International Journal of Knowledge Processing Studies
(KPS)
Homepage: http://kps.artahub.ir/

ORIGINAL RESEARCH ARTICLE

The Role of Knowledge Structures in Transferring the Culture of Environmental Protection Towards Sustainable Development

Ali Keshtparvar Kasamaee[1], Hamid Reza Mirtavusi[2,*], Saeed Sharifi [3]

[1] *PhD student Department of Cultural Management and Planning, Isf.C., Islamic Azad University, Isfahan, Iran. ali.keshtparvarkasmaee@iau.ir , 0009-0004-0843-5081*

[2] *Assistant Professor, Department of Management, Isf.C., Islamic Azad University, Isfahan, Iran. H.mirtavousi@iau.ac.ir, 0009-0004-0843-5081*

[3] *Professor, Department of Cultural Management and Planning, Isf.C., Islamic Azad University, Isfahan, Iran. sa.sharifi7584@iau.ac.ir*

ARTICLE INFO

Article History:
Received: 2025-08-29
Revised: 2025-09-25
Accepted: 2025-11-26
Published Online: 2025-12-01

Keywords:
Environment, Cultural Model, Environmental Protection, Sustainable Development, Environmental Organization.

Number of Reference:31
Number of Figures: 2
Number of Tables: 9

DOI:
10.22034/kps.2026.543951.1247

ABSTRACT

Sustainable development represents a new perspective on the relationship between humans, nature, and society, aiming to meet present needs without limiting the ability of future generations. This study seeks to design and explain a cultural model of environmental protection within the framework of sustainable development in the National Environmental Organization. The research is applied in purpose and exploratory in method, employing both qualitative and quantitative (mixed) approaches through grounded theory and exploratory factor analysis. Data collection relied on semi-structured interviews with 12 experts, including university professors, managers in environmental fields, and representatives of organizations, municipalities, and NGOs. Analysis followed grounded theory procedures—open, axial, and selective coding—resulting in 15 categories within a paradigm model. These included causal conditions (ecological, social, economic, ethical, and political necessities), the central phenomenon (cultural model of environmental protection), enabling conditions (sustainability culture, governance, and leadership), intervening conditions (cognitive, attitudinal, socio-cultural, political, economic, and infrastructural factors), strategies (cultural transformation, behavioral innovation, and sustainability strategies), and consequences (environmental and socio-political outcomes). In the quantitative phase, the statistical population extended to managers and staff of the National Environmental Organization. Data from exploratory factor analysis were processed using SPSS26, confirming validity and reliability of the questionnaire as factor loadings exceeded 0.3 and significance coefficients surpassed 1.96. Furthermore, structural equation modeling via AMOS confirmed the strength of relationships among model components, validating the proposed framework.

► **Citation:** Keshtparvar Kasamaee, A., Mirtavusi, H. & Sharifi, S. (2025). The Role of Knowledge Structures in Transferring the Culture of Environmental Protection Towards Sustainable Development. *International Journal of Knowledge Processing Studies (KPS)*, 5(4): 22-39. Doi: 10.22034/kps.2026.543951.1247

1. Introduction

In the contemporary era, environmental degradation has emerged as one of the most pressing global challenges, threatening the stability of ecosystems, human well-being, and the prospects of sustainable development. While technological innovations, legal frameworks, and policy interventions have been extensively pursued to mitigate ecological crises, the cultural dimension of environmental protection has often been underestimated. Culture, as a system of values, beliefs, and behavioral norms, deeply influences how societies perceive and interact with the environment. Without integrating environmental protection into cultural practices and social norms, efforts toward sustainability may remain fragmented and superficial. At the same time, the mechanisms through which environmental culture is transferred, institutionalized, and internalized across generations remain complex and insufficiently explored. This highlights the need to understand the epistemological foundation of knowledge structures that enable the diffusion of environmental culture within the framework of sustainable development (Mohammad, 2024).

Knowledge structures can be understood as the organized frameworks through which individuals and societies acquire, process, store, and apply knowledge. They include formal education systems, informal learning practices, scientific knowledge dissemination, media channels, and traditional forms of knowledge embedded in communities. These structures act as cognitive and institutional bridges that shape not only the way environmental issues are understood but also how values of sustainability are embedded into daily practices. However, many societies face the challenge of fragmented or hierarchical knowledge systems that fail to effectively transfer environmental culture across diverse social groups. For example, while scientific knowledge may highlight the urgency of environmental action, cultural narratives and traditional practices may sometimes contradict or resist such knowledge, creating epistemological gaps that hinder sustainable development.

This underscores the importance of rethinking the role of knowledge structures as active mediators of cultural transfer in the domain of environmental protection.

A critical problem lies in the uneven accessibility and credibility of knowledge structures across communities. In many developing contexts, environmental knowledge is concentrated within academic or policy-making institutions, with limited pathways for dissemination to local populations (Green et al., 2019).

