NEW TRENDS IN LANDSCAPE RESEARCH-2025



GREEN INFRASTRUCTURE, URBAN ECOLOGY, URBAN ECOLOGY, XERISCAPING, MYCELIUM, BAMBOO , RAIN GARDENS,



GREEN ROOF / ROOF GARDEN, LIVING WALLS / VERTICAL GARDENS , NATURE-BASED SOLUTIONS, BIOPHILIC DESIGN,



ACTIVE MOBILITY , POLLINATOR-FRIENDLY CORRIDORS, BIOMATERIALS, SPONGE CITY CONCEPT, LOW-CARBON MOBILITY



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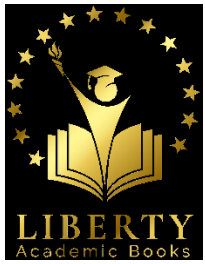

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PREFACE

Dear readers,

The strong connection between landscape, environment, and quality of life is at the center of scientific research today. With the goals of sustainable cities, healthy living spaces, and ecological integrity, landscape architecture intersects with many disciplines, including agriculture, environmental sciences, urban planning, health, biology, and ecology. In recent years, these multidimensional relationships have enabled an increase in interdisciplinary approaches and new directions in landscape research.

In this context, the discipline of landscape architecture is increasingly taking on a strategic role in producing solutions to environmental problems. Work in areas such as nature-based solutions, ecological planning, climate adaptation, green infrastructure systems, and sustainable land use has gained significant momentum both in academia and in practice. These developments bring with them a new scientific orientation that focuses not only on design aesthetics but also on environmental responsibility and social benefit.

Landscape architecture is not merely an aesthetic design discipline but a comprehensive scientific field that aims to protect natural and cultural resources, improve quality of life, and enhance environmental awareness. The compilation and research articles in this book bring together disciplines such as Horticulture, Agricultural Economics, Field Crops, Soil Science, Aquaculture, Biotechnology, Ecology, and Urban and Regional Planning, among others, that contribute to this field, with the aim of evaluating the nature-culture-human interaction within a holistic framework.

Our greatest hope is that this book, titled **"New Trends in Landscape Research – 2025**" will contribute to academic knowledge, serve as a source of inspiration for new research, and shed light on approaches related to sustainable landscape planning in particular. We sincerely thank all the academics and research students who contributed to our book with their valuable work, as well as Liberty Publishing House for their support at every stage of the process.

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Explaining the Climate Crisis to Children and Promoting Climate Literacy

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1. INTRODUCTION

Contemporary human activities induce enduring alterations in climate systems, with the climate crisis manifesting through increasingly destructive and irreversible effects. Addressing this global issue necessitates not only technical solutions but also interdisciplinary and holistic approaches. In this context, education plays a crucial role in both mitigating the effects of climate change and facilitating societal adaptation to these changes (Lombardi, 2022). The significance of education in combating climate change-related challenges is growing daily. However, the potential of education to effectively contribute to mitigation and adaptation processes has not yet been fully integrated into policy frameworks. Realizing this potential is closely linked to the implementation of a comprehensive approach that spans from early childhood to higher education (UNESCO, 2012b). The intention here is not merely to highlight the close relationship between climate change and education, but to emphasise the importance of fostering awareness about the issue, which is critical for understanding the climate change problem today. In this context, the focus should be on examining climate literacy.

Climate change presents a distinct challenge compared to historical social issues, as its impacts vary significantly across regions and temporal scales. Addressing these effects necessitates swift and comprehensive transformations by nations, international organisations, and local communities. Although individuals, institutions, and communities with expertise in various fields endeavour to devise solutions, the complex and interdisciplinary nature of climate change complicates the assessment of these efforts in isolation. Consequently, effective solutions must consider the diverse needs and interests of different groups, enhance the climate literacy of all stakeholders, and ensure their active participation in the process (Ledley et al., 2018). To

effectively combat climate change, it is crucial to accurately comprehend both its causes and consequences (Kaçmaz, 2021). Such understanding fosters individuals' ability to critically evaluate their behaviours, make informed decisions, and develop solutions. However, awareness initiatives that solely focus on information dissemination are insufficient for fostering climate literacy. For these efforts to be impactful, they must be supported by participatory, action-oriented, and transformative approaches (Singh, 2020). Furthermore, the majority of adults today completed their education before climate change emerged as a global crisis, highlighting gaps in their knowledge regarding this issue in their daily lives (UNEP, 2011). Therefore, it is imperative to promote awareness from early childhood to ensure a more sustainable world for both current and future generations.

The issue of climate change represents a critical challenge that necessitates a comprehensive approach. The awareness of this problem among individuals is a significant factor that will influence its future trajectory. Consequently, initiating climate literacy from childhood is imperative for both the present and future. The initial section of this study, grounded in a literature review, examines the concept of climate literacy. The subsequent section delineates four subsections concerning the development of climate literacy in children: methods for explaining climate issues to children, the integration of climate education into school curricula, the role of digital tools, and the importance of family education and social participation.

2. WHAT IS CLIMATE LITERACY?

The concept of literacy has evolved significantly beyond the basic skills of reading and writing, particularly when examined through a historical lens. Over the past fifty years, the expectations of a literate

individual have expanded considerably, encompassing the ability to comprehend societal issues, make informed decisions, and take appropriate actions (McBride et al., 2013). United Nations Educational, Scientific and Cultural Organization (UNESCO), for instance, does not confine literacy to reading and writing skills alone. Instead, it defines literacy as the capacity to recognize, understand, interpret, and communicate with written and printed materials across various contexts. Consequently, literacy is viewed as an ongoing learning process that empowers individuals to achieve their objectives, enhance their knowledge, and engage effectively in society (Miler & Sladek, 2011). In this regard, the term literacy has been increasingly incorporated into the literature through emerging concepts such as computer literacy, cultural literacy, environmental literacy, and ecological literacy (McBride et al., 2013). Notably, the notion of climate literacy is gaining prominence as a new term within the academic discourse. However, despite its growing significance, the term encounters several semantic challenges, as it remains in its nascent stages.

The concept of climate literacy was initially defined in 2009 in the document "Climate Literacy: The Essential Principles of Climate Science" (USGCRP, 2024). However, the semantic clarity of climate literacy remains elusive, as its content has not been definitively established, and consensus has yet to be achieved. Consequently, climate literacy, a relatively novel concept, is still in the process of development, despite its inclusion in studies across various disciplines (Miler & Sladek, 2011). Although the term is associated with a new era, it signifies an important area of focus due to the profound implications it encompasses.

Climate literacy refers to the capacity of individuals to comprehend the functioning of the climate system, the ways in which their actions alter this system, and the impact of climate on both individuals and other

natural components of the world. This knowledge is crucial not only at the academic level but also in everyday life, as it is asserted that individuals who grasp the causes, processes, and consequences of climate change are better equipped to take action to mitigate emerging risks. A climate-literate society possesses the capability to develop and implement effective climate solutions. Research indicates that enhancing climate literacy not only fosters positive changes in individual behaviours but also expedites planning processes. It is anticipated that climate literacy will be further enhanced by incorporating local and cultural knowledge into education, alongside scientific information. In this context, being climate literate is assessed as understanding fundamental concepts rather than complex scientific information and utilizing this knowledge to devise solutions to problems. Consequently, individuals begin to perceive climate issues not solely in environmental terms but also in social, psychological, and economic contexts (USGCRP, 2024). Therefore, the awareness fostered through climate literacy will underscore that climate issues are not merely environmental phenomena but rather comprehensive challenges encompassing a multitude of problems.

