012) In October 2021, the name of "the Ministry of Environment and Urbanisation" was changed as "the Ministry of Environment, Urbanisation and Climate Change" and issues related to climate change were added among the ministry's policies.
K-12 Curricula	Primary School Curricula, Grade 8 Science Curriculum and Grade 9 Chemistry Curriculum
Teachers' professional development programmes	Climate change is addressed in several courses in TPD programmes. For instance, in "Environmental Education", "Science and Technology Originated Problems", and "Sustainable Development and Education" courses (YOK, 2021). Turkish Ministry of Environment and Urban Development run some training programmes for teachers on climate change.
Informal learning settings (Museums etc.)	Climate change is addressed in many exhibitions and activities in science museums in Turkey. Konya and Kocaeli Science Centers are among them.
Citizen Science actions, Initiatives about Climate Change	TEMA (Turkish Foundation for Combating Soil Erosion, for Reforestation and the Protection of Natural Habitats), Climate Research Association, Climate Change Policy and Research Association.

Part C: Conclusion

It is more than clear that climate change is the phenomenon of climate transformation, characterised as one of the most crucial environmental threats in Europe and worldwide. Climate change has set off alarms and new strategies have already been adopted by the EU, such as the European Green Deal as well as by the United Nations. Considering how each European country and especially the consortium countries deal with climate change (as detailed in Annex 1 and Annex 2 of the current report), we will investigate and map the gaps in the literature regarding the environmental education and CCESD integration in schools and beyond. Focusing on the current situation in Greece, Spain, Bulgaria, Turkey and Germany (Annex 1), it becomes obvious that there are challenges in the adaptation of the new environmental strategies and policies.

Although environmental education is a good path to follow in order to facilitate this adaptation to new environmental strategies and habits especially in students and youngsters, it seems that the informative resources exist in EU countries (e.g. programmes running by the countries' governments, NGOs or other stakeholders), as indicated in Annex 1 and Annex 2, are not that effective in cultivating people's environmental awareness. This probably reflects that there is not any systematic approach to improve social learning on environmental issues and climate change but rather some more scattered relevant information. Thus, it is mostly from a citizen's perspective how much or how well they will be informed about climate change and its impacts on their lives.

In addition to that, a systematic approach entails the connection of different stakeholders' groups (official or non-official ones) that work in favour of developing good environmental practices. **Another gap to fill is to build a connection among different environmental stakeholders and the citizens so as to create a shared purpose and a common strategy to gain a more essential social learning on climate change.** This seems to pre-assume a bottom up approach, starting from the connection with local communities' stakeholders and ending to the global ones.

It is very important to inspire individuals in a shared vision, to encourage them acting as a team and provide them new knowledge on environmental issues. The communication between citizens and environmental stakeholders is facilitated if the general public is environmentally informed and educated. Therefore, it is crucial for citizens to understand how climate change impacts their lives and this is the reason why it is essential to hold an active role in the society participating for example in programmes dedicated to environmental awareness, development of good practices on climate change, etc., in order to follow environmental-friendly behaviour and a more sustainable way of thinking before acting.

Apart from the significance of the cultivation of climate change awareness in the society it is also important to promote and integrate the environmental education and CCESD in formal and informal education. This still remains a challenge in most of the EU countries. Despite the fact that CCESD's role in formal education has been widely recognised, this is not enough to bring effective results. Based on the literature review and the national reports of the five partner-countries, the environmental education and CCESD should follow a thoughtful plan to be

successfully integrated in the school's curriculum (primary, secondary and high school). In other words, even if the educational policy makers are trying to reach the sustainable development goals to fill the gaps described above, the best path to achieve this is by providing training and TPD schemes to all teachers.

Apart from their traditional teaching in classrooms, **teachers need to develop new skills and competencies, such as digital skills and teaching methods in online educational environments essential for the COVID-19 era and beyond.** The literature review shows in a very simple way that digital skills can be proved a very successful key path which brings together different stakeholders and students or general public in an online environment. It is undoubted that improving teachers' digital competencies in CCESD, the collaboration between the teachers holding different backgrounds is facilitated promoting the multi- and interdisciplinary character of environmental education. Using digital tools in their teaching, teachers improve their teaching and gain more confidence to collaborate with teachers from different disciplines.

A multi-dimensional learning approach of CCESD is enhanced with digital tools and competencies teaching "toolkits" used by the teachers as supplementary educational material in face to face, online and blended learning environments. Furthermore, the development of digital tools in order to catch the students' interest on environmental and sustainability issues would be also beneficial. Bearing in mind that teachers can be considered as the gatekeepers between the new generation (i.e. students) and the society, it is a call of duty to offer them opportunities for self- and professional development.

There is a long list of examples and documentation all around Europe, which include full training courses devoted mostly to TPD. Active methodologies are necessary for dealing with climate change education, facilitating the initiative of students, as demonstrated by the interest of the younger generations in climate change and sustainable development all around Europe. For example, activities using theoretical and experimental modelling, problem-based learning, digital simulations, socio-scientific issues, and project work can be examples that fit well the needs of an active education in climate change. Furthermore, best practices using digital tools, or learning through MOOC courses, improve teachers' digital competencies, according to the different levels of the Digital Competence framework.

ClimaTePD comes at the right time in all the consortium countries as it aims at producing valuable knowledge and filling the gaps in the literature that have been previously identified. Based on this literature review, 2-days Multiplier Events will take place in each consortium country for 15 local educational stakeholders, teachers, policy makers and practitioners. The state of affairs about the climate change in secondary education in each partner country will be presented and round-table discussions with the participants will reveal the challenges that the teaching community usually face while teaching about the environmental crisis. The Multiplier Events' participants will exchange their views regarding the teaching challenges of TPD schemes on climate change education and how they could develop their digital skills. They will also discuss and analyse the teaching learning practices and didactics that in-service secondary teachers face in terms of using digital educational tools in the classrooms and how easy it is to have open access

to them. Some of the key points that Multiplier Events' participants will elaborate on and analyse focus on:

- How the education (both formal and informal) could contribute to awareness and action on climate change
- The rules, incentives, programmes and capacities in place to address CCESD in formal and informal education
- The ecological, social, economic, political participatory as well as the cultural dimensions or aspects of climate crisis and climate protection and how these dimensions can be made a subject of discussion in educational projects in a manner appropriate for the students
- If teachers are equipped with the skills and knowledge they need to act on the climate crisis
- If teachers are prepared and supported to teach about these difficult issues in a way that empowers their students
- The schools' curricula and books and how they support the development of attitudes and values needed to promote environmental sustainability

The Multiplier Events' results will be more than helpful for the development of the educational scenarios that will be included in the ClimaTePD online training and will be part of the digital repository.

To sum up, the ClimaTePD project will update the initial teacher education and introduce new contents and programmes in the TPD schemes. Additionally, the project can be a lever for updating and improving teachers' digital competencies by introducing new examples within the teachers' digital competencies framework. A dialogue between the institutions and the policy makers is necessary at this transition point, and ClimaTePD can effectively contribute to it.

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Annex 1: Climate change education, climate change policies and TPD schemes in Greece, Spain, Germany, Bulgaria and Turkey

Annex 1 is a section which holds a significant role in this report. The current Annex presents the state of affairs regarding the dimensions of climate change education in Greece, Spain, Germany Bulgaria and Turkey. The aim of this chapter is to investigate, analyse and describe the policy actions and initiatives about environmental and climate change education in the consortium countries in order to identify deficiencies, weaknesses and best practices that (may) exist.

The Consortium partners performed desktop research, including investigation of policy documents and research, description and curriculum analysis, considering the inclusion of climate change and digital teaching skills into the TPD schemes and the secondary education. This literature overview is based on the analysis of web resources, national policy documents and reports by European Organisations as well as data from national organisations, foundations, and other initiatives related to CCESD in secondary education and into TPD schemes.

Moreover, in Annex 1 the brief summary reports of each consortium country are presented. The brief summaries are drafted to help the participants of the Multiplier Events (E1-E5) to get a general overview of the state of affairs regarding the dimensions of climate change education and TPD schemes in each of the consortium counties (acting more like a guide). These brief summary reports are written both in English and in the respective language of each partner-country, and they follow a different template specially chosen for the Multiplier Events' implementation.

1. Greece

Environmental Education in Greece

At the end of the 20th century, a wide form of Environmental Education combined with the sustainable development appeared in the Greek educational system. Even if Environmental Education was established back in the 70's in many European countries, Greece was significantly delayed by about ten years due to historical and societal political reasons and most importantly due to the seven years of dictatorship. The political scenery of the country has left no room for such environmental action. Finally, the term Environmental Education was introduced in our country in 1976. Environmental Education literally appeared in the Greek school in 1990 with the Law 1982/90 (article 11, par. 13), first in the secondary school's curriculum and the following year it was introduced in the Primary Education (Karamanou, 2018, Mpelitou, 2020).

Its official establishment in the Greek educational system dates back to the first period of the "Metapolitefsi" period, while its roots as an applied educational area was located in the early 80's in the frame of Optional Educational Innovation, introduced in the secondary education.

It is possible that Environmental Education didn't come in Greece from the west, as a vague form of the subject seems to have an around seventy year-old presence in the Greek school. This is referred to the pedagogical principles and the social orientations of the "New Education"

movement, which first appeared in Greece at the beginning of the 20th century and its main purpose is the school integration in the social life, which was completely cut off from the society until then. In the context of this extremely diverse reform movement, the subject of "patridognosia" was introduced in the primary school in 1913, which could be considered as a precursor of Environmental Education but it is totally different regarding its content (Karamanou, 2018).

For the first time, patridognosia linked education with the environment (geophysical, social and cultural) following a holistic approach bridging nature with social life including a national, economic, religious, historical, artistic and cultural frame (https://el.wikipedia.org/wiki/%CE%A0%CE%B1%CF%84%CF%81%CE%B9%CE%B4%CE%BF%CE%B3%CE%BD%CF%89%CF%83%CE%AF%CE%B1). Under the government of George Papandreou, a later attempt during this period called "educational spring" introduced the subject: "Meleti Perivallontos" (Environmental Study), which ended unsuccessfully due to the imposition of the dictatorship in 1967 (Karamanou, 2018).

In 1988, the Ministers of Education of the EU member countries committed to promoting Environmental Education in the official curriculum of the secondary public schools in each country. One of the main goals of Environmental Education was "*to make students aware of the relationship between people and their physical and social environment, to raise awareness of the environmental problems and inspire them to be active and deal with them*" (Law 1892/90, article 111, §13).

Environmental Education in Greece finds its first official recognition in the Greek educational system at the beginning of the 21st century and more specifically in 2003 under the educational internal reforming. Some of its main targets were the development of a student's creative personality, with cognitive, social and emotional skills, democratic consciousness and humanistic values. These skills and values aim at helping students and future active citizens to be able to face the modern challenges of a multidimensional society of knowledge, know-how and growing multiculturalism (Karamanou, 2018).

Furthermore, Environmental Education became officially part of the new Curricula for Compulsory Education as an innovative interdisciplinary research programme of the "Flexible Zone", which aimed at bridging humanities, natural and socio-economic sciences. In this way, Environmental Education paves the way for the integration of the Education for Sustainable Development in school.

The "New School - School of the 21st Century" was officially recognised as a sustainable school, which was created on a pilot basis in 2011, incorporating educational processes and practices focusing on the principles of sustainability (http://repository.edulll.gr/edulll/bitstream/10795/1940/2/1940_%ce%a0%ce%a3_%ce%a0%ce%95%ce%a1%ce%99%ce%92%ce%91%ce%9b%ce%9b%ce%9f%ce%9d_%ce%91%ce%9d%ce%91%ce%a1%ce%a4%ce%97%ce%a4%ce%95%ce%9f.pdf).

In the corpus of the secondary school curricula, a new subject entitled "Environment and Education for Sustainable Development" was introduced included in the area of "Experiential Actions - Combined activities", which is taught by the project method one hour per week in combination with the cognitive field "School and Social Life" for 1st grade and the "Local History"

for 3rd grade, respectively (Ministerial Decision 113727 / Γ2 / 03-10-2011) (Karamanou, 2018, Tigkas & Flogaiti, 2019).

During the years the Environmental Education was reformed into Education for Sustainable Development incorporating the basic principles and values of Sustainability. Focusing on the Unified Interdisciplinary Curriculum Framework, the Analytical Curriculum Framework and the general goals of the school education, the interest for the environment is highlighted and reflected without an official presence as an independent subject in the schools' curriculum (Mpelitou, 2020).

Very recently, the Ministry of Education and Religious Affairs in collaboration with the Institute of Educational Policy (IEP), introduced the "Skills Workshops", in all levels of Greek school (kindergarten, primary and secondary education) for the year 2021-2022. As a dynamic and educational action, the "Skills Workshops" include modern and innovative learning methods with a special reference and a whole section on environment (Ecology - World and local Natural heritage - Climate change - Natural disasters, Civil protection - World and local cultural heritage). The aim of these workshops is to enhance the cultivation of mild skills, life and technology skills as well as science skills in all students, in the frame of a new and up to date curriculum framework (http://www.iep.edu.gr/el/psifiako-apothetirio/skill-labs).

In Greece, only a limited number of studies have examined the evolution of CCESD in education. These studies present the topics, the duration and the individual characteristics of the environmental programmes in Greece, as well as the students and teachers' participation in the primary and the secondary education. The environmental programmes implemented in Greek schools in Kavala, Florina, Arta, Evros, Orestiada and in many other areas in Greece showcase a significant increase in the number of the environmental programmes implemented and also in the teachers and students' participation in these programmes. In addition, according to the Ministry of Education and Religious Affairs, there are approximately 2,100 environmental programmes per year implemented in secondary education, with a time reference around 2002 (Malandrakis, et al., 2020). For example, in Crete, an energy efficiency education programme resulted in students conserving energy at home and sharing information with their parents (Petropoulou, 2018).

Sustainable development (and climate change) in Teachers' education in Greece

Teachers' professional development programmes are a critical vehicle to transform in-service teachers into modern professionals, by enhancing both their personal and professional development. Training programmes support teachers' professional development, and facilitates their ability to adapt to potential changes in the school curricula by improving their skills in teaching within the frame of authentic learning.

It should also be noted that environmental education is not a compulsory subject at school for many European countries, including Greece. Training in environmental education issues has played a positive role in changing educators' attitudes, enhancing their cognitive frame and developing their meta-cognitive skills. This was expressed by their nature-based interests, and

their creativity in teaching and implementing environmental programmes. Thus, environmental education should be at the top of the agenda in the development of new school curricula—as possible scenarios after COVID-19 demonstrate that human societies will suffer new pandemics in the future (Petkou, et al., 2021).

University Departments and CCESD

University and in particular most of the Pedagogical Departments in Greece highly contribute in school-teachers' lifelong learning programmes development, such as trainings on Environmental Education and CCESD. In Greece, independent modules of Education for Sustainable Development have been already established in most of the Pedagogical Departments of Preschool and Primary Education and also in some of the Secondary Education Departments.

Departments of Education give students the opportunity to learn about the theoretical framework of Environmental Education and CCESD, to frame a general understanding of the current environmental issues and become familiar with the pedagogical methods to apply environmental topics in practice. The university modules of the Environmental Education and CCESD are mainly based on the Constructivist theory using students' ideas and life experiences. In this way, Environmental Education and CCES could be taught focusing on people's pre-existing experiences relevant to the subject which play an important role in the learning process and the knowledge structure at both personal and social levels.

These learning experiences will help pre-service and in-service teachers to develop their own perception about the environment and better prepare themselves to teach their students about environment and climate change.

Several models have been proposed for teachers' professional development in Environmental Education and CCESD in which self-efficacy plays a significant role (Kennelly et al., 2008). However, the studies examining the self-efficacy of the trainees in Environmental Education TPD programmes (e.g. Molesey et al., 2010) and especially the studies dealing with the role of students' previous experiences and their background in self-efficacy are particularly limited (Papadopoulou, 2015).

Environmental Education Centers

The Environmental Education Centers (EECs) (Kentra Perivallontikis ekpaideusis – KPE) (https://kpe.inedivim.gr/) belong to a network of decentralised public educational structures of the Ministry of Education and Religious Affairs and they deal with the Environmental Education and Sustainability. EEcs were established by the Law 1892/90 and the first centres started operating in Achaia in July 1993. The main goal of EECs is to highlight and promote issues based on three pillars: Environment, Society and Economy and to support CCESD at local, national and international level.

The target audience is mainly children and youngsters, but also adults (residents of the area, heads of local organisations, tourists, etc.). The Centers are in constant cooperation with the local bodies (e.g. local organisations, communities, governmental services, public institutions,

etc.) and their basic principle is the citizens' participation in the programmes implemented by the Centre.

EECs plan to strengthen the formal education through its connection with informal and non-formal educational environments, which are more participatory, learner-oriented and promote lifelong learning based on the strategy of "Education for Sustainable Development: 2005-2014" (UNECE, 2005). EECs at this point are called to play a critical role in promoting environmental issues and shaping citizens' participation by:

- Conducting training programmes and seminars for both primary and secondary school teachers' professional development. The seminars and programmes are implemented in collaboration with Heads of Environmental Education Departments in Universities, Research Centres and other Institutions.
- Designing and implementing educational programmes on critical local or global environmental issues for students of all levels of education.
- Producing educational material either in hard copies or in digital form. This material is created in collaboration with experts and scientists, Universities and representatives of Governmental and Non-Governmental organisations. The purpose of this material is to support educational programmes and thematic networks, covering cognitive, methodological and emotional needs of both actions of environmental and formal education.
- Developing collaborations at local, national and international level with universities, technical institutes, research institutes, respectively EECs, environmental organisations and associations. These collaborations aim at promoting and solving environmental issues following the culture and the sustainable development of each region.
- Informing and raising awareness about their actions as well as issues of environmental protection through workshops, events, as well as the production of printed and electronic publications (CDs, videos, etc.).

All EECs develop activities that follow the same directions as they are governed by the same institutional framework. The actions in which the EECs can be involved are the following (Katsakiori et al., 2008):

- Design and implementation of Environmental Education programmes for the students who visit the EECs.
- Development of educational and informational material.
- Training for teachers and professors of EECSD.
- Promotion of Environmental Education programmes in the schools of each area in collaboration with the Environmental Education Officers and other stakeholders.
- Implementation of actions to raise citizens' awareness.
- Collaborations' development with various organisations, networks and communities.
- Promotion of scientific research in the field of Environmental Education. The main action of EECs is the design and implementation of educational programmes, either one-day or multi-day, for students of all educational levels.

Most EECs produce educational and informative material regarding the topics of the programmes they organise with a content related to the particular characteristics of the local environment. Posters, printed brochures, etc. advertise their topics from the local natural and cultural environment while for their educational material they mainly design brief educational packages, with short texts and worksheets for students (Katsakiori et al., 2008). The educational material of all EECs can be classified into eight major thematic categories:

- Hydrosphere
- Atmosphere
- Land ecosystems
- Urban environment
- Biodiversity
- Ecosystems
- Energy and
- General topics.

According to Katsakiori et al. (2008) many programmes are related to the aquatic environments, fewer are programmes related to the forests and an even smaller percentage are programmes related to environmental routes and paths. Finally, the expected results from the Environmental Education Centers' activity focus on students' awareness regarding the EECSD, their skills' development and cultivation of their active participation in improving their life quality. Another crucial task of EECs is the teachers' professional development programmes on Environmental Education in order to transfer their knowledge in the classroom and utilise the educational material produced by the EECs (Mpelitou, 2020).

CCESD and digital skills during the COVID-19 pandemic

In March 2020, schools were suddenly closed due to the COVID-19 pandemic. Because of this urgent situation, it was really difficult to make a fast transition from traditional classroom learning to the digital and e-learning environments. Greek teachers started to use digital tools to communicate and interact with their students, organising asynchronous learning activities. They used a variety of digital tools in order to engage their students while they were teaching and improve their students' critical thinking. As there was no space and time for the right organisation of this smooth transition to e-learning, the development of online educational programmes followed the context of the Distance School Education (Distance Education) which has been established over years, in theory and practice (Liarakou et al., 2020).

Even if Distance Education is a field that can be turned into an interactive learning experience, it seems that it was selected as the only option during the closure of schools due to COVID-19 pandemic. Pandemic created a series of problems to all levels of educational structures as well as to students, testing the resilience of any educational system in Europe and worldwide (Poulios, 2020).

In addition, teachers, without the required background and skills, were responsible to respond successfully to their duties and change their teaching practices and their educational

material into online, in a very short time, in the frame of the Emergency Remote Teaching (ERT). Teachers either developed primary digital material, or they used secondary digital material mainly found in digital repositories or other educational resources. Teachers of Environmental Education and CCESD had to pick one or both of these options above.

The use of digital tools in Environmental Education proved to be more efficient in the context of asynchronous Distance School Education, as the teaching material could be organised into educational scenarios, making the learning process more attractive for the students. COVID-19 also forced the educational process and the teacher-trainee relationships to be updated through a novel prism that upgrades the role of the digital educational tools and other educational materials. Although there wasn't any syllabus as a guide, the majority of the Environmental Education teachers successfully developed such kinds of skills. Another critical barrier during the period of Distance School Education was that the access to the online educational resources was limited and remained a challenge (Liarakou et al., 2020).

Only a few online repositories offered educational material and helped teachers during the whole Emergency Remote Teaching period. Learning material for the Environmental Education teaching was found in the Photodentro LOR (http://photodentro.edu.gr/lor/). Photodentro is the panhellenic repository of learning material for primary and secondary education and it is open access to everyone (students, teachers, parents and anyone interested). It is the first digital repository part of the Open Educational Resources of the "Photodentro " family and it is a central e-service of the Ministry of Education and Religious Affairs for the organisation and distribution of digital educational content within the school community. Photodentro hosts learning material (e.g. autonomous and reusable digital material that can be used for teaching and learning) such as interactive simulations, visualisations, experiments, explorations, pictures, educational games, 3D maps, exercises and much more (bodies.http://photodentro.edu.gr/lor/). Most of the learning objects are "click-and-play" and they cover many subjects and scientific areas such as maths, physics, biology, history, literature, environmental education and EECSD, etc. (http://photodentro.edu.gr/lor/subject-search?locale=en). These digital educational sources of various types converge more with the principles of asynchronous distance education.

In addition, the high level of interaction that educational scenarios offer at all levels (with the material itself, between trainees and between the teacher and the students) and the dynamic assessment and feedback options they provide, make these learning material suitable for an adaptive learning, with central pillar the needs and the special characteristics of the trainees.

Although the learning objectives of Environmental Education were not created to respond to the case of this Emergency Online Education, the circumstances gave the opportunity to be re-examined through this perspective (Liarakou et al., 2020). Distance education, whether holds a complementary or an autonomous role, enhances and strengthens the learning process, promotes participants' interaction and cooperation and influences students' attitudes (Nianiouris & Kalogiannakis, 2020).

Connecting distance learning with environmental education, students deal with environmental issues following a more interdisciplinary approach and a more attractive way of teaching environmental education. Distance education contributes to facilitating students'

understanding of environmental issues, improves the effectiveness of environmental actions and enhances students' knowledge while cultivating positive attitudes about the environment and sustainability.

The following activities are part of the material taught in the primary schools of Serres, Greece, between March and June 2020. These activities include brief scenarios using attractive educational tools in order to cultivate the communication between the students and the school and their interaction with their teachers and their peers. Material produced from these activities was recorded (in written texts, photographs, artwork or videos) and shared to all teachers and students of the school. These activities followed the distance education protocol, both synchronous and asynchronous. Some of these activities are briefly presented in the Table 1 below. (Poulios, 2020).

Table 1: Suggested activities (Poulios, 2020).

