Kolenatý, M., & Petrásková, S. (2026). The Implementation of Climate Change Education in the National Curricula of Selected European Countries.
Sociologický časopis / Czech Sociological Review, online first. https://doi.org/10.13060/csr.2026.017

Appendix

Table A1. The coding frame with additional sources

CCE Dimensions	Sub-dimensions	Sub-dimension specifications*
Cognitive	**Systemic knowledge** (Boyd et al., 2025; Lubej et al., 2025; Schubatzky et al., 2024)	Greenhouse gases (GHGs), GHGs' climate influence, sources of GHGs (natural, anthropogenic) Mechanism of the greenhouse effect, economic/political/cultural factors affecting GHG emissions Evolution of (and links between) GHG concentrations/temperatures over time Carbon cycle, fossil fuels formation The Earth's atmosphere, weather and climate The Earth's climatic system, evolution of climate changes, climate change tipping points Impacts of CC on the weather system, impacts of climate change (CC) on biosphere / biodiversity Impacts of CC on the hydrosphere (water resources/reserves, drought, floods) Systemic misconceptions (ozone layer etc.)
	Mitigation (Muccione et al., 2025; Shukla et al., 2022) + https://unfccc.int/topics/introduction-to-mitigation?utm_source=chatgpt.com	Energy production, renewable and non-renewable sources of energy Renewables (solar, wind, water, geothermal, biomass, hydrogen…) Coal phase-out, decarbonisation Mitigation measures, their effectiveness Carbon sequestration, carbon sinks Energy efficiency, circular economy, energy sharing and energy communities Zero-carbon technologies, electro mobility Climate neutrality, scenarios of decreasing GHGs emissions Carbon footprint (individual, household, collective), calculating and decreasing carbon footprint (energy, travel…) Individual and collective actions that lead to climate mitigation
	Adaptation (Castro & Sen, 2022; Currie-Alder et al., 2021; Feinstein & Mach, 2020; Hügel & Davies, 2024; Pörtner et al., 2022)	Water management, water shortages, blue-green infrastructure, water retention, wetlands, dams Ecosystem services Drought and flood management Sustainable forestry, protection and restoration of terrestrial, freshwater/coastal/ocean ecosystems Risk management, extreme events Trees and greenery – adaptation potential Landscape engineering, land use change Urban heat island, urban CC adaptation Lifestyle stability, livelihood flexibility, community capacity Health issues related to CC, adaptation of institutions to climate change (infrastructure, attendance etc.)
	Global, European, national frameworks and legislation (Kulovesi et al., 2024; Maslin et al., 2023; UNESCO, 2020)	UN, SDGs, UNFCCC, Kyoto Protocol, COP conferences, Paris Agreement Green Deal, Fit for 55, EU CC-related legislation National CC initiatives, strategies, legislation, climate litigations
	Climate change research (Newsome et al., 2023) + https://cleanet.org/clean/literacy/climate/index.html	IPCC, IPCC reports History of CC research Climate modelling, data collection, scenarios, predictions (how climate science works), uncertainty Climate deniers, climate disinformation, greenwashing
	Socio-economic aspects of CC (Otto et al., 2020; Trott et al., 2023; Walshe, 2013)	Climate justice Political aspects of CC (just transition) Social aspects of CC (e.g. energy poverty, just transition) Social, economic, and political drivers/barriers of CC mitigation (carbon tax) Impacts of CC on agriculture, industry, well-being, society, geopolitics Evolution of human civilisation and CC (+ historical events related to CC) Climate conflicts, climate migration
Action-oriented	**Climate change action competence (individual sphere)** (Bianchi et al., 2022; de Haan, 2010; Finnegan, 2022; Goldwert et al., 2025; Rieckmann, 2018; Sass et al., 2020, 2023; Schönstein & Budke, 2023; Torsdottir et al., 2024; Tserej et al., 2024; Wals, 2015; Wiek et al., 2011)	Knowledge of individual action possibilities to foster climate action Skills and practices for fostering climate action (individual) Individual agency, empowering learners to individual action (selecting, planning, implementing individual action) Exploring alternate worldviews, ethical values related to CC (normative competence) Climate activism Skills for understanding, working with, and creating CC-related graphs, charts, tables, schemes etc. Skills for CC-related data collection and data analysis Systems/anticipatory/exploratory thinking Skills for evaluating the impact and (dis)advantages of individual solutions and action Building self-confidence and self-efficacy for individual action Fostering willingness to act (individual action)
	Climate change action competence (collective sphere) (Bianchi et al., 2022; de Haan, 2010; Finnegan, 2022; Goldwert et al., 2025; Rieckmann, 2018; Sass et al., 2020, 2023; Schönstein & Budke, 2023; Torsdottir et al., 2024; Tserej et al., 2024; Wals, 2015; Wiek et al., 2011)	Knowledge of collective action possibilities to foster climate action Skills and practices for fostering climate action (collective) Exploring alternate worldviews, ethical values related to CC (normative competence) Collective agency, empowering learners to collective action (selecting, planning, implementing collective action) Skills for understanding, working with, and creating CC-related graphs, charts, tables, schemes etc. Skills for CC-related data collection and data analysis Systems/anticipatory/exploratory thinking Civic engagement, political agency, climate activism Locally focused and community-driven actions, place-based education Working with local actors/partners/stakeholders Regional, municipal CC initiatives, measures, and strategies Local CC initiatives, measures, and strategies Skills for evaluating the impact and (dis)advantages of collective solutions and action Building self-confidence and self-efficacy for collective action Fostering willingness to act (collective action)
	Inter-personal skills for climate action (Mogensen & Schnack, 2010; Rieckmann, 2018; UNESCO, 2017, 2020b)	Skills for CC-related argumentation Skills for peer interaction and team work, decision making, communicating Skills for building partnerships, understanding stakeholder interests, organising meetings etc.
Social and emotional	**Social/career competencies and skills** (International Labour Organization, 2019; Nebuloni & Van Der Ree, 2021; Nuttall, 2024; Organisation for Economic Co-operation and Development, 2024)	Individual and collective actions that lead to social and climate justice CC-related career planning, green jobs Skills for working in new businesses/industries associated with the transition to a low-carbon future Media literacy – identifying misconceptions and misinformation
	Emotions related to climate change (Clayton, 2020; Clayton & Karazsia, 2020; Hickman et al., 2021; Ojala, 2012, 2013, 2022; Pihkala, 2020; Sangervo et al., 2022)	Self-reflection skills Recognising and acknowledging CC-related emotions Coping strategies with challenging CC-related emotions (fear, anger, anxiety, concern, depression, paralysis…) Building hope and resilience, constructive hope
	Climate change perception (Anabaraonye et al., 2018; Bentz, 2020; Hannigan et al., 2025; Lam & Trott, 2022)	Expressing CC perception through creative outcomes (poems, essays, pictures, photos, paintings…)