The significance of climate literacy should be understood in terms of its dual contribution: enhancing individuals' knowledge and playing a pivotal role in addressing climate-related issues. This is because climate-related challenges are both influenced by human actions and have the most significant impact on people. Consequently, the responsibility for resolving these issues should rest with individuals. To comprehend climate, climate change, and their derivatives, it is essential to grasp the intrinsic aspects of these phenomena (Arslan & Arı, 2021). Climate change should be viewed as both a cause and a consequence of the events experienced (Kaçmaz, 2021). Therefore, the awareness of individuals, who are both responsible for and affected by this process, is crucial in combating climate change (Cüre, Dayanğan, & Duman, 2022).

To equip individuals to address climate change in daily life, it is imperative to cultivate climate literacy knowledge and skills within educational settings (Karakuş & Akbaş, 2024). The emphasis here is on the inherent paradox of the climate issue, which is constructed by humans and yet most acutely affects them. This issue underscores the notion that humans, as primary contributors to climate problems, must also assume the fundamental responsibility for resolving them. The realisation of this responsibility is intrinsically linked to the concept of climate literacy.

Climate literacy necessitates an understanding of the fundamental principles governing the global climate system, the capacity to critically assess scientific information pertaining to climate, and the ability to engage in informed actions concerning climate-related issues (Limaye et al., 2020). Consequently, a climate-literate individual is characterised by their ability to analyse anthropogenic climate change and access credible sources on the topic (USGCRP, 2024). This raises the pertinent question: "Should everyone be climate literate?" Achieving this level of literacy across all societal segments in the short term is undoubtedly challenging. Nonetheless, it is imperative to recognise that, in the long term, achieving at least a basic level of climate literacy among all individuals is crucial (Miler & Sladek, 2011). Although climate literacy lacks a long-standing tradition at the scientific level, its significance is underscored by the pivotal role it plays in fostering a consciousness beneficial to humanity. While the immediate cultivation of this awareness may seem improbable, it is essential to acknowledge that climate literacy will be instrumental in addressing the climate challenges confronting the world.

3. PROMOTING CLIMATE LITERACY AMONG CHILDREN

3.2. How Should Climate Be Explained to Children?

The questions of what, how, and to what extent children should be informed about climate change, which examples should be provided, and how they should interpret natural events or changes in their environment are central to climate literacy. Establishing enduring awareness in this domain cannot be achieved by merely addressing the topic superficially or presenting examples that are disconnected from children's daily experiences. To create a genuine impact, climate literacy must be integrated into children's lives. In other words, it should encompass a multifaceted approach that enables children not only to acquire information but also to develop environmental awareness and take action (MoNE, 2021). Therefore, the awareness imparted to children within the framework of climate literacy should transcend a mere information-laden reality. In this context, multifaceted trends that support climate literacy should be considered (Figure 1).



Figure 1: Strategies to prepare children for climate change and to enhance their climate literacy (UNESCO, 2024b).

Currently, there is no robust institutional framework that addresses the unique sensitivities of children to climate change. Plans such as National Adaptation Action Programs seldom incorporate children's

knowledge, skills, and potential contributions in this area. However, sustainable development issues, which encompass fundamental topics such as human and child rights, disaster risk, climate change, and social equality, equip children with the skills to critically evaluate both sustainability and their societies (UNICEF, 2013). Indeed, children, as the decision-makers of the future, represent the most critical link in this awareness-raising process. The primary concern here is how to explain climate to children and how to cultivate climate-literate individuals. This is because climate, by its nature, involves both a complex system and psychological conditions such as fear and anxiety. In this context, the significance of education, one of the most fundamental issues, becomes apparent. Other aspects that require meticulous attention and are closely related to this include the use of digital tools, family education, and social participation.

3.3. Climate Education in School Programs

Education serves as a strategic instrument in addressing climate change and preparing for its impacts. Consequently, educational policies and curricula should be designed to enhance awareness of the causes and effects of climate change. Additionally, adaptation strategies must be developed. Climate education should also empower children to comprehend the impact of their consumption habits on the climate (UNEP, 2011). In essence, the primary objectives in integrating climate issues into education should be to foster a sustainable future and to impart practical skills at both individual and societal levels. Thus, the goal extends beyond merely imparting scientific knowledge; it also involves effecting tangible changes in children's attitudes and behaviours in accordance with this information. In this regard, climate change education assumes a critically important role (Uyar & Uyar, 2023). This form of education should aim to sensitise children to

environmental issues and contribute to their development of a conscious and responsible lifestyle (IPCC, 2021).

In the context of climate change, current educational approaches require reevaluation to equip students with the skills necessary to adapt effectively to a rapidly changing world. The educational system's response to climate change should not be limited to the inclusion of new subjects in the curriculum. Instead, education should adopt a more holistic and transformative approach that seeks to cultivate critical climate-related knowledge and skills (UNESCO, 2012b). In this context, climate change education should be integrated into the curriculum at all educational levels to provide a comprehensive understanding of the subject. The multidimensional nature of climate change should be addressed not only through scientific data but also through a holistic approach that encompasses various disciplines such as politics, law, ethics, sociology, economics, and culture (UNESCO, 2012a). This is because climate education embodies meanings far deeper than merely being an environmental issue. The necessity of addressing climate challenges from an interdisciplinary perspective exemplifies the profound dimension that its inherent meaning attains.

The primary objective of climate change education is to cultivate children's competencies in accessing, critically evaluating, and making informed decisions regarding climate-related information. Furthermore, it is imperative that climate change education remains current, as both challenges and solutions evolve in tandem with the changing world (Uyar & Uyar, 2023). Consequently, it is essential to equip children with new knowledge and skills to adapt to this rapidly changing environment. For this process to be effective, policymakers must formulate strategies and policies pertinent to climate education (UNESCO, 2012a). There is a broad consensus among international organisations, society, and educators that schools should prioritise climate change education.

School-based education is regarded as one of the most effective platforms for children to comprehend climate issues and develop problem-solving skills (Lambert, Lindgren & Bleicher, 2011). Similarly, numerous international organisations underscore the global threat posed by the climate crisis and highlight the importance of raising awareness and educating children on this matter (Figure 2). This emphasis is also reflected in the 2015 Paris Agreement, where Article 12 explicitly mandates collaborative efforts in climate change education, training, public information, and participation (UNFCCC, 2015). These examples illustrate the significant position that climate issues and climate literacy, which actively address these issues, have gained prominence on the global agenda.