Activities		
Title	**Level**	**Duration**
Our ecological print	3rd-6th grade of primary school, secondary and highschool	2h
World Stray Animals Day	5th-6th grade of primary school, secondary and highschool	3-4h
Forests and forests' wildfires	5th-6th grade of primary school, secondary and highschool	2h
Earth day	4th-6th grade of primary school, secondary and highschool	2h
Learn about the climate	5th-6th grade of primary school, secondary and highschool	2-4h
17 sustainable development goals	5th-6th grade of primary school, secondary and highschool	3h

Some conclusions extracted by the activities' implementation in the primary schools of Serres, are presented below:

- Distance learning can limit, but not exclude, the experiential content of the environmental education activities.
- The Internet offers teachers a huge amount of resources and educational material that they can use.
- The use of digital tools and ICT offered an attractive content to all the activities.
- Distance education facilitates parents' engagement in some family activities.
- Online activities promote students' skills development such as searching, composing and evaluating information and lead to the digital literacy of the students (Poulios, 2020).

The Greek Association of Teachers for Environmental Education (P.E.K.P.E.)

The Greek Association of Teachers, P.E.K.P.E. was founded in 1992. P.E.K.P.E. is a scientific, non-profit association of teachers of all levels, which aims at strengthening and promoting Environmental Education in every possible way. Some of the key goals of P.E.K.P.E. are to promote the communication and cooperation between teachers involved in Environmental Education and the exchange of information and experiences between Greek and foreign teachers. (http://dide.reth.sch.gr/envedu/peekpe/page%20kentr.htm)

P.E.K.P.E.'s activity is oriented towards supporting:

- the sustainability education programmes, which are implemented in schools,
- the establishment and the operation of the Environmental Education Centers as institutions for lifelong learning programmes, scientific reflection, study and promotion of the research around the environmental issues in Greece and beyond,
- the dissemination of informative and educational material about environmental and ecological issues,
- the cultivation of the environmental awareness in the general public,
- systematic contribution to changing attitudes and behaviours and the cooperation and the exchange of information and experiences with other national or international organisations through events, seminars, workshops and conferences. (https://dspeekpe.wixsite.com/peekpe)

We4all

We4all is a non-profit environmental organisation that was created in 2018, after the time of the wildfires of Marathon area in Greece. The organisation's activities include:

- Tree Planting / Reforestation actions
- Watering and caring for our planted trees
- Protecting and preserving forest land
- Cleaning up seashores and marine environment
- Organising events to bring people of similar interests and vision together
- Organising seminars and lectures in schools and other organisations to raise environmental awareness. (https://we4all.com/blog/category/actions)

Arcturos

Arcturos is a non-profit, non-governmental, environmental organisation (NGO) founded in 1992, focusing on the protection of wildlife fauna and natural habitat, in Greece and abroad. The foundation of Arcturos was driven by the constant need to solve the problem of bear and wolf's imprisonment. Since 1995, Arcturos has been successfully carrying out activities about environmental education in institutions of primary and secondary education, with the approval of the Ministry of Education and Religious Affairs. Each year, around 100.000 students of primary and secondary schools are being educated and trained by the specialised educational team of

Arcturos, which carries out the projects in the regions of Attica and Thessaloniki as well as other regions nearby. (https://www.arcturos.gr/en/activities/environmental-education/)

Climate change actions in Athens

The mayor of Athens, Kostas Bakogiannis, and the mayor of Istanbul, Ekrem Imamoglou, discussed, on the 21st of September 2021, with the Greek Prime Minister, Kyriakos Mitsotakis about the possibilities of a future cooperation between the two cities in areas of common interest, such as culture as well as tackling the challenges of climate change. (https://www.kathimerini.gr/politics/561507085/klimatiki-allagi-kai-politismos-stin-atzenta-tis-synantisis-toy-k-mitsotaki-me-toys-dimarchoys-athinas-konstantinoypolis/)

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2. Spain

National frameworks regarding climate change

Climate change is currently accelerating, making it difficult for human societies and ecosystems to adapt quickly to these changes. In Spain, heat waves have increased, with longer summers; the semi-arid climate has expanded, and river flows have decreased. In response to climate change, two types of actions can be taken: mitigation, by reducing emissions of greenhouse gases of human origin, and adaptation, by adopting measures to minimise the risks.

In a recent press article (El Mundo, 2019), the perception is that "Spanish society is already in changing mode". The former director of the European Environment Agency, Domingo Jiménez Beltrán, one of the coordinators of the Study of Perceptions, Values and Social Attitudes sponsored by the Sustainable Development Foundation believes that: "Citizens know what is happening, they know what needs to be done and they only need to be empowered to take action", warns Jiménez, who acknowledges his "surprise" at how ecological awareness has increased in recent years. The online survey shows a shift in consumer habits: 47% recognise that their next car will be hybrid or electric, 96% are in favour of traffic restrictions in cities and 32% are considering the impact caused by air travel.

Sea pollution (97%), fires (95%), species extinction (95%) and water scarcity (94%) are the impacts that most concern Spaniards. The study divides Spaniards into "concerned" about the environmental situation (50-60%), "committed" (20-25%) and "naysayers" (5-20%).

The CIS addressed the issue of climate change in more details in the barometer of November 2018. 66.6% of Spaniards believe that the extreme droughts or floods in the country that has suffered in the last years have to do with climate change, compared to 26.8% who stated that these are phenomena that have always occurred. On the other hand, 62.7% believe that climate change can be stopped and reversed.

They do not, however, have much confidence in the ability of politicians to solve it: 52.6% of that surveyed think that the parties pay little attention to the issue and 35.4% say none at all. The perception that politicians are not involved in the fight against climate change was corroborated in the January 2019 barometer, in which the CIS asked Spaniards about issues related to sustainable development.

Among the main obstacles to achieving sustainable development goals, lack of political will (40.5%), political and institutional corruption (23.2%) and lack of social awareness in individuals, companies, and institutions (11.4%) were mentioned. Most Spaniards (40.8%) relate sustainable development to environmentally friendly development; 31.1% to development that takes into account future generations and 24.9% to development that takes into account climate change.

On the other hand, an international survey published by Ipsos Global Advisor and conducted in collaboration with the Halifax International Security Forum, reveals that only 28% of Spaniards believe that their government is acting effectively against climate change.

Internationally and globally, 45% of people believe that their country is doing the right things to combat climate change.

However, there will be a new legislative framework for the next years, the Draft Law on Climate Change and Energy Transition which will enter into place in 2021 approved in the Spanish Parliament, which is an extraordinarily complex regulatory project due to the heterogeneity of its content, which combines a series of essentially programmatic contents with genuinely legal mandates.

In this new Law there is a full section devoted to climate change, education and research. In one of the paragraphs it states that "The Government shall review the treatment of climate change and sustainability in the basic curriculum of the teachings that form part of the Education System in a cross-cutting manner, including the necessary elements to make education for sustainable development a reality.

Likewise, the Government, within the scope of its competences, shall promote actions to guarantee adequate teachers' training in this area". Additionally, "The Government will take into account the influence of informal education together with formal and non-formal education, and will make use of it to carry out awareness-raising campaigns to raise public awareness of the effects of climate change and the impact of human activity on it. Furthermore, the Government and the different Public Administrations will recognise and provide the necessary means and resources so that organisations can carry out non-formal educational activities, understanding that this is another way to promote the involvement of particularly vulnerable groups such as children and young people in the fight against climate change."

This Law has been elaborated by the Ministry for Ecological Transition and Demographic Change (https://www.miteco.gob.es/), and approved in Congress this year, pending of being finally approved in the Senate, something that will for sure happen this year.

The Ministry is also in charge, since 2006, of all actions related to issues about environment and climate change from economic, political, and sometimes educational perspectives. It publishes the so-called National Plan for Adaptation to Climate Change (PNACC). The new edition of PNACC 2021-2030 is the basic planning instrument to promote coordinated action against the effects of climate change in Spain. Its main objective is to avoid or reduce present and future damage from climate change and to build a more resilient economy and society. The PNACC defines objectives, criteria, areas of work and lines of action to promote adaptation and resilience to climate change. This new Law is a very important departure for the renewal of teacher education in this area.

In the 80's Spain opened an institution called the National Centre for Environmental Education (CENEAM). Its main objective is to promote information, training, dissemination, awareness, environmental education, and public participation in order to improve the training of professionals and promote the responsibility of citizens in relation to the environment. CENEAM develops and executes environmental training actions aimed at different sectors of the population, which may be carried out in collaboration with other public or private organisations or entities. Its portal, a very comprehensive resource center, includes varied information about all aspects related to environmental challenges, sustainability and environmental education

policies, including a section about climate change and climate education, sustainable development. (https://www.miteco.gob.es/es/ceneam/recursos/mini-portales-tematicos/cambio-climatico.aspx)

Environmental Education in Spain

Climate change is perceived as an important problem that is needed to be included in education at all levels. Two Ministries deal with climate change education, the Ministry of Education and the Ministry for the Ecological Transition, which demonstrates that the current government has taken this theme as preferential in its policies.

There is a current discussion in introducing climate change as one of the subjects to be studied at all stages of education (as happened in Italy). A perception on putting emphasis on these is growing, as was made in innovation and digital technologies years ago. Environmental education in Spain is a demand of today's society and education must respond to this demand. Although environmental educators, teachers and environmental experts have done an extraordinary job in the Spanish education system, much more work still needs to be done on environmental education in schools and institutes.

Climate change education projects that bring the environment into school classrooms in a cross-cutting manner in subjects, such as language and maths, are the perception of most of the innovators in this area. It is, in other words, teaching from a different perspective, an environmental perspective.

From a bottom-up approach, students are very concerned about the consequences of climate change. Before the pandemics, and following the international demonstration initiated by Greta Thunberg, many schools participated in street demonstrations. Awareness about environmental issues and climate change are continuously growing in society and especially among the young generations.

Gaps in Spain

As usual, in our perception there are deficiencies in the dialogue between the Ministry of Ecological Transition and the Ministry of Education. For instance, there are no clear policies about digital skills development and climate education, and with the new Law, there is a great opportunity for these dimensions to be developed. The same can be said about teacher education and TPD programmes, which the universities will need to materialise in new educational programmes.

The new regulatory framework on climate issues is the new Law but needs a transition period to put it in place. Additionally, digital skills development (Reference Framework for teachers' Digital Competence, published in 2020) is also part teacher education programmes described as the Digital Competencies for Educators, which are implemented, with slight changes in all the Spanish regions, which are the ones that have the power to implementing the different programmes and actions in their respective territory, particularly in the area of "Security" and the

competence "Protection of the environment, considering the impact of technologies on the environment".

Collaborative problem solving is mentioned to "carry out energy-saving measures at the school, and we design and propose digital environmental awareness projects to be developed in the annual programmes of my educational community". Or for the teachers "to carry out didactic proposals to transmit to the students the need to reduce the cost of consumables and raise awareness of the environmental benefits of printing only what is necessary." Although climate change is not usually mentioned in these examples, this framework for teachers' digital competencies offers space to adapt it to climate change education using digital tools.

Secondary school curriculum on the integration of climate change

In Spain, the Royal Decree 126/2014, in February 28th, established the basic curriculum for Primary Education and Royal Decree 1105/2014, in December 26th, established the basic curriculum for Compulsory Secondary Education and Baccalaureate mentioning the climate change in three core subjects (Sciences Applied to Professional Activity, Geography and Geology) and in many other specific subjects (Ethical Values, Scientific Culture and Earth and Environmental Sciences).

In the field of Basic Vocational Training, Order ECD/1030/2014 and Order ECD/648/2016 established, respectively, the curricula of fourteen and six training cycles in the management area of the Ministry of Education, Culture and Sport, incorporating in the modules the Subjects of "Consequences on climate change", "Factors and components of the natural landscape: climate, relief, hydrography and natural vegetation", and comments on "weather and climate graphs".

Sustainable development (and climate change) in Teachers' education in Spain

For elementary school teachers, both in their training and in their practice, addressing environmental issues is often an option that can sometimes be dismissed or considered an irrelevant option. One of the reasons why this happens is because relevant and meaningful models, strategies and didactic adaptations that allow teachers to address environmental issues in the classroom lack from the educational system. This fact is partly generated from the initial training of teachers since there is no explicit interest in these issues (Lopera, M., Charro, E., 2016).

Initial teachers' education does not specifically comprise climate change education, although some universities might introduce some aspects within specific subjects, i.e. STEM. In terms of primary education, within the course: "Didactics of Knowledge of the Environment", some aspects of climate change are treated, many times limited to linking climate change to weather aspects. This is due to the fact that in the manual of this subject, climate change is associated with human activities and consequences limited to the environmental aspects, not the economic ones.

As mentioned by Morote (2019) In order to solve the problems of prejudices and stereotypes that future teachers may have, the challenges are: 1) To promote teaching and

teachers' professional development programmes at the university with a greater critical spirit and scientific rigour on this subject; 2) To instruct future teachers on how to interpret the curriculum and textbooks, since in relation to climate change they often offer information that is not very rigorous; and 3) To encourage future teachers to search for and critically interpret the information received from the different sources of information in order to distance themselves, in this way, from the so-called fake news.

Climate change in informal education

Climate change education is embedded within wider programmes, most of them coordinated by the National Centre for Environmental Education (CENEAM), as mentioned before. CENEAM has been developing a programme of activities that includes an Environmental Training Programme. This programme offers a wide range of courses. CENEAM maintains a programme of temporary exhibitions that offers exhibitions on environmental themes. Within their site, it includes a "miniportal" with resources for climate change education and communication.

There are several initiatives devoted to the public and sometimes to professionals related to the climate change economy. For instance:

IDAE E-LEARNING PLATFORM:

https://www.aprendecomoahorrarenergia.es/

It offers a total of nine free courses (lasting between 1 and 6 hours) on energy saving in everyday life, aimed at the general public. The aim is to promote energy saving in our homes, offices and cars. It is an on-line platform, which uses simple courses to teach a series of tips to raise awareness and encourage the acquisition of good habits.

UNIVERSITY OF SALAMANCA. Climate Change: evidence, socio-economic causes and solutions. MOOC course at the MIRIADAX platform.

According to them, the course combines scientific rigour with political analysis, also incorporating society as a necessary element of change. It first provides the scientific bases of climatology and the state of the art of climate science. It then inserts the climate crisis into a civilisation multi-crisis, before comprehensively breaking down the main causes of climate change, looking at the socio-economic roots of the current model of production and consumption and the productive sectors that contribute most to the problem. It addresses the responses being made by the international community to a challenge of such magnitude. In the wake of the Paris Climate Agreement reached in 2015, the official narrative of a change of model has been the dominant tone. In the light of this expectation, we will review the real progress made, the possibilities of transition to a new scenario, the pillars on which this transition should be based and the role of society in this framework. Duration: 7 weeks (estimated 35 hours of study).

Spanish educational programmes and best practices on climate change

There are several TPD courses, both online (MOOCs mainly and face to face.

- For instance, the course offered by the University of Salamanca: https://miriadax.net/web/concienciacion-y-capacitacion-en-materia-de-cambio-climatico-para-profesores-de-primaria-y-secunda0/inicio

The course has been developed with the support of the Ministry for Ecological Transition, through the Biodiversity Foundation. The course revolves around the physics and chemistry of climate change and its impact on society, as well as the Integration of the subject of climate change into the school curriculum.

It is composed by different modules:

- Module 1. A changing climate. A scientific perspective;
- Module 2. Evidence for Climate Change.
- Module 2. Evidence of Climate Change;
- Module 3. The Workings of Climate Change.
- Module 3. The Workings of Climate Change;
- Module 4. Human activity as a cause of Climate Change;
- Module 5. Future Scenarios

- The MOOC course "Climate change awareness and training for teachers", provided by the Spanish Ministry of education – INTEF: https://enlinea.intef.es/courses/course-v1:INTEF+ClimaMOOC+2019_4T/about

The course's objectives are a) to offer a scientific approach to climate phenomena; b) to make known the mechanisms of climate change and its effects, and c) to raise awareness of the role of human activity in causing climate change. Interestingly, the completion of this MOOC will help the participants to improve their digital teaching competence, according to the Spanish Digital Teaching Competence Framework 2017. This MOOC focuses on Area 1. Information and information literacy, Area 2. Communication and collaboration, Area 4. Security and Area 5. Problem solving.

- Naturaliza. Active environmental learning https://www.naturalizaeducacion.org/wp-content/uploads/2019/12/Dossier-Naturaliza.pdf
- Educación Ambiental y cambio climático. Didactic Guide for Teachers. http://aeclim.org/wp-content/uploads/2016/01/guia-didactica-ed-ambiental-y-cambio-climatico.pdf
- Clima Change Portal. Offered by the Spanish ministry of ecological transition and Demographic Change- National center for Climate Change, is a source of references, documents, data and projects. https://www.miteco.gob.es/es/cambio-climatico/temas/default.aspx
- Terral Project, Environmental education in the face of climate change.

An educational project of the Andalusian Regional Government aimed at promoting the development of initiatives and processes of environmental education and awareness-raising on

climate change to encourage personal and collective involvement in a process of reducing greenhouse gas emissions. The Terral project aims to guide teachers' actions and offer suggestions, support resources and complements for the implementation or design of awareness-raising activities on the seriousness of climate change.
(https://www.juntadeandalucia.es/medioambiente/portal/home?categoryVal=)

- Climántica, Project http://climantica.org/climanticaFront/es/page/Weblog

Climántica is an environmental education project of the Xunta de Galicia, initiated in September 2006 and the result of teamwork carried out by different experts. The Climántica team consists of four working groups -didactics, graphic edition, multimedia and scientific consultancy- that work in coordination through the use of a collaborative platform hosted on the intranet of the project's website.

Other International courses in Spanish

- Another example is the course "Climate change education" at: https://www.edx.org/es/course/educacion-sobre-el-cambio-climatico

The programme is devoted to learn how to work on climate change with primary and secondary school students in a constructive and fun way. The contents is as follows: Module 1: Our climate is changing; Module 2: Energy and climate change; Module 3: Water and climate change; Module 4: Soil and climate change; Module 5: Landscape and climate change; Module 6: Sustainable environments; Module 7: Healthy environments

- Another example is provided by the UN CC e-learn, offering the course "Climate Change: From Learning to Action":
  https://unccelearn.org/course/view.php?id=98&page=overview

It is structured around the following modules: Module 1. What is climate change and how does it affect us; Module 2. How to adapt to climate change; Module 3. How to Mitigate Climate Change; Module 4. How to plan and finance action on climate change? Module 5. How do climate negotiations work? Module 6. How to address climate change in practice?

- Finally, the COURSERA course "Turning the Heat Down: From Climate Science to Action", offered by the World bank
  https://es.coursera.org/learn/cambios-temperatura

This action-oriented MOOC will provide participants the opportunity to learn about the impacts of climate change at the regional scale and the specific sectoral strategies used to increase resilience and move towards a low-carbon future. Participants have the opportunity to study these issues in depth and adapt your learning experience to one or more of the following regions: Latin America and the Caribbean, Sub-Saharan Africa, Middle East and North Africa,

Eastern Europe and Central Asia, East Asia and the Pacific, South Asia. The MOOC brings together renowned scientists and policy makers who will provide an overview of the latest scientific evidence on climate change, low-carbon development strategies and climate resilience at regional level across sectors, as well as an analysis of the Paris Agreement and other outcomes of the 21st Conference of the Parties. Duration: Approx. 14 hours.

Apart from the cases mentioned above there are some other examples of good practices in Spain:

- Classrooms in Action. Teaching climate change with eTwinning https://www.etwinning.net/en/pub/newsroom/highlights/teaching-climate-change-with-e.htm; https://www.etwinning.net/downloads/2020_book_teaching_climate_change_with_eTwinning_EN.pdf
- Drawdown! Action Plan to Reverse Global Warming http://www.rebeccanewburn.com/u4-climate-action-plan.html
  Pedagogical practice and tools
- Video about climate change https://www.smithsonianmag.com/videos/category/science/climate-change-101-with-bill-nye-the-science/

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121/000019 Proyecto de Ley de cambio climático y transición energética. BOE, 16//04/2021. https://www.congreso.es/public_oficiales/L14/CONG/BOCG/A/BOCG-14-A-19-5.PDF

Morote Seguido, A.F. (2019). La enseñanza del cambio climático en la Educación Primaria. Exploración a partir de las representaciones sociales del futuro profesorado y los manuales escolares de Ciencias Sociales. *ENSAYOS, Revista de la Facultad de Educación de Albacete, 34*(2). http://www.revista.uclm.es/index.php/ensayos

3. Germany

Political Framework

Germany alone is responsible for 2% of global CO2 emissions (European Commission 2019, p 12) and thus is still one of the biggest drivers of climate change in terms of per capita consumption. It should be noted that emissions have been decreasing slightly recently, but compared to the necessary reductions under the Paris Climate Agreement, Germany is far from meeting its commitments.

In 2021, a momentous ruling was even made by the Federal Constitutional Court: the national climate protection targets, with the annual emission levels permitted until 2030, are incompatible with fundamental rights. This means that there are insufficient requirements for further emission reductions from 2031 onwards. The German Climate Act must be improved now.

There is a broad political consensus that the consequences of climate change and Germany's role in it are a serious challenge that must be addressed at all levels of the German society. There is also consensus that education has a crucial role to play in this process. However, there are major differences in the assessment of what role Germany should play in overcoming the climate crisis. The need for ESD is also assessed differently.

It should be noted that in addition to the established advocacy groups such as BUND Naturschutz Deutschland e.V. (nature conservancy association) or Landesbund für Vogelschutz e.V. (birds conservancy association, there are countless groups that cover many areas of life. Among them are Lawyers for Future, so are Farmers, Entrepreneurs, Psychologists, Teachers, Families, Artists, Churches, Developers and of course Scientists for Future. Two major parties and numerous small splinter parties are also credibly committed to effective climate protection. In the economic sector, there are numerous companies that are acting in the spirit of a 1.5-degree target, and some alliances between different groups of actors are also being formed. The regional differences are immense. In Germany, there are several outstanding research institutes working on climate change (e.g. the Potsdam Institute for Climate Impact Research or Hemholtz Institutes[3]) - they seem to have a strong influence in the regions around them, for example.

In addition, there are countless individuals in their respective spheres of life - be they municipalities, companies, schools, political parties, institutes, facilities or families - who are striving for more climate protection.

One could state that there has been much more debate on climate protection issues in Germany in recent years and that there are more projects and plans on this topic. Nevertheless, there is a large ambition gap as well as an implementation gap, if the goals of the Paris Climate Agreement are to be achieved and the time window described in the current IPCC report is to be used (see also: German Advisory Council on the Environment).

Education for Sustainable Development (ESD) in the Educational system in Germany

[3] https://www.pik-potsdam.de/de

Education for Sustainable Development has been around since the beginning of the first relevant UNESCO Global Actions Program. And Germany has also recently distinguished itself by making education for sustainable development a higher priority. In 2021, Germany co-drafted and signed the so-called Berlin Declaration[4] within the framework of the UNESCO World Conference on ESD in the German capital city. This declaration emphasizes the importance of ESD and the signatory countries affirm that they will structurally ensure that ESD is implemented in their education systems.

However, this should not obscure the fact that ESD and also climate education are not given the relevance they would need in everyday school life. A current expert opinion from 2019 provides a summary:

"Empirical evidence suggests that ESD has not yet found its way into the classroom on a broad scale, but is usually only taught by individual teachers who are particularly committed in this area - often in the area of science teaching and in the subject of geography." (Aktionsrat Bildung 2021, p 13)

The experts' recommendations for the German education system are as follows:

- "Creation of binding guidelines by the KMK (Standing Conference of the Ministers of Education and Cultural Affairs of the States in the Federal Republic of Germany).
- Systematic integration of ESD into the development of teaching and professionalization of teachers.
- Strengthening the interdisciplinary principle and anchoring ESD in all school subjects.
- Strengthening the subject of geography at the secondary level.
- Development of innovative teaching and learning formats that enable the acquisition of differentiated and multidimensional knowledge on sustainability and also enable and motivate concrete application in practice."(Source: Aktionsrat Bildung 2021[5])

The authors of the report emphasize that it is not only about imparting knowledge, but also about the acquisition of creative competencies. In preparing their report, they observed that ESD is often minimized to scientific knowledge transfer.