* all items must be explicitly related to climate change (or climate change education) in the curricula.

Additional references for defining sub-dimension specifications

Anabaraonye, B., Nji, I. A., & Hope, J. (2018). Poetry as a valuable tool for climate change education for global sustainability. *International Journal of Scientific and Engineering Research*, *9*(9), 81–85. https://www.researchgate.net/profile/Benjamin-Anabaraonye-2/publication/328699820_POETRY_AS_A_VALUABLE_TOOL_FOR_CLIMATE_CHANGE_EDUCATION_FOR_GLOBAL_SUSTAINABILITY/links/5bdc7d454585150b2b996645/POETRY-AS-A-VALUABLE-TOOL-FOR-CLIMATE-CHANGE-EDUCATION-FOR-GL

Bentz, J. (2020). Learning about climate change in, with and through art. *Climatic Change*, *162*(3), 1595–1612. https://doi.org/10.1007/s10584-020-02804-4

Bianchi, G., Pisiotis, U., Cabrera, M., Punie, Y., & Bacigalupo, M. (2022). *The European sustainability competence framework*. Publications Office of the European Union. https://doi.org/10.2760/13286

Boyd, K. J., Gold, A. U., Chandler, P. D., & Crim, H. A. (2025). Climate change education in the new landscape of climate literacy. *PLOS Climate*, *4*(5 May), 2024–2026. https://doi.org/10.1371/journal.pclm.0000623

Castro, B., & Sen, R. (2022). Everyday adaptation: Theorizing climate change adaptation in daily life. *Global Environmental Change*, *75*(February 2021), 102555. https://doi.org/10.1016/j.gloenvcha.2022.102555

Clayton, S. (2020). Climate anxiety: Psychological responses to climate change. *Journal of Anxiety Disorders*, *74*(March), 102263. https://doi.org/10.1016/j.janxdis.2020.102263

Clayton, S., & Karazsia, B. T. (2020). Development and validation of a measure of climate change anxiety. *Journal of Environmental Psychology*, *69*(April), 101434. https://doi.org/10.1016/j.jenvp.2020.101434

Currie-Alder, B., Rosenzweig, C., Chen, M., Nalau, J., Patwardhan, A., & Wang, Y. (2021). Research for climate adaptation. *Communications Earth and Environment*, *2*(1), 4–6. https://doi.org/10.1038/s43247-021-00294-5

de Haan, G. (2010). The development of ESD-related competencies in supportive institutional frameworks. *International Review of Education*, *56*(2), 315–328. https://doi.org/10.1007/s11159-010-9157-9

Feinstein, N. W., & Mach, K. J. (2020). Three roles for education in climate change adaptation. *Climate Policy*, *20*(3), 317–322. https://doi.org/10.1080/14693062.2019.1701975

Finnegan, W. (2022). Educating for hope and action competence: a study of secondary school students and teachers in England. *Environmental Education Research*, *29*(11), 1617–1636. https://doi.org/10.1080/13504622.2022.2120963