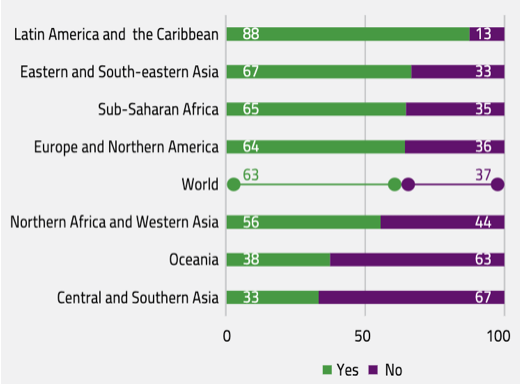

Figure 2: A comparison of the emphasis placed on climate change in teacher education curricula across different continents (UNESCO, 2023a).

In parallel, United Nations Children's Fund (UNICEF) is actively working to integrate climate change adaptation and disaster risk reduction into the education system, guided by child-friendly school principles. This approach is designed to incorporate climate, disaster, and environmental issues into all educational components, including policy, legislation, curriculum, teacher training, school infrastructure, and management (UNICEF, 2013). UNESCO, with its expertise in

education, culture, and social sciences, similarly emphasises the role of education in climate change adaptation and mitigation. It views education as a means to impart knowledge, skills, and capacity, as well as to shape the values and behaviours necessary for sustainable living. UN Environment Programme (UNEP), on the other hand, stresses the importance of education in facilitating countries' transition to low-carbon growth, reducing deforestation, enhancing climate awareness, and strengthening public consciousness (UNEP, 2011). Although international organisations possess significant influence over educational policy directions, they lack the authority to directly intervene in national curricula, thus assuming a more advisory role (Dawson et al., 2022). Despite their limited scope of authority, each organization contributes to the advancement of climate literacy. The central issue remains how climate education is integrated into national curricula and the measures taken by official educational institutions in this regard.

The integration of climate change into educational curricula by curriculum developers globally is imperative not only to align with contemporary demands but also to shape future generations (Dawson et al., 2022). Nevertheless, within formal educational institutions, climate change education is predominantly confined to the instruction of atmospheric composition and processes from a natural science perspective. Traditionally, climate science is taught within geography and earth sciences courses. In this context, climate change education is delivered at primary and secondary school levels through science curricula in numerous countries. However, climate change education transcends the confines of climate science alone, possessing an interdisciplinary nature that encompasses a broad spectrum of fields (UNEP, 2011). Consequently, climate change education should incorporate diverse components to facilitate an effective and comprehensive learning process. This education should be approached with an interdisciplinary perspective, integrating mutually supportive

elements from various fields such as science, social studies, and environmental education. The objectives and outcomes presented to students should be articulated in a manner that avoids misconceptions. Furthermore, experiential learning opportunities should be provided to enable a profound understanding of the process. The impacts of climate change should be contextualized within local and regional settings. Simultaneously, engaging teaching materials should be employed to enhance environmental responsibility (Barak & Gönençgil, 2020; UNESCO, 2009). Another critical aspect of the discourse on climate education is the correlation between the educational content and the age group of the learners.

The determination of the appropriate age and educational level for introducing climate science is a significant consideration (Miler & Sladek, 2011). In this context, preschool children should be instructed in an accessible manner about the value of the environment, their responsibilities in maintaining environmental cleanliness, and methods to identify and mitigate environmental risks encountered in daily life. Primary school students should be provided with foundational knowledge, including basic concepts of climate change and environmental responsibility, the significance of natural resources, and ecological cycles. Additionally, instruction should cover methods to identify and prevent environmental risks, basic disaster preparedness, and the environmental impact of individual actions. Secondary school students should be educated on topics such as climate change adaptation and mitigation, the protection of local ecological cycles, and the interplay of these cycles with social, environmental, and economic factors. Furthermore, concepts of environmental responsibility, such as the life cycle of consumer products, recycling, and resource conservation, should be addressed. Topics such as disaster preparedness, risk and vulnerability assessment, the exacerbation of risks by inequalities, and the evaluation of diverse solutions should also be included (UNICEF,

2013). In light of these considerations, it is evident that climate education should commence at the preschool level, fostering a sense of responsibility in individuals as they progress through their education.

Global advancements in climate change education are increasingly evident. For instance, South Korea has incorporated climate change education across all educational levels, including preschool, since 2007. In France, climate change education was initially introduced into the educational system in 2013 and was further strengthened by the "Climate Change and Resilience Law" in 2021. Similarly, Chile has integrated climate change into early childhood, primary, and secondary education as part of the "National Environmental Education Strategy" of 2023. In the United Arab Emirates, climate change topics are included not only in curricula but also in teaching materials and voluntary programs that support educational institutions, aiming to embed climate and environmental awareness at every educational level. Norway's "2021-2030 Climate Action Plan" underscores education as a pivotal tool in transitioning to a low-emission society, highlighting the role of schools in fostering climate and environmental awareness across all educational stages (UNESCO, 2023). Consequently, climate education has evolved to occupy a direct role in educational systems to enhance climate awareness.

Conversely, some countries emphasise experiential learning alongside curricular integration of climate change. In Ecuador, the 2018 "Manual of Good Environmental Practices for Educational Institutions" promotes both knowledge-based and practical learning through school-based campaigns, seminars, and environmental activities. In Morocco, approximately 6 million students have participated in planting seeds and saplings in school areas as part of the "One Student, One Tree, One School, One Forest" initiative. New Zealand's "Prepare today, live well tomorrow" climate change program not only imparts information but

also encourages student action. In Côte d'Ivoire, the "Green Pupil" project is designed to instil environmental awareness and eco-citizenship concepts in primary and secondary students, particularly through extracurricular activities. In El Salvador, the 2021 "National Higher Education Policy" advocates for these topics in elective courses and extracurricular activities, such as sapling planting, environmentally themed film screenings, youth climate clubs, and sustainable agriculture (UNESCO, 2023). Thus, in certain countries, climate education is evolving into a comprehensive program that encompasses both theoretical and practical dimensions.

Turkey is among the nations that prioritise climate literacy. In the 2022-2023 academic year, the "Environment Education and Climate Change" course was introduced as an elective in middle school curricula. This course is designed to facilitate students' comprehension of natural resource utilization and the production-consumption relationship; to assess environmental issues and climate change from a comprehensive perspective, ranging from local to global contexts; and to foster individual and social responsibility in addressing the climate crisis. Furthermore, the course seeks to enhance students' environmental awareness and responsibility, not only within the classroom but also during extracurricular activities and field trips (MoNE, 2022a). Additionally, the Turkish Preschool Education Development Association and the TEMA Foundation have developed the "Minik TEMA" program for preschool and early primary school children. This program is designed to cultivate awareness on topics such as the environment, soil, erosion, sustainable living, and climate change, through experiential learning (Şeker et al., 2018) (Figure 3).



Figure 3: This image from the video of the TEMA Foundation's "Mini TEMA Education Program" exemplifies the observation-based learning methodology employed to facilitate understanding of natural environments (TEMA Foundation, 2023).

Similar to many countries globally, Turkey has implemented various measures to promote climate education awareness. Consequently, the objective is to approach the climate issue from a holistic perspective that encompasses a social dimension, in addition to its cognitive aspects.