This imbalance creates a disconnect between the production of environmental knowledge and its cultural adoption. Moreover, cultural values themselves are often deeply rooted in traditions, rituals, and identity, making it difficult for abstract scientific discourses to resonate with lived experiences. Consequently, the cultural transfer of environmental protection is not simply a matter of communication but involves a complex process of translation, adaptation, and integration into existing cultural frameworks. Understanding how knowledge structures can facilitate this translation process is therefore central to bridging the gap between environmental awareness and sustainable practices (Adanma & Ogunbiyi, 2024).

Another dimension of the problem is the growing dominance of digital technologies and their dual role in shaping knowledge transfer. On the one hand, digital platforms, social media, and e-learning systems offer unprecedented opportunities to disseminate environmental culture on a global scale. On the other hand, these technologies may contribute to information overload, misinformation, or superficial engagement with environmental issues.

The question then arises: how can digital knowledge structures be designed to support deep cultural transformation rather than merely raising awareness?

This challenge becomes particularly significant in contexts where environmental protection requires behavioral change, collective action, and intergenerational learning—all of which depend on durable

cultural integration rather than transient exposure to information.

Furthermore, sustainable development is a multidimensional concept that integrates ecological, social, and economic goals (Sekhar et al., 2024). The transfer of environmental culture must therefore go beyond promoting ecological awareness to address the interconnectedness of sustainability dimensions. Knowledge structures must equip societies with the ability to recognize trade-offs, negotiate values, and foster inclusive participation in decision-making processes (Ruggerio, 2021).

Yet, current knowledge structures often remain siloed, focusing narrowly on either scientific expertise or cultural traditions without creating integrative frameworks.

This fragmentation weakens the transformative potential of environmental culture and risks reproducing unsustainable practices. Addressing this gap requires a systemic approach that positions knowledge structures as integrative platforms where diverse epistemologies—scientific, cultural, indigenous, and experiential—can interact and co-evolve (Koul et al., 2022).

The urgency of this problem becomes even more pronounced in light of global environmental crises such as climate change, biodiversity loss, and resource depletion (Dabiri et al., 2019). These crises demand collective responses that are both scientifically informed and culturally embedded. A society's willingness to adopt sustainable lifestyles depends on how effectively knowledge structures embed environmental protection into cultural consciousness. However, in many regions, environmental education remains peripheral in school curricula, cultural institutions do not prioritize ecological values, and policymaking is disconnected from community-level knowledge systems (Appannan et al., 2023).

As a result, environmental culture struggles to gain the legitimacy and resilience necessary to sustain long-term behavioral change. Investigating the role of knowledge structures in this process can illuminate pathways for designing more robust and context-sensitive strategies for sustainability (Liu et al., 2020).

Lastly, there is a theoretical and practical gap in current scholarship. While much research has focused on environmental education, awareness campaigns, and cultural studies of sustainability, less attention has been given to the epistemological mechanisms through which knowledge structures shape cultural transfer.

Without understanding the architecture of these structures—how they generate, validate, and transmit knowledge—efforts to foster environmental culture may remain fragmented or ineffective. This calls for a comprehensive inquiry into the role of knowledge structures as both enablers and barriers in transferring the culture of environmental protection toward sustainable development. By addressing this gap, the study aims to provide insights not only for academic discourse but also for practical policymaking, curriculum design, and cultural interventions that can empower societies to internalize sustainability as a lived and enduring value system (Heyd, 2016).

Beyond the structural and institutional aspects, the issue of knowledge transfer in the context of environmental culture also involves the cognitive and psychological dimensions of learning. Individuals do not simply absorb information passively; rather, they interpret new knowledge through pre-existing cognitive frameworks shaped by culture, education, and socialization. This means that even when accurate environmental knowledge is made available, it may not necessarily translate into sustainable behavior unless it resonates with personal and collective belief systems. For example, cultural myths about the inexhaustibility of natural resources may counteract scientific explanations about ecological limits. Thus, knowledge structures must be capable of not only transmitting facts but also reconfiguring cognitive schemas and cultural narratives in ways that make environmental protection meaningful and actionable. This complex interplay between knowledge, cognition, and culture remains underexplored in the literature.

Additionally, the dynamics of intergenerational knowledge transfer present another challenge. Environmental protection and sustainable development are inherently long-term endeavors, requiring continuity of cultural values across multiple generations. However, intergenerational gaps in values, communication styles, and technological literacies often weaken this continuity. While older generations may rely on oral traditions and lived experiences, younger generations increasingly depend on digital platforms for knowledge acquisition. Bridging these generational divides requires adaptive knowledge structures that can translate environmental culture into forms accessible and appealing to diverse age groups (Botkin & Edward, 2015). Without such adaptability, environmental culture risks fragmentation, where younger generations fail to inherit or reinterpret the ecological wisdom of their predecessors. Understanding how knowledge structures can mediate intergenerational learning is thus crucial for ensuring the sustainability of cultural transmission (Armaghan, 2018).