The problem is also perceived from the perspective of students and teachers. A study that surveyed these groups of actors came to the following conclusion: "Both learners and educators desire a distinctly higher amount of ESD within formal educational settings compared to the status quo" (Grund / Brock 2020, p 1).

Nevertheless, it must be noted that there are very different circumstances depending on the federal states. Some positive examples:

- Niedersachsen (Lower Saxony) has formulated its own decree on Education for Sustainable Development: "The aim of the ... decree is to contribute to developing an explicit understanding of Education for Sustainable Development (ESD) in schools, to

[4] https://zfl.fau.de/medien/berliner_erklaerung-BNE.pdf

[5] https://www.vbw-bayern.de/vbw/Themen-und-Services/Bildung/Aktionsrat-Bildung/Kurzgutachten-ARB-Nachhaltigkeit-im-Bildungswesen.jsp

systemically anchor ESD in teaching and school culture and to further develop it qualitatively".[6]

- Hamburg is already known worldwide for having developed an ESD master plan.[7] This plan focuses not only on schools, but also on the cooperation of many different groups of actors.
- In Bavaria, according to the LehrplanPLUS in Bavaria (the state syllabus), Education for Sustainable Development is considered to be an educational goal that applies across all schools and subjects (allgemeines Bildungs- und Erziehungsziel).[8] This means that in principle it should be taken into account in almost every subject.

The situation is similar in other areas of the education system.

In the field of early **childhood education**, there are numerous materials in the sense of Education for Sustainable Development. Research data on the extent to which climate change is addressed in the institutions is not available. It should be noted that in only six of sixteen federal states explicit reference to the topic of sustainability can be found in the educational programmes for early education (Singer-Brodowski 2017, with reference to Aktionsrat Bildung 2021).

The universities and the University of Applied Sciences have a dual role: on the one hand, they are the very influencers that draw attention to climate change in the first place. Teaching in the field of geography is almost certainly one of the central places where climate education is practiced. On the other hand, universities and universities of applied sciences have not sufficiently addressed the question if what they teach and the way they teach contributes to climate change. After all, it is precisely these institutions that produce many of the decision-makers in German society - which still falls far short of the goals of the Paris Climate Agreement. Nevertheless, it should also be noted here that there are several networks that strive for more Education for Sustainable Development (see chapter "German networks") and that more and more centers for teacher education at universities and teachers' training colleges have a working focus on ESD.

Further training for teachers is available at very different locations, depending on the federal state. In Bavaria, teachers' training is largely organised at the Academy for Teacher Training and Personnel Management in Dillingen (ALP)[9]. Here there are single offers in the area of climate education. The possibilities are - depending on the federal state - very different. Institutions whose actual task is not primally teacher education also make offers: The Climate Foundation for Citizens in Baden-Württemberg[10] has set up a place where the connections are explained very vivdly. A startup from the EdTech sector (fobizz) offers an online training on the topic of "Climate Change and Sustainability in the Classroom"[11].

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6 https://www.mk.niedersachsen.de/startseite/schule/schulerinnen_und_schuler_eltern/bildung_fur_nachhaltige_entwicklung_bne/bne_konzept/bildung-fuer-nachhaltige-entwicklung-bne-90480.html

7 https://www.hamburg.de/nachhaltigkeitlernen

8 https://www.lehrplanplus.bayern.de/uebergreifende-ziele/textabsatz/24777

9 https://alp.dillingen.de/akademie/

10 https://klima-arena.de/angebote/lehrkraefte/lehrerfortbildung/

11 https://fobizz.com/fortbildung/klimawandel-und-nachhaltigkeit-im-unterricht/

In the field of **non-formal education**, there was a large environmental protection movement in the 1980s, with church youth work being particularly prominent alongside the relevant associations. There are also activities here today, but not nearly to the extent that would seem appropriate to the climate crisis. The debate is not very pronounced and it is rather individual groups that work on this. Although there is no research data available here either, these suppositions are reasonable. It should also be mentioned that in the informal field of education, especially through self-organisation in Fridays for Future groups, a great deal of climate education takes place in (young) people's private daily lives. There are countless possibilities to get information through different internet offers: Video tutorials, newspapers provide partly very serious, social media channels but sometimes also very misleading information.

Conclusion

The topic of education for sustainable development has arrived in the German education system. Numerous and relevant initiatives are already taking place and are contributing to a lively and objective discussion. However, there is a lack of concepts and enforcement power to bring the topic into the mainstream and to sustainably improve the education system in this area.

Good Practices in Schools

The Hanseatic City of Hamburg has stood out for years in its efforts to promote Education for Sustainable Development in Germany. It is both a municipality and a federal state and has developed an ESD master plan for various fields of action.[12]

The climate schools are a good example of how education for sustainable development in the sense of climate education can be successfully implemented in schools. [13] They follow the whole institution approach, which stands for an holistic concept that integrates all aspects – infrastructure, organisation, curriculum, learning processes and methods – towards ESD.

"For the first time, the climate schools are developing their own climate protection plans on a broad basis, some of which extend into the year 2030. There are currently 63 climate schools in Hamburg (as of 2019) that have planned educational and technical measures. The aim of the programme is to strengthen the climate competencies of the school community and to reduce CO_2 emissions caused by school operations. The schools are supported in the implementation of the measures by the LI department "Environmental Education and Climate Protection" in close cooperation with the fifty/fifty staff at Schulbau Hamburg." (Source: project description https://li.hamburg.de/klimaschule/)

The implementation in the schools varies greatly. An example is the Emilie Wüstenfeld Gymnasium, which, in addition to a climate protection plan for the school, has also undertaken a climate study group, a survey among the pupils on the subject of eating habits, a deposit collection box and the trial introduction of carbon dioxide measuring devices in some classrooms.[14]

[12] https://www.hamburg.de/nachhaltigkeitlernen
[13] https://li.hamburg.de/klimaschule/
[14] https://www.ewg-hamburg.de/schule/klimaschule2/

Similar programmes exist in some other federal states, e.g. North Rhine-Westphalia (School of the Future)[15], Berlin (Berlin Climate School)[16] or Bavaria (Environmental School) [17].

Good Practices in concepts of teaching

"Gestaltungskompetenz" (ability to shape the future) as a competence concept of ESD

A special feature in the German process of establishing Education for Sustainable Development is the project "transfer21" (http://www.transfer-21.de/), which was completed in 2008, but still has an impact on school practice and professional discussion. Here, together with sustainability and futurologists, a compilation of 12 competencies was developed, the development of which is important if pupils are to develop in the sense of Education for Sustainable Development.

In their concept of competencies, de Haan and colleagues are guided by Weinert: "Competencies" are "'the cognitive abilities and skills available to or learnable by individuals to solve specific problems, as well as the associated motivational, volitional (...) and social dispositions and abilities to use the problem solutions successfully and responsibly in variable situations'" (Weinert 2001, quoted from de Haan 2008, p 29).

These competences are all geared towards so-called Gestaltungskompetenz. "Gestaltungskompetenz ((ability to shape the future) refers to the ability to apply knowledge about sustainable development and to recognize problems of unsustainable development" (de Haan 2008, p 31). Thus, the concept particularly emphasizes the action aspect of education in distinction to purely cognitive approaches of Education for Sustainable Development, where the emphasis is rather on a reflective ability. Accordingly, "situated learning" is the preferred method in this project.

In the following, the 12 sub-competences are presented in wording (Source: http://www.transfer-21.de/indexb4c1.html?p=222).

1. build up knowledge in an open-minded way and integrate new perspectives
2. be able to analyse and assess developments with foresight
3. gain knowledge and act in an interdisciplinary manner
4. being able to recognize and weigh up risks, dangers and uncertainties
5. be able to plan and act together with others
6. be able to consider conflicting goals when reflecting on strategies for action
7. being able to participate in collective decision-making processes
8. be able to motivate oneself and others to become active
9. be able to reflect on one's own and other people's models
10. be able to use ideas of justice as a basis for decision-making and action
11. be able to plan and act independently
12. be able to show empathy for others

[15] https://www.sdz.nrw.de/
[16] https://www.berliner-klimaschulen.de/
[17] https://www.lbv.de/umweltbildung/fuer-schulen/umweltschule-in-europa/

Although this approach has been an important and prominent contribution to the professional discussion for a long time, it is still not a matter of course to orientate teaching with regard to ESD in terms of design competence. However, there are professionals and teachers in various disciplines and working contexts who have undergone training in this area.

Example of methods of an ESD

Methoden der BNE

In Germany, it is common among ESD professionals to also use their own repertoire of methods. An example of a collection of methods in the field of ESD can be found here:

https://www.politischebildung.schule.bayern.de/bne/methoden-der-bne/

The methods are characterised above all by the fact that they enable participation, promote explorative learning, take the social space into account, take on great complexity, provide a lifeworld orientation and also address the emotional aspects of learning.

Material stories are used, for example, in chemistry lessons to make complex connections between humans and nature didactically accessible. Learners follow the path of a substance from extraction to refinement, distribution and use. The stories not only make global connections easier to understand, but also offer learners the opportunity to change their perspective, to deal with dilemmas and their own feelings and to establish a connection between world events and their own everyday life. The University of Augsburg, for example, offers a book series on this topic.[18]

Example of a very good teaching material

It should be emphasized that in Germany, the subject of geography ("Geographie" and "Erdkunde") in particular has dedicated itself to education for sustainable development. A particularly good example of teaching material is the work "Klimawandel im Unterricht" (Climate Change in the Classroom) for secondary schools.[19]

In this book, not only is the Anthropocene Period and global change explained in a very thorough way, but conscious-raising is also practiced in relation to personal everyday life or dealing with dilemmas.

[18] https://www.uni-augsburg.de/de/forschung/einrichtungen/institute/wzu/ueber-uns/stoffgeschichten/

[19] https://www.westermann.de/artikel/978-3-14-109820-4/Diercke-Weltatlas-Lehrermaterial-zur-aktuellen-Ausgabe-Klimawandel-im-Unterricht

Good Practices in Teacher Education

The FOLE project of the University of Eichstätt-Ingolstadt should be mentioned as an example of ambitious teacher education. This is a research and practice project funded by the Bavarian State Ministry for the Environment and Consumer Protection for the further training of university lecturers and seminar teachers in teacher education in ESD in Bavaria. (FOLE-BNE_Bay).

The poster on the project results FOLE-BNE_Bay 2021 describes the project:

The offer at the universities includes an ESD basic module, an ESD advanced module and an individual ESD coaching module. In addition, an ESD digital basic module with synchronous times and asynchronous tasks was designed, implemented and evaluated. The training programme was developed on the basis of an adapted model of professional competence for ESD multipliers (based on Reinke 2017 and Kunter et al. 2011).

In addition to professional knowledge (including subject knowledge and subject didactic knowledge), motivation and self-efficacy have an impact on teaching and instruction. The modules include scientific basics on sustainability and ESD concepts, competences and ESD content. Appropriate forms of learning were experienced and then didactically analysed through corresponding tasks on media, in group work as well as during a future workshop. Together, they collected ideas for their own teaching plans. The modules for teachers at all Bavarian universities were advertised in close cooperation with the university didactics centers. The in-service training for the seminar teachers was compiled from the modules and specially adapted in each case. Special modules on the Whole School Approach were developed for in-service training for school headmasters.

Other universities, such as the Ludwig-Maximilians-Universität München[20], the University of Vechta[21] or the University of Tübingen[22] are also known for having taken the topic of sustainability and climate change intensively into account in their teaching and research for years - including in teachers' training.

A Rounder Sense of Purpose

Another example of good teacher education is the approach of the ERASMUS project "A Rounder Sense of Purpose", which has a website in German. This is about the competence development that teachers need if they want to practice ESD.

A model has been developed that covers a whole range of central areas of competence: For all areas there are

[20] https://www.elmundo.lehrerbildung-at-lmu.mzl.uni-muenchen.de/index.html

[21] Nachhaltige Entwicklung an der Universität Vechta: https://www.uni-vechta.de/uni/nachhaltige-hochschule/home/

[22] https://uni-tuebingen.de/studium/studienangebot/schluesselqualifikationen-das-studium-professionale/zertifikate/zertifikat-studium-oecologicum.html und http://worldcitizen.school/

descriptions and example activities on the project's homepage on how to understand and practically realise them: https:// de.aroundersenseofpurpose.eu/

German Networks

Netzwerk LeNa

https://netzwerk-lena.org

The LeNa network "is a platform for exchange and joint activities for the further development of teachers' training in general education schools in the sense of Education for Sustainable Development". It was established "with the participation of university teachers from Germany, Austria and Switzerland (...)".

Netzwerk HOCH_N

https://www.hochn.uni-hamburg.de/

"What contribution to sustainable development can higher education institutions make in the fields of action sustainability reporting, governance, teaching, research, operations and transfer? How can a common understanding of sustainability and transformation be developed in the university network? How can sustainable development succeed in higher education institutions as a whole? These and similar questions as well as the establishment of a nationwide university network are the focus of the project called Sustainability at Universities: Develop - Network - Report (HOCHN), which is funded by the BMBF (...)."

Netzwerk Hochschule und Nachhaltigkeit Bayern

https://www.nachhaltigehochschule.de

"The Network University & Sustainability Bavaria supports university actors in improving the framework conditions for sustainable development at Bavarian universities. It addresses university administrations, scientists and students of all disciplines as well as administrative staff of Bavarian universities and involves actors from ministries, politics, business and civil society."

Netzwerk Umwelt an Hochschulen und Forschungseinrichtungen der Region Ost

https://www.netzwerk-umwelt.org/

"More than 30 organisations already belong to the network. In addition to many universities and colleges, there are a number of research institutions, in particular Leibniz Institutes, institutions of the Helmholtz Association and the Fraunhofer-Gesellschaft. … The reason for this initiative was the realization that many environmentally relevant activities exist in the numerous institutions that are not known to the outside world, but nevertheless have transferability … and can thus develop positive effects in other institutions as well."

netzwerk n

https://netzwerk-n.org/

"The netzwerk n e. V. is committed to change at universities in the sense of sustainable development in all areas of university activity (operation, teaching, research and governance) and

is thus working on an overall institutional transformation of universities." It is primarily aimed at students and doctoral candidates.

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Collections of materials

Aus- und Fortbildungseinheiten für Lehrkräfte zum Klimaschutzplan 2050: Bildungscent e.V. im Auftrag des Bundesministeriums für Umwelt, Naturschutz und nukleare Sicherheit (BMU), 2019: http://www.bildungscent.de/Klimaschutzplan/ (5 Module inkl. Material, Verlaufsplan, Linklisten usw.)

BNE-Box LMU: https://www.bne-box.lehrerbildung-at-lmu.mzl.lmu.de/

Digital Literacy Lab (Materialen zu den 17 Zielen für Nachhaltigkeit, Einbindung digitaler Elemente) Ziel 12 und 13: Klimafresser - Ernährung und Klima: https://tueftelakademie.de/fuer-lehrende/unterrichtsmaterialien/digital-literacy-lab/klimafresser-ernaehrung-klimawandel-lernreise/

Materialsammlung und Linkliste des Projekts Creativity Klimaretter Hamburg (Masterplan BNE Hamburg): https://klimaretter.hamburg/materialien/

Methodenmuster (BNE-Box der LMU) mit exemplarischem Inhalt, können aber auf jeden Inhalt hin angepasst werden: https://www.bne-box.lehrerbildung-at-lmu.mzl.lmu.de/materialien/methodenmuster/

Spiele zum Thema Klima und Klimawandel (TUM): https://www.sg.tum.de/sportdidaktik/praxismaterialien/klima-bewegt/

4. Bulgaria

Sustainable development is an important priority for Bulgaria and the country is strongly committed to contribute to the achievement of the Sustainable Development Goals on national and international level.

Institutional and policy framework

The main institutions involved in Climate change policy and legal framework, strategic and operational activities at national level in Bulgaria are:

- The Ministry of Environment and Water (MOEW) is the national body coordinating the adaptation policy-making process.
- The Ministry of Education and Science in cooperation with the other ministries, institutions and organisations conduct national policy in the field of research.
- The National Institute of Meteorology and Hydrology (NIMH) (chief executive of research and operational activities in Meteorology, Agrometeorology and Hydrology in Bulgaria) monitors climate change through several weather stations included within the Regional Basic Synoptic Network and Regional Basis Climatological Network in RA VI (Europe) - about 40 synoptic and more than 90 climatic stations across the country. There aren't any Global Surface Network or Global Upper Air Network stations in Bulgaria and only one Global Atmosphere Watch station in the country exists (Rojen).
- The Bulgarian Academy of Sciences (BAS) carries out research and development activities on climate change, examining fluctuations in key indicators, adaptation of the individual sectors, etc.
- The National Institute of Geophysics, Geodesy and Geography at BAS provides operational, monitoring and expert information, analyses and assessments in the field of seismology, earthquake engineering, geography, current tectonics, physics of the atmosphere and ionosphere and environmental magnetism.

Much of the current knowledge regarding the observation of extreme climate events and their impacts derives from IPCC reports or from EU-funded projects (e.g. CLAVIER project funded by FP6). Scenarios and projections for the coming decades derive from the CLAVIER and CECILIA projects mentioned above or from the HadCM3 model.

Policy and Legal Framework

Bulgaria's national climate policy is determined on the one hand by the country's international commitments arising from the UN Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, outlining the general framework of international efforts to address the challenges, caused by climate change and, on the other hand, by the obligations arising from the country's membership in the EU and the current and newly adopted European legislation in this field.

In pursuance of Bulgaria's international commitments, on July 23, 2015, is adopted the Law on Ratification of the Doha Amendment to the Kyoto Protocol to the UNFCCC and the Law on Ratification of the Agreement between the European Union and its Member States and Iceland, for the second commitment period under the Kyoto Protocol to the UNFCCC (SG, issue 60 of 07.08.2015).

On 22.05.2015 the law for amendment and supplement of the law for limitation of the climate change was passed (ZOIK, promulgated SG, issue 41 of 05.06.2015). The legislative act clarifies the provisions regarding accurate and correct transposition of the European legislation on the participation of the aviation sector in the European Emissions Trading Scheme and the manner of prescribing the sanctions for non-compliance. In addition, some of the texts of the law have been edited, references have been made to EU acts that entered into force after the promulgation of the law in March 2014, and texts transposing more fully the texts of Directive 2003/87 / EC have been included.

As a party in the Kyoto Protocol, Bulgaria has developed a National Adaptation Strategy (commitment arising from the Climate Change Mitigation Act). The National Climate Change Adaptation Strategy and the Action Plan for the Republic of Bulgaria (NAS) were approved by the Council of Ministers on the 25th November 2019. It is a reference document, which sets the framework for climate change adaptation (CCA) action and national priorities up to 2030.
The Strategy builds on the National Climate Change Risk and Vulnerability Assessment of the Bulgarian Economic Sectors (MoEW 2014) and draws extensively on:

- the information, analyses, and recommendations of nine sector assessment reports,
- Disaster Risk Management Assessment report and
- the report on the 'Macroeconomic Implications of Climate Change'

Different stakeholders (policy-makers, NGOs, scientific community) were involved in its development in order to reflect all perspectives. At the final stage of the NAS development MOEW implemented a project funded under the operational programme "Good governance" 2014-2020, in partnership with the International Bank for Reconstruction and Development. The project utilized the role of MOEW to develop the NAS under the guidance of the EU adaptation strategy.

In general, NAS acknowledges the need for climate adaptation action on economy-wide and sectoral levels, but also all collected data and evaluated information gave ground for the development of specific set of measures, which shall decrease the vulnerability of the country from climate change effects. The sectors included in NAS are agriculture, biodiversity, and ecosystems (BD&ES) services, energy, forestry, human health, transport, tourism, urban environment, and water. Disaster-risk management is also considered as a cross-sectoral topic.

The Bulgarian Government's vision regarding climate change adaptation is as follows: "to develop the country's highest possible level of resilience against climate change, by taking any measures needed and feasible, thus securing the undisturbed functioning of the country's economic sectors, safeguarding its population's health and well-being, and preserving its rich natural assets".

The long-term objective of NAS is: "to proactively pursue long-term high-impact economic, social, and ecological resilience and sustainability, to allow Bulgaria's citizens, private

sector, and public institutions to adequately prepare and protect themselves against vulnerabilities deriving from climate change".

The National Climate Change Adaptation Strategy and Action Plan establishes a process of monitoring and reporting, which will be performed in accordance with the recently approved Regulation on the Governance of the Energy Union. According to a Regulation on the Governance of the Energy Union, reporting on national adaptation actions will be performed every 2 years, starting in 2021. Progress on the implementation of measures envisaged in the Action Plan under the Strategy will be assessed in one mid-term (2025) and one final official report (2031) for submission to the Council of Ministers.

National Development Programme BULGARIA 2030 adopted by the Council of Ministers addresses three main strategic goals: accelerated economic development, demographic upswing, and a reduction in inequalities. The programme outlines 13 national priorities in five development areas. A 'Green and Sustainable Bulgaria' is among these development areas, in which a circular and low-carbon economy (SDGs 7, 8, 12), clean air and biodiversity (SDGs 3, 8, 11, 12, 13, 14, 15), and sustainable agriculture (SDGs 2, 14, 15) will be addressed (UN DESA, 2020). The programme reflects the approach of the whole government to sustainable development and considers the links between the SDGs (Republic of Bulgaria, 2020).

In 2020, Bulgaria submitted its first Voluntary National Review (VNR) to the UN, which offers comprehensive analysis of the implementation of the SDGs, measures progress made and identifies challenges and future steps for the implementation of the 2030 Agenda and it covers all 17 Goals. The VNR outlines some of the initiatives undertaken in Bulgaria towards the achievement of the SDGs and it reflects the attempt for receiving wider public feedback through an online consultation process via the government public consultation portal, acknowledging the crucial importance of data to measure progress in sustainable development. As an EU Member State, Bulgaria strives to meet EU targets for the SDGs and in 2019 the National Statistical Institute launched Monitorstat – a web-based platform for tracking SDG progress, containing all indicators of the Eurostat SDG framework and multiple indicators from the global SDG framework.

The VNR outlines key challenges to SDG implementation: reversing the negative demographic trend is among the main objectives; poverty and inequality, including between regions, pose an obstacle to SDG implementation. Underperformance in reading, mathematics and science mean that more effort is needed to provide quality education for all.

Among the main objectives of the Bulgarian government is monitoring SDG implementation, ensuring coordinated dialogue and designing sustainable development policies. Other most important tasks ahead, according to the VNR are also the creation of a national mechanism for coordination and implementation of the SDGs and raising awareness and dissemination among stakeholders about the 2030 Agenda.

Beyond the overall national framework, on sectoral level, there are several documents, relevant to adaptation policy in Bulgaria:

- National Disaster Risk Reduction Strategy 2018-2030: SoA analysis in regard to specific risks including earthquakes, floods, landslides, forest fires, storms, snowfall and extreme temperatures; the vision of the strategy is to ensure a resilient and safe environment for

the Bulgarian population and the expected outcome of its implementation is to prevent new risks and reduce the existing ones in order to achieve resilience.