3.4.Use of Digital Tools

In contemporary society, there is a growing awareness of environmental and climatic issues, leading to a conscious effort towards the rediscovery of nature and progress in this domain (Ankaya et al., 2018). Consequently, innovative solutions are being proposed to address the preservation of ecological balance and biodiversity in response to environmental challenges and climate change (Gülgün et., 2015; Yazici et. al., 2017). The 21st century is characterised by both the intensification of environmental problems and the rapid advancement of digital transformation in education. As such, issues like climate change and sustainability have become fundamental necessities for ensuring the well-being of future generations, while digital tools present significant potential for facilitating transformative changes in education (Vinuesa et

al., 2019). Furthermore, technological advancements have increasingly integrated digital platforms into daily life, resulting in positive impacts across various sectors, including social and cultural structures, the economy, health, the environment, and energy consumption. Education is one of the domains where this digital transformation is most rapidly and effectively experienced. The integration of digital tools into educational processes and the enhancement of interaction in teaching amplify the influence of digitalization in education (Arslan & Karakuş, 2024). Consequently, it has become imperative for children to acquire skills such as information retrieval in digital environments, information synthesis, and safe usage. Thus, equipping students for the digital era and appropriately utilizing technology should be fundamental objectives of a successful education system (Altinsoy & Boyraz, 2024). The digital transformations occurring are closely linked to the education system, particularly in establishing connections with climate education.

The increasing role of digitalization in education has significantly contributed to climate change education, making complex global issues like climate change more comprehensible. This development has facilitated children's understanding of intricate environmental processes (Aydoğan et al., 2022) (Figure 4). Presently, rapid advancements in artificial intelligence and educational technologies are emerging as innovative tools for fostering climate literacy competence. These advancements offer children more interactive, data-driven, and personalized climate education experiences, surpassing traditional methods (Institute for Development Impact, 2025).



Figure 4: This visual from the NASA Climate Kids platform addresses fundamental issues related to climate literacy, encompassing the scientific evidence of climate change, its effects on the oceans, the greenhouse effect, and the necessity for future research (NASA, n. d.).

The development of digital games, Web 2.0 tools, and artificial intelligence-supported teaching materials to enhance climate literacy has become an essential requirement (Vinuesa et al., 2019). Web 2.0 applications utilized in education provide a range of digital tools that render learning processes more interactive and creative. Social media platforms such as YouTube, WhatsApp, Instagram, and Facebook facilitate communication and sharing, while digital mind maps like Mindmeister, Coggle, and Bubbles aid in organizing thoughts. Children can visualize content using digital boards (Padlet, Lino It) and word clouds (WordaRT, Tagul). They can also develop creative writing skills through cartoon (Toondoo, Sketch toy), story, and book writing (Storybird, Book Creator) tools. Furthermore, online learning is supported by distance education platforms such as Edmodo, Google Classroom, and Adobe Connect. These tools render the learning process active, participatory, and multifaceted (Çelik, 2024). Evidently, the evolving nature of digitalization has transformed child education into a multifaceted reality.

Additionally, mobile technologies for individual use have become pivotal in accessing these new-generation digital learning environments (Aydoğan et al., 2022). Indeed, games specifically developed for mobile devices enable learning on the go. For instance, the Earth Hero application allows users to monitor their carbon footprint and set sustainable goals (Institute for Development Impact, 2025). Consequently, the proliferation of education-focused mobile applications and their accessibility to all individuals enhance awareness of globally significant issues such as climate change. Moreover, it supports sustainable education by making open educational content accessible to a broader audience (Aydoğan et al., 2022). Another notable outcome is that, through social media platforms and online communities, children can share climate projects, collaborate with peers, and communicate with experts. Hashtags such as "#ClimateAction" and "#SustainableSchools" motivate environmental action by connecting young individuals to global environmental movements (Institute for Development Impact, 2025). Therefore, the integration of digital technologies into the education system has significantly contributed to raising awareness of climate issues.

Recent advancements in digital technologies have evolved into complex digital ecosystems, enabling children to profoundly engage with environmental crises and actively contribute to these issues. These tools not only enhance motivation for learning but also bolster climate literacy, a crucial competence for comprehending global crises such as climate change. In this context, six notable digital tools emerge as essential components shaping the future of climate challenges (WINSS, 2025):

1) Virtual and Augmented Reality (VR/AR): VR and AR technologies transcend traditional learning methods, offering

opportunities to virtually experience phenomena such as melting glaciers or disappearing forests through applications like Google Expeditions.

2) Gamification and Interactive Applications: Gamification facilitates not only knowledge transfer but also behavioural transformation. Next-generation applications such as EcoChallenge 2.0 encourage children to analyze their carbon footprint and make environmentally conscious decisions. Applications like "WWF Together" and "Recycling Summary" both entertain and enhance children's environmental awareness.

3) Artificial Intelligence and Big Data-Based Environmental Monitoring: Artificial intelligence provides a personalized, data-driven learning experience in sustainability education. NASA's "GLOBE Observer" and Microsoft's 'AI for Earth' initiative enable children to directly collect and analyze environmental data.

4) E-Learning Platforms and Online Courses: Platforms such as Coursera and the UNESCO-supported "Earth School" have the potential to offer equitable access to education globally.

5) Citizen Science and Crowdsourcing: Platforms like iNaturalist, which contribute to biodiversity, or Litterati, which combats global plastic pollution through data-driven efforts, exemplify concrete citizen science platforms and mobile applications that transform learning into direct action.

6) Smart Agriculture and the Internet of Things (IoT): In agriculture-based sustainability education, IoT technologies provide children with opportunities to analyze various variables, from soil moisture to crop growth. Microsoft's FarmBeats platform illustrates the convergence of digitalization and environmental awareness in agricultural production.

Conversely, certain nations are independently advancing initiatives to enhance climate literacy and cultivate environmentally conscious individuals. For instance, the digital platform Astrid, developed in Iceland, provides a comprehensive educational framework designed to heighten children's awareness of climate change, encourage proactive engagement, and assist in managing climate-related anxiety through scientifically grounded content (UNESCO, 2023). In South Korea, the "Data-Driven Carbon Literacy" project enables students to assess their carbon footprints by monitoring energy consumption at home and school, thereby fostering environmentally sensitive and solution-oriented individuals. The "EducoNetImpact" project in Belgium facilitates student awareness of the environmental impact of digital technologies. Similarly, in the United Kingdom, artificial intelligence is employed to enhance the efficiency of waste separation processes, integrating this subject into educational curricula and instilling a green vision among students (UNESCO, 2024a). The education systems in these countries, bolstered by digitalization, not only augment environmental awareness among children but also enhance their problem-solving capabilities.

In Turkey, there is a growing interest in digital education for addressing critical issues such as climate change. Initiatives like the "Digital Content Preparation and Augmented Reality Supported Global Warming and Climate Change Applications Trainer Training" by TUBITAK aim to deliver effective education on this subject. Additionally, "the Climate TEMA education Platform" developed by the TEMA Foundation serves as a significant resource leveraging digital technologies for climate and environmental education (Figure 5). Furthermore, the Ministry of National Education's (MoNE) Climate Change Action Plan underscores the efficacy of digital technologies in education to elevate climate change awareness. The plan seeks to develop cartoons, animations, books, brochures, and digital content,

integrate climate-related modules and games into platforms such as EBA and ÖBA, and organize activities enabling students to calculate waste digitally (Kenan, Hazar & Akyol, 2024).