Goldwert, D., Patel, Y., Nielsen, K. S., Goldberg, M. H., & Vlasceanu, M. (2025). Climate action literacy interventions increase commitments to more effective mitigation behaviors. *PNAS Nexus*, *4*(6), 1–10. https://doi.org/10.1093/pnasnexus/pgaf191

Hannigan, S., Hradsky, D., Bellingham, R., Raphael, J., & White, P. J. (2025). Reimagining climate change futures: A review of arts-based education programs. *Futures*, *173*(July), 103667. https://doi.org/10.1016/j.futures.2025.103667

Hickman, C., Marks, E., Pihkala, P., Clayton, S., Lewandowski, R. E., Mayall, E. E., Wray, B., Mellor, C., & van Susteren, L. (2021). Climate anxiety in children and young people and their beliefs about government responses to climate change: a global survey. *The Lancet Planetary Health*, *5*(12), e863–e873. https://doi.org/10.1016/S2542-5196(21)00278-3

Hügel, S., & Davies, A. R. (2024). Expanding adaptive capacity: Innovations in education for place-based climate change adaptation planning. *Geoforum*, *150*(March), 103978. https://doi.org/10.1016/j.geoforum.2024.103978

International Labour Organization. (2019). *Skills for a greener future*. https://www.ilo.org/wcmsp5/groups/public/---ed_emp/---ifp_skills/documents/publication/wcms_709121.pdf

Kulovesi, K., Oberthür, S., van Asselt, H., & Savaresi, A. (2024). The European Climate Law: Strengthening EU procedural climate governance? *Journal of Environmental Law*, *36*(1), 23–42. https://doi.org/10.1093/jel/eqad034

Lam, S., & Trott, C. D. (2022). Construção de significados pelas crianças sobre as alterações climáticas através do [Children's climate change meaning-making through photovoice: Empowering children to learn, care, and act through participatory process]. *Educação, Sociedade & Culturas*, *62*, 1–25.

Lubej, M., Petraš, Ž., & Kirbiš, A. (2025). Measuring climate knowledge: A systematic review of quantitative studies. *IScience*, *28*(2). https://doi.org/10.1016/j.isci.2025.111888

Maslin, M. A., Lang, J., & Harvey, F. (2023). A short history of the successes and failures of the international climate change negotiations. *UCL Open Environment*, *5*, 1–16. https://doi.org/10.14324/111.444/ucloe.000059

Mogensen, F., & Schnack, K. (2010). The action competence approach and the 'new' discourses of education for sustainable development, competence and quality criteria. *Environmental Education Research*, *16*(1), 59–74. https://doi.org/10.1080/13504620903504032

Muccione, V., Ewen, T., & Vaghefi, S. A. (2025). A scoping review on climate change education. *PLOS Climate*, *4*(1), 1–26. https://doi.org/10.1371/journal.pclm.0000356

Nebuloni, V., & Van Der Ree, K. (2021). Green jobs and green futures for youth. In *International Labour Organization*. www.ilo.org/wcmsp5/groups/public/---dgreports/---stat/documents/normativeinstrument/wcms_230304.pdf

Newsome, D., Newsome, K. B., & Miller, S. A. (2023). Teaching, Learning, and Climate Change: Anticipated Impacts and Mitigation Strategies for Educators. *Behavior and Social Issues*, *32*(2), 494–516. https://doi.org/10.1007/s42822-023-00129-2

Nuttall, B. (2024). Green career education and guidance through the perceptions and experiences of career practitioners in English secondary schools. *Journal of the National Institute for Career Education and Counselling*, *53*(1), 105–121. https://doi.org/10.20856/jnicec.5310

Ojala, M. (2012). Hope and climate change: The importance of hope for environmental engagement among young people. *Environmental Education Research*, *18*(5), 625–642. https://doi.org/10.1080/13504622.2011.637157

Ojala, M. (2013). Coping with climate change among adolescents: Implications for subjective well-being and environmental engagement. *Sustainability (Switzerland)*, *5*(5), 2191–2209. https://doi.org/10.3390/su5052191

Ojala, M. (2022). Climate-change education and critical emotional awareness (CEA): Implications for teacher education. *Educational Philosophy and Theory*, *0*(0), 1–12. https://doi.org/10.1080/00131857.2022.2081150

Organisation for Economic Co-operation and Development. (2024). Cultivating green futures: Helping students understand and progress towards green jobs. *OECD Education Policy Perspectives*, *104*. https://doi.org/doi.org/10.1787/7c9912c5-en

Otto, I. M., Donges, J. F., Cremades, R., Bhowmik, A., Hewitt, R. J., Lucht, W., Rockström, J., Allerberger, F., McCaffrey, M., Doe, S. S. P., Lenferna, A., Morán, N., van Vuuren, D. P., & Schellnhuber, H. J. (2020). Social tipping dynamics for stabilizing Earth's climate by 2050. *Proceedings of the National Academy of Sciences of the United States of America*, *117*(5), 2354–2365. https://doi.org/10.1073/pnas.1900577117