- National Forest Strategy 2013-2020 includes measures for strengthening the resilience of forest ecosystems to climate change;
- Common Strategy for Management and Development of Hydro-melioration (Irrigation and Drainage) and Protection Against Harmful Effects of Water: development of a functioning and viable Hydro-melioration Sector in Bulgaria, which enables more sustainable and productive use of water and irrigated land. The strategy envisages Hydro-melioration to manage the infrastructure for the provision of irrigation and drainage services and to oversee the infrastructure for flood protection and river corrections that protect agricultural land from harmful effects of water.
- Strategy on Adaptation to Climate Change for Sofia Municipality, adopted in 2017: objectives and scope of the Strategy are to define and analyse the vulnerability and the potential risks of climate change for Sofia Municipality. The Strategy presents the municipality's framework for adaptation to climate change up to 2020 and sets out concrete measures for adaptation and converting a long-term strategy into action and achievable results.
- Sofia Municipality is currently working on an Implementation Plan for the Strategy on Adaptation to Climate Change, covering 2018-2025, which will set out concrete actions for each of the adaptation measures and actions subject to the monitoring of implementation.
- The Operational Programme Environment 2014-2020 provides a separate Priority Axis 4 - Prevention and Flood Risk Management, directly linked to climate change and envisages measures aimed at providing resistance to disasters, preventing risk to human health and the environment and mitigating the consequences of floods.
- Flood Risk Management Plans (FRMP) 2016-2021 were adopted for water management in each basin and they examine all aspects of risk management, focusing on prevention, protection and preparedness and they include programmes of specific measures or combination of measures. The MOEW started the implementation of a project that aims to plan flood risk management for the second cycle of the Floods Directive, considering the impact of climate change on the four river basin districts by developing flood risk management plans for the period 2022-2027.

There is a lack of common legislation and framework at national level related to climate change education in Bulgaria. Therefore, the core competences, knowledge and skills related to climate change and sustainable development are scattered across the school curriculum, mainly covered in several school subjects (in pre-school education, in primary school education - the subjects "Man and the Nature" and "Man and the Society", and in secondary school level -STEM subjects: biology, chemistry, physics, geography…).

Currently, there is insufficient institutional capacity to include climate change issues in the educational system and insufficient teaching capacity; a lack of educational materials on a

resource-efficient, low-carbon and climate-resilient economy; lack of interdisciplinarity – the subjects of climate change and energy efficiency do not exist as a standalone topic in the educational curriculum. There is no effective and flexible mechanism to coordinate all the key players in the climate action education field or to change the students' and teachers' behaviour towards low energy consumption.

Environmental Education in Bulgaria

Secondary school curriculum on the integration of climate change

The Regulation No13 on 21.09.2016 of the Ministry of the Education and Science in Bulgaria defines the civil, health, environmental and intercultural education and sets the main goals and objectives for secondary school education in the field of Sustainable development. Here, the main goals of the Environmental education are defined as: formation of ecological culture, environmental awareness and environmental behaviour and interrelation with a view to knowledge of environmental Laws, protection, improving, managing and use of natural resources, and the preservation of the natural environment and ecological balance.

The main "climate change" topics in the secondary school education in Bulgaria are covered mainly within the subjects "Man and the Nature" (which starts in the 3rd grade of the Bulgarian school, students aged 9-10), "Biology and Health education" (grades 5-12), and "Geography and Economics" (grades 5-12).

The educational content and organisation of these subjects is determined by the regulatory framework. The Preschool and School Education Act, which entered into force on the 1st of August 2016, has developed uniform State Educational Standards for the system of pre-school and school education, which, in Chapter Three, Item Eight, refer to "civil, health, environmental and intercultural education".

Ordinance No5 on the 30th of November 2015, for the general education, regulates the main requirements for the educational outcomes from the subject "Man and the Nature", basic education, initial stage of training. The specific objectives of the training in this subject are indicated, some of which are:

- Mastering basic knowledge, skills and attitudes related to substances, organisms, natural processes,
- Stimulating interest in nature and striving to protect the environment and one's own health,
- Formation of skills for observation and study of objects, processes and phenomena in nature.

The comparative review of the State Educational Standards for the different educational levels and stages shows that climate change topics refer to a set of knowledge, skills and attitudes formed during the general education of students. The analysis of the State educational standards shows that in the Primary level (Fig. 12).

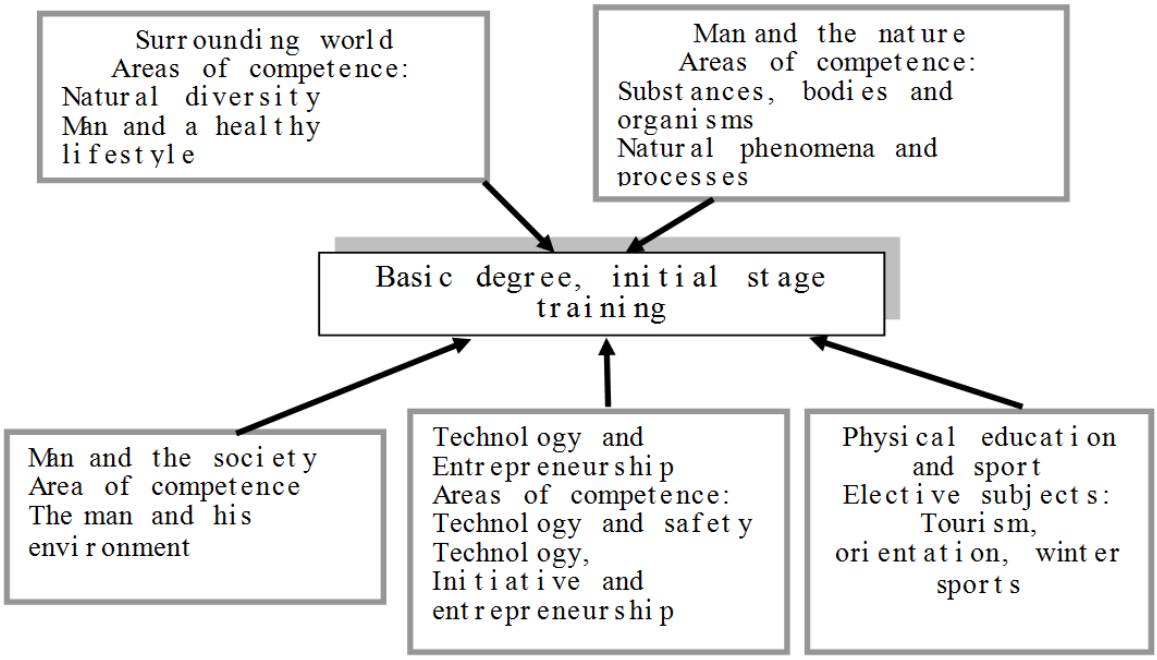

Figure 12: The Initial stage of the basic educational degree climate change topics are directly or indirectly covered within the school subjects Surrounding world and Man and nature.

Organisation of the training within these subjects is determined by the regulatory framework. From the analysis of the standards it becomes clear that in the Primary level or the initial stage of the basic degree (grades 1-4) the basic cognitive skills in terms of environmental education include: to describe, to list, to name, to recognise. These skills correspond to the level of "knowledge" and "understanding" of Bloom's hierarchical taxonomy. The logical part covers skills to make connections both horizontally – to corresponding stage, and vertically - to the next educational stages for the respective cultural-educational field, but also with regard to the other cultural-educational areas of the Curriculum. Cognitive skills at the levels of "knowledge" and "understanding" presuppose their hierarchical inclusion in the next skills in the rank, according to Bloom's taxonomy.

In the secondary level of the basic degree (5th - 7th grade) the State educational standards for the subjects of natural sciences provide opportunities for the formation of integrated thinking on the problems related to climate change, to be understood in the sense of nature as a whole and the man as part of it, through the inclusion of integral concepts - matter, energy, system, motion, etc. Cognitive skills for operationalising this knowledge have a common basis. Therefore, their logical part can be transferred both within the subjects of the field and between the different cultural and educational fields.

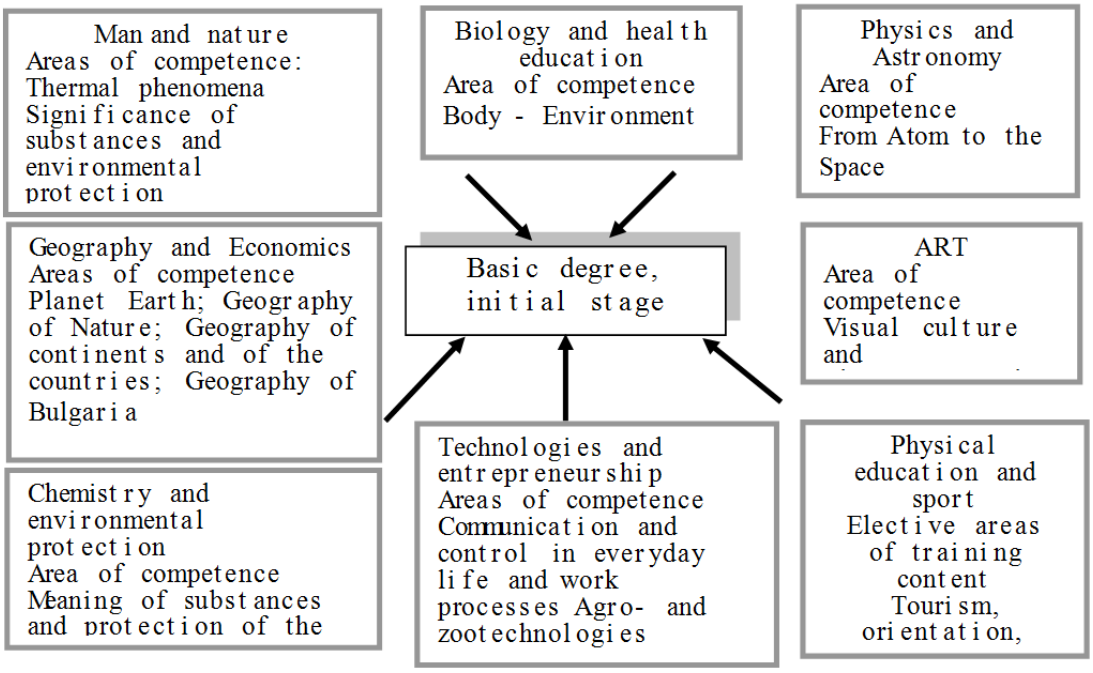

Figure 13: Given the specifics of the subject field, the opportunities for problems related to climate change in secondary school directly or indirectly, are sought predominantly in the subjects Man and the Nature and Biology and Health Education.

The basic cognitive skills, subject of formation in this stage are: to name, to describe, to indicate, to recognise, to compare, to apply and to analyse. Some of these skills cover the next taxonomic levels of skills - application and analysis.

With regard to the other subjects included in the secondary level of the basic degree: Chemistry and Environmental Protection, Physics and Astronomy, Geography and Economics, the problems related to climate change can be analysed in terms of the human impact on various natural phenomena and processes - electricity, radioactivity, light, movement, energy transitions. The integral (interdisciplinary) concepts discussed above play a key role here. These integral concepts as elements of knowledge are part of the areas of competence: From the atom to space, the meaning of matter and environmental protection, the planet Earth. Geography of nature and others.

In the high school stage, the understanding of integrity in the interpretation of objects, processes and phenomena is preserved (Fig. 14).

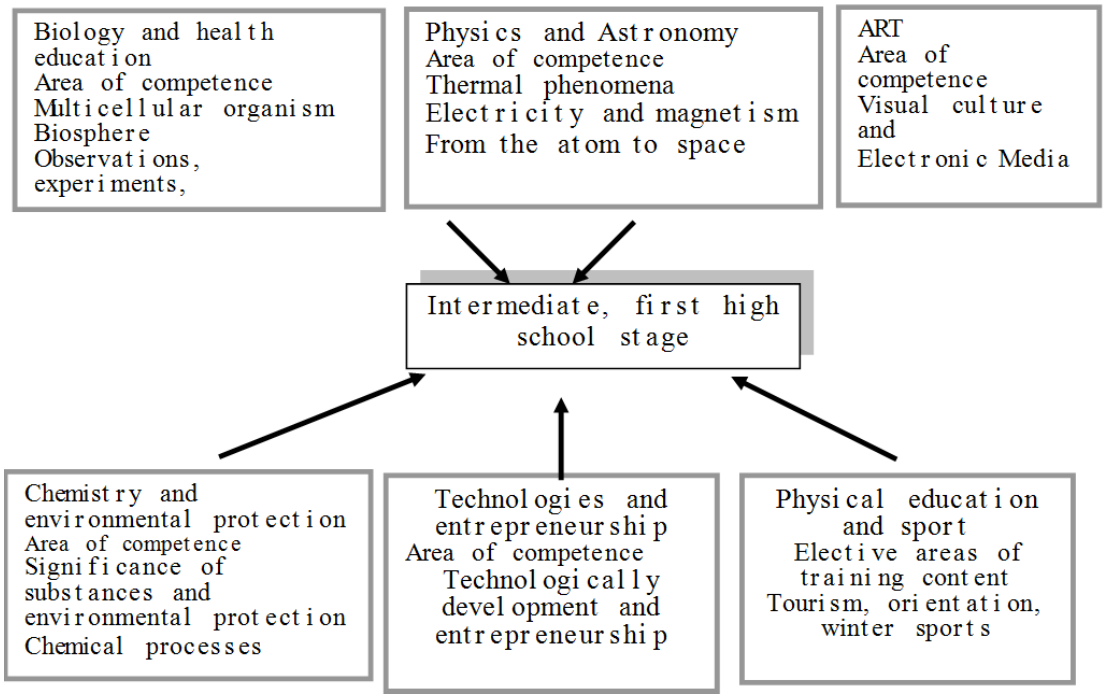

Figure 14: Ecological knowledge is predominantly present in the field of the subject "Biology and Health Education", as part of the areas of competence Multicellular organism, Biosphere, Observations, experiments, research.

In this educational stage the problems related to climate change are integrated in the STEM subjects (biology, chemistry, physics, ecology and environmental protection). Man presents himself as part of the global world, in which coordinated and interconnected factors influence him and through which he can function in a qualitatively different nature. The standards for learning content highlight the need to ensure sustainable development of the planet in the future (including by building environmentally responsible behaviour). The interrelationships between climate change issues as an element of environmental education (on the one hand) and education for sustainable development, health and civic education (on the other hand) are clear.

In Art. 22, Chapter Three, of the Law on Preschool and School Education [4], Standards for Civic, Health, Environmental and Intercultural Education are normatively regulated. In Ordinance No13 on civic, health, environmental and intercultural education, where, as the main objectives of environmental education are defined: "environmental education is aimed at forming an environmental culture, environmental awareness and environmental behaviour in their relationship with each other in order to know the environmental Laws, protection, improvement, management and rational use of natural resources, as well as protection of the natural environment and ecological balance". The ordinance specifies the knowledge, skills and attitudes that students must acquire at the end of the respective educational stage (Appendix 3 to Art. 14, para. 2, t.).

Area of competence - water, soil, air Knowledge, skills and attitudes as a result of the child's education	
PRE-SCHOOL EDUCATION	Describes the importance of water, soil and air for human, animal and plant life
Primary school INITIAL STAGE OF MAIN DEGREE (I - IV class)	Describes the main components in the composition of atmospheric air and the stages in the water cycle, commenting on the importance and significance of each component (atmosphere, water, soil) according to their main functions in nature and their importance for living organisms and humans; -argues the need to preserve the purity of air, water and soil and the contribution of everyone an individual; -lists examples of approaches to saving water in the family and in the community and applies them; -comments on the interconnectedness of the components air, water, soil, plants and animals;
SECONDARY SCHOOL STAGE BASIC DEGREE (V-VII class)	-lists the main sources of water pollution, soil and air; -describes the main threats to the components of the environment - e.g. soil erosion (due to deforestation), industrial and domestic pollution of river and sea waters and in the air, etc .; -distinguishes between different types of air and water pollutants and their impact on human health; formulate practical measures to improve air, water and soil quality and develops cleanliness projects them; -links noise levels and sources to the effects on human health; -illustrates with examples modern approaches to noise reduction in urban environments; -commented on possible changes in the living room behaviours and habits that can lead to reduce pollution of air, water and soil
FIRST HIGH SCHOOL STAGE MEDIUM DEGREE (VIII-X grade)	-interprets information on air pollution in large cities and towns; -comments on air pollution from transport, industry and everyday life; -defines the concept of "pollution hotspots"; - knows the main air pollutants, fine dust particles, sulfur and nitrogen oxides, tropospheric ozone, etc., as well as specific pollutants hydrogen sulfide, ammonia, volatile organic compounds, CFCs, etc .; -describes and classifies the types of pollution of

	soils and assesses its impact on the environment and human health; -develops ideas and projects for conservation of the purity of the waters and water basins; uses methods to save water in your home and yes preserves its purity; -analyses the occurred changes in the population place where he lives and gives an assessment of their pros and cons
Area of competence - energy and climate Knowledge, skills and attitudes as a result of the child's education	
PRESCHOOL EDUCATION	-has an idea of the natural sources of energy; -describes known climate change
INITIAL STAGE OF MAIN DEGREE (I - IV class)	-lists various sources and ways of energy production and explains how they affect the state of the atmosphere and the environment; -assesses the importance of saving energy for the protection of natural resources and formulates rules of conduct in the family, in the classroom, at school; -comments on human behaviour activities that pose a threat to the ozone layer and explains ways to prevent its depletion; -describes the effect of ultraviolet rays on the human body and ways to prevent it
HIGH SCHOOL STAGE BASIC DEGREE (V-VII class)	-classifies energy sources and productions (coal, oil and natural gas; water, wind and sun) according to their impact on the environment and makes sense of the concept of "green energy"; -tests hypotheses about what polluting institutions, communities and producers are doing or can do to change the way they are produced and comments on strategies to deal with the problem in different countries; -explains the relationship between climate change and natural disasters (extreme storms, floods, droughts, desertification); -argues the importance of possible activities to preserve the integrity of the ozone layer and energy balance in nature, such as demonstrates degrees of personal responsibility
FIRST HIGH SCHOOL STAGE MEDIUM DEGREE (VIII-X grade)	-uses sources of publicly available information on the possible effects on the atmosphere and the environment from the production of energy from various sources when working on various projects; -tests hypotheses and argues possible solutions and justification of positions for balanced and environmentally friendly consumption of energy resources;

	-works in a team to discuss ideas and participates in activities related to changes in consumer behaviour in order to reduce greenhouse gas emissions into the atmosphere; -describes mechanisms for reducing greenhouse gas emissions (European Greenhouse Gas Emissions Trading Scheme, Voluntary Emission Reduction Scheme); -analyses the effects of climate change on ecosystems and their capacity to ensure a sustainable flow of food, energy and water; -interprets the need to adapt to climate change and climate change mitigation; -develops ideas and projects for adaptation to climate change

Sustainable development (and climate change) in Teachers' education in Bulgaria

Currently, there is insufficient institutional capacity to include climate change issues in the educational system and insufficient teaching capacity; a lack of educational materials on a resource-efficient, low-carbon and climate-resilient economy; lack of interdisciplinarity – the subjects of climate change and energy efficiency do not exist as a standalone topic in the educational curriculum. There is no effective and flexible mechanism to coordinate all the key players in the climate action education field or to change the students' and teachers' behaviour towards low energy consumption.

Climate change in informal education
NGOs

Among the most active NGOs in the field of climate change education in Bulgaria are:

- NTEF – National Trust Eco Fund- Sofia, an independent public institution, providing funding for environmental projects. NTEF acts as the main initiator of educational activities on the topic, but it has a limited territorial coverage in the country.

- Bulgarian Environmental Partnership Foundation - supports Bulgarian organisations and civic groups in the field of environmental protection. Fulfilling more than 250 initiatives and projects focusing on biodiversity conservation; awareness of renewable energy, climate change and energy efficiency and promoting the use of renewable energy; revitalizing and improving urban environment and living space; sustainable mobility; building and promoting walking and cycling routes (including green corridors); eco-education, etc.

- The EcoCommunity Foundation pays special attention to environmental and civic education of adolescents, and develops various initiatives targeting youth and children,

such as nature-themed competitions, green camps, outdoor lessons, eco-educational activities, creation of bio gardens, etc.

These organisations supported several initiatives and projects, targeting climate change actions in schools and educational institutions in Bulgaria. Some of the main projects are listed below:

Project	Short description
"Towards Introduction of Climate Action in the Curriculum of Bulgarian Schools" Project duration: 09/18 - 04/21 Project link – NTEF Project link – EUKI	The project goal is the institutionalisation of a permanent interdisciplinary teachers' professional development programme on climate action and energy efficiency and the improved energy efficiency of school buildings and related reduction of greenhouse gas (GHG) emissions, based on the changed behaviour of teachers and students during the lifetime of the project and beyond.
BEACON - Bridging European and Local Climate Action (BEACON) Project duration: 04/18 - 08/21 Project link	The project BEACON aims to promote climate action and facilitate an exchange between national governments as well as municipalities and schools in Europe. The aim of the project is to strengthen bi- and multilateral cooperation and create common ambition to realise the Paris Agreement.
Climate Protection through Energy Efficiency - Introducing Models for Stimulating Energy Savings in Schools in Romania and Bulgaria Project duration: 2017 - 2018 Project link	The project "Climate Protection through Energy Efficiency - Introducing Models for Stimulating Energy Savings in Schools in Romania and Bulgaria" aims to raise awareness among students and teachers about energy efficiency and how to encourage them to save energy in schools.
Project: The climate depends on us /Проект „Климатът зависи от нас " Project duration: 1/2014-12/2015 Project link	The project "Climate depends on us" aims to strengthen the civic awareness and participation on climate change issues in schools and local communities in Western Bulgaria. The main theme here is the small contribution of each of us in everyday life, games and observations on the ground about bad practices and creative youth activities to change towards more climate-friendly habits.

Material and resources in English

- Climate and Energy Efficiency: We Study the Climate, We Save Energy, We Think of the Future – Volume 1: Climate change and energy efficiency activities in school.

- Climate and Energy Efficiency: We Study the Climate, We Save Energy, We Think of the Future – Volume 2: Methodical materials

Teacher training materials from 5th to 7th grade in Bulgarian schools on the topic of climate change and saving energy. It represents an interdisciplinary (STEM education-based) teachers' manual for theoretical and practical work in schools on the topics of climate change and energy production and consumption, geography, astronomy, chemistry, biology, physics, and economics.

The publication is structured in two volumes. The second volume, provides a methodological toolbox or teachers' manual containing the descriptions, worksheets, and templates for all practical exercises with the students.

References:

Climate ADAPT - Sharing Information across Europe https://climate-adapt.eea.europa.eu/

Green Policy Platform https://www.greengrowthknowledge.org/map

Preschool and School Education Act (in force since 01.08.2016)

Ordinance No5 of 03.06.2016 on preschool education, Prom. - SG, no. 46 from 17.06.2016, in force from 01.08.2016.

Ordinance No5 of 30.11.2015 on general education, Prom. - SG, no. 95 of 08.12.2015, in force since 08.12.2015.

Ordinance No13 of 21.09.2016 on civic, health, environmental and intercultural education.

International Energy Agency https://www.iea.org/about Sustainable Development Goals Knowledge Platform https://sustainabledevelopment.un.org/memberstates

5. Turkey

Environmental Education in Turkey

"Turkey's National Climate Change: Adaptation Strategy and Action Plan" was prepared in coordination with the Ministry of Environment and Urbanisation, and approved by the Prime Minister's High Planning Council (CSB, 2012). In the summer of 2021, dozens of wildfires burnt a significant amount of forest in Turkey's Mediterranean Region. Just after these huge wildfires, in October 2021, the name of "the Ministry of Environment and Urbanisation" was changed as "the Ministry of Environment, Urbanisation and Climate Change" and issues related to climate change were emphasized among the ministry's policies. Here are some issues that need attention in the action plan (CSB, 2012):

- *Integrating climate change adaptation into the agriculture and food security policies*
- *Developing and expanding R&D and scientific studies to identify the impacts of climate change on agriculture and to ensure adaptation to climate change*
- *Strengthening water resources management capacity, interagency cooperation and coordination with regard to adaptation to climate change*
- *Integrating climate change adaptation into the agriculture and food security policies*
- *Integration of the climate change adaptation approach to ecosystem services, biodiversity and forestry policies*
- *Identifying and monitoring the impacts of climate change on biodiversity and ecosystem services*
- *Strengthening response mechanisms for natural disasters caused by climate change*
- *Developing the capacity to combat risks originating from climate change in the national healthcare system*
- *Ensuring adaptation to climate change on cross cutting issues*
- *Protecting soil and agricultural biodiversity against the impacts of climate change*
- *Developing standards and programmes in order to define the principles and policies aimed at protecting and improving the environment and preventing environmental pollution. In this context, training, research, projecting, creating action plans and pollution maps, identifying and monitoring the basics of their application, and conducting work and processes related to climate change.* (CSB, 2012).