Figure 5: The visual from the *Let's Talk About Climate* [*İklim Hakkında Konuşalım*] e-book, available on the "Mini TEMA Education Platform", elucidates the effects of climate change for children through simple and comprehensible metaphors (TEMA Foundation, 2021).

Consequently, digital tools not only enrich educational processes but also provide substantial opportunities for children to cultivate climate literacy, environmental awareness, and sustainable life skills. This technological transformation allows education to transcend a passive information transfer process, fostering individuals who are environmentally conscious, critically thinking, and solution-oriented (WINSS, 2025). Therefore, an analysis of the relationship between digital elements and climate literacy reveals the active role they play in the education system. It is thus evident that individuals sensitive to environmental damage have become more attuned to climate literacy through digital tools.

3.5. Family Education and Social Participation

The family constitutes the primary social milieu where children initially acquire knowledge, skills, attitudes, and values. Within this

context, children cultivate their responsibilities towards the environment and establish the groundwork for societal participation (Halstead, 1999). These formative experiences significantly influence the perspectives that children will develop regarding the environment, society, and life (Ritter, 2020). Consequently, fostering climate literacy awareness at an early age is crucial for nurturing children into individuals who are sensitive, conscious, and solution-oriented towards environmental challenges. This early education not only imparts knowledge but also enables children to mature into individuals who will assume responsibility for the climate crisis (Monte & Reis, 2021). Thus, a prominent factor in climate education, which encompasses numerous components, is the family environment and social engagement.

As climate change education increasingly permeates schools globally, understanding parents' attitudes and approaches to this issue becomes imperative. This is because children continue to learn not only in school but also at home. Parents' beliefs, values, and daily practices concerning climate change directly influence children's awareness and motivation to engage with this issue (Madden et al., 2023). Therefore, it is essential for adults to recognise the importance of collaborating with schools on environmental and climate matters. The involvement of parents and adults in school life should extend beyond children's education to encompass societal engagement. In this context, schools should undertake the responsibility of fostering relationships with families (UNICEF, 2013). These considerations underscore that establishing a robust synthesis between school, child, and family is a prerequisite for effective education. The family environment, much like the school, plays a crucial role in climate literacy.

The development of resilience against climate change, environmental degradation, and disasters is of paramount importance for children in early childhood and their caregivers (UNICEF, 2022).

(Figure 6). However, the role of parental support in addressing the complex and long-term crisis of climate change remains inadequately defined, as guiding children in this context represents a relatively novel responsibility for families (Sheffield & Landrigan, 2010). Although parents recognise the significance of supporting their children through the climate change process, they often lack the necessary guidance, which hinders effective communication on this issue. This uncertainty complicates the continuation of climate-related discussions within the family (Dayton et al., 2022). To ensure the efficacy of this responsibility, community support, awareness initiatives, quality early childhood education, and the provision of appropriate tools are essential (UNICEF, 2022). Consequently, emphasising the power of community action is crucial for enhancing family communication on climate change. While individual efforts are impactful, large-scale policies and social change are imperative for effectively addressing the climate crisis (Fawzy et al., 2020).



Figure 6: This visual represents a comprehensive educational trend that promotes children's engagement with sustainable living practices, including waste management and recycling within the family context (Sorial, 2024).

To resolve climate change and environmental challenges, technical knowledge and cultural awareness must operate in tandem (Pirli et al.,

2023). Programs and policies should encourage families to adopt sustainable lifestyles and actively engage in combating climate change. As fundamental societal units, families require access to adequate information and resources to fulfil this role. This access will enable families to better comprehend climate risks, implement protective measures for their well-being, and engage in constructive dialogues with their children based on accurate information. Furthermore, it will enhance their climate literacy, enabling them to discern false climate information, establish open communication with their children, and support them in managing climate-related concerns (Cuartas et al., 2025). Therefore, the enhancement of climate literacy within the family environment should be regarded as an inclusive and competent approach that encompasses not only children receiving education from their parents but also the parents themselves.

The report titled "Climate Change and Families," published by the United Nations Department of Economic and Social Affairs (DESA), underscores the pivotal role families play in achieving sustainable development goals. When families are educated about climate change and sustainable living, they can transmit this knowledge and these values across generations. This dynamic positions families as significant social actors in the creation of a sustainable environment (UN DESA, 2021). In this context, the concept of family literacy emerges as a critical issue. Family literacy is regarded as an integral component of the 17 Sustainable Development Goals of the United Nations. Communities worldwide adapt these goals to their local contexts and devise solutions tailored to their needs. Family literacy projects are instrumental in enhancing societal resilience and mitigating potential risks. Presently, numerous countries are implementing family-focused, applicable, and community-integrated educational models to address the climate crisis and similar global challenges (Taylor, 2020). It is imperative to examine

the extent to which the inclusion of families in climate literacy efforts can be actualized.

The United Nations urges its member states to bolster global collaborations to address the climate crisis and other global threats. To this end, it promotes multilateral literacy projects targeting families, not only at the inter-state or local level. However, according to a 2011 UNESCO report, many countries, ranging from Canada to Cuba and Uganda, are implementing family literacy programs tailored to the local needs of families. These countries aim to empower local communities through family-based learning models, viewing education as a component of social development rather than solely an individual endeavour (Taylor, 2020). Countries in the Arab Gulf and MENA regions are also striving to actively involve families in the process of combating climate change. In this context, communication campaigns, educational programs, and inclusive policies are being developed. For instance, Jordan is endeavouring to ensure the participation of women and children in the formulation of climate policies through the "Stakeholder Engagement Plan (SEP)" developed within the framework of the 2022-2050 National Climate Change Policy. Similarly, in Iraq, the "Climate Resilience and Environmental Justice Initiative" in Southern Iraq program establishes local committees to identify the needs of families affected by climate change, with a particular focus on the participation of women (Cuartas et al., 2024). The aforementioned countries exemplify efforts to position the family unit as a central subject in climate education. Consequently, family literacy has become a recognised necessity for the sustainability of climate education.

In Turkey, the significance of family involvement in addressing climate change is underscored. The Climate Action Plan, published in 2022 by the MoNE, highlights that climate change and environmental awareness should extend beyond children, advocating for a multi-actor

learning environment that includes families and educators. Parents are informed about climate change through family seminars, and the entire school community is engaged in the environmental awareness process through activities such as exhibitions, forums, panels, and competitions involving children (MoNE, 2022a). The report by the Yuva Association further emphasises that families are crucial actors who can assume responsibility for the climate crisis both individually and socially. In this context, families are encouraged to discuss climate change with children, adopt habits to reduce energy and water consumption at home, and participate in recycling by sorting waste. Additionally, they are advised to engage in local decision-making on environmental issues and to opt for climate-friendly transportation methods such as cycling, public transportation, or walking in daily life. These actions not only enhance children's climate awareness but also reinforce the understanding of sustainable living within the family (Yuva Association, 2024). Furthermore, the "Zero Waste Education Platform" program, initiated in 2019, serves as a digital education platform aimed at fostering zero waste awareness among children, teachers, and families. Emphasizing the conscious use of natural resources and waste prevention, the platform seeks to transform consumption habits through the 5D model, which includes the principles of "Think, Don't Consume If Not Necessary," "Consume Less," "Evaluate, Reuse," "Change, Use for Different Purposes," and "Transform, Let Nature Win." Educational materials comprise recycling games, puzzles, zero-waste checklists for home, weekly waste tracking charts, and various activities that children can engage in with their families. Thus, the learning process extends beyond the school environment and is bolstered by family participation (TEMA Foundation, 2024; MoNE, 2022). Through these educational approaches, the issue of climate change is addressed in a comprehensive manner, both intellectually and practically. Within this framework, the concepts of child, family, and education form an interconnected synthesis.