Pihkala, P. (2020). Eco-anxiety and environmental education. *Sustainability (Switzerland)*, *12*(23), 1–38. https://doi.org/10.3390/su122310149

Pörtner, H.-O., Roberts, D. C., Poloczanska, E. S., Mintenbeck, K., Tignor, M., Alegría, A., Craig, M., Langsdorf, S., Löschke, S., Möller, V., & Okem, A. (2022). IPCC Sixth Assessment Report 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. In *Intergovernmental Panel on Climate Change (IPCC)*. https://www.ipcc.ch/report/ar6/wg2/?utm_source=chatgpt.com

Rieckmann, M. (2018). Learning to transform the world: Key competencies in education for sustainable development. In *Issues and trends in education for sustainable development* (pp. 39–60). UNESCO.

Sangervo, J., Jylhä, K. M., & Pihkala, P. (2022). Climate anxiety: Conceptual considerations, and connections with climate hope and action. *Global Environmental Change*, *76*(April), 0–2. https://doi.org/10.1016/j.gloenvcha.2022.102569

Sass, W., Boeve-de Pauw, J., Olsson, D., Gericke, N., De Maeyer, S., & Van Petegem, P. (2020). Redefining action competence: The case of sustainable development. *Journal of Environmental Education*, *51*(4), 292–305. https://doi.org/10.1080/00958964.2020.1765132

Sass, W., De Maeyer, S., Boeve-de Pauw, J., & Van Petegem, P. (2023). Honing action competence in sustainable development: What happens in classrooms matters. *Environment, Development and Sustainability*, *25*(4), 3649–3670. https://doi.org/10.1007/s10668-022-02195-9

Schönstein, R. F., & Budke, A. (2023). Teaching action competence in education for sustainable development – a qualitative study on teachers' ideas, opinions, attitudes and self-conceptions. *Frontiers in Education*, *8*. https://doi.org/10.3389/feduc.2023.1256849

Schubatzky, T., Wackermann, R., Haagen-Schützenhöfer, C., & Wöhlke, C. (2024). How well do German A-level students understand the scientific underpinnings of climate change? *Sustainability (Switzerland)*, *16*(17), 1–23. https://doi.org/10.3390/su16177264

Shukla, P. R., Skea, J., Slade, R., Al Khourdajie, A., van Diemen, R., McCollum, D., Pathak, M., Some, S., Vyas, P., Fradera, R., Belkacemi, M., Hasija, A., Lisboa, G., Luz, S., & Malley, J. (2022). *Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. https://doi.org/10.1017/9781009157926.001

Torsdottir, A. E., Olsson, D., & Sinnes, A. T. (2024). Developing action competence for sustainability – Do school experiences in influencing society matter? *Global Environmental Change*, *86*(April), 102840. https://doi.org/10.1016/j.gloenvcha.2024.102840

Trott, C. D., Lam, S., Roncker, J., Gray, E. S., Courtney, R. H., & Even, T. L. (2023). Justice in climate change education: A systematic review. *Environmental Education Research*, *29*(11), 1535–1572. https://doi.org/10.1080/13504622.2023.2181265

Tserej, O., Sidoti, B., Assael, S., Padolf, A., Bistrain, M., Shen, J., & Feeley, K. J. (2024). How do teachers learn and engage with climate change? An examination of the shade our schools—leaves are cool! Citizen science program. *Citizen Science: Theory and Practice*, *9*(1), 1–14. https://doi.org/10.5334/cstp.619

United Nations Educational, Scientific and Cultural Organization. (2017). *Education for sustainable development goals: Learning objectives*. https://doi.org/10.31142/ijtsrd5889

United Nations Educational, Scientific and Cultural Organization. (2020). Education for sustainable development: A roadmap. In *Education for sustainable development: a roadmap*. https://doi.org/10.54675/yfre1448

Wals, A. E. J. (2015). *Beyond unreasonable doubt. Education and learning for socio-ecological sustainability in the Anthropocene* (Issue December). Wageningen University.

Walshe, N. (2013). Exploring and developing student understandings of sustainable development. *Curriculum Journal*, *24*(2), 224–249. https://doi.org/10.1080/09585176.2013.781388

Wiek, A., Withycombe, L., & Redman, C. L. (2011). Key competencies in sustainability: A reference framework for academic program development. *Sustainability Science*, *6*(2), 203–218. https://doi.org/10.1007/s11625-011-0132-6

Table A2. Results of the analysis of the Czech elementary school curriculum – current version