The globalization of knowledge also adds complexity to the issue. In an interconnected world, environmental culture is increasingly shaped by transnational flows of ideas, policies, and practices (Kour et al., 2021).

Global discourses on sustainability, such as those advanced by the United Nations' Sustainable Development Goals (SDGs), interact with local cultural norms in ways that are not always harmonious. In some cases, global sustainability narratives may be perceived as external impositions, undermining local ownership and legitimacy.

In other cases, they may inspire innovative adaptations that strengthen cultural commitments to environmental protection (Lange & Dewitte, 2022). The question becomes: how can knowledge structures balance global and local epistemologies, ensuring that environmental culture is both context-sensitive and globally relevant? This tension between the universal and the particular underscores the epistemological significance of knowledge structures in mediating cultural transfer (Tomislav, 2018).

Moreover, there is the problem of power relations embedded in knowledge structures. Knowledge is never neutral; it is produced, validated, and disseminated within systems of power that privilege certain voices while marginalizing others. In the field of environmental protection, scientific expertise often dominates policymaking, while indigenous knowledge and community-based practices may be sidelined (Kang et al., 2016). This epistemic inequality not only undermines cultural inclusivity but also deprives sustainability efforts of valuable perspectives rooted in centuries of ecological wisdom. A critical challenge, therefore, is to design knowledge structures that democratize the production and dissemination of environmental knowledge, creating dialogical spaces where diverse epistemologies can coexist and enrich one another. Addressing these power asymmetries is vital for transferring environmental culture in a way that is equitable, inclusive, and genuinely sustainable (Silvestre & Ţîrcă, 2019).

Another under examined issue is the role of emotions and affect in knowledge transfer. While knowledge structures are often conceptualized in cognitive or institutional terms, emotional and affective dimensions play a significant role in how cultures internalize environmental values. Fear of ecological collapse, attachment to natural landscapes, pride in community stewardship, or grief over environmental loss—all of these emotions shape how individuals and communities engage with environmental culture. Knowledge structures that fail to engage with the affective dimensions of culture may struggle to generate meaningful behavioral change. Hence, the challenge is to understand how knowledge structures can integrate emotional and symbolic elements into the cultural transfer of environmental protection, making sustainability not just a rational choice but also an emotionally compelling one (Ozili & Iorember, 2024).

Furthermore, contemporary environmental challenges demand systemic thinking, yet many knowledge structures remain compartmentalized (Arthington et al., 2018).

For instance, school curricula may address environmental issues within isolated science courses, while social studies, literature, and arts remain disconnected from ecological themes. Similarly, policymaking institutions often divide responsibilities across separate ministries, limiting opportunities for interdisciplinary collaboration.

This compartmentalization reflects an underlying epistemological fragmentation that weakens the integrative cultural transfer required for sustainability. A systemic rethinking of knowledge structures is therefore necessary—one that breaks down disciplinary silos, promotes holistic perspectives, and fosters integrative cultural narratives of sustainability (Holmberg & Sandbrook, 2019).

The practical implications of these challenges are significant. Without robust knowledge structures capable of transferring environmental culture effectively, sustainability policies risk becoming rhetorical rather than transformative. Communities may endorse the language of sustainability without internalizing it as a cultural practice. Educational reforms may introduce environmental content without ensuring that students connect it to their daily lives. Public awareness campaigns may raise concern without producing long-term behavioral change. Thus, the central problem is not merely a lack of knowledge, but the weakness of knowledge structures in embedding that knowledge into cultural systems that drive sustainable action (Nosrati et al., 2023).

Given these challenges, there is a clear need for systematic research that investigates the epistemological role of knowledge structures in cultural transfer processes. Such research can illuminate how knowledge is organized, validated, communicated, and internalized in ways that foster genuine cultural transformation toward environmental protection. It can also identify barriers that prevent knowledge from becoming culturally embedded, whether these barriers are cognitive, institutional, technological, or political. By addressing these gaps, scholars and practitioners can develop strategies for strengthening knowledge structures as vital instruments of cultural transfer, thereby enhancing the effectiveness of sustainability initiatives at both local and global levels.

In light of the above, the central problem can be summarized as follows: while environmental culture is essential for sustainable development, the role of knowledge structures in facilitating its transfer remains insufficiently understood. Without clarifying this role, sustainability efforts risk failing to achieve their intended cultural impact. Therefore, this study seeks to address the guiding research question:

"What is the role of knowledge structures in transferring the culture of environmental protection towards sustainable development?"