Consequently, while the awareness fostered for climate literacy initially appears to manifest at an individual level, it ultimately reflects a social dimension through holistic education.

4. CONCLUSION

The environmental and climatic damage resulting from global changes initially manifested on a local scale. However, particularly in the last century, with the increase in intercontinental mobility, this damage has escalated to a global level (Yazıcı, 2024). Factors such as uncontrolled population growth, migration, industrialisation, environmental pollution, and the unsustainable consumption of natural resources have precipitated significant challenges across all communities. These developments have heightened concerns regarding the future (Atıl, et al., 2005). Consequently, in light of the events of the past century, taking substantial steps towards sustainability has become crucial for both current and future generations (Yazıcı & Gülgün 2016).

Projections of future climate data indicate significant increases in daily temperatures, prolonged heatwaves, and more severe weather events over the next 50 years (Kaçmaz Akkurt & Şemsiyeci, 2024). Raising public awareness about climate risks, vulnerabilities, and the increasing trends of these threats, as well as educating on solutions to mitigate these risks, is vital for fostering a society resilient to climate change. In this regard, education and awareness programs should be tailored to the needs of local, national, and international stakeholders (UNESCO, 2012b). The imminent threat posed by environmental degradation is a matter of concern for all societies. It is imperative to implement necessary measures to address the crises induced by climate conditions. At this point, education and awareness, particularly climate literacy, are essential components of these measures.

Education serves as a crucial tool for individuals to make informed decisions about climate and to acquire the skills necessary to adapt to evolving environmental conditions. Indeed, education significantly contributes to enhancing social awareness by fostering climate literacy (Lombardi, 2022). However, scientists indicate that awareness levels regarding climate change remain low, highlighting a paucity of studies on climate literacy (Miler & Sladek, 2011). This situation underscores the necessity of integrating climate literacy into contemporary education. Effective climate literacy is inherently solution-oriented, aiming not only to impart fundamental concepts but also to equip children with the knowledge to develop concrete solutions to the climate crisis. This approach prioritises a practical, solution-focused understanding over theoretical knowledge (Corner et al., 2015).

One essential condition for addressing the challenges posed by climate change is the integration of technological advancements, which are increasingly significant (Nükte, 2025). Digital tools provide a powerful and transformative platform for climate education, extending access to information beyond geographical and socioeconomic barriers. These platforms, which transcend traditional classroom-based methods, offer children a comprehensive understanding of the climate system, the causes and effects of change, and potential solutions (Pirli, 2020). Through visualizations, simulations, and multimedia content, complex scientific data becomes more comprehensible. Concurrently, they provide a more participatory and inclusive learning opportunity for understanding climate change (Sustainability Directory, 2025). Consequently, climate literacy empowers individuals and communities to take informed actions against environmental issues. Individuals who become aware play a crucial role in safeguarding both current and future generations (Radzi, Osman & Said, 2022). Another factor contributing to the well-being of future generations and enhancing climate literacy is family education and social engagement. Parents must assume a critical

role in modeling sustainable lifestyles for their children, fostering critical thinking, and encouraging a connection with nature. This must be grounded in effective communication between parents and their children regarding climate change (Dayton et al., 2022).

Ultimately, nature, while being harmed by human activities, remains a vital domain that requires restoration. Furthermore, climate change should not be viewed solely as an environmental issue but as a complex problem necessitating interdisciplinary solutions. The challenges posed by this issue require a concerted effort involving several elements. These steps include enhancing climate literacy through education and awareness, integrating the positive aspects of technological advancements into the solution framework, and fostering a strong awareness in children through family education and social participation.

REFERENCES

- **Dergi Makaleleri**

Ankaya, F., Yazıcı, K., Balık, G., Gülgün Aslan, B. (2018). Dünyada ve Türkiye'de Ekoturizm, Sosyal, Kültürel ve Ekonomik Katkıları. Ulusal Çevre Bilimleri Araştırma Dergisi, 1(2), 69-72.

Altinsoy, E. & Boyraz, S. (2024). Digital Literacy and Moral Values in the Digital Environments: Secondary Students' Perceptions. A journal of educational research and practice, 33(2), 32-54. 10.26522/brocked.v33i2.1024

Arslan, K. & Arı, A. G. (2021). İklim Okuryazarlığına Yönelik Ortaokul Öğrencilerinin Kendilerini Algılama Düzeyleri. Sürdürülebilir Çevre Dergisi, 1(2), 1-12.

Arslan, K. & Karakuş, N. (2024). Environmental Teaching Supported by Web 2.0-Based Digital Games for a Sustainable Life. Sustainability, 16, 1-22. https://doi.org/10.3390/su16229691

Atıl, A., Gülgün, B., Yörük, İ. (2005). Sürdürülebilir Kentler ve Peyzaj Mimarlığı. Ege Üniversitesi Ziraat Fakültesi Dergisi, 42(2), 215-226.

Aydoğan, E., Atik, A. D., Dikmen, E. Ş., Erkoç, F. (2022). Development and Usability Testing of an Educational Mobile Learning App for Climate Change and Health Impacts. Turk J Biochem, 47(3), 373-383.

Azevedo, J. & Margarida, M. M. (2017). Climate Literacy: A Systematic Review and Model Integration. International Journal of Global Warming, 1-17. 0.1504/IJGW.2017.084789

Barak, B. & Gönençgil, B. (2020). Dünyada ve Türkiye'de Ortaokul Öğretim Programlarının İklim Değişikliği Eğitimi Yaklaşımına Göre Karşılaştırılması. Coğrafya Dergisi, 40, 1-15. https://doi.org/10.26650/JGEOG2019-0039

Corner, A., Chiari, S., Völler, S., Mayrhuber, E. S. (2015). How do Young People Engage with Climate Change? The Role of Knowledge, Values, Message Framing, and Trusted Communicators. WIREs Clim Change, 6, 523-534. 10.1002/wcc.353

Correia, P. R. M., Valle, B. X., Dazzani, M., Infante-Malachias, M. E. (2010). The Importance of Scientific Literacy in Fostering Education for Sustainability: Theoretical Considerations and Preliminary Findings from a Brazilian Experience. Journal of Cleaner Production, 18(7), 678-685. 10.1016/j.jclepro.2009.09.011

Cuartas, J., Ramirez-Varela, L., Spitzer, J., Brieant, A., Ghazanfar, A., Lansford, J. E., Sanson, A. (2025). Climate Change, Families, and Human Development: Review of the Evidence. Journal of Cognition and Development, 1-23. https://doi.org/10.1080/15248372.2025.2468187

Çelik, T. (2024). Examining the Experiences of Creating Environmental Awareness and Social Participation Perception with Web 2.0 Based Digital Tools. Ahi Evran Üniversitesi Kırşehir Eğitim Fakültesi Dergisi, 25(3).