CCE Dimensions	Sub-dimensions*	Curricula items related to given codes	Position in the curricula
Cognitive	Systemic knowledge	Effects of polluted air and climate change on living organisms and humans	Biology (Climate and weather in relation to life)
		Use of fossil fuels as a source of energy	Chemistry (Organic compounds)
		Climate and weather in relation to life – the protection and usage of natural resources, air pollution, and climate change	Cross-curricular Topics/ EE (Basic conditions for life)
		Causes of extreme natural events, natural catastrophes, and the most common extreme natural events in the Czech Republic	Biology (Extreme events caused by natural influences)
		Protection and creation of the environment, waste management, natural disasters, and ecological catastrophes	Humans and their World (Respectful behaviour towards nature)
	Mitigation	The most efficient use of energy sources, and the use of renewable energy sources, especially solar radiation, wind, water and biomass	Humans and Nature (Target focuses)
		Renewable and non-renewable energy sources	Physics (Energy)
		Position of humans in nature and the complex function of ecosystems in relation to human society – obtaining renewable sources of raw materials and energy	Cross-curricular Topics/ EE (topic characteristics)
		Advantages and disadvantages of using different energy sources in terms of impact on the environment	Physics (Energy)
		Possibilities and types of energy saving	Cross-curricular Topics/ EE (Basic conditions for life)
	Adaptation	Causes of extreme events, natural world catastrophes, the most common extreme natural events in the Czech Republic, and protection from them	Biology (Extreme events caused by natural influences)
	Global, European, and national frameworks and legislation		
	Climate change research		
	Socio-economic aspects of CC	Position of humans in nature and the complex function of ecosystems in relation to human society – obtaining renewable sources of raw materials and energy	Cross-curricular Topics/ EE (topic characteristics)
Action-oriented	Climate change action competence (individual sphere)	Responsible behaviour towards nature and climate protection	Humans and Their World (Responsible behaviour towards nature)
	Climate change action competence (collective sphere)	Responsible behaviour towards nature and climate protection	Humans and Their World (Responsible behaviour towards nature)
	Inter-personal skills for climate action		
Social and emotional	Social/career competencies and skills		
	Emotions related to climate change		
	Climate change perception		

Table A3. Results of the analysis of the Czech elementary school curriculum – new version in preparation