2. Literature Review

Due to the importance of the research topic, studies have been conducted that are different in approach from the current study or have been conducted with a limited purpose, as we have mentioned a few examples in the table below:

Table 1. *Research literature review*

Research Methodology	Researcher Name	Research Results
The Role of the Constitutional Supervisory Body in Environmental Protection within the Framework of Article 50 of the Constitution of the Islamic Republic of Iran	Mohammadipour and Mashhadi (2025)	It seems that, given the country's developing conditions and the priority of economic issues, the Guardian Council should have a balanced view of Principle 50 and the issue of environmental protection, which may be better, due to the importance of the environmental aspect in sustainable development, to pay more special attention to this principle and activate its capacity to the maximum.
Environmental Justice Scenarios and Sustainable Development Goals (Case Study: Kashan County)	Khorasani and Niazi (2023)	These drivers, in order of priority, are environmental education, green economy, green participation, clean energy, green technology, environmental culture, sustainable agriculture, environmental rights, the right to nature and urban planning that is appropriate to the environment.
The Impact of Globalization Dimensions on Economic Growth and Environmental Quality in Iran	Farhang et al. (2023)	The findings of this study indicate that in order to improve environmental quality and achieve sustainable development, policymakers should pay attention to reducing the negative impacts of globalization on the environment and adopt strategies to reduce CO2 emissions

Research Methodology	Researcher Name	Research Results
		in formulating policies.
Sociological Analysis of Environmental Protection Behavior	Imamgholi et al. (2022)	The results of the study regarding the similarities between the two regions can be pointed out in their perceptions of the ability to influence environmental outcomes. Residents of the cities of Sanandaj and Sulaymaniyah have equal self-efficacy in the extent of influence on environmental protection behavior.
Socio-Economic and Environmental Effects of Renewable Energy Deployment	Virah-Sawmy and Stromberg (2025)	A review of environmental impacts shows that studies of renewable energy deployment usually focus on negative local impacts and positive global benefits, such as climate change mitigation, remain implicit.
The Importance of Culture for Social Sustainability - Discussion of Cultural Security and Insecurity in Neighborhoods	Anderson et al. (2025)	To understand such preferences, the concepts of cultural security and cultural insecurity are useful. People's interest in "culture" may challenge policymakers' perspectives on sustainable urban development.
A Comparative Study of Global Environmental Policies to Promote Sustainable Development and Economic Growth	Adanma and Ogunbeyi (2024)	Key findings indicate that both regulatory-based and market-based environmental policies have a significant impact on sustainable development and economic growth.
Promoting Sustainable Development through Strategies, Environmental Management Accounting, and Environmental Performance	Appannan et al. (2023)	The results of structural equation modeling analysis showed that environmental management accounting mediates the effects of pollution prevention strategies and clean technologies on environmental performance, but does not mediate the effect of process management strategy.
A Study on the Impact of Media Use on Environmental Protection Behavior	Hao et al. (2023)	The structural equation modeling analysis reveals that media use has a significant effect on students' environmental protection awareness and environmental protection intention, while media use does not have a significant direct effect on their environmental protection behaviors.
Strategies and Challenges of Sustainable Development in Eurasia	Obydenkova (2022)	This study seeks to create a better dialogue between different bodies of literature in the fields of regional studies, environmental policy, and international relations to improve our understanding of the barriers to sustainable development in Eurasia.

3. Method

The present study is applied-developmental in terms of its purpose and descriptive-survey in terms of its method. The approach used in this study is a mixed exploratory approach that is a combination of qualitative and quantitative methods. Interviews and questionnaires are used to answer the research questions. Considering the development of the research need to discover the variables in the research in order to design the model, the inductive method was used. In the present study, due to the use of the interview tool, the purposive sampling method was used. This stage involved the use of qualitative methods and its results were used as the basis for the next stage. In the second stage, the identified model was tested using theme analysis and its validity was determined using confirmatory factor analysis and AMOS software. This stage involved the use of quantitative methods.

Research Area: In the literature review stage, articles, books, theses, etc. related to the research topic were considered to identify indicators. And in the interview stage, university professors and managers in the field of environmental expertise, officials of environmental organizations, municipalities and NGOs were used as participants (a total of 12 people).

Sampling method and sample size: In this study, the purposive sampling method (non-probability) was used using the strategy of combining multiple purposive methods. In this way, the selection of samples is done until there is no newer information or new features. A total of 12 interviews were conducted to identify concepts. In the second stage, the purposive sampling method was used to determine the validity of the model and use confirmatory factor analysis. The number of samples in this stage was 384 people.

Research Objectives

1. Investigating the causal conditions affecting the cultural model of environmental protection with a sustainable development approach
2. Strategically investigating the explanation of a model for a cultural model of environmental protection with a sustainable development approach

3.Investigating the intervening factors affecting the explanation of a model for a cultural model of environmental protection with a sustainable development approach

4.Investigating the contextual factors affecting the explanation of the cultural model of environmental protection with a sustainable development approach

5.Investigating the consequences affecting the explanation of a model for a cultural model of environmental protection with a sustainable development approach

4. Findings

In order to answer the research question "How is the design and explanation of a cultural model for environmental protection with a sustainable development approach?", the open and axial coding of each of the sections of the contextual model are given below.