Secondary school curriculum on the integration of climate change

Climate change is addressed in the Turkish Curriculum in different subjects. Following excerpts are from the curricula in different levels. Issues related to climate change are discussed in Grade 8 Science Curriculum and Grade 9 Chemistry Curriculum.

Turkish Science Curriculum Grade 8 (MEB, 2018a, p.47):

- *F.8.1. Seasons and Climate / World and Universe*

This section of the curriculum focuses on the influence of the world's movements, position, light on the surface of the world and the formation of the seasons; the formation of climates and weather events; climatic knowledge. The aim is to gain knowledge and skills about global climate change and its effects.

- *F.8.1.2. Climate and Air Movements*
  Recommended Duration: 6 lesson hours
  Topic / Concepts: Climate, climatic knowledge, climatic knowledge, global climate change
- *F.8.1.2.1. Explains the difference between climate and weather events.*
- *F.8.1.2.2. Having an understanding that climatic knowledge (climatology) is a branch of knowledge and that the specialists working in this field are called climatologists.*

- *F.8.6.3. Matter Cycles through Ecosystems and Environmental Problems (MEB, 2018a, pp.52-53):*
  Recommended Duration: 8 class hours
  Topic / Concepts: Water cycle, oxygen cycle, nitrogen cycle, carbon cycle, ozone layer, global warming
- *F.8.6.3.1. Drawing a diagram related to matter cycles through ecosystems*
- *F.8.6.3.2. Questioning the importance of matter cycles in terms of life.*
- *F.8.6.3.3. Discuss the causes and possible consequences of global climate change.*
  a. *The greenhouse effect is explained.*
  b. *In the context of global climate change, environmental issues are being questioned about how they can affect the future of the world and human life. They are asked to express their artistic predictions in an artistic way as to how environmental issues may have an impact on the future of the world.*
  c. *Students are allowed to calculate their ecological footprint (extension can be used from internet)*
  d. *The precautionary measures taken by the countries of the world to prevent global climate change (e.g., Kyoto Protocol) are called.*

- *F.8.6.4. Sustainable Development*
  Recommended Duration: 6 lesson hours
  Topic / Concepts: Sustainable development, economical use of resources, recycling
- *F.8.6.4.1. Shows the importance of economical use of resources.*
- *F.8.6.4.2. Projects aimed at the economical use of resources.*
- *F.8.6.4.3. They emphasise the importance of solid waste disposal for recycling.*
- *F.8.6.4.4. Provides solution suggestions using research data related to the contribution of recycling to the country's economy.*
- *F.8.6.4.5. Provides solutions to problems that may be encountered in the future in the event that resources are not used sparingly.*

Turkish Secondary School Chemistry Curriculum Grade 9 (MEB, 2018b, pp.52-53):

- *9.5. Nature and Chemistry*
  Key concepts: chemical contaminant, pollution, global warming, greenhouse effect, hard / soft water
- *9.5.2. Environmental Chemistry*
- *9.5.2.1. They expose the chemical pollutants that cause air, water and soil pollution.*
  a. *Nitric oxides, carbon dioxide and sulfur oxides are used as air pollutants.*
  b. *As water and soil contaminants, it is used on plastics, detergents, organic liquids, heavy metals, batteries and industrial wastes.*
- *9.5.2.2. It proposes solutions to reduce the effects of chemical pollutants that harm the environment.*
  a. *Emphasising the vital importance of the atmosphere for living things, the need to be sensitive to living things and the environment is emphasized when selecting and using consumables.*
  b. *Students are encouraged to gather information and share it with the class using cognitive technologies about research, studies and the results of research into reducing environmental damage from chemical pollutants. The need to question the validity and reliability of the information and sources of information obtained in literary studies is recalled.*
  c. *In order to create awareness in the field of environmental cleanliness, students are encouraged to develop campaign or activity proposals with their group friends. The importance of making the division of responsibilities and fulfilling the responsibilities that fall on everyone is mentioned in the success of group work.*

Sustainable development (and climate change) in Teachers' education in Turkey

The Turkish Ministry of Environment and Urban Development run some training programmes for teachers on climate change. Turkish Ministry of Environment and Urban Development, TUBITAK, Turkey Industrial Shipping and Administration Institute (TUSSIDE) and Ministry of Education jointly carried out "Climate Change Seminars" for secondary school teachers[23].

Some universities in Turkey offer master programmes on climate change. For example, Istanbul University[24] is among them. Some other universities[25] run training programmes for capacity building among key players in Turkey to combat climate change. Here is a training programme entitled "Driven Cities and Climate Change Online Training Programme". The programme aims to increase the capacity of local governments in Turkey to accelerate and strengthen the fight against climate change at the local level.

[23] https://csb.gov.tr/cevre-ve-sehircilik-bakanligi-ogretmenlere-iklim-degisikligi-egitimi-veriyor-haber-7387

[24] https://sosyalbilimler.istanbul.edu.tr/tr/duyuru/yeni-program-tanitimi-iklim-degisikligi-tezli-yuksek-lisans-programi-6400560046004A006C0045004C003400700068003000310 0

[25] http://unsdsn.boun.edu.tr/surdurulebilir-sehirler-ve-iklim-degisikligi-online-egitim-programi/

Programmes, courses and associations related to climate change and environmental education in Turkey

Climate change is addressed in several courses in TPDs in Turkey. For instance, in "Environmental Education", "Science and Technology Originated Problems", and "Sustainable Development and Education" courses.

Climate change in online TPDs in Europe and beyond (give examples if possible)

- Online teachers' communities and forums
- Online training platforms, MOOC
- **Climate change in informal education**: Climate change is addressed in many exhibitions and activities in science museums in Turkey. Konya and Kocaeli Science Centers are among them.
- **ClimAlt**[26] offers free online courses on climate change for young people
- **Massive Open Online Course (MOOC) "Climate Change: a question of justice**?"[27]
- **TEMA (Turkish Foundation for Combating Soil Erosion, for Reforestation and the Protection of Natural Habitats), Turkey**[28]**:** TEMA has several educational platforms for K-12 level and beyond and for public.
- **Climate Research Association, Turkey**[29]**:** Climate Research Association (Iklim Araştırmaları Derneği - IAD) is a non-profit organisation bringing knowledge and expertise on a wide range of topics about climate change and its impacts on economy, society and environment.
- **Climate Change Policy and Research Association, Turkey** [30]
- **Climate Change and Erosion Awareness Project**[31]
- **European Climate Action Network (CAN)**[32]
- **Regional Environmental Center, Turkey (REC Türkiye)**[33]
- **Yeşil Kutu (Green Box), Regional Environmental Center, Turkey (REC Türkiye)**[34]: Yeşil Kutu (Green Box) is a comprehensive training programme for environmental education.

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[26] https://www.climaltproject.eu/resources/online-course
[27] https://environmentalmigration.iom.int/massive-open-online-course-mooc-climate-change-question-justice
[28] https://e-tema.org
[29] https://en.iklim.org.tr
[30] https://www.iklimdernegi.org/index
[31] https://www.iklimin.org/en/
[32] https://caneurope.org
[33] https://rec.org.tr/en/
[34] https://rec.org.tr/projearsivi/yesilkutu/

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Annex 2: Climate change education, climate change policies and TPD schemes in Europe and beyond

Annex 2 aims to briefly describe the state of affairs regarding CCESD, climate change in TPD schemes and climate change policies in European and other countries. The countries in Annex 2 are listed in alphabetical order.

The second Annex of the current report not only gives an overview of CCESD in Europe and beyond but also plays a critical role, same to Annex 1, in the implementation of the ClimaTePD project. It is more than important to acquire information and best practices from other countries that could be integrated into the ClimaTePD training programme for secondary in service teachers. Relevant resources are also crucial in order to keep an updated and broad repository available and open to all teachers.

1. Albania

Environmental Education in Albania

Environmental Education in Albania slowly appeared after the collapse of the communist system in 1990. The Ministry of Environment which was established after 1990 set the protection of nature and the natural resources, as a top priority (Shumeli, et al., 2012). During the years and with national aspirations to join the European Community, Albania's Ministry of Environment, Forestry and Water Management drafted a National Environmental Strategy presenting the impact of individuals' actions on the environment. The strategy recommends that environmental awareness should be developed at all levels in the country, including the educational system and the improvement of the educational material within schools as well as the development of a series of environmental interventions, such as teachers' professional development programmes and local projects within the community (UNICEF, 2012).

The schools' curricula in Albania are not considered to be of high quality, as they are excessively rigid and have little or no relevance to the new social and economic situation of the country. The need for environmental education and training seems to be a one way path for sustainable development and despite all the positive educational reforms, the inclusion of environmental education in all levels of the school system (from the early childhood school up to the high school) still remains a top priority (Hall, 2004). Environmental education in the curriculum for primary, secondary and high school should follow different approaches. Starting from simple activities involving students to better help them know, understand and respect themselves and the natural environment in primary school, to more complex activities that help them understand the complexity of the relationships between people and the natural phenomena in secondary and in high school (UNICEF, 2012).

Environmental education has slowly infused into various school programmes under the natural sciences, the social sciences and other disciplines. This also happens in many other countries, including Ireland, Italy, Portugal, Sweden, UK, Cyprus etc., where environmental

education is not an independent school subject. Only once, the environmental education had the role of an independent subject in the frame of the "Knowledge on nature" course which was compulsory in the 5th grade. "Knowledge on nature" main goal was to help students understand nature and acquire the basic scientific concepts (Shumeli, et al., 2012).

Apart from the Ministries in Albania, there are also many other stakeholders that play an important role in scaling up climate change awareness throughout education (UNICEF, 2012). The number of the environmental NGOs has significantly increased, starting from 7 in 1994 and reached around 100 by 2002. Most of these NGOs are based in Tirana and they mainly organise environmental projects and other relevant educational activities.

For example, WWF established a partnership with the Albanian Biologists' Association to spread awareness on preserving the country's outstanding natural heritage. A teachers' professional development programme was set up, in different districts in Albania, where teachers are informed about the latest techniques and methods of environmental education and they are encouraged to develop environmental programmes in their schools. The programme has been supported by the Albanian Ministry of Education (Hall, 2004).

Another programme entitled "Child-Led Environmental Education Initiative" (CLEEN) was developed by UNICEF paving the way to environmental sustainability in Albania and it is now featured as a nationwide, media-driven behaviour change campaign known as ABC, or "Albania, Beautiful and Clean". CLEEN followed a participatory, life skills-based approach engaging children and their families, encouraging them to undertake sustainable behaviour change and empowering them to act and improve the environment in their schools, homes and communities. As part of this campaign, Albanian students identified that plastic waste seem to be one of the biggest environmental problems around the globe. The services of a private recycling contractor were engaged, as well as the national media were contacted and coordinated cleanup activities to eliminate plastic bags and bottles were organised. Approximately 40,000 students and children in Albania learned about the environment through the CLEEN project (UNICEF, 2012).

Apart from the CLEEN project, there is a programme in Albania known as the "Children Stand Up". Children Stand Up aims to develop a more environmentally oriented curriculum in primary and secondary schools, with the support of environmental activists and specialists, targeting children and young people. The programme runs in Albania and Italy and it aspires to raise the awareness of teachers, students, civil society and local government officials by engaging schools in climate-friendly initiatives such as planting trees. Apart from the discussions that children host in their schools and their neighbourhoods, a web-radio platform was developed in the frame of this programme, called "Underadio". The radio was operated by children and its main goal is to raise children's environmental awareness in other areas not directly targeted by the project. (https://www.savethechildren.net/blog/albania%E2%80%99s-%E2%80%9Cchildren-stand-%E2%80%9D-climate-action)

Environmental Centres in Albania

<u>Environmental Center for Development Education and Networking (EDEN) in Albania</u>

The Environmental Center for Development Education and Networking (EDEN) is one of the most active organisations in Albania. As EDEN is a non-governmental, non-politically oriented, non-profit organisation, it aims at contributing in building a sustainable development and healthy environment through informing, educating and offering services in partnership with the interested actors.

EDEN is focusing its work in four sectors:

- Capacity Building
- Environmental Education
- Environmental Management Practices
- Public Information and Participation

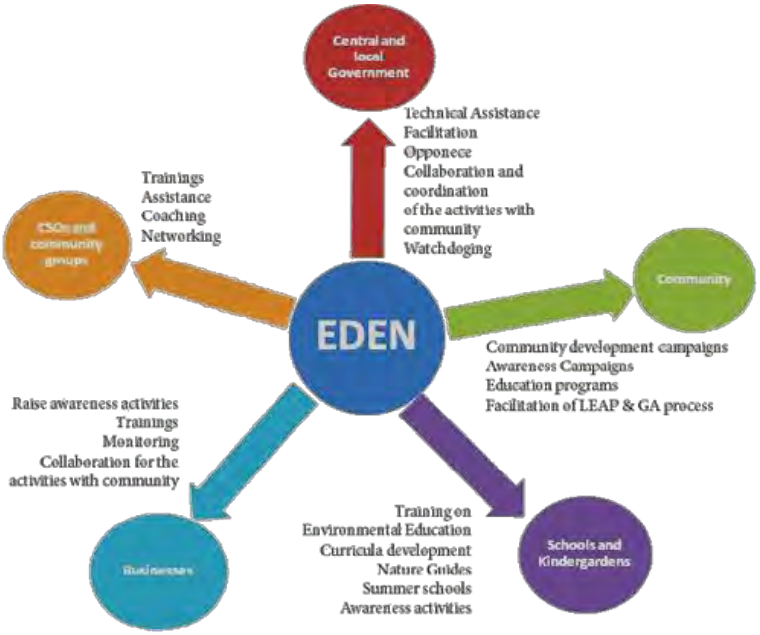

Figure 15: EDEN is focusing its work in four sectors. (https://www.eden-al.org/index.php/en/about-us/profile)

The first environmental project that the EDEN's Environmental Education group implemented was the "Nature Guides" - Tirana's Ambassadors for sustainable development (December 2004 - June 2005). "Nature Guides" showed that youngsters are very interested in participating in environmental activities. EDEN promotes environmental education programmes based on the experiences coming from the UK and the Netherlands. Internship programmes and summer schools are also critical actions of the EDEN's Environmental Education group. (https://www.eden-al.org/index.php/en/)

Regional Environmental Center (REC) Albania

The Regional Environmental Center (REC) Albania is an Albanian legal entity registered under the Law of non-profit organisations. As part of the REC office network, REC Albania works

to fulfil the REC's mission by supporting NGOs and environmental institutions and stakeholders at the national, regional and local levels, supporting:

- Local initiatives and environmental investments
- Environmental planning and management, and national, regional and rural development
- Environmental education and information
- Environmental legislation and the legislative framework
- Capacity development and technical assistance
- Public participation in environmental matters
- Civil society support and assistance

REC contributes directly to the 2013 UNESCO Global Action Plan on CCESD and the UNECE Strategy on CCESD, and facilitates the achievement of the UN SDGs by building capacity in relation to the United Nations' 2030 Agenda for Sustainable Development.

On the International Earth Day, the Regional Environmental Center (REC) Albania, with the support of EDEN, organised environmental educational activities for 9-year school students from "Sabahudin Gabrani" and "Dora d'Distria" schools in Tirana under the programme ACHIEVE, funded by the European Union. (http://albania.rec.org/index-eng.php)

Center for Protection of the Natural Ecosystems in Albania (EcoAlbania)

The Center for Protection of the Natural Ecosystems in Albania (EcoAlbania) is a non-governmental environmental organisation established in 2014 as a joint initiative of professors of the Department of Biology at the Tirana University and the "Save the Blue Heart of Europe" team in Albania. Its main goals are to protect the natural ecosystems and their ecological interactions through the protection of the wildlife and their habitats with the belief that the use of the renewable natural sources should be sustainable for the human wellbeing in the country and stop the increasing destruction and help in the recovery of the natural environment.

As part of the "Save the Blue Heart of Europe" project, EcoAlbania visited six elementary and secondary schools in the Vjosa valley to educate students from the ages of 10 to 18 years old on environmental issues. Through this programme, the students acquired knowledge about the most important environmental problems in Albania and they learned how to reduce their environmental impact starting with actions as individuals. The project outcomes mainly focused on the environmental awareness of the younger generation in the visited communities.
(https://www.ecoalbania.org/en/profile/)

2. Armenia

The Republic of Armenia has been committed to implement the 2030 Agenda for Sustainable Development. A recent report[35] indicates that there are still more to be done and in particular following areas need further efforts for improvement of the SDG implementation:

- *legislation concerning equality,*
- *mitigation and adaptation to climate change,*
- *energy diversification and sustainable use of natural resources,*
- *judicial reform*.

3. Australia

Climate change is one of the biggest issues in Australia. Nonetheless, schools and teachers are not provided enough resources about climate change. Calls for climate change to be part of the curricula for primary and secondary education were detailed in 2010 when the United Nations Educational, Scientific and Cultural Organisation (UNESCO) established the Climate Change Education for Sustainable Development (CCESD) programme. Here are some initiatives and resources for teaching about climate change.

- **Climate change education for sustainable development: the UNESCO climate change initiative**. https://unesdoc.unesco.org/ark:/48223/pf0000190101
- **CSIRO's Sustainable Futures.** https://www.csiro.au/en/Education/Programs/Sustainable-Futures
- **Cool Australia:** https://www.coolaustralia.org https://www.coolaustralia.org/curriculum-materials/?types_k=unit-type&types_v=unit&year_level_k=&year_level_v=&ca_topic_k=ca_topic-climate-change-2&ca_topic_v=2084&subject_k=&subject_v=&
- **Future Earth:** https://futureearth.org
- **The Climate Reality Project:** https://www.climaterealityproject.org
- **ClimateWatch.** https://www.climatewatch.org.au
- **Scootle:** https://www.scootle.edu.au/ec/p/home
- **With One Planet Climate Change Education:** http://withoneplanet.org.au/ http://withoneplanet.org.au/teachers/carbon-unit-years-9-10/
- **The Australian Academy of Science:** The science of climate change https://www.science.org.au/education/immunisation-climate-change-genetic-modification/science-climate-change
- **The Climate Council:** https://www.climatecouncil.org.au

[35] https://sustainabledevelopment.un.org/memberstates/armenia

- **The Intergovernmental Panel on Climate Change (IPCC) is** the United Nations body for assessing the science related to climate change. https://www.ipcc.ch/reports/

4. Azerbaijan

The Government of Azerbaijan has been committed to implement the 2030 Agenda for Sustainable Development. A recent report[36] indicates that there are still more to be done and in particular following areas need further efforts for improvement of the SDG implementation

- *Accelerate economic diversification and ensure dynamic development of the non-oil sector contributing to the implementation of SDG.*
- *Develop competitive human capital through expand the scope of active labor market programmes, increasing investment in education and ensuring full accessibility to the compulsory health insurance system;*
- *Strengthening the use of alternative energy sources and protecting biodiversity.*
- *Ensure sustainable development through the rehabilitation, reconstruction and reintegration of the liberated territories, consideration of the SDGs and other international challenges, resources and perspectives;*
- *Improve data collection and analysis on sustainable development, including strengthening capacity for analysis and generating detailed disaggregated data on gender, ethnicity, age groups, habitats and regions/administrative districts;*
- *Establish of SDG Financing Mechanism with the engagement of private sectors and government institutions to achieve the selected targets of SDGs.*

5. Belarus

Belarus is committed to implement the 2030 Agenda for Sustainable Development and relies on achieving the Sustainable Development Goals through coordinated economic, social and environmental activities by all national partners under conditions of political stability and economic growth. A national coordination mechanism has been established in Belarus to match national circumstances and priorities in the 2030 Agenda implementation process, to take into account the cross-cutting and indivisible nature of the SDGs and to achieve a balance between the three components of sustainable development (economic, social and environmental).

The institutional innovations established by the President of Belarus at the post of the National Coordinator for the Achievement of the Sustainable Development Goals and the establishment of a national council for sustainable development. The National Coordinator monitors the implementation of SDGs at a national level and coordinates the efforts of all parties involved.

Environmental Education in Belarus

[36] https://sustainabledevelopment.un.org/index.php?page=view&type=30022&nr=2637&menu=3170

The first Youth Conference on climate change in Belarus called "Visegrad Youth Group'' (VYCA + Belarus) took place in December 2018. The Association ``Education for sustainable development", together with other Belarusian non-profit organisations organised various co-creation activities in Minsk involving different stakeholders in the development of the climate agenda. One of the activities is TeRRIFICA's crowd mapping tool: an online public participation platform for identifying climate hot spots on pilot region maps Crowd-mapping tool Belarus. (https://terrifica.eu/resources/crowd-mapping-tool/. [last accessed on 24 September 2021]) For example, if a person knows a park or territory with hot temperatures without trees, he/she could map this on the website. Registered users can mark places related to certain aspects of climate change: air temperature, water, and wind circulation, air, and soil quality.

6. Bosnia and Herzegovina (BiH)

Environmental Education in BiH

In Bosnia and Herzegovina, Sustainable Development is incorporated in existing Laws on agriculture, forestry, water, energy, regional development, nature protection but they are not linked to the educational system. Education on sustainable development has been addressed exclusively to education on environmental protection through school subjects (biology, environment, nature and society, etc.) and the work of Eco and school clubs. Nonetheless, good practice examples which support the idea and the concept of CCESD exist, in extracurricular school activities. The work of the schools and teaching process mostly refer to the proscribed curriculum. The additional, extracurricular activities in most cases refer to the projects in which schools participate.

According to the Laws regarding secondary education, the number, type and period of optional education shall be defined in accordance with the resources and possibilities the school has at its disposal. Schools are generally very interested in developing optional activities, including those related to the environment although most of the challenges are related to the funding, the time constraints or the students' transportation. (http://www.promente.org/IPA-ESdPI-green-en.pdf)

CCESD in Bosnia and Herzegovina has shown that this type of education would be very beneficial in terms of raising awareness about the environmental issues and connecting it with responsible citizenship. If embedded in the educational system, CCESD would have a positive impact in the society by teaching students how to actively participate in decision-making activities, while caring for the environment. As a part of formal and non-formal education, CCESD would have the potential to reach out to people regardless of the age groups and sectors. The main obstacles in the implementation of CCESD programmes in Bosnia and Herzegovina are the low citizens' participation in the environmental issues and the overbearing bureaucracy (Hadjichambis, 2019).

Eco-Schools environmental education programme

25 high schools in Bosnia and Herzegovina have the chance to participate in the international programme "Eco-Schools". The programme aimed at improving the environmental education in schools (at all levels), in collaboration with the local municipalities, utility companies, civil society organisations, media and young people. Eco-Schools' aim is to educate new generations to become environmentally conscious and active citizens.