CCE Dimensions	Sub-dimensions*	Curricula items related to given codes	Position in the curricula
Cognitive	Systemic knowledge	The role of natural processes in the causes, impacts, and measures related to climate change	Biology (Organisms and the environment)
		The finiteness and non-renewability of natural resources due to their formation and extraction; planetary boundaries and the impact of fossil fuel use on the climate	Biology (Dynamic planet)
		Different forms of energy heating of the Earth's surface by sunlight, the formation of fossil fuels, and the conversion of sunlight into electrical energy in solar panels	Physics (Forms of energy)
		Energy raw materials, an overview of fossil fuels (oil, natural gas, coal) as sources of energy and as sources of other raw materials for petrochemicals and other industries	Chemistry (Chemistry and society)
		Human influence on air pollution with real impacts on the environment (the greenhouse effect)	Chemistry (Chemistry and planet Earth)
		Spatial and temporal distribution of sunlight, ai,r and water movement (climate conditions)	Geography (Natural and socioeconomic environment)
		The carbon cycle in nature, relevant contexts – from the functioning of the human body to plant growth to the processes of the combustion of (fossil) fuels	Chemistry (Chemistry and society)
		Understanding how various human activities affect the environment in different ways and in different regional contexts, the most significant environmental problems	Geography (Sustainability of life on Earth)
		Use of resources, soil fertility, water purification, and climate stabilisation	Biology (Organisms and the environment)
		Natural processes in the carbon cycle (photosynthesis, respiration, decomposition) and their role in the production of greenhouse, the impacts of climate change on nature	Biology (Organisms and the environment)
		Solar radiation intake for a specific location and time, its causes and consequences on natural processes and human activities	Geography (Natural and socioeconomic environment)
		The concept of planetary boundaries, the safe use of individual components of the environment, and the current rate of exceeding these limits (e.g. climate change)	Biology (Organisms and the environment)
	Mitigation	Mitigation/adaptation measures that use natural processes (e.g. photosynthesis), the use of rock properties to capture carbon (e.g. controlled weathering)	Biology (Organisms and the environment)
		Critical assessment of the sustainability of energy sources for future generations, the efficiency of their use, the use of new energy sources (hydrogen, nuclear energy)	Chemistry (Chemistry and society)
	Adaptation	Mitigation/adaptation measures that use natural processes (e.g. photosynthesis), the use of rock properties to capture carbon (e.g. controlled weathering)	Biology (Organisms and the environment)
		The impacts of climate change on human health (overheating during heat waves, risk of heart attack)	Biology (Organisms and environment)
	Global, European, and national frameworks and legislation	The consequences of climate change and their relation to the 2030 Agenda (Sustainable Development Goals)	Cross-curricular Topics (Society for everyone)
	Climate change research		
	Socio-economic aspects of CC	Examples where human interventions in the environment have brought about originally unforeseen consequences, learning from these examples in the future	Cross-curricular Topics (Sustainable environment)
		The interconnectedness of the social and ecological aspects of various situations in students' surroundings	Key competencies – citizenship and sustainability
		Evaluation of the intended and unintended consequences of human actions related to environmental degradation and past climatic events	History (We create history)
		Understanding climatic conditions, interpreting the influence of these factors on human society, the interactions between climate and human activity	Geography (Natural and socioeconomic environment)
		The finiteness and non-renewability of natural resources due to the long-term processes of their formation and extraction, the concept of planetary boundaries, the concept of planetary boundaries as it relates to the impact of fossil fuels in connection with the impact of fossil fuel use on the climate	Biology (Dynamic planet)
		Understanding the mutual influence of human activity and climate in the past, environmental history, adaptation to climatic phenomena and extremes in the past	History (We create history)
		Understanding the interrelationship between the natural and social science perspectives on climate change – the integration of knowledge from different fields	Cross-curricular Topics (Sustainable environment)
		Energy, climate change, the uneven distribution of financial and mineral resources in global human society, and population migration	Biology (Dynamic planet)
Action-oriented	Climate change action competence (individual sphere)	Examining the functioning of students' households (or the environment in which they live) in various areas (e.g. water consumption, energy), students' willingness to become more involved in environmental protection and strengthening sustainability in the future; learning to think about savings opportunities within the framework of specific conditions and proposing realistic and meaningful measures	Cross-curricular Topics (Sustainable environment)
		Understanding the fragility and unpredictability of the current world; the importance of careful and thoughtful intervention in the surrounding environment; using the concept of planetary boundaries	Cross-curricular Topics (Sustainable environment)
		Fostering the ability to understand that it is necessary to think about how the environment will develop (at different levels – from local to global) in the future, but that at the same time everything cannot be planned and predicted precisely; understanding why the precautionary principle needs to be applied and what are the causes of uncertainties in predictions of future developments	Cross-curricular Topics (Sustainable environment)
		Developing the ability of students to act actively and responsibly in the environment and to understand the links between the natural environment and human activity	Geography (Sustainability of life on Earth)
		Active participation in the current and future societal discussion of how to respond to ecological problems and the climate crisis	History (We create history)
		Fostering the ability to think (based on an understanding of cause-and-effect relationships) about future developments and to work and cope with the probabilistic nature of developments, uncertainties, and limited predictability	Cross-curricular Topics (Sustainable environment)
		Field data collection, working with various information sources (e.g. AI, discussions with experts, work with texts, films)	Cross-curricular Topics (Sustainable environment)
	Climate change action competence (collective sphere)	Understanding the fragility and unpredictability of the current world; the importance of careful and thoughtful intervention in the surrounding environment; using the concept of planetary Boundaries	Cross-curricular Topics (Sustainable environment)
		Developing competencies through experience (e.g. active participation in the school and municipality); reflecting on experiences; applying knowledge, skills, and continuously developing attitudes and values; learning to connect with the community, the social and environmental context (in a group or in a classroom, locally in the school or community, but also globally in the wider world)	Elementary education – key competencies (Citizenship and sustainability)
		Developing a relationship with a place; the ability of students to think about the future and to express their possible concerns about development, but also their wishes and visions of how their community should develop	Cross-curricular Topics (Sustainable environment)
		Field data collection, working with various information sources (e.g. AI, discussions with experts, work with texts, films)	Cross-curricular Topics (Sustainable environment)
		Fostering the ability to understand that it is necessary to think about how the environment will develop (at different levels – from local to global) in the future, but, at the same time, that not everything can be planned and predicted precisely; understanding why the precautionary principle needs to be applied and what are the causes of uncertainties in predictions of future developments	Cross-curricular Topics (Sustainable environment)
		Developing the ability of students to act actively and responsibly in the environment and to understand the links between the natural environment and human activity	Geography (Sustainability of life on Earth)
		Active participation in the current and future societal discussion of how to respond to ecological problems and the climate crisis	History (We create history)
		Giving students specific examples of the impact of climate change in their environment on world events, explaining how these examples relate to climate change and how climate change affects or can affect the students' lifestyle; fostering their ability to think holistically, in relation to context, and in terms of interrelationships	Cross-curricular Topics (Sustainable environment)
		Fostering the ability to think (based on an understanding of cause-and-effect relationships) about future developments and to work and cope with the probabilistic nature of developments, uncertainties, and limited predictability	Cross-curricular Topics (Sustainable environment)
	Inter-personal skills for climate action		
Social and emotional	Social/career competencies/ skills		
	Emotions related to climate change	Students need to be given the opportunity to openly talk about their concerns about how various manifestations of climate change are negatively affecting their 'world'; the ability to find a positive vision for the development of their community also leads to strengthening their hope in successfully managing existing problems	Cross-curricular Topics (Sustainable environment)
	Climate change perception		