Causal Conditions

Causal conditions of the cultural model of environmental protection: Causal conditions are categories that influence the central category. Based on the interviews conducted, the central codes of "ecological necessity, social and economic necessity, moral and political necessity" were identified and linked to another broader selected code called causal conditions. The participants in the study stated that conditions are involved in the cultural model of environmental protection with a sustainable development approach, as shown in Table 2.

Table 2. *Axial coding of qualitative data (causal conditions)*

Axial coding	Secondary coding	Open coding
Ecological imperative	Environmental care	Biodiversity collapse
		Protecting ecosystems to prevent species extinction
		Climate change mitigation
		Cultural changes Carbon reduction
		Preventing soil erosion through sustainable agricultural traditions
		Cultural norms Reducing greenhouse gas emissions
		Reducing resources through circular economy traditions
	Need for behavior change	Behavior change in marine conservation
		Plastic waste epidemic
		Culture change in single-use plastic usage
		Indigenous methods of water conservation
		Cultural respect for forests
Social and economic imperative	Social and human well-being	Protecting public health
		Food security
		Environmental justice
		Moral duty to future generations
		Community resilience
	Economic sustainability	Green job creation
		Cost savings
		Supporting sustainable cultures of small-scale producers
		Market stability
		Cultural pressure for ethical business practices
		Avoiding environmental debt
		Promoting ethical consumerism
		Environmental tax policies
		Green investment funds
		Green procurement policies
		Traditional methods of food production sustainability
		Reducing waste Economic burden
Ethical and political imperatives	Cultural and ethical imperatives	Duty Ethics for protecting the land
		Protecting cultural landscapes
		Respect for life
		Shared cultural values
		Environmental certification standards
		Aesthetic preservation
	Sovereignty and policy empowerment	Disaster preparedness
		Cultural protection Environmental laws
		Integrating urban planning
		Cultural needs of green cities
		Anti-consumerism regulations
		Carbon pricing/taxation
		Environmental impact assessment
		Biodiversity protection laws
		Renewable energy subsidies
	Resource protection	Soil restoration techniques

Axial coding	Secondary coding	Open coding
	and management	Water-saving technologies
		Invasive species control
		Water economy strategies

Contextual Conditions

Contextual conditions of the cultural model of environmental protection:

Context is a set of specific characteristics that indicate the phenomenon in question, that is, the location of events and incidents related to the phenomenon. Context indicates a set of specific conditions in which action and response strategies take place. The set of contextual elements in the cultural model of environmental protection with a sustainable development approach includes "culture of sustainability, governance and social leadership", which is given in Table 3.

Table 3. *Axial coding of qualitative data (contextual conditions)*

Core coding	Secondary coding	Open coding
Culture of sustainability	Beliefs and worldview	Understanding animal behavior as a warning
		Myths about nature
		Anthropocentrism versus ecocentrism
		Community-based conservation versus personal freedom
		Justice and equity in resource use
		Voluntary simplicity
		Respect for the ecological wisdom of elders
		Ethical consumerism
		Preference for fair trade organic or local goods
	Social norms and behaviors	Nature-related festivals and rituals
		Adaptation to green trends
		Following environmental movements or resisting change
		Trust in data versus traditional beliefs
		Indigenous practices in conservation.
		Promoting conservation folklore
	Environmental culture awareness	Digital literacy on green issues
		E-waste recycling culture
		Intergenerational knowledge transfer
		Educating elders to youth about nature
Social governance and leadership	Social responsibility of leaders	Cultural attitudes towards politics
		Trust in government regulations
		Pressuring corporations for social responsibility
		Legal recognition of conservation efforts
		Supporting small farms against imported goods
		Supporting compliance with environmental laws
		Clergy support for sustainability
	Cultural exchange	Cultural diplomacy on climate change
		Developing cultural symbols of sustainability
		Adopting a circular economy
		Green advertising and branding
		Environmental tourism and cultural heritage
		Cultural aesthetics in green design
		Eco-art and environmental messaging
		Public visual protests for climate action
	Cultural participation	Public acceptance of green fees
		Support for community-owned renewable energy projects
		Cultural notions of wealth
		Cooperative business models
		Cultural openness to green technology
		Learning from nature in architecture/engineering
		Cultural mourning for extinction
		Cultural readiness for use Reuse/Recycle
		A comedy shaping public opinion on green issues

Intervening Conditions

Intervening conditions of the cultural model of environmental protection: Structural conditions belong to a phenomenon and affect action and response strategies. They facilitate strategies within a specific context or limit and constrain them. The participants suggest that cognitive and attitudinal factors, socio-cultural norms and values, political and economic factors, infrastructural and informational factors, individual and social factors are among the intervening conditions of the cultural model of environmental

protection with a sustainable development approach, which is presented in Table 4.