The International Eco-Schools programme was first developed by the Foundation for Environmental Education (FEE) in 1994 and is now implemented in 67 countries and 60,000 schools. As of the end of 2018, BiH was part of this programme, and the BiH Authorised Representative is the MUNJA Social Innovation Incubator, which has been working to empower young people in partnership with over 200 schools in all parts of the country. (https://www.ekopak.ba/en/news/390/the-largest-global-environmental-education-program-eco-schools-started-in-bosnia-and-herzegovina)

Regional Environmental Center for Central and Eastern Europe: Bosnia and Herzegovina (REC BiH)

The Regional Environmental Center for Central and Eastern Europe (REC) is an international organisation with a mission to assist in solving environmental problems. REC Bosnia and Herzegovina was established in March 1997 with the main goal of providing support to environmental protection, conservation and improvement. Activities are implemented in both entities of BiH (the Federation of Bosnia and Herzegovina and Republika Srpska), and also in Brcko District. REC BiH operates as an international organisation, based on the Charter on Diplomatic Status signed by the REC and the Ministry of Foreign Affairs of Bosnia and Herzegovina in December 1999. (https://archive.iwlearn.net/rec.org/index.html)

In the frame of environmental education and Sustainable Development, REC BiH published the Green Pack, which is an environmental education kit for environmental protection and sustainable development teaching for children between 11 - 14 years old. The kit contains lesson plans on 23 environmental topics, including information specific to BiH, structured to provide users with information on each theme as well as the lesson's objectives and methodology. Teachers can also find factsheets and diagrams at the end of each lesson plan for distribution to their students. (http://www.rec.org/publication.php?id=124)

"Education for the sustainable development of UNESCO heritage" cross-border programme

The project "Education for the sustainable development of UNESCO heritage" aims at contributing to the fulfilment of the national goals in education for sustainable development. The ***NGO Eco Center DELFIN from Kotor, Montenegro, in collaboration with the Regional Development Agency for Herzegovina (REDAH) from Mostar, the "Veljko Drobnjakovic" primary school from Risan and the 3rd Elementary School of Mostar, BiH, implemented the programme*** *"Education for the sustainable development of UNESCO heritage", which was completed in* ***March 2021.*** *The project's principal goal was to engage young people in an informal educational programme on sustainable development, environmental protection, natural and cultural resources and climate change for students and teachers in two educational institutions.* ***The***

participants (students and their teachers) enhanced their knowledge in various sectors of sustainable development in non-formal educational environments.

The project underlined the importance of non-formal education in the field of information, education and promotion of the value of protected areas. In addition, participants contributed actively in the environmental protection by planting indigenous plants showing respect to the natural environment and the future generations. The programme was implemented in the frame of the UN Regional Programme "Dialogue for the Future: Promoting Dialogue and Social Cohesion in and Between Bosnia and Herzegovina, Montenegro and the Republic of Serbia" by UNESCO, UNDP and UNICEF, with the support of the UN Peacebuilding Fund. (https://en.unesco.org/news/education-sustainable-development-unesco-heritage-montenegro-and-bosnia-and-herzegovina)

Climate Action 2021

The Council of Ministers in BiH will soon adopt the National Determined Contributions (NDCs) having as mitigation goal the greenhouse gases emission reduction up to 12.8% till 2030. The country will follow the updated Climate Change Adaptation and the Low Emission Development Strategy as well as the Fourth National Communication and the Third Biennial Update Report by the end of 2021. During 2021, many events are organised to engage citizens, communities, local governments, the private sector and other authorities regarding the necessity to take actions on climate change in Bosnia and Herzegovina.
(https://www.ba.undp.org/content/bosnia_and_herzegovina/en/home/climate-and-disaster-resilience/ClimateAction.html)

7. Canada

There are many resources for teaching about climate change at K-12 curricula in Canada. Nonetheless, according to survey with Canadians[37], following issues are raised by participants as challenges for teaching about climate changes:

- *There is little time in the curricula for teaching about climate change*
- *Support for integrated climate change education by all subject teachers*
- *Best practice for teaching climate change for a behavioral change are needed.*
- *Within formal education, Ministries of Education should embed core climate change expectations across subjects and release policy statements guiding climate change education for each regional jurisdiction.*
- *Within public education, Canadians should be provided with more information about climate change from trusted sources including scientists and academics utilizing television and radio news programming, online news and documentaries.*

[37] Field, et al., 2019; https://www.edcan.ca/articles/climate-change-education-canada/

8. Croatia

Environmental Education in Croatia

Following the Strategy for Sustainable Development of the Republic of Croatia, the Action Plan on Education for Sustainable Development was adopted by the government on the 8th of April 2011. The plan was developed in close cooperation with the Ministry of Environmental Protection, Physical Planning and Construction, the Ministry of Science, Education and Sports and other relevant stakeholders.

Further educational mechanisms are to be developed through other action plans which are in the process of development, such as Action Plan on Environmental Protection, Action Plan for the Protection of the Adriatic Sea, Coast and Islands and Action Plan on Sustainable Consumption and Production which is in its final stage. (https://unece.org/fileadmin/DAM/env/esd/7thMeetSC/Country_Reports/Croatia.pdf)

CCESD in the educational system of the Republic of Croatia is acquired through regular primary and secondary lessons in nature and society, nature, chemistry, geography and art in primary and in secondary schools. Climate related topics should be handled in a multidisciplinary way, an approach which is currently underutilised in Croatian education. Many efforts towards curriculum reforming are about to be developed, however no major steps have been made so far. (https://www.socialchallenges.eu/en-GB/city/15/Challenges/56)

More educational workshops, posters and other educational material should be provided and people must realise that they play an important role in preserving the environment. Environmental education could raise the general knowledge and awareness level on environmental issues. It could also fulfil the need for lifelong learning and personal development, raising the responsibility and changing people's habits. Some of the respondents however believe this would be possible only if it were part of primary education (Hadjichambis, 2019). CCESD is also enriched by optional and non-compulsory subjects and extracurricular activities in line with schools' priorities. In Universities, Sustainable Development is addressed through some compulsory courses i.e., at the University of Zagreb postgraduates courses such as Ecology (within the Biology Department - Faculty of Sciences Zagreb), Social Ecology (Faculty of Philosophy, Faculty of Textile Technology) or Eco-engineering (interdisciplinary specialist study coordinated by the Faculty of Chemical Engineering and Technology), etc.

The National Curriculum Framework (NCF) was adopted in July 2010. The values of the NCF focus on (and which are also important for the CCESD) knowledge, solidarity, identity and responsibility. The NCF provides for the implementation of the following interdisciplinary themes: 1) personal and social development 2) health, safety and environmental protection 3) learning to learn 4) entrepreneurship 5) use of information and communication technology and 6) civil education.

In May 2011, a Regional conference on CCESD was organised in Zagreb, focusing among other things on Sustainable Development within vocational education. As the Croatian schools continue their participation in the international programmes concerning environmental education and climate change, such as SEMEP (South-East Mediterranean Environmental project),

UNESCO Associated Schools and FEE (Foundation for Environmental Education) in which NGO the Nature Friends Movement 'Our Beautiful Homeland' continues its role as national coordinator and organiser of the eco-quiz show 'Our Beautiful Homeland'.
(https://unece.org/fileadmin/DAM/env/esd/7thMeetSC/Country_Reports/Croatia.pdf)

DOOR

DOOR is a civil society organisation of experts devoted to the promotion of sustainable energy development, founded in 2003. DOOR has successfully implemented more than 75 projects with goals ranging from climate change mitigation, encouraging citizens' participation in sustainable energy policy-making, improving education about renewable energy sources and alleviating energy poverty.

Within their projects they have organised more than 100 workshops, round tables, trainings, conferences and other public events attended by several thousand participants. Furthermore, they have published many manuals, organised a number of study trips and established continuous cooperation with numerous organisations from Croatia and abroad.

DOOR cooperates with many Croatian and foreign organisations active in environment protection, education, social services, rural development, renewable energy sources, energy efficiency. They work with civil society organisations, local and national authorities, schools, universities, institutes, agencies and other stakeholders.

DOOR is very active in youth education and awareness with the production of educational materials for students and teachers about sustainable energy use and climate change since 2006, equipping two schools with educational material for renewable energy use, established a course about renewable energy sources, which was made available to all technical vocational schools in Croatia and organised the first national intra-school competition in energy savings and energy efficiency, plus and an art competition related to climate change. A financially self-sustainable novel approach to educate students would be supported by DOOR's internal climate expert person and the educational expert acting as lead persons for the challenge. DOOR's goal is to provide innovative tools and approaches to inform students about climate issues. (https://www.socialchallenges.eu/en-GB/city/15/Challenges/56)

9. Cyprus

Environmental Education in Cyprus

The first attempt to introduce CCESD in the Cypriot educational system occurred in the 1990s. This mostly took the form of outdoor nature-based activities and environmental education programmes, which were in accordance with international approaches to environmental education in the 1990s. It was an attempt to introduce CCESD without questioning the main characteristics of Cypriot educational system, such as the teacher-centred approaches and the

limited environmental content of the curriculum. Despite limitations, those introductory steps paved the way for the implementation of CCESD in the Cypriot education system.

The resulting legislations established between 2004 and 2013 are the ones which still frame current CCESD policy in Cyprus. This policy is characterised by a 'whole-school' approach with an emphasis on the development of the CCESD programmes that involve the school community in collaborative action, the development of a plan for informal CCESD education through a network of Governmental Environmental Education Centers (EECs) and a programme for teachers' professional development in CCESD.

It is also noteworthy that according to current CCESD policy in Cyprus, special emphasis is placed on the transition from environmental education programmes, which mainly focused on nature conservation and outdoor activities, to community action programmes (Zachariou & Korfiatis, 2021).

In Cyprus, environmental learning has been promoted through the EU standards with a number of environmental education programmes – such as the "Golden-green Leave", "GLOBE", "Young reporters for the environment"' and "The seed of life", that have found their way to classrooms. In addition, the concept of "ECO-Schools" has become the goal for many of the primary and secondary schools in Cyprus. It is an international programme of the Foundation for Environmental Education. Its goal is to raise students' awareness of sustainable development issues through classroom study as well as school and community action.

Today, nearly 90% of the schools on the island have embraced this environmental philosophy. Environmental Centres are of great importance which provide opportunities for free-choice learning beyond and outside of the formal education system and can contribute to the education for sustainability. Subsequently, the establishment of many environmental centres around Cyprus has strengthened environmental learning from various perspectives.

During the last decade, the Ministry of Education and Culture of Cyprus completed a Strategic Action Plan for Environmental Education (2007). In the framework of the recent educational reform, new curriculum was developed regarding environmental learning. The new curriculum introduced Environmental Education and CCESD as a new school subject in all grades of primary education, while in the secondary education it is infused through other subjects (Manoli, et al., 2014).

Although CCESD policy in Cyprus did not naturally succeed as an environmental policy, its development was the outcome of all the aforementioned parameters. The elaboration of the 'National Action Plan for Environmental Education and Sustainable Development' (NAPEESD) (Cyprus Pedagogical Institute 2007) by the Ministry of Education and Culture intends to establish a framework for the implementation of CCESD in all levels of formal education in a unified, systematic and concise way (Zachariou & Kadji-Beltran, 2009).

The main goal of the integration of CCESD in the curriculum is the establishment of the sustainable school. Sustainable school is a learning organisation where students are able to learn, create and act thinking about the protection of the environment and the right of all people to live in economic, cultural, social conditions and environmental sustainability. In this curriculum, environmental issues and natural phenomena are interrelated in the light of the social, economic, political and ethical factors which influence them. In this context, its thematic units constitute a

flexible learning tool, through which each school has the opportunity and the possibility to approach the issues of environment and sustainability based on its own needs and aspirations. (http://peeaad.schools.ac.cy/index.php/el/)

The curriculum of public schools in Cyprus does not address climate change sufficiently. As a result, students do not receive a proper and adequate perception and understanding on climate change through their formal education which would potentially empower them to engage in climate actions as active citizens (Spyrou, et al., 2021). The implementation of CCESD in Cypriot schools was found challenging by school principals and teachers. As a reaction, a mentoring programme was introduced in schools where CCESD-experienced teachers support other colleagues in planning and implementing CCESD in primary schools (Kadji-Beltran, et al., 2017).

INDUCTION project

The project "INDUCTION" was funded by the Cyprus Research Promotion Foundation and co funded by European Funds promoting the induction of teachers to CCESD with the help of mentoring. The project was carried out in three phases. The first phase consisted of a needs assessment and was conducted via a nationwide administered questionnaire and semi-structured interviews addressing teachers new to CCESD. The second phase included training on CCESD (20 h) and at the third phase of the project, each teacher had to develop a CCESD unit constituting of a minimum of three lessons (3 X 80 mins). The topics were selected by the teachers (Kadji-Beltran, et al., 2017).

Youth for Climate Cyprus

Despite the fact that Cyprus is disproportionately affected by climate change and its effects are already visible, there is an absence of public debate and transparency on policies and measures taken on climate change. This contributes to a lack of awareness among the general population about the climate crisis and the need for urgent action. A group of young people in Cyprus came together to form the Youth for Climate Cyprus activist group that aims in addressing environmental issues and climate change.

The activist work of young people aims to develop environmental awareness and urge the government to take action about climate change by policy measures that provide the necessary space for their perspectives and contributions in public debates. Such measures need to address, among others, the role of education, the media and facilitate a more democratic and inclusive public dialogue around climate change.

Some policy recommendations are to:

1. Provide training to a) teachers on environmental education and b) to journalists and media professionals on climate change and youth activism in general.
2. Develop more critical approaches in the national curriculum (along with relevant educational material) with regards to citizenship education, climate change and climate justice.

3. Establish formal and informal actions (physical and online, i.e. conferences, seminars, online spaces etc.) to promote dialogue among political and other entities to discuss their role as enablers of youth political participation rather than as agents who impede it, and to provide opportunities for youth to publicly discuss with them social issues, such as that of climate change, which impact and concern youth in ways that may differ from other social groups (Spyrou, et al., 2021).

Network of Environmental Education Centers (DKPE)

The Network of Environmental Education Centers (DKPE) is the coordinating body of the Ministry of Education and Culture for the promotion of the issues related to Environmental Education and sustainable development in the frame of formal, informal and non-formal education. DKPE is in close cooperation with all the Directorates of Education and Departments of the Ministry of Education and Culture, as well as with Government Departments and Services, Universities and Research Centres, non-governmental organisations that can effectively assist in consolidation of environmental education and CCESD. The principal priority of the DKPE is to shape a civil society that acts on the basis of environmental protection and quality assurance forming a sustainable world.

The main responsibility of the DKPE is the implementation of the National Strategic Plan for environmental education focusing on sustainable development, approved by the Council of Ministers in October 2007, as well as the maintenance and sustainability of actions, in a unified and systematic way at all levels of education. DKPE focuses on the integration of CCESD in all educational levels and the parallel promotion of central educational actions, as they are foreseen in the National Strategic Plan, which can contribute to the development of the sustainable school which will function as a body of environmental and social change.

On the basis of the above strategic goal, DKPE implements a series of central actions such as the implementation and supervision of the Network of Environmental Education Centers (KPE Pedoula, KPE Athalassa, KPE Community Akrotiri, KPE Salamius), the integration of CCESD in the school's curriculum in all educational levels, the teachers' professional development programmes on the environmental education and CCESD, the writing of educational materials, the participation in international programmes and networks as well as the promotion of research in this field. (http://www.moec.gov.cy/dkpe/)

Centre of Environmental Research and Education (CYCERE)

The Cyprus Centre of Environmental Research and Education (CYCERE) is an innovative environmental centre in Cyprus dealing with education and research fields. It aims at contributing to the preservation of the environment by adopting and promoting strategies in the fields of environmental education and environmental research. CYCERE is recognised by the Republic of Cyprus as a non-profit organisation.

The educational programmes and activities of CYCERE are open to everyone and especially to students who are interested in learning about the natural ecosystems of Cyprus,

enabling them for a more experiential environmental educational approach. CYCERE research programmes are implemented using national and European funding and cover a wide range of environmental and educational topics. Collaboration with researchers and young people is also encouraged by the researchers and the promotion of environmental research in Cyprus.
CYCERE provides environmental programmes and actions to help citizens improve their wellbeing in 4 main domains:

A. Environmental Education

- Development and implementation of CCESD programmes for the schools that visit CYCERE
- Raising young people awareness on environmental issues
- Support CCESD programmes in schools

B. Environmental Research

CYCERE and its researchers participate in a series of research programmes in collaboration with universities and research institutions in Cyprus and abroad.
The objectives of the environmental research of CYCERE are:

- The preservation and improvement of the ecological and social role of the natural environment
- The protection of biodiversity and especially species and habitats of great environmental or ecological value
- Environmental education
- Environmental Citizenship and Environmental Citizenship Education
- Citizen Science
- Management and preservation of the natural environment
- Sustainable use of natural resources

C. Environmental Information

CYCERE seeks to transfer environmental knowledge in a simple way not only to the general public but also to people working in policy development centres. The main goal of CYCERE is to raise public awareness on environmental issues, so as to develop attitudes and participatory attitudes that will contribute to the protection of ecological balance and quality of life and ensure the health of our planet. (http://kykpee.org/kykpee/)

10. Denmark

Environmental Education in Denmark

As part of Danish preparation for the world summit on climate change reduction in Copenhagen in December 2009 (COP15), the Danish Ministry of Education was very active organising many initiatives. The Ministry's agenda was based on strengthening teaching in science subjects, motivating young people to enrol in higher education courses in science and technology

at universities. The strategy of the Ministry was focused on turning the public interest on climate change as a vehicle to focus on enhancing science education in public schools (Breiting & Wickenberg, 2010).

Nordic countries

The current situation in terms of curriculum and educational policies related to secondary education in Nordic countries is collected from different sources.

There is a great tradition on environmental awareness and climate change in all Nordic countries. Greta Thumberg has been the voice of those young people around the world who were noticing how their future would be in danger because of the loose policies for fighting climate change in most of the developed countries, in the endeavour of building sustainable societies.

"Our house is falling apart. The future, as well as what we have achieved in the past, is literally in your hands now. But it's still not too late to act. It will take a far-reaching vision. It will take courage. It will take a fierce determination to act now to lay the foundations where we may not know all the details about how to shape the ceiling. In other words, it will take 'cathedral thinking'. (Greta Thunberg, EU Parliament, 16 April 2019)

11. Finland

Environmental Education

In 2014, a new National Core Curriculum for Basic Education was published. In this document, sustainability is a basic aim (Finnish National Board of Education, 2016; Utbildningsstyrelsen, 2014). The phrase 'sustainable development' occurs already in the first paragraph and the schools are commissioned to build a sustainable future. The curriculum regards humans as a part of nature and dependent on vital ecosystems. According to the curriculum text, a sustainable lifestyle is necessary and basic education will lay the foundation for global citizenship and culturally sustainable development. The students need to understand the seriousness of climate change and to strive for sustainability.

Then, teaching about the environment and climate change forms an important part of the curriculum in Finnish schools. There is a great concern among young students. Schoolchildren across Finland went on strike several times in early 2019. Inspired by the Swedish teenage activist Greta Thunberg, they met in dozens of cities and towns to demand action on climate change. A recent survey found that Finnish children and teens increasingly name climate change as a major worry. "I would have gone to the protests if I had known about it, but I was here taking a maths test," says Olivia, a ninth-grader. "Greta Thunberg is brave, and it is important to share this information." (https://finland.fi/life-society/finnish-schools-emphasise-climate-change-education/[04/08/2021])

Teaching about climate change is already important in the Finnish educational system, and a new climate studies programme is being developed with the idea that climate change should be part of every subject. Some NGOs have developed climate change and circular economy material that can be used as teachers see fit.

According to the vision defined in 2021, in 2025 climate responsibility is both a mode of action and a civic skill within the learning community. Climate responsibility becomes a reality through agency, daily actions, attitudes in education, and in continuous learning. It is not enough to reproduce what already exists, but climate change challenges us to renew our routines, to influence and address the systemic changes that are necessary. The planetary boundaries are the starting point on which a climate-responsible approach is based. (Opetushallitus, 2020)

Sustainable development (and climate change) in teachers' education in Finland

The Ministry not only underlines the integration of sustainable development perspectives in the early childhood and school education. It also "stresses the importance of addressing the sustainable development perspectives in teachers' education and supports the strengthening of the sustainable development in the training of the in-service teachers" (p.9).

At the same time, there is a bottom-up approach occurring. The Teacher Student Union of Finland (SOOL, 2020a) stresses among its goals for teachers' education that sustainable development needs to be integrated in the teachers' professional development programmes, highlighting teachers as sustainable lifestyle role models. In 2019, SOOL's general assembly demanded an integration of climate change education in the educational programmes in the universities and polytechnics (offering vocational teacher education), and they challenged them to include climate change and sustainability education in their studies' programmes.

12. Georgia

Georgia has been committed to implement the 2030 Agenda for Sustainable Development. A recent report[38] indicates that the Government's policies and priorities are well-aligned to the SDGs and the level of integration of nationalized SDGs into Georgia's development planning, in line with its EU integration aspirations, is substantially high.

13. Hungary

In Hungary, adaptation strategies and programme documents at the national and regional levels have been developed in recent years: National Adaptation Strategy (part of the NCCS-2), 1st National Adaptation Programme (part of the CCAP-1), National Adaptation Geo-information System (NAGiS); Report on the scientific assessment of the possible effects of climate change on the Carpathian Basin (RCB); Climate and nature protection action plan; Climate change strategies of the counties (NUTS3 level) and many settlements (LAU1 level).

The governance structure on climate protection in Hungary has been strengthened in the recent years. In 2019, the Deputy Secretariat of State for Climate Policy was established under the Ministry for Innovation and Technology. The Climate Policy Department (under the Deputy Secretariat of State for Climate Policy) is responsible for the elaboration and implementation of

[38] https://sustainabledevelopment.un.org/memberstates/georgia

the NCCS-2. Additionally in 2013, the National Adaptation Center (as a department of the Mining and Geological Survey of Hungary) with the main task to support strategic planning in the fields of reduction of greenhouse gas emissions (climate change mitigation through the National Decarbonisation Roadmap) adaptation to the expected impacts of climate change (through the National Adaptation Geo-information System and the National Adaptation Strategy).

Hungary has committed to tackle climate change through its National Climate Change Strategies through the years, starting from the first adopted National Climate Change Strategy (NCCS 1) in 2008 and reviewed in 2013. Based on lessons learned from the NCCS 1, the NCCS 2 for 2014-2025 was formulated and introduced. The NCCS 2 has since been updated. To effectively put an adaptation strategy in place, implementation is based on four consecutive three-year Climate Change Action Plans (CCAPs). Each CCAP contains a detailed description of different measures based on the NCCS 2's short-term sectoral actions and clarifies responsibilities and financing.

Major energy plans such as the National Energy Strategy 2030, the National Energy and Climate Plan (NECP), the National Energy Efficiency Action Plan until 2020 and the National Building Energy Performance Strategy mention the importance of climate change adaptation and resilience in the energy sector, referring to the National Adaptation Strategy, although they do not prioritise it or elaborate further on this topic.

Hungary's National Energy Strategy to 2030 was also updated to include an outlook until 2040 focusing on clean, smart and affordable energy while strengthening energy independence and security, and decarbonising energy production. Renewable and nuclear electricity, and electrification of end-use sectors, are identified as the key drivers towards the targets of 2050. Hungary expects substantial investments in the power sector, notably for the construction of two new nuclear power generating units. Also, renewable energy production has increased significantly but growth in the sector has slowed. The introduction of a new support system for electricity from renewable sources could get progress back on track. However, measures that limit wind power developments are likely to have a negative impact on the sector.

Environmental Education in Hungary

Eco-schools programme in Hungary is a flexible programme, developed by the Hungarian Institute for Educational Research and Development (HIERD) (Evaluation of the Eco Schools programme in Hungary: (https://www.researchgate.net/publication/325742702_AN_EVALUATION_OF_THE_HUNGARIAN_ECO-SCHOOLS_-_THE_MONITORING_APPROACH [last accessed on 24 Sept 2021]). It uses a whole-school approach to introduce the principles of sustainability in a practical way as well as through study subject matter. Activities range from school trips to environmental projects and exhibitions made for the local community to school patrols where students check and collect data on energy consumption and local Green Parliaments where students are involved in real decision-making with local town halls. By the end of 2017, 1134 Hungarian schools held an Eco-School title with 350,012 students and 34,890 teachers participating in such programmes.

14. Israel

Environmental Education in Israel

Climate change is one of the three primary threats to biodiversity in Israel. Climate change impacts are expected to increase pressure on natural ecosystems and act synergistically with other human effects to amplify the threats on biodiversity. For these reasons Environmental Education is one of the recommended tools for increasing the environmental literacy of the people and especially of the students. CCESD and educational activities cultivate public awareness on environmental issues through educational programmes run by the Ministry of Education (Sternberg, et al., 2015).