Dawson, V., Eilam, E., Tolppanen, Assaraf, O. B. Z., Gokpinar, T., Goldman, D., Putri, G. A. P. E., Subiantoro, A. W., White, P., Quinton, H. W. (2022). A Cross-country Comparison of Climate Change in Middle School Science and Geography Curricula. International Journal of Science Education, 44(9), 1379-1398. https://doi.org/10.1080/09500693.2022.2078011

Dayton, L., Balaban, A., Scherkoske, M., Latkin, C. (2022). Family Communication About Climate Change in the United States. Journal of Prevention, 2, 1-15.

Fawzy, S., Osman, A. I., Doran, J., Rooney, D. W. (2020). Strategies for Mitigation of Climate Change: A Review. Environmental Chemistry Letters, 18, 2069-2094. 10.1007/s10311-020-01059-w

Gülgün, B., Abdioğlu, M., Yazici, K., & Dursun, Ş. (2015). Altenatives of the Green Tissues in the City Centres. International Journal of Ecosystems and Ecology Science, 5(1), 17–22.

Halstead, J. M. (1999). Moral Education in Family Life: The Effects of Diversity. Journal of Moral Education, 28(3), 265-281. https://doi.org/10.1080/030572499103070

Kaçmaz Akkurt, G. & Şemsiyeci, S. (2024). Evaluation of Nature-based Solutions to Improve the Urban Microclimate in Mediterranean Climate Conditions: A Case Study of Izmir-Karsiyaka. Sustainability, 16(7). https://doi.org/10.3390/su16072646.

Kaçmaz, G. (2021). İklim Değişikliği ile Mücadelede Doğa Temelli Çözümler. Eğitim, Bilim, Kültür ve Sanat Dergisi, 3(2), 82-92. https://doi.org/10.53784/peyzaj.1022369.

Karakuş, S. & Akbaş, Y. (2024). 8. Sınıf Öğrencilerinin Çevre ve İklim Okuryazarlıkları Arasındaki İlişkinin İncelenmesi. Sosyal Bilgilerde Yenilikçi Araştırmalar Dergisi, 7(1), 1-26. https://doi.org/10.47503/jirss.1456551

Kenan, A., Hazar, F. N., Akyol, S. (2024). Climate Change Education in Digital Magazine Format: Evaluation of the M-IKLIM Application. International Journal of Turkish Education Sciences, 12(3), 1478-1512. https://doi.org/10.46778/goputeb.1528798

Lambert, J. L., Lindgren, J., Bleicher, R. (2011). Assessing Elementary Science Methods Students Understanding About Global Climate Change. International Journal of Science Education, 34(8), 1167-1187. https://doi.org/10.1080/09500693.2011.633938

Ledley, T. S., Gold, A. U., Niepold, F., McCaffrey, M. (2018). Moving Toward Collective Impact in Climate Change Literacy: The Climate Literacy and Energy Awareness Network (CLEAN). Journal of Geoscience Education, 62(3), 307-318. https://doi.org/10.5408/13-057.1

Leuzinger, S. & Hattenschwiller, S. (2013). Beyond Global Change: Lessons from 25 Years of CO2 Research. Oecologia, 171(3), 639-651. 10.1007/s00442-012-2584-5

Limaye, V. S., Grabow, M. L., Stull, V. J., Patz, J. A. (2020). Developing A Definition of Climate and Health Literacy. Health Affairs, 39(12), 2182-2188. 10.1377/hlthaff.2020.01116

Lombardi, D. (2022). Climate Crisis Mitigation and Adaptation: Education and Developmental Psychology's Responsibility in Helping Face This Threat. Educational and Developmental Psychologist, 39(1), 1-4. https://doi.org/10.1080/20590776.2021.2012834.

Madden, L., Joshi, A., Wang, M., Turner, J., Lindsay, S. (2023). Parents' Perspectives on Climate Change Education: A Case Study From New Jersey. SAGE Publications, 8(1), 184-202.

McBride, B.B., Brewer, C. A., Berkowitz, A. R., Borrie, W. T. (2013). Environmental Literacy, Ecological Literacy, Ecoliteracy: What do we mean and how did we get here?. Ecosphere, 4(5), 1-20. https://doi.org/10.1890/ES13-00075.1

Miler, T. & Sladek, P. (2011). The Climate Literacy. Procedia Social and Behavioral Sciences, 12, 150-156. https://doi.org/10.1016/j.sbspro.2011.02.021

Monte, T. & Reis, P. (2021). Design of a Pedagogical Model of Education for Environmental Citizenship in Primary Education. Sustainability, 13(11), 1-23. https://doi.org/10.3390/su13116000

Nükte, S. (2025). An Analysis of the The Age of Stupid Documentary in the Context of Environmental Communication. Erciyes İletişim Dergisi, 69-91. https://doi.org/10.17680/erciyesiletisim.1609943.

Pirli, A., Pirli D., Gönen, M. & Gülgün, B. (2023). Kent ve Su İlişkisinin Belgesel Filmlerde Temsili: "Asfaltın Altında Dereler Var!" Belgesel Filmi Örneği. Chapter 1. Yazici, K. (Ed.). Peyzaj ve Kentler '2023 Çalışmaları'. 3-41, ISBN: 978-625-367-034-4. Iksad Publications.

Pirli, D. (2020). Dijital Kültürde Hareketli Görüntünün Yeri: Hareketli Görüntü Örnekleriyle İçerik Yakınsaması. Parsa, A. F. & Akçora As, E. (Eds.), Dijital İmgeler Evreni. s. 69-90. ISBN 978-975-553-764-1. Doruk Yayınları.

Radzi, S. N. F., Osman, K., Said, M. N. M. (2022). Progressing towards Global Citizenship and a Sustainable Nation: Pillars of Climate Change Education and Actions. Sustainability, 14(9), 1-23. https://doi.org/10.3390/su14095163

Ritter, M. J. (2020). Civility and Shared Fate: Social Studies Education as Teaching for Belonging. Journal of Curriculum Studies Research, 2(1), 1-15. https://doi.org/10.46303/jcsr.02.01.1

Sheffield, P. E., Landrigan, P. J. (2010). Global Climate Change and Children's Health: Threats and Strategies for Prevention. National Institute of Environmental Health Sciences, 119(3), 291-298. 10.1289/ehp.1002233

Singh, S. A. (2020). Climate Change Education: Knowing, Doing and Being (Book Review). International Research in Geographical and Environmental Education, 29(4), 362-365. https://doi.org/10.1080/10382046.2019.1703318

Şeker, P. T., Gürcan, N., Arar, B., Alaca, G. (2018). Okul Öncesi Dönem Çocuklarının Çevre ile İlgili Görüşlerine Minik Tema Programının Etkisinin İncelenmesi. Gelecek Vizyonlar Dergisi, 2(2), 22-31.

Uyar, S. & Uyar, Ş. (2023). İklim Krizi Karşısında Eğitimin Rolü. International Social Mentality and Researcher Thinkers Journal, 9(71), 3534-3538.