Table 4. *Axial coding of qualitative data (intervening conditions)*

Axial coding	Secondary coding	Open coding
Cognitive and attitudinal factors	Environmental awareness	Severity of perceived environmental threats
		Belief in human-nature interdependence
		Trust in scientific consensus
		Personal responsibility for nature
	Environmental attitude	Optimism for sustainability solutions
		Fear of ecological collapse
		Cultural despotism versus agency
		Value of future generations' well-being
		Moral commitment to environmental conservation
Socio-cultural norms and values	Socio-cultural values	Collective versus individualistic resource use
		Religious/spiritual views on nature
		Traditional ecological knowledge
		Cultural taboos against environmental damage
		Environmental superstitions and symbols
		Valuing wealth accumulation versus sustainable living
		Social stigma for unsustainable behavior
		Generational transmission of environmental values
	Socio-cultural norms	Gender norms in environmental care
		Social stigma for overconsumption
		Community-based conservation norms
		Influence of celebrities/influencers on green trends
		Cultural narratives of progress versus sustainability
Political and economic factors	Economic and structural influences	Affordability of sustainable products
		Availability of green jobs
		Government subsidies for environmentally friendly practices
		Cost of renewable resources Inevitable
		Rejection of mass production for handicrafts
		Market demand for sustainable goods
		Consumerism versus minimalism
		Economic inequality and access to green technology
	Political and institutional factors	Power of environmental policies
		Corruption in environmental governance
		Lobbying by fossil fuel industries
		Transparency in environmental data
		Role of environmental NGOs
		Public participation in policymaking
Infrastructural and informational factors	Technological and infrastructural factors	Availability of renewable energy technology
		Waste management systems
		Public transportation infrastructure
		Suspicion of new sustainable technologies
		Agricultural sustainability innovations
		Energy efficiency in industries
		E-waste recycling mechanisms
		Green building standards
		Digital tools for environmental education
	Educational and informational factors	Environmental education in schools
		Media coverage of climate issues
		Public access to sustainability research
		Impact of social media activity
Individual and social factors	Behavioral and lifestyle factors	Adoption of plant-based diets
		Use of reusable products
		Desirability of reducing car use
		Work-life balance and consumption
		Participation in recycling programs
		Food culture and waste habits
		Energy saving behaviors in Home
		Supporting local/organic agriculture
		Social sanctions against pollutants
		Water conservation habits
	Social dynamics and society	The power of environmental movements
		Peer pressure to move towards sustainability
		Manipulating environmental perceptions by brands
		Social cohesion in response to the crisis
		The conflict between development and conservation
		Urban versus rural environmental priorities

Strategies

Strategies of the Cultural Model of Environmental Protection: Strategies are based on actions and reactions to control, manage and feedback the phenomenon under study. Strategies are purposeful and are carried out for a reason. The strategies of this research include radical cultural changes and behavioral innovation, sustainability strategies, which are stated in Table 5.

Table 5. *Axial coding of qualitative data (strategic conditions)*

Axial coding	Secondary coding	Open coding
Radical cultural changes and behavioral innovation	Cultural and behavioral change	Integrating environmental stewardship into religious teachings
		Using folklore and oral traditions to convey sustainability lessons
		Supporting cultural events celebrating nature
		Post-consumer festivals
		Creating debate clubs
		Green film productions with zero-waste sets
		Adapting sustainability advice to cultural habits
		Highlighting local environmental champions
		Culinary revival of forgotten products
		Reinforcing traditional prohibitions on harming nature
		Strengthening psychological programs focused on climate grief
		Gaming learning for environmental crises
	Science fiction-level green technology and innovation	Autonomous air purifiers in megacities.
		Green Influencer Partnerships
		Floating Solar Panels on Water Canals
		Self-healing Structures That Grow Like Trees
		Mushroom-Based Blockchain for Sustainable Computing
		Digital Entertainment for Educational Zoos
	Next-generation economic and livelihood models	Monetizing Sustainable Content
		Regulating Real-Time Taxes Based on Air Quality
		Stock Markets and Investing in Sustainable Companies
		Controlling Underground Trade in Banned Unsustainable Goods with Environmental Taxes
Sustainable strategies	Green economic engineering	Local Lending Centers for Tools, Equipment to Reduce Ownership
		Free Tools and Training in Parks
		3D Printing with Biodegradable Materials
		Strict Penalties for Violating Eco-Cultural Norms
		Monthly Road Closures for Bike Rides, Markets, and Street Shows
		Environmental Permits for Large Events
		Variable Air Quality Murals
		Surcharges for Disposable Clothing
		Fines for Loud Vehicles
	Intergenerational-intergenerational strategies	Changing the Role of Students in Workshops to Executives
		Eco-Friendly Podcasts For Kids
		Entry of "Environmental Proverbs" in the Original Language
		Interactive Exhibits That Show the Life Cycle of Waste and How to Fix It
		Environmentally Themed Sports Leagues
	Economic incentives	Solar-Powered Phone Chargers in Parks
		Water ATMs
		Clothes Made from Free Recycled Plastic
		Environmental Debt Forgiveness
		Paid Leave for Employees to Work on Green Projects
		Riding an All-Electric Fleet and Cheap Carbon Reduction
		Zero-Waste Bulk Stores