Nowadays, it is necessary to promote and improve the citizens' environmental literacy in Israel and beyond. Especially in Israel there are many environmental case studies related to students' everyday life and their experiences that underline the statement above and they can be classified into three different levels:

- The local level
- the national level and
- the global level.

The local case studies are varied from one region to another. For example, air pollution is a very relevant topic for students who live in the Haifa Gulf region, while floods are more relevant to other areas. The hydrological system is very important at the Israeli national level, while the greenhouse effect and global warming belong to the global topics.

The majority of the teachers in Israel believe that climate change is a human responsibility. They still possess many misconceptions and gaps in knowledge about the nature and consequences of climate change, and they don't seem ready to take action on this topic (Seroussi, et al., 2019). To integrate environmental education into Israeli schools' curricula the Ministry should focus more on research concerning teachers' and students' difficulties in teaching and learning subjects in an integrative manner, developing the appropriate learning and teaching strategies, the appropriate learning/teaching materials including the teachers' professional development trainings (Orion & Fortner, 2003).

In Israeli elementary schools, Environmental Education is to be taught along with other themes under one of five key areas of scientific knowledge. Accordingly, the standards' document lists five substantive areas for elementary school programmes:

- Materials sciences: substances and energy
- Life sciences: the world of living creatures and human beings, their health and the quality of their life
- Earth and the planetary sciences
- Technology: the man made world, information and communication and
- Environmental sciences: ecological systems and environmental quality.

With the exception of secondary school students who opt to "major" in environmentally related topics, learning about the environment does not take place in Israel's high schools. Although in elementary and secondary schools it seems that there is an integration of environmental education in the curriculum, in high schools it is not systematically integrated (Sagy & Tal, 2015).

Supplementary environmental initiatives in Israeli schools

Beyond the officially sanctioned environmental programmes offered by the Ministry of Education, there are local initiatives in hundreds of schools, in which parents, teachers or communities seek to provide a plethora of supplementary information sources and enrichment learning programmes on environmental topics. Academic centres and non-governmental organisations such as the Society for the Protection of Nature in Israel, the Heschel Center for Environmental Leadership and the CRB Fund offer environmental programmes to the students. There are also collaborations between schools and industries, i.e. Intel has funded supplementary environmental instruction in several schools and the Teva pharmaceutical conglomerate initiated a chemistry studies programme in the city of Beer-Sheva, with several environmental applications. Israel's Electricity Company and Makhteshim chemical company support similar "green" educational enterprises. Nonetheless, there are three leading national initiatives that provide supplementary programmes at elementary schools:

- Keepers of the Environment,
- Green Network and
- Green Schools - overseen by the Ministry of Environmental Protection and the Ministry of Education.

The goal of all three programmes is to inspire students to greater environmental involvement and activism, frequently with the cooperation and support of their parents and other community groups. Israel offers many alternative environmental programmes for students, aiming to support the country's growing ecological needs. As long as Israel's educational goals remain centred on security, economics and industrial needs, without integrating the environment as a critical priority, it is time to truly make environmental education a compulsory subject for all students in all educational levels (Sagy & Tal, 2015).

Green educational institutions

The Ministry of Environmental Protection and Ministry of Education are leading the accreditation process for green institutions:

- Green kindergartens
- Green schools
- Green campus

The accreditation process includes three main components:

1. environmental education curriculum,
2. environmental activities in the community and
3. intelligent use of resources (water, energy, waste and recycling, and more).

The accreditation process itself encourages those involved to take responsibility for the environment. During the process, environmental considerations tend to become even more central to decision-making, and today's children will begin to internalise the fact that there is no other way but to see all points of the triangle in their entirety: Economy - Society - Environment.

Joint programme

In 2009, the Ministries of Education and Environmental Protection initiated a joint programme to implement the concept of sustainability in the education system - from preschool to high school. The goal of integrating sustainability in Israel's education system is to provide every graduate of the Israeli education system the knowledge and skills that will enable them to make informed decisions in the future, and lead to informed, engaged, caring, and responsible civic behaviour in relation to the environment. The main topics of the programme are:

- Behaviour in accordance with sustainability principles
- Reduction of pollution and environmental risks
- Climate change, air pollution, greenhouse gas emissions
- Waste and consumption
- Alternative energies
- Water use in Israel and
- Biodiversity and open spaces

National Green Building Competition for Green Schools

The Ministry of Environmental Protection, the Ministry of Education and the Israeli Green Building Council (ILGBC) established the annual Green Schools Competition. All "green" elementary schools are invited to participate in the contest, in which they present a green project for their school. The overall goal is to encourage innovative thinking in the area of green building, and to allow Israeli students the opportunity to attend a school that implements green building principles, which provide an infrastructure for making a healthy and high quality learning environment.

National Cleanup Day

National Cleanup Day is held once per year and it is aimed at raising public awareness about environmental protection and in particular, keeping open spaces and public areas clean. Schools and youth movements mark the day by conducting cleanup activities across the country and by learning about the importance of keeping the public domain clean.

Youth movements

The Ministry of Environmental Protection, Ministry of Education, and Youth Movement Council in Israel have joined forces to empower and enhance youth movements, for the benefit of a sustainable society.
(https://www.gov.il/en/departments/guides/enviromental_education_system)

Society for the Protection of Nature in Israel (SPNI)

The Society for the Protection of Nature in Israel (SPNI) is Israel's oldest and largest environmental non-profit organisation. For over 60 years, SPNI has been dedicated to protecting and preserving Israel's natural resources, environment, biodiversity and unique landscape. The work carried out by SPNI now will determine what the land of Israel will look like for generations to come.

SPNI was founded in 1953. Sixty years later, SPNI is still blazing the trail for nature and the environment in Israel. As the oldest, largest and most beloved environmental organisation in Israel today, SPNI is more determined than ever to guard Israel's scant open spaces, protect its coasts and beaches, and promote sustainable development in order to preserve the country's natural resources for future generations. Many households are members of the SPNI and thousands of individuals participate in the organisation's activities each year, including children and young people who regularly participate in SPNI's environmental courses. (https://www.natureisrael.org/Where-We-Work/Environmental-Education)

15. Italy

Environmental Education in Italy

Environmental education in Italy wasn't part of the school's curriculum. Since 1972, several documents have been issued such as the report entitled «The Limits of Growth» which was published by an organisation called the "Club of Rome". The report referred to the global challenges facing humanity, including the environmental issues and proposing solutions through scientific analysis.

In 2016, a document stating some crucial environmental education guidelines was worked out by our Ministry of the Environment. This document refers to the ways to integrate climate change and environmental education as an independent subject in schools. It is an effort based on the document "Learning for the future: Competences for Education for Sustainable Development" published in 2012 (http://www.unece.org/env/esd.html), dealing with territory and sea protection and environmental education and it is divided into three parts following the Italian Education System. (http://www.scuolamediazanifidenza.edu.it/attachments/article/831/Environment%20Education%20in%20schools%20in%20Italy.pdf)

From September 2020, teachers of all educational levels integrate climate change and environmental sustainability in their teaching**.** CCESD was used as a pilot programme to ultimately fold the climate agenda of the UN into the entire school's curriculum in Italy. (https://www.nytimes.com/2019/11/05/world/europe/italy-schools-climate-change.html) Each year, teachers dedicate 33 hours of their teaching to climate change education and other related topics. The lesson is integrated into the existing curriculum classes, as well as in other traditional subjects such as geography, math, chemistry and physics. Having the environmental education in schools as a mandatory education will encourage Italian students to be more environmentally conscious and make Italy a global leader in the fight against climate change. (https://www.nycfoodpolicy.org/italy-mandates-climate-change-education-for-all-students/)

In Italy, apart from the formal education, associations and other organisations are trying also to promote CCESD in informal and non-formal education. The most important environmental associations in Italy which work with Italian schools are the Italian Association of Environmental and Resource Economists (IAERE) and the Fondo Ambiente Italiano (FAI).

IAERE

The Italian Association of Environmental and Resource Economists is a scientific association, founded in 2012, and it is based in Milan. The principal goals of IAERE are the:

- Development and application of environmental and resource economics as a science in Italy,
- Communication enhancement between teachers, researchers and students in environmental and resource economics,
- Development of the cooperation between university level teaching institutions and research institutions in Italy and
- Open data and scientific results to institutions and collaboration establishment between companies, trade unions and environmental NGOs.

IAERE is an association that provides a platform for scientific exchange in the field of Environmental and Resource Economics in Italy. The Association aims particularly at facilitating interaction among scholars, researchers and students, in order to increase the impact of good scientific research at national level, encouraging the application of research results by organising workshops, conferences, exhibitions, seminars, meetings, cooperating with journals and promoting postgraduate courses. (http://www.iaere.org/)

Fondo Ambiente Italiano (FAI)

FAI, the National Trust for Italy, restores and takes care of special natural places in Italy for the current and the future generations. http://fai-international.org/ Legambiente (League for the Environment) is the most widespread environmental organisation in Italy, with 20 Regional branches and more than 115,000 members. It is acknowledged as an "association of

environmental interest" by the Ministry of the Environment, it represents the UNEP National Committee for Italy and it is one of the leading members of EEB ("European Environmental Bureau") the Federation of European environmental organisations, and of IUCN - the World Conservation Union. Its headquarters are in Rome, with a staff made up of fifty professionals and experts on different fields of activity. Its motto is "Think Globally, Act Locally» (https://www.legambiente.it/legambiente/about-legambiente)

16. Lithuania

Lithuania has carried out an analysis of compatibility which showed that most of the SDGs and their targets are reflected in the national strategic planning documents. In order to ensure coherence and integration of economic development, solution of social problems and protection of the environment, Lithuania has established a system of institutional and strategic planning based on the principles of sustainable development.

Lithuania has outlined the following priority areas: reduction of poverty, social exclusion and income inequality, promotion of employment; strengthening of public health; increasing the quality of health care and accessibility of health services; development of innovative economy and smart energy; quality education; development cooperation.

Quality education is of particular importance in Lithuania. Special focus was placed on accessibility and quality of early childhood education, the improvement of general education, learning outcomes and inclusive education development. The Lithuanian population is among the most educated nations in the world. Since 2011, Lithuania has been a leader among the European Union Member States by a number of people aged between 25 and 64 years old with secondary and/or higher education. In order to provide more favourable conditions for high-quality education, Lithuania intends to implement an extensive reform of the educational system involving pre-school, primary, general and higher education as well as adults' and vocational education.

Lithuania is determined to continue the implementation of the 2030 Agenda and to contribute in finding solutions in global problems by making use of the opportunities provided by the SDGs. The Ministry of Environment is responsible for reporting on the implementation of the Action Plan annually. The Action Plan indicates dedicated financial resources for implementation of the measures and defines the implementing institutions. Assessment criteria and values are also established in the Action Plan.

Environmental Education in Lithuania

The Lithuanian Children and Youth Centre's Sustainable Schools' programme started in 2013 and its goal was to promote and create awareness on sustainable development in school communities. The programme was among nominees for the 2018 UNESCO-Japan Prize on Education for Sustainable Development (ESD), part of UNESCO's wider work on ESD (The Lithuanian Children and Youth Centre's Sustainable Schools' programme https://lvjc.lt/about-

lithuanian-youth-center/; https://en.unesco.org/news/imagination-and-energy-help-schools-lithuania-turn-sustainability-ideas-action [last accessed on 24 Sept 2021])

The programme works through the formation of Green Teams of ten people in educational establishments which can include everyone (teachers, students and parents to administrative staff). It's a simple but powerful kindergarten experiment in biodegradability and an innovative way that schools in Lithuania follow in order to embrace sustainability. Each school starts the programme with a themed conference with invited sustainability experts. Additionally, there are two or three training sessions per year for teachers and liaison with university research. Participating schools draw up a plan at the start of every academic year, which is submitted to the programme and provides advice on its content and structure. At the end of the year, a report with what has been achieved and the number of participants engaged is published. Schools are awarded in an official ceremony where Green, Silver and Gold medals are given for their achievements.

17. Malta

Environmental Education in Malta

Environmental education appeared in Malta in 1962 with the establishment of the country's first two environmental NGOs, nowadays known as BirdLife Malta and FEE-Nature Trust. (https://thegeep.org/learn/countries/malta) In 1982, geography, history and civics were put together under the title of social studies in order to provide the first CCESD form in primary schools. This goal was difficult to be achieved in the Maltese islands due to a number of reasons, including the lack of teachers' preparation, the lack of resources, etc. In 2004, Malta adopted the majority of the EU environmental Law with the exception of certain derogations, due to its particular geography.

Environmental education is also promoted at a national level through curriculum embedding within school's context and policy-making. An opportunity to infuse CCESD into other subjects at secondary school, especially the sciences, but it is up to the individual teacher to carry them out. Integrated science exposes students to issues of waste management, renewable energy, pollution and biodiversity. The incorporation of environmental issues in the science curriculum can increase the relevance of science to the students (Mifsud, 2012).

The success of environmental programmes in Malta, coordinated by the environmental NGOs in collaboration with other relevant institutions and public entities, is targeting school students. Main objective of the CCESD programmes and the educational activities are to promote increased understanding of the natural world and CCESD's direct curricular embedding. (https://thegeep.org/learn/countries/malta) Nowadays, NGOs have become very active in the formal sector and organise environmental activities for school children. They also supply schools with teaching resources and promotional material and some NGOs organise trainings and seminars for teachers to equip them with skills required to organise environmental activities (Mifsud, 2012).

Nature Trust Malta (NTM)

Nature Trust (Malta) is a non-profit, non-governmental environmental organisation working in the Maltese Islands, founded in 1962 under the name Natural History Society of Malta. NTM gives great importance to CCESD in Malta as it is an essential component in a strategy for a mentality change in the country towards sustainable lifestyles and choices. The main goal is to raise awareness and inspire people for a better environmental future. NTM is organising environmental projects such as habitat conservation and the creation of marine protected areas.

NTM is particularly active in environmental education through diverse methodologies and media, i.e. visits in countryside, publications and the programmes EkoSkola, YRE (Young Reporters for the Environment) and LEAF (Educating about Forests). The first two programmes focus on providing information, while programmes like EkoSkola are process-based and they function to develop skills through active democratic participation and engaging activities.

- *NTM's Outdoor Provision Programme (OPP) for CCESD*

NTM widened its outdoor activities opportunities by including other visiting sites, such as the Xrobb l-Ghagin Nature Park and Centre for Sustainable Development in 2011. NTM's OPP makes use of the outdoors as a resource and as a subject for CCESD. The significance of site visits embraces the NTM's vision on CCESD whereby activities related to ecological sustainability are developed under the widest umbrella topic that includes socio-economic issues.

- *Publications*

NTM produces a range of publications for a wide range of ages and levels of interest. These include the scientific "Central Mediterranean Naturalist" and the non-scientifically oriented "Archipelago" and "Il-Ballottra". Il-Ballottra is written in Maltese and addressed to school children. Other publications include booklets about Id-Dwejra, Il-Majjistral and Xrobb l-Ghagin parks. (https://naturetrustmalta.org/environmental-education/)

EkoSkola

EkoSkola is a programme that became synonymous with CCESD at all levels of formal education. Thanks to EkoSkola, the number of schools participating in the programme is increasing over the years. The participating schools that have engaged in the integration of CCESD in their curriculum through a whole school approach are awarded the Green Flag – an international certification based on international quality criteria for CCESD. The programme encourages the participation of children in decision-making, planning and implementation of environmental activities with the aim of improving the quality of life in their school and community. Furthermore, EkoSkola has been very proactive in promoting youngsters' voices on sustainability in a local and a national level and beyond. (https://ekoskola.org.mt/)

BirdLife Malta

BirdLife Malta is the oldest environmental organisation in Malta, established in 1962. Its main vision is the protection of wild birds and their habitats. As a non-governmental organisation (NGO), BirdLife Malta is also a member of the BirdLife International network working towards conserving global biodiversity and the sustainability of natural resources. The organisation works to limit illegal hunting across the Maltese Islands and enhance protection for the natural environment.

Apart from the activities briefly presented above, BirdLife Malta strives to connect children, youths and adults with nature by organising educational programmes and activities. BirdLife Malta collaborates with 75% of the primary schools in Malta. "Dinja Waħda" is BirdLife Malta's flagship environmental programme in schools of all levels (kindergarten, primary and secondary schools) since 1994, run in collaboration with the Education Directorate. Dinja Waħda connects classroom learning with the natural environments through activities designed in such a way that both students and teachers enjoy and learn from them.

Moreover, BirdLife Malta is offering a whole educational kit to school communities including a) innovative and cross-curricular activities and resources, b) guided field visits to Nature Reserves and c) educational material for teachers' professional development programmes. (https://birdlifemalta.org/environmental-education/schools/)

18. Moldova

Moldova is committed to create a strong foundation for low emission and climate resilient growth. Moldovan Institutions recognise the importance of adapting to new climatic conditions and have a strong commitment to get prepared against disasters and climate risks. Climate change is streamlined into the main strategic planning document of the country - the National Development Strategy "Moldova 2030" (2019). Prior to that Moldova developed in 2017 its Low Emissions Development Strategy up to 2030.

The Energy Strategy of the Republic of Moldova outlines the climate change mitigation in the sector until 2030. The Republic of Moldova was advancing and evaluating the results of the implementation of the Climate Change Adaptation Strategy in the second cycle of its National Adaptation Planning process (NAP2) in 2020. An institutional setting was created: the National Commission on Climate Change acting as an inter-institutional body for the promotion and coordination of the actions applied in the frame of UNFCCC and the Paris Agreement.

Environmental Education in Moldova

Climate change awareness and education have the potential to support ambitious policies as well as to enable the greenhouse gas reduction leading to citizens' behavioural changes. More opportunities will be available for climate change and people's engagement by the provision of both academic and practical tools, exchanging experiences, opinions and by implementing hands-on activities.

19. Montenegro

Environmental Education in Montenegro

Montenegro is moving towards a goal-oriented planning of the school's curriculum content, embracing environmental awareness and sustainability concepts among the main educational goals achieved through teaching.

Preschool: One of the main goals of preschool education is the creation of ecological consciousness in upcoming generations. Formal teachers' professional development programmes has not been yet scheduled and further efforts are needed towards this direction.

Primary schools: The primary schools aim to help students acquire basic knowledge related to Laws on the development of nature and society, as well as to encourage healthy lifestyles and responsible attitudes towards the environment. Furthermore, to help students know better the environmental and cultural diversity of Montenegro, the new curricula include outdoor activities in accordance with a plan which would allow students to visit different regions of the country during their primary education. It is important for the successful implementation of the training programmes, the teaching materials such as textbooks and handbooks and those included in the "green pack junior", to be included in the new curricula.

Secondary schools: Secondary schools' main goal is to develop individuals who will be responsible and active regarding the natural and social environment. Hence, the approach is similar to that described for primary education, as the challenges and problems are almost the same.

Vocational training: Students of the four-year vocational schools should also gain the knowledge required to achieve the curriculum goal related to taking responsibility for the natural and social environment. Environmental protection and sustainable development is also to be included in job training. The introduction of the new curricula requires adequate training of teachers, including those responsible for vocational subjects.

Teachers' professional development programmes: Teachers' professional development programme is still an ongoing activity, mainly provided through projects, when these are available. The training material is also prepared in the frame of the projects.

Informal and non-formal education: Efforts have been made to develop and introduce new curricula for adults with the aim of establishing an education system that will guarantee lifelong training possibilities which should support economic and social development. By the end of 2011, 69 institutions for adults' education have been licensed to offer 120 lifelong learning programmes. As with formal education, informal education requires the development of training programmes incorporating the aspects of sustainable development and environmental protection (United Nations Economic Commission for Europe, 2015).

Educo Centre

The Educo Centre is a non-governmental organisation established in 2002 in Podgorica, Montenegro. The Educo Centre focuses on the Environment/Sustainable development and Youth

and Education. The Centre aims to support development which is based on the respect of the environment and the natural resources. The Educo Centre aims at increasing the level of awareness through education campaigns advocating the necessity to protect and preserve the natural potentials. All the activities that are organised by the Educo Centre are carried out in several main sectors, such as education - environmental protection, environmental education and promotion of sustainable activities and socio-economic aspects of the local economic development.

The creative activities can raise citizens' awareness promoting policy research and defining alternative solutions, engaging government and other public institutions and the private sector. The main projects organised by Educo Centre in the educational field are: the project "New Opportunities for Children with Special Needs" and the project "Environmental Education – The Route to Sustainable Development". (https://www.annalindhfoundation.org/members/educo-centre)

REC Montenegro

REC Montenegro aims at contributing and supporting the UNESCO's Global Action Plan for Sustainable Development and facilitates the achievement of the United Nations' SDGs. REC Montenegro contributes in improving the quality of the educational system in the country and promoting public awareness on environmental issues. Some of the main actions are to:

- Enable smart, sustainable and inclusive growth through high-quality education
- Support development of innovative educational tools to promote holistic and interdisciplinary approach of sustainable development's values and skills
- Promote and assist teachers' professional development programmes
- Develop tools and campaigns on sustainable development issues to encourage participation in environmental decision-making processes.

(http://recmontenegro.org/strategic-themes/education-for-sustainable-development/)

20. North Macedonia

Environmental Education in North Macedonia

Environmental education in North Macedonian schools is neither a continuous nor a progressive process because it lacks high level institutional and national support. The inclusion of environmental issues in the educational material of the schools is lacking an appropriate planning for consistency and theoretical grounding. As a result, there is a similar condition in the schools' curricula. Environmental education in North Macedonia as in many countries of the world emerged from the "natural sciences" school subjects: Nature, Science, Biology, Nature and Society, Introduction to the Environment. Teachers in North Macedonia hold what can only be described as an ad hoc approach to environmental education. There is a correlation between textbooks from 2001 and 2012 regarding the environmental topics addressed. Around 2.18% -

3.04% of the teaching time is spent on environmental education and ecology in the schools (Srbinovski, 2013).

Environmental education is mainly implemented by civil society organisations in North Macedonia. The programme entitled "We do not have a spare planet" is implemented by OXO (Association for Education, Communication and Consulting) in kindergartens, primary and secondary schools, student dormitories and private secondary schools. Educational material developed for preschool and school levels in the frame of the project.

In September 2018, 74 of the 1,212 public kindergartens and schools in North Macedonia were awarded a green flag (10 kindergartens, 40 primary schools and 10 secondary schools) or getting a silver (7 schools) or a bronze (7 schools) award in the eco-schools' list. 124 environmental projects have been successfully implemented. Other civil society organisations, such as Go Green, the Centre for Environmental Research and Information Eko-svest, Zero Waste and Macedonian Civic Education Centre, are supporting environmental education in schools by helping them to establish processes for waste recycling, carry out activities for water and energy efficiency and green the schools' premises, and by conducting civic education activities. (http://www.unece.org/index.php?id=52683)

21. Norway

Environmental Education in Norway

Starting in 2013, the Norwegian government appointed a committee (chair, Sten Ludvigsen) to assess the subjects in primary and secondary education and training in terms of the requirements for competences in future working life and society. In April 2016, the white 26-paper Fag – Fordypning – Forståelse: En fornyelse av Kunnskapsløftet (Subjects – Specialisation – Understanding: A renewal of the promotion of knowledge) was published by the Ministry of Education (Kunnskapsdepartamentet, 2016). 'Sustainability' is mentioned sixteen times in this document, and other concepts to which sustainable development is linked are climate/climate change, democracy, real life skills, human rights and needs. (VV.AA. (2021) Mapping Education for Sustainability in the Nordic Countries. http://dx.doi.org/10.6027/temanord2021-511)

An important aspect concerning sustainable development is to what extent knowledge components or topics related to this issue are to be covered in the subjects' curricula (social sciences, natural sciences, etc).

Sustainable development (and climate change) in Teacher education in Norway

While sustainable development is identified as a general competence and featured in the learning outcomes set for some subjects, it is not heavily integrated into the framework and guidelines for teachers' education. 'Sustainable development' is mentioned twelve times in both the national guidelines, and in the same way in the two documents. The guidelines state that teachers' education should provide research-based knowledge about the climate,

environment, and development, and competence that supports students' learning about, attitudes to, and actions for sustainable development. Moreover, sustainable development is mentioned in the guidelines for the subjects Food and Health, Natural Science and Social Studies – most frequently in Natural Science.