Vinuesa, R., Azizpour, H., Balaam, M., Dignum, V. (2019). The Role of Artificial Intelligence in Achieving the Sustainable Development Goals. Nature Communication, 1-15. https://doi.org/10.1038/s41467-019-14108-y.

Yazıcı, K. (2024). Çevresel Sürdürülebilirlik ve Türkiye'deki Üniversitelerin Greenmetric Sertifika Sistemindeki Başarısının İncelenmesi. Bozok

Tarım ve Doğa Bilimleri Dergisi, 3(1), 37-46. https://doi.org/10.59128/bojans.1487801

Yazici, K., Gülgün, B., & Ankaya, F. (2017). Potential of Rural Tourism and Ecotourism and SWOT Analysis Case of Başkale Van Turkey and Its Surroundings. Karabuk University Journal of Institute of Social Sciences, (3), 131–144.

Yazici, K., & Gülgün, B. (2016). TR83 İllerinde Süs Bitkileri Sektörünün Mevcut Durumu ve Geliştirilmesi Üzerine Bir Araştırma. Selçuk Gıda Tarım Bilimleri Dergisi, 3(1), 18–24.

- **Book Chapter and Conference Paper (Presentations)**

Cüre, M. G., Dayanğan, Ç., Duman, S. (2022). İklim Okuryazarlığı. (Ed.: Çelik, A. A.). Tüketim Okuryazarlığı: Bilinçli Tüketici-Tüketim, Nobel Akademik Yayıncılık, Ankara, 151-188.

- **Books and e-Books**

TEMA Foundation (2021). İklim Hakkında Konuşalım. İstanbul: Türkiye İş Bankası Kültür Yayınları. https://iklimtema.org/?/kitaplar/page/iklim-hakkinda-konusalim.

- **Web Resources**

Cuartas, J., Spitzer, J., Ramirez-Varela, L., Brieant, A., Ghazanfar, A., Lansford, J. E., Mulatle, M., Opiyo, R., Sanson, A., Aref, A. (2025). Climate Change and Families: Review of the Evidence and Policy Recommendations. Doha International Family Institute (DIFI) & Duke University Center for Child and Family Policy.

Doha International Family Institute (DIFI) (2024). Climate Change and Families: Review of Evidence and Policy Recommendations. https://www.difi.org.qa/wp-content/uploads/2024/10/Climate-Change-Web.pdf.

Institute for Development Impact (2025). Digital Innovation in Climate Education: Building Tomorrow's Climate Leaders. https://i4di.org/digital-tools-climate-literacy/.

IPCC (2021). Climate Change 2021: The Physical Science Basis. https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_FullReport.pdf.

Ministry of National Education (MoNE) (2021). Çevre ve İklim Değişikliği Okuryazarlığı Becerileri Etkinlik Kitabı. https://ogmmateryal.eba.gov.tr/kitap/okuryazarlik-becerileri/cevre-iklim/cevre-iklim.pdf.

Ministry of National Education (MoNE) (2022a). Çevre Eğitimi ve İklim Değişikliği Dersi Öğretim Programı (Ortaokul 6, 7 veya 8. Sınıflar). https://mufredat.meb.gov.tr/Dosyalar/202244102710628-2022-10-cevre-egitimi-iklim-degisikligi-ogretim-programi-web.pdf.

Ministry of National Education (MoNE). (2022b). İklim Değişikliği Eylem Planı. https://merkezisgb.meb.gov.tr/meb_iys_dosyalar/2022_09/29171316_Milli_EYitim_BakanlYYY_Yklim_DeYiYikliYi_Eylem_PlanY.pdf.

NASA (n. d.). Climate Kids. https://climatekids.nasa.gov.

North American Association for Environmental Education (NAAEE). (2022). Mapping the Landscape of K-12 Climate Change Education Policy in the Unites States. https://dg56ycbvljkqr.cloudfront.net/sites/default/files/eepro-post-files/K-12%20Change.Full%20Report.pdf.

Sorial, M. (2024). The Parent's Guide to Environmental Education: Simple Steps for Families. https://learningmole.com/parents-guide-to-teaching-environmental-education/.

Sustainability Directory (2025). How Can Digital Tools Be Used for Climate Education. https://climate.sustainability-directory.com/question/how-can-digital-tools-be-used-for-climate-education/.

Taylor, D. (2020). Family Literacy: Fosters Ties Between Nations and Responds to: The Climate Emergency. https://www.dennytaylor.com/news/2020/family-literacy-fosters-ties-between-nations-and-responds-to-the-climate-emergency.

TEMA Foundation (2023). Doğada Gözlem. https://www.youtube.com/watch?v=qxASPzuHXRQ.

TEMA Foundation (2024). Sıfır Atık Eğitim Portalı. https://sifiratiktema.org.

UN DESA (2021). Families and Climate Change International Year of the Family +30 Observance of the 2024 International Day of Families & the 30th anniversary of the International Year of the Family Background Note. https://social.desa.un.org/sites/default/files/IDF.2024.BACKGROUND%20NOTE.pdf.

UNESCO (2009). International Seminar on Climate Change Education. https://www.uncclearn.org/wp-content/uploads/library/unesco45.pdf.

UNESCO (2012a). Climate Change Education for Sustainable Development in Small Island Developing States: Report and Recommendations. United Nations Educational, Scientific and Cultural Organization. https://unesdoc.unesco.org/ark:/48223/pf0000216473.

UNESCO (2012b). Education Sector Responses to Climate Change. https://unesdoc.unesco.org/ark:/48223/pf0000215305.

UNESCO (2023). Climate Change Communication and Education Country Profiles: Approaches to Greening Education around the World. https://unesdoc.unesco.org/ark:/48223/pf0000387867.

UNESCO (2024a). Bridging the Green and Digital Transitions Through Education. https://unesdoc.unesco.org/ark:/48223/pf0000391873.

UNESCO (2024b). Greening Curriculum Guidance: Teaching and Learning for Climate Action. https://unesdoc.unesco.org/ark:/48223/pf0000390022.

UNEP (2011). Climate Change Starter's Guidebook. https://sustainabledevelopment.un.org/content/documents/921unesco3.pdf.

United Nations Framework Convention on Climate Change (UNFCCC) (2015). Paris Agreement. https://unfccc.int/sites/default/files/english_paris_agreement.pdf.

UNICEF (2013). Climate Change and Environmental Education. United Nations Children's Fund. https://www.uncclearn.org/wp-content/uploads/library/unicef31.pdf.

UNICEF (2022). Early Childhood Development and Climate Change. https://www.unicef.org/eap/documents/early-childhood-development-and-climate-change.

USGCRP (2024). Climate Literacy: Essential Principles for Understanding and Addressing Climate Change. U.S. Global Change Research Program, Washington, https://doi.org/10.7930/clg2024.

WINSS (2025). 6 Digital Tools for Environmental Education & Sustainability in 2025. https://www.winssolutions.org/digital-tools-in-sustainability-education/.

Yuva Association (2024). Erken Çocuklukta İklim Değişikliği Eğitimi İçin Geliştirilen Bir Model ve Etkinlik Örnekleri. https://www.yuva.org.tr/wp-content/uploads/2024/08/Yuva_dernegi_Iklim_Degisikligi_V5.pdf.



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