Consequences

Consequences of the Cultural Model of Environmental Protection: The results that emerge from strategies. Consequences are the results and outcomes of actions and reactions. Consequences cannot always be predicted and are not necessarily what individuals intended. Consequences may be incidents and events, may take a negative form, may be real or implied, and may occur in the present or future. It is also possible that what is considered a consequence at one point in time may become part of the conditions and factors at another time. The consequences of this research include environmental consequences, socio-political consequences, which are stated in Table 6.

Table 6. *Axial coding of qualitative data (consequences)*

Axial coding	Secondary coding	Open coding
Environmental consequences	Conserving biodiversity through culturally rooted conservation practices	Reduced deforestation
		Cleaner waterways due to cultural taboos against pollution
		Soil restoration through traditional agricultural methods
		Less plastic waste due to revival of traditional packaging
		Increased green spaces in urban areas as cultural symbols
		Reduced overfishing through community-based seasonal bans
		Wildlife corridors under land management protection
		Desertification through old water harvesting techniques
	Environmental change	Changes in diets
		Improved labor rights in green industries
		Ethical consumption
		Slowing climate change
Sociopolitical consequences	Governance and policy implications	Stronger environmental regulations influenced by cultural values
		Reduced corporate lobbying against environmental regulations
		Growth of ecotourism centered on cultural heritage
		Local food systems as alternatives to industrial agriculture
		Reduced reliance on imports due to revival of domestic production
	Social and behavioral implications	Stronger social bonds through shared environmental goals
		Youth participation through eco-cultural activities
		Pride in heritage related to sustainability
		Reduced environmental anxiety due to action Tangible
		Healthier lifestyles from organic diets
		More interdisciplinary research
		Critical thinking skills through cultural exchange discussions
		Trade agreements in favor of eco-cultural goods
		Cultural-ecological alliances
		Reducing consumerism
		Intergenerational collaboration

From among the identified factors, a selective coding paradigm was carried out, and based on it, a linear relationship between the secondary code and the research's central code was determined, including causal conditions, contextual conditions, intervening conditions, strategies, and consequences. Figure 1 shows the coding paradigm, in other words, the qualitative research process model.

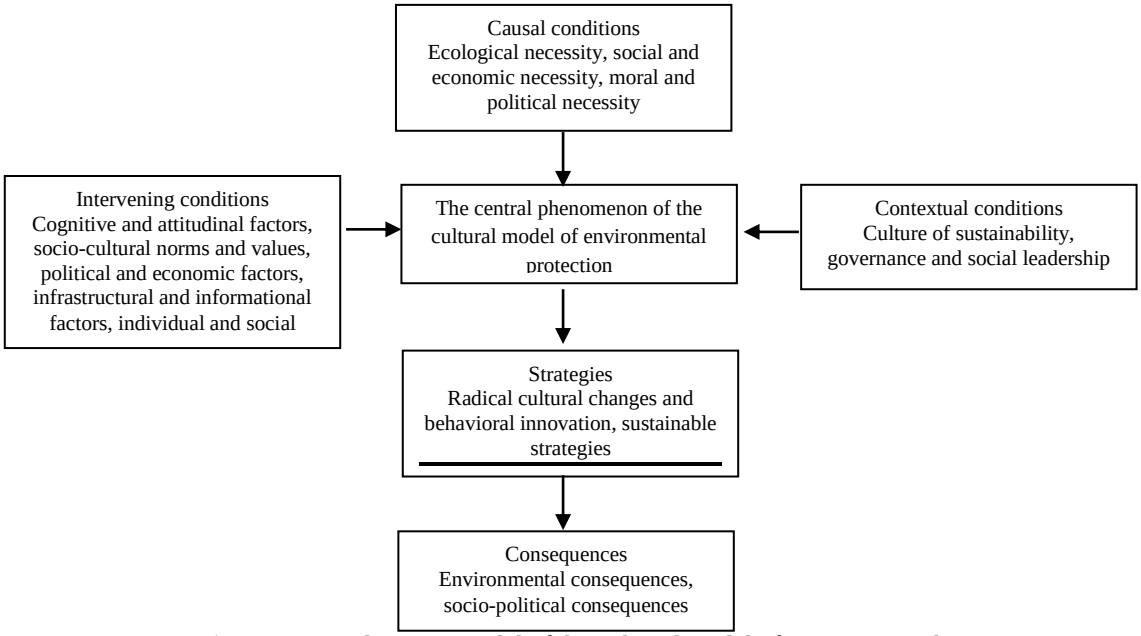

Figure 1. *Paradigmatic model of the cultural model of environmental protection*

In the second stage of the research, based on a questionnaire designed and using the confirmatory factor analysis method, the designed model was validated. Before addressing this section, a summary of descriptive statistics is presented as follows:

H.: The distribution of data related to the variables is normal

H1: The distribution of data related to the variables is not normal.