Herein some of the experiences and activities for TPD programmes are presented. For instance:

- University of OSLO, Faculty of Social Sciences - Course Addressing the Climate Emergency through Education; Oslo Summer School for Social Sciences 2021. (https://www.sv.uio.no/english/research/phd/summer-school/courses-2021/Addressing%20the%20Climate%20Emergency%20through%20Education.html)

22. Portugal

Environmental Education in Portugal

The National Strategy for Education for Citizenship (ENEC) was publicly presented in September 2017. It constitutes a reference document to be implemented in the school year 2017/2018, in public and private schools that integrate the Project of Autonomy and Curricular Flexibility, in convergence with the Profile of Students Leaving Compulsory School and the Essential Learning. Climate change is present in this strategy.

It should also be noted the approval, through the Resolution of the Council of Ministers no.100/2017, of the National Strategy for Environmental Education for the period 2017-2020 (ENEA2020) which results to a commitment between the Ministries of Environment and Education.

The different domains of Education for Citizenship are organised into three groups. The first is compulsory for all levels and cycles of schools (because they are transversal and longitudinal areas). In this domain the Environmental Education and Climate Change is included, whose curricular reference document is the Environmental Education for Sustainability Environmental Education for Sustainability.

There are several documents devoted to environmental education. An example is the one from the Ministry of Education "Benchmark of Environmental Education for Sustainability", for introducing environmental education and climate change in compulsory education. (https://www.dge.mec.pt/sites/default/files/ECidadania/Educacao_Ambiental/documentos/referencial_ambiente.pdf)

There are also some TPD initiatives organised by NGOs and other international organisations, for instance the organisation 2811, providing the online course "Climate Change Academy"- Course: The Media and Climate Change Teaching. (http://climaedumedia-en.weebly.com/objectives.html)

23. Romania

The current Programme of the Romanian government is based on the principle: "Leave no one behind", addressing all policies and priority actions in an integrated approach. The first National Sustainable Development Strategy in Romania (NSDS) was elaborated in 1999, then reviewed in 2008 and currently the Strategy utilises the 2030 Agenda for Sustainable Development and its 17 SDGs.

The institutional framework for sustainable development in Romania comprises of the Inter-ministerial Committee with responsibilities of coordinating the sustainable development policy led by the vice Prime-Minister, Minister of Environment, the sub-Committee for Sustainable Development of the Parliament of Romania and the Department for Sustainable Development under the Prime-Minister's Office.

Biodiversity in Romania is unique; therefore regional partnerships are of great importance in order to stop the tracks in the biodiversity decline, tackling species extinction and ecosystems degradation due to the anthropogenic impact on the environment. The programme on Environmental Protection through Biodiversity Conservation (part of the programme of Government 2018-2020) acknowledges the fundamental role of habitat played in biodiversity conservation, with the main habitat targeted being represented by forest ecosystems.

The energy sector in Romania has an essential contribution to Romania's development with strong influence on economic growth, wellbeing and the environment. Romania's low dependency on imported energy resources, combined with structural changes in the economy, leads to the downsizing and relative decline of energy-intensive industries, helping the country to avoid major disruptions during Europe's recurring energy crisis. Romania has a geographical location which favours wind, solar and water energy and mineral resources.

The Monitoring, Reporting and Evaluation (MRE) methodology is based on reducing the climate impacts, vulnerabilities, risks, and increasing adaptive capacity,. The responsible entities in Romania report annually to the Ministry of the Environment, Water and Forests the progress regarding the actions included in the NAP. The NAP includes metrics or benchmarks, mostly process-based, for the implementation such as the type of action, objective, timeline, responsible institutions, result indicators/unit measures, and estimated resources and their source of financing.

Environmental Education in Romania

A research on environmental education and education for sustainable development in Romania through teachers' perceptions and recommendations conducted in 2018 outlined solutions for improving environmental education (EE) and education for sustainable development (ESD) in the Romanian education system (Environmental education and education for sustainable development in Romania. (Teachers' perceptions and recommendations, https://www.researchgate.net/publication/324924663_Environmental_education_and_education_for_sustainable_development_in_Romania_Teachers_perceptions_and_recommendations [last accessed on 24 Sept 2021])

Findings showed that the environmental education and the CCESD in the national education system, teachers perceived that the biggest impact had the activities that they organised in the field, followed by those organised in schools and by students' debating environmental issues with the authorities and their teachers. As weaknesses were perceived the small share of activities in the field, the prevailing theoretical character of the formal learning activities, the little time resources, and the fact that the state does not support schools in initiatives promoting sustainable development. Respondents considered that the family and the school have the biggest impact on the pre-school children and students' education on climate change.

24. Russia

Russian K-12 curricula and professional development programs include issues related to environmental education[39]. Besides, schools, teachers, and governmental and non-governmental organizations put effort for teaching environmental education and issues related to climate change. Salimova et al. (2015)'s study revealed that there is a difference in the understanding of key values, objectives and problems relating to sustainable development in Russia among public.

25. Serbia

The Republic of Serbia is committed to the acceleration of the implementation of the 2030 Agenda and the citizens have expressed their support during the national consultations launched in 2012 on the new global development agenda. Serbia actively participated in the work of the OWD on Sustainable Development Goals (SDGs) and the Intergovernmental Committee of Experts on Sustainable Development Financing within the scope of the National Sustainable Development Strategy (2009-2017) and pursuant to the EU accession negotiation process started in 2014. In 2015, an integrated and networking institutional mechanism was created to cover all aspects of sustainable development.

An Inter-Ministerial Working Group is responsible for the Implementation of the 2030 Agenda (IMWG) and coordinates the work of all ministerial and state institutions. The Secretariat for Public Policy is mapping the National Strategic Framework against the SDGs results in the Serbia and the 2030 Agenda document. The Statistical Office of the Republic of Serbia collects maps and creates relevant national indicators to measure the progress on the SDGs.

Additionally, a focus group of the National Assembly of Serbia for the Development of Control Mechanisms for the Process of Implementation of the SDGs was formed in 2017. The Assembly creates a legal framework and ensures budgeting for the SDGs development, but also public advocacy of the SDGs through liaising with local, cross-border, regional and international stakeholders and through inter-parliamentary cooperation.

[39] https://thegeep.org/learn/countries/russia

The government undertook structural reforms in Serbia, including stable public finances for the highest-aiming SDGs achievement. In partnership with the UN development system, the Serbian government identified the inter-linkages between the goals and targets with the acquis communautaire through RIA, so that it improved coherence of the sectoral and the inter-sectoral government policies for the SDGs. In 2018, the IMWG supported by the UN Country Team, organised the Subregional Conference on the Promotion and Progress on the 2030 Agenda providing momentum to the achievement of the SDGs throughout the region.

Serbia laid out a long-term plan for transforming into sustainability within the Serbian strategic framework, which relies on two pillars: the National Programme for Adoption of the Acquis 2018-2021 and the National Priorities for International Assistance 2014-2017, with actions until 2020. The mainstreaming of the 2030 Agenda implementation in Serbia evolves through monitoring, reviewing and reporting. Furthermore, it also relies on state institutions, local authorities and communities, human rights mechanisms, civil society, social partners, business communities, academia and research community, bilateral and multilateral development partners within, across, and beyond borders. In general, sustainable possibilities are based on the whole government and society in Serbia.

Environmental Education in Serbia

Children and youngsters in Serbia are able to receive a national version of an innovative, interactive textbook on climate change called "Climate Box" (Climate Box Serbia. https://climate-box.com/about-us/ [last accessed on 24 Sept 2021]). It is an innovative educational package for preschoolers, primary and secondary school students, that will contribute to raising awareness and levels of usable knowledge about climate change and its consequences for the living world on the planet. The adaptation of the "Climate Box" also includes training for lecturers in the field of biology, geography, physics, and environmental protection.

26. Slovenia

Environmental Education in Slovenia and the Eco-schools programme

Eco-schools programme in Slovenia was developed under the title "Eco-school, a Way of Life" and it was founded after the initiatives from the Eco-Schools International Programme with the support of the Ministry of the Environment, the Ministry of Education and Sport and the Ministry of Higher Education, Science and Technology. In 2005, 215 Slovenian schools participated in this programme and 142 schools got an award.

In Slovenia the programme is usually run by enthusiastic individuals rather than by the educational staff. In the school year 2018/19, 722 educational institutions registered as eco-schools representing 35% of all schools in Slovenia.

The main goals of the Eco-Schools programme are oriented towards:

- Providing high-quality education and creating opportunities for lifelong learning opportunities open to everyone

- Improving general knowledge of the environment and of sustainable development principles
- Establishing CCESD as a component of development in Slovenia
- Developing new environmental projects and activities into existing networks and to develop new ones. (http://kazalci.arso.gov.si/en/content/eco-schools-slovenia)

In all other schools that are not included in the Eco-school programme, environmental topics are introduced as a cross-curricular subject called environmental education. In most of the cases, environmental education is integrated into science lessons, and the emphasis is on knowledge building (Krnel & Naglič, 2009). Until 2008, there was no environmental education in Slovenian schools. Environmental Education replaced the existing subject called "Early natural and social studies". The national curriculum for the Environmental Studies gives a particular emphasis on the students' experiences and ideas and on the children's concrete activities regarding the environment (Hus & Aberðek, 2007).

After 2008, CCESD was introduced in the Slovenian school's curriculum as a content within compulsory subjects and as fieldwork. Some schools have established extracurricular interest groups or joined environmental activities organised by various non-governmental organisations such as the Eco-schools programme (Šorgo & Kamenšek, 2012). Other national and international educational projects in Slovenia, related to the Reka river and karst phenomena, engage around fifteen teachers and more than a hundred students every year (Debevec Gerjevic, 2010).

Lately, CCESD has already become part of the teaching and learning experience in the secondary school's curriculum but it is not being taught in a cross-curricular or an interdisciplinary way (Šorgo & Kamenšek, 2012). Teachers' beliefs towards the environment are important in influencing students' attitudes especially when the behaviour is consistent with the interests of the society (Lukman, et al., 2013).

27. Slovakia

Sustainable development is important for Slovakia and the adoption of the 2030 Agenda, both in terms of its global significance and complexity. In order to achieve these new and comprehensive sustainability objectives, Slovakia relies on innovative approaches and follows three main principles of implementation:

- Sustainable development must lie at the heart of all public policies.
- Slovakia is dedicated to implementing Agenda 2030 by integrating it into all public policies at all levels. To accomplish this ambition, Slovakia has established the 2030 Agenda as the centrepiece of its strategic governance framework.
- Individual commitment and cross-generational engagement is vital.

The national priorities for the 2030 Agenda are covered by six priorities for its implementation, which exhibit its tailor-made road towards a more resilient and sustainable society. The six national priorities integrate the 17 Sustainable Development Goals along with country-specific objectives. Slovakia's VNR will present the country's main challenges within each

priority, existing policies and good practises to tackle these difficulties, and finally, a review of how Slovakia endorses the outlined priorities internationally. Education is one of these key priorities and it incorporates SDGs 4, 8 and 10, and thus contains aspects of decent employment. More than that, this priority emphasises that education is a lifelong process, which should enable a life in dignity under rapidly changing circumstances and requirements.

Slovakia outlines as next step the integration of the priorities into a national development strategy until 2030, as well as into sectoral policies and investment plans, in order to ensure a whole-of-government approach and adequate financing. Therefore, a robust institutional framework involving key stakeholders was established: the coordination of the 2030 Agenda is shared by the Deputy Prime Minister's Office for Investments and Informatisation and the Ministry of Foreign and European Affairs, a Government Council involving key line ministers, as well as representatives of NGOs, academia, private sector, and city and regional associations has also been established.

The key challenges in Slovakia for climate change have an effect on both urban and rural areas. In urban areas, climate change is expected to increase economic risks and ecosystems, including risks from heat stress, storms and extreme rainfall, floods, landslides, air pollution, drought, water scarcity, etc. Rural areas are expected to have a significant impact on water availability and supply, food security, infrastructure and agricultural incomes, including shifts in food and non-food crop production. There is no special national methodology in Slovakia related to reducing climate impacts, vulnerabilities, risks, and increasing adaptive capacity yet. However, the sectoral methodology on reducing climate impacts, vulnerabilities and risks, on large infrastructure plans and projects was adopted by the Ministry of Transport.

Environmental Education in Slovakia

In 2017, the Ministry of Environment in Slovakia launched the Green Education Fund – an innovative instrument bringing together businesses, civil society and state administration (Green Education Fund – Slovakia. https://zelenyvzdelavacifond.sk/sk/node/4 [last accessed on 24 Sept 2021]. The initiative is supposed to be a systemic, longer-term solution, supporting environmental awareness and eco-education projects. The commitment falls under focus area 9 of the Batumi Initiative to promote public participation and education for sustainable development. Slovak Environment Agency engages many partners mainly coming from the private sector as well as civil society.

28. Sweden

Environmental Education in Sweden

The curriculum for the compulsory school in Sweden includes themes around sustainable development and climate change in different subjects. A problem-solving and solutions orientation to learning is also encouraged in the curriculum. The Fundamental Values and Tasks of the School support students "to translate ideas into action and solve problems" and

that, by the end of their education, they should be able to "solve problems and transform ideas into action in a creative and responsible way".

Sustainable development (and climate change) in Teacher education in Sweden

In line with national educational policy, most universities explicitly include as an overall goal of their teachers' education programmes, an ability to make judgments in terms of sustainable development (including climate change). In terms of specific courses dealing with sustainability, clear differences are evident among these different teachers' education programmes.

29. Ukraine

Since 2015, Ukraine implemented a series of reforms, aiming to enhance the achievement of the SDGs' socio-economic transformations and strengthen its democratic system. SDGs are integrated into the state policy on a 'leave no one behind' basis.

An inclusive process of the SDGs adaptation was utilised in the national SDGs system consisting of 86 national targets with 183 monitoring indicators. The government of Ukraine has also developed an institutional setting: the Inter-Agency Working Group on SDGs. Responsibilities of the ministries for the SDG targets were defined, the President of Ukraine issued a Decree setting the SDGs as a benchmark for programming and forecasting documents. Additionally, a SDGs' monitoring system was developed for the assessment of mainstreaming the SDGs into national and sub-national planning. SDG targets have been incorporated in 162 Governmental regulatory legal acts (4,300 planned actions). In March 2020, the new Cabinet of Ministers adopted this programme, which was also aligned to the SDGs.

Environmental Education in Ukraine

Educational campaigns are important, acting as drivers of sustainable changes and the actualisation of the problem and teaching of a new way to implement those changes. The Ukrainian government and NGOs support the European Union in its fight against climate change. However, further legislative changes are needed in order to enhance climate changes.

30. USA

There are plenty of resources for teaching about climate change at K-12 curricula in the USA. Nonetheless, according to an NPR/Ipsos poll, majority of parents in the U.S. support the teaching of climate change but most teachers do not teach climate change.
https://www.npr.org/2019/04/22/714262267/most-teachers-dont-teach-climate-change-4-in-5-parents-wish-they-did

Resources for educators:

- **The Yale Programme on Climate Change Communication**. https://climatecommunication.yale.edu/for-educators/
- **About the Climate Change Education Project.** https://www.nasa.gov/sites/default/files/405273main_2009_HE_GCCE.pdf
- **Middle School Curriculum.** https://earth.stanford.edu/climate-change-ed/curriculum/middle#gs.dym936
- **High School Curriculum:** https://earth.stanford.edu/climate-change-ed/curriculum/high#gs.dymbxu
- **The Climate Curriculum Project:** https://www.climatecurriculum.com/climate-lessons-1

31. Key Stakeholders (organisations or networks) in Europe related to climate change and environment

- ***European Climate Action Network (CAN)***

Climate Action Network (CAN) Europe is Europe's leading NGO coalition fighting dangerous climate change. With over 170 member organisations active in 38 European countries, representing over 1.500 NGOs and more than 47 million citizens, CAN Europe promotes sustainable climate, energy and development policies throughout Europe. The vision of CAN is a world actively striving towards and achieving the protection of the global climate in a manner that promotes equity and social justice between peoples, sustainable development of all communities, and protection of the global environment. CAN Europe empower civil society organisations to influence the design and development of effective climate change policy in Europe, both in the European Union as well as in European countries outside the EU. (https://caneurope.org)

- ***EIT Climate-KIC***

EIT Climate-KIC is a Knowledge and Innovation Community (KIC), working to accelerate the transition to a zero-carbon, climate-resilient society. Supported by the European Institute of Innovation and Technology, its goal is to identify and support innovation that helps society mitigate and adapt to climate change. EIT Climate-KIC brings together partners in the worlds of business, academia, and the public and non-profit sectors to create networks of expertise, through which innovative products, services and systems can be developed, brought to market and scaled-up for impact. Moreover, EIT Climate-KIC runs a range of inspirational education programmes across Europe and online, for students, postgraduates and professionals. These programmes develop participants' skills and capacities, empowering them with up-to-date knowledge and best practice. Following this way, a new generation of entrepreneurs and climate leaders are more environmentally aware to realise a zero-carbon, climate-resilient society and tackle climate change in their communities.

Education should be a priority in communities most vulnerable to climate impacts – offering experiential and transformational learning experiences. EIT Climate-KIC's portfolio offers practical ways to drive meaningful systems innovation by providing learning services, four strategic programmes and free online courses. (www.climate-kic.org/)

A new series of training programmes has been launched aiming to support participants in developing thinking around circularity and create circular strategies within their businesses and organisations.

- ***"Train-the-trainer" courses on Circularity Thinking:*** The training delivered throughout Autumn 2021 aims to help participants create a circular mindset and understand how to develop circular strategies, to in turn become leaders in training colleagues and stakeholders on this topic.
- ***"Circularity Thinking" courses for the food and manufacturing sectors:*** Two additional training programmes have now been launched, focusing on the use of the Circularity Thinking tools within the manufacturing and food sectors within EIT Regional Innovation Scheme (RIS) countries. The new courses will allow participants to analyse material flows within their activities and create solutions that reduce resource use, including challenge identification, case studies and tools to understand real-life circular needs. (www.climate-kic.org/news/eit-climate-kic-launches-new-series-of-circular-economy-courses/)

- ***Education for Climate Coalition***

The Education for Climate Coalition is a flagship initiative of the European Education Area kicked off with an initial focus group meeting in March 2021, with the participation of Commissioner Mariya Gabriel. (www.euchems.eu/newsletters/education-climate-coalition/**)** *On 22nd of June, the Education for Climate Coalition met in an online conference, where students, teachers, education institutions and stakeholders discussed with policymakers how young people and the education community in general can be involved in achieving a climate neutral and sustainable society through concrete actions. Commissioner Mariya Gabriel said: "'To make a difference' – this is what the #EducationForClimate Coalition is all about. To make a difference in your school, in your neighbourhood, in the very region you live in and where you contribute actively to the green transition our societies go through."* (www.eureporter.co/politics/european-commission/2021/06/24/education-for-climate-coalition-european-commission-organises-first-gathering-of-young-people-and-education-communities/)

This initiative aims to support a fair, green and digital societal transition in Europe by mobilising the education and training community. (www.euchems.eu/newsletters/education-climate-coalition/) It also seeks to upscale and promote sustainability projects involving pupils and teachers serving as a platform (the platform launched in November 2021), to share knowledge and experience and connect people involved in actions working towards climate neutrality. The actions of the coalition support and complement other European Green Deal projects and are oriented towards five priority areas:

- green skills development

- teacher education
- changes to citizen behaviour
- the interaction between education and scientific research
- awareness of issues.

(www.schooleducationgateway.eu/en/pub/latest/news/education-climate-coalition.htm)

Individuals and collective actors ---at the local, regional and national levels will be invited to contribute to the Coalition's efforts by making pledges for actions on a dedicated online platform that will be released in order to connect stakeholders in the field of education and to enhance innovation and the sharing of knowledge. (www.euchems.eu/newsletters/education-climate-coalition/)

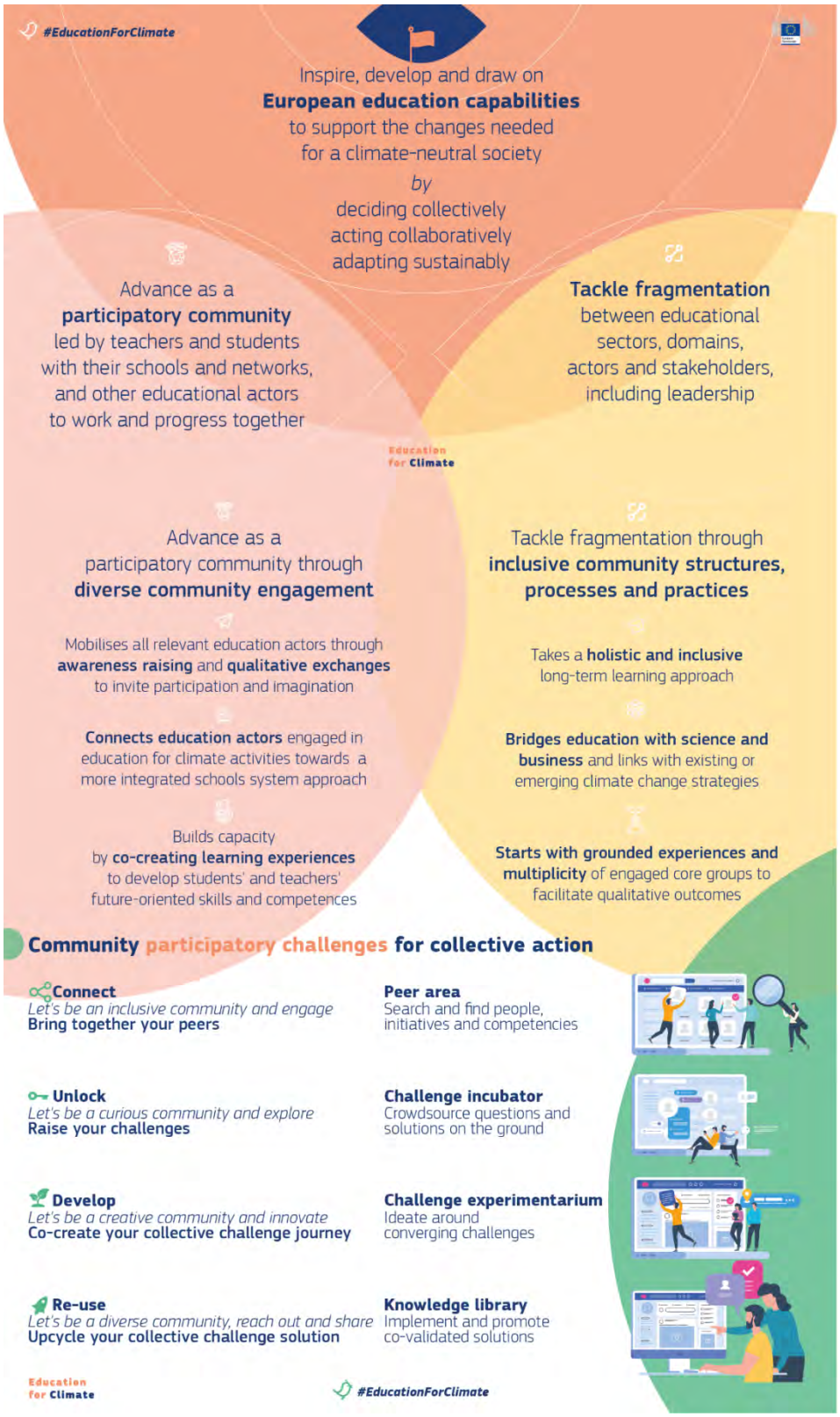

Figure 16: A brief description of the Education for Climate coalition. (https://education-for-climate.ec.europa.eu/news_en?search_api_fulltext=&page=1)

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