Table A4. Results of the analysis of the Estonian elementary school curriculum

CCE Dimensions	Sub-dimensions*	Curricula items related to given codes	Position in the curricula
Cognitive	Systemic knowledge	Importance of studying climate change and examples of contemporary ways of studying it, examples of possible consequences of climate change	Geography (European and Estonian climate)
		Greenhouse gases and environmental problems	Chemistry (Carbon compounds in nature)
	Mitigation	Examples of transport-related environmental problems and ways of solving them, environmentally friendly use of transport	Geography (European and Estonian climate)
		Advantages and disadvantages of using thermal, nuclear, hydroelectric, wind power plants to produce energy, sustainable use of energy	Geography (Geography and economy)
		Renewable and non-renewable natural resources, their use, examples of producing and using renewable energy at home, the need for reasonable consumption	Natural Science (Estonia's natural resources)
	Adaptation	Examples of natural disasters and their influence on nature and human activities	Natural Science (Planet Earth)
		Environmental problems related to urbanisation	Geography (European and Estonian population)
		Principles of sustainable forestry	Natural Science (Planet Earth)
	Global, European, and national frameworks and legislation		
	Climate change research	Importance of studying climate change and examples of contemporary ways of studying it	Geography (European and Estonian climate)
	Socio-economic aspects of CC	Local and global environmental issues and finding solutions to them, solving dilemmas	Natural Science (Society and citizenship – general competencies)
Action-oriented	Climate change action competence (individual sphere)	Evaluating the impact of human activities on the natural environment	Natural Science (Society and citizenship – general competencies)
		Valuing sustainable lifestyle, being environmentally aware consumers, concern about environmental problems, motivation to participate in environmental protection	Natural Science (Values and attitudes – learning outcomes)
		Making competent decisions in everyday life related to the environment, taking into account scientific, economic, political, ethical, and moral viewpoints and estimating the impact of such decisions	Natural Science (Values and attitudes – learning outcomes)
	Climate change action competence (collective sphere)	Evaluating the impact of human activities on the natural environment	Natural Science (Society and citizenship – general competencies)
		Valuing sustainable lifestyle, being environmentally aware consumers, concern about environmental problems, motivation to participate in environmental protection	Natural Science (Values and attitudes – learning outcomes)
		Making competent decisions in everyday life related to the environment, taking into account scientific, economic, political, ethical, and moral viewpoints and estimating the impact of such decisions	Natural Science (Values and attitudes – learning outcomes)
	Inter-personal skills for climate action		
Social and emotional	Social/career competencies/ skills		
	Emotions related to climate change		
	Climate change perception		

Table A5. Results of the analysis of the Spanish elementary school curriculum

CCE Dimensions	Sub-dimensions*	Curricula items related to given codes	Position in the curricula
Cognitive	Systemic knowledge	Climate and landscape, atmospheric phenomena, relationship between climatic zones and landscape diversity	Education in Civic and Ethical Values
		Climate change, introduction to the causes and consequences of climate change and its impacts on the Earth's landscapes	Civic Literacy (Ecosocial awareness)
		Implementation of a sustainable development model, analysis of environmental problems such as global warming	Biology and Geology (Ecology and sustainability)
		Causes of climate change and its consequences for ecosystems	Biology and Geology (Ecology and sustainability)
		Functions of the atmosphere and hydrosphere and their essential role in life on Earth	Biology and Geology (Ecology and sustainability)
	Mitigation	Mitigation measures	Civic Literacy (Ecosocial awareness)
		Sustainable mobility, cycling as a regular means of transportation, responsible consumption	Physical Education (Sustainable interaction with the environment)
		Energy sources and their practical uses and basic aspects of energy forms	Physics and Chemistry
		Sustainable mobility	Geography and History (Civic engagement)
	Adaptation	Urban agenda – sustainable urban development, the city as a space for coexistence	Civic Literacy (Ecosocial awareness)
		Adaptation measures	Civic Literacy (Ecosocial awareness)
	Global, European, and national frameworks and legislation		
	Climate change research		
	Socio-economic aspects of CC	Understanding how human interaction with the world around them has evolved, the limits of the biosphere, energy model based on fossil fuels	Societies and Territories (Challenges of the modern world)
		Basic political and social notions, characteristics of democratic frameworks, research and dialogue about relevant ethical issues (climate crisis)	Education in Civic and Ethical Values
		Ecosocial dimension of our existence, ecophysical conditions and limits of the planet, the ecological footprint of humans, systemic relationships between the individual, society, and nature, with particular emphasis on climate crisis	Education in Civic and Ethical Values
		Measurements and strategies leading to a just ecological transition	Education in Civic and Ethical Values
		Ecosocial responsibility, eco-dependence and interdependence between people, societies, and the natural environment	Civic Literacy (Ecosocial awareness)
Action-oriented	Climate change action competence (individual sphere)	Assessing the opportunities offered for students' personal development, but also the limitations that must be implemented to ensure the maintenance and care of their surroundings	Geography and History (Specific competencies)
		Evaluating different alternatives to curb climate change and achieve the SDGs, identifying causes and ecosocial problems, and justifying, argumentatively and critically, the ethical duty to protect and care for nature	Education in Civic and Ethical Values
		Active engagement in values, practices, and affective attitudes consistent with respect, care, and protection of people, animals, and the planet, through participation in activities that promote responsible consumption and sustainable use of land, air, water, energy, and safe, healthy, and sustainable mobility, recognising the role of individuals, groups, and entities committed to protecting the environment	Education in Civic and Ethical Values (Specific competencies)
		Building the competence to raise awareness of the seriousness of the consequences of the climate crisis and the need to adopt behaviours that respect the dignity of all living beings, promoting active and participatory attitudes regarding environmental issues	Geography and History (Civic engagement)
		Designing and adopting behaviours and actions that contribute to achieving sustainable development, and defending universal, fair, and equitable access to the resources that the planet offers us	Geography and History (Specific competencies)
		Identifying and explaining characteristics of democratic frameworks and comparing their knowledge with others through research and dialogue about relevant ethical issues (climate crisis)	Education in Civic and Ethical Values
		Developing environmentally responsible practices and habits, achieved through activities that concretely promote knowledge and care for the planet, reflection on our actions on the planet, and the consolidation of healthy and sustainable lifestyles, responsible management of soil, air, water, energy, and safe, healthy, and sustainable mobility	Education in Civic and Ethical Values (Specific competencies)
	Climate change action competence (collective sphere)	Identifying ecosocial problems, proposing possible solutions, and implementing sustainable lifestyles, recognising respectful behaviours, co-responsibility, protection of the environment and sustainable use of natural resources, and expressing the positive and negative changes caused to the environment by human action	Basic Knowledge (Specific competencies)
		Building the competence to raise awareness of the seriousness of the consequences of the climate crisis and the need to adopt behaviours that respect the dignity of all living beings, promoting active and participatory attitudes regarding environmental issues	Geography and History, Civic Engagement, upper-elementary
		Evaluating different alternatives to curb climate change and achieve the SDGs, identifying causes and ecosocial problems, and justifying, argumentatively and critically, the ethical duty to protect and care for nature	Education for Civic and Ethical Values
	Inter-personal skills for climate action		
Social and emotional	Social/career competencies/ skills	Empowering students' as agents of ecosocial change from an entrepreneurial and cooperative perspective, designing, participating in, and getting involved in activities that allow them to advance toward the SDGs	Education in Civic and Ethical Values
	Emotions related to climate change	Dealing with emotions and developing sensitivity and affection within the framework of the civic and ecosocial problems that our time poses	Education in Civic and Ethical Values
	Climate change perception		

Table A6. Results of the analysis of the Finnish elementary school curriculum

CCE Dimensions	Sub-dimensions*	Curricula items related to given codes	Position in the curricula
Cognitive	Systemic knowledge	Exploring environmental changes, especially climate change and the decline in biodiversity	Geography (Sustainable use of natural resources)
	Mitigation	Energy production and sustainable use of energy resources	Physics (Physics in society)
	Adaptation		
	Global, European, and national frameworks and legislation		
	Climate change research		
	Socio-economic aspects of CC	Dimensions of sustainable development, creating a way of life and a culture that cherishes the integrity of human dignity, understanding the seriousness of climate change and a commitment to sustainable action	The Value Base of Basic Education (The need for a sustainable lifestyle)
		Climate change, sustainable use of natural resources, sustainable food production and animal welfare, the possibilities of a bioeconomy, and ecosystem services for a sustainable future	Biology (Towards a sustainable future)
Action-oriented	Climate change action competence (individual sphere)	Sustainable living, food literacy, and consumerism, understanding the technological side of the everyday life of households	Home Economics
		Using students' knowledge to build a sustainable future and to evaluate their choices in the sustainable use of energy resources	Physics (Learning objectives: Values and attitudes)
		Observing the environment and changes that occur, activating students to follow current events in their own environment, in Finland, and around the world	Geography (Learning objectives: Geographical skills)
		Knowledge, skills, capabilities for everyday home management and a lifestyle that is sustainable and promotes well-being	Home Economics
		Observing changes in the local environment, giving examples of environmental changes occurring in Finland and elsewhere, key factors causing these changes	Geography (Learning objectives: Geographical skills)
	Climate change action competence (collective sphere)	Pupils are involved in designing and implementing a sustainable daily life, and strengthening the school's development in responsibility, as community members, local residents, and citizens	General Educational Principles (Responsibility for the environment and orientation towards a sustainable future)
		Observing changes in the local environment, giving examples of environmental changes occurring in Finland and elsewhere, key factors causing these changes	Geography (Learning objectives: Geographical skills)
	Inter-personal skills for climate action		
Social and emotional	Social/career competencies/ skills		
	Emotions related to climate change	Building hope for the future by creating the knowledge base for an ecosocial civilisation	General Educational Principles (Responsibility for the environment and orientation towards a sustainable future)
	Climate change perception		