Table 7. *Data normality test*

Test result	Significance level	Kolmogorov-Smirnov statistic	Variables
Normal	0.109	1.367	Causal Conditions
Normal	0.157	0.978	Contextual Conditions
Normal	0.156	1.113	Intervening Conditions
Normal	0.132	1.243	Strategies
Normal	0.134	1.165	Consequences

Based on the results of the Kolmogorov-Smirnov test, in all cases a significant value greater than the error level (0.05) has been obtained. Therefore, there is no reason to reject the null hypothesis and the data distribution is normal.

Examining the Significance of the Cultural Model of Environmental Protection

After confirming the factor structure of the research constructs, structural equation modeling was used to examine the relationships between the variables. Structural equations were used to test the research hypotheses.

A structural equation model is a specific causal structure between a set of unobservable constructs.

A structural equation model consists of two components: a structural model that specifies the causal structure between latent variables and a measurement model that defines the relationships between latent variables and observed variables.

Using the structural equation model, the relationships between latent variables with each other and the measurement items of each latent variable with the related variable can be examined.

Multivariate theoretical models cannot be evaluated in a two-variable manner, which considers only the relationship between one independent variable and one dependent variable at a time. Multivariate analysis refers to a series of analysis methods whose main feature is the simultaneous analysis of K independent variables and n dependent variables.

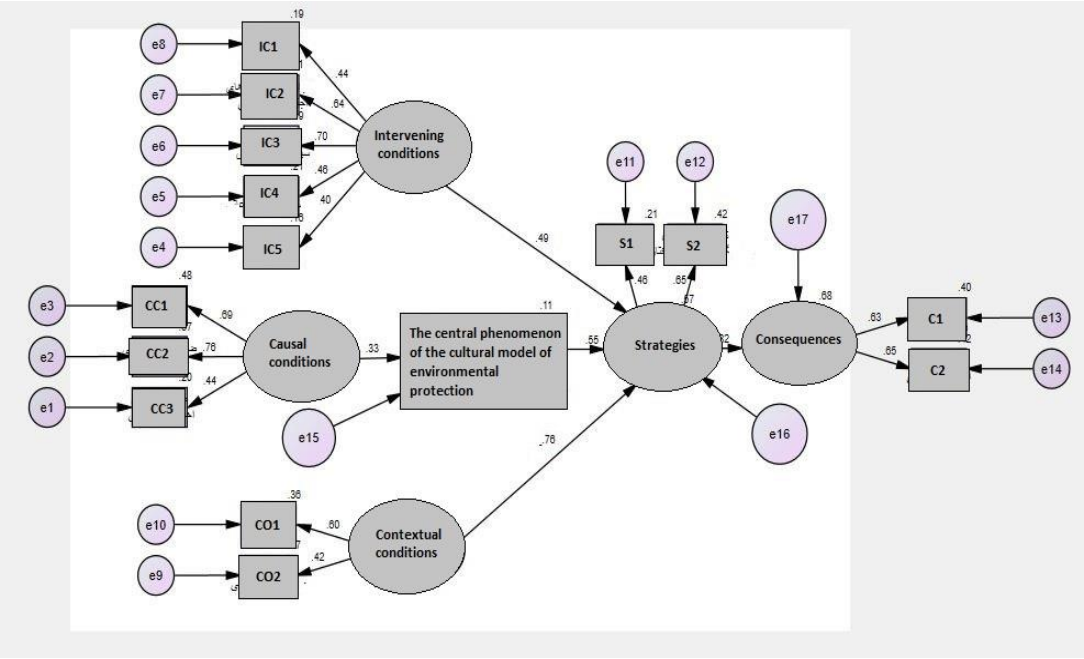

Figure 2. *Structural model being estimated by Amos software*

All factor loadings are above 0.3. To express the acceptability of the model, the Bentler-Bonnet normalized fit indices, relative fit, incremental fit, adaptive indices and perfect square have been used. The results obtained from the model are shown in Table 8.

***Table 8**. Model fit indices*

SRMR	PCFI	PNFI	**PRATIO**	**RFI**	**IFI**	**GFI**	**CFI**	**NFI**	**RMSEA**	**X2/df**	Model
1-3	Acceptable Rate	0.8<	0.09<	0.9<	0.9<	0.9<	0.9<	0.9<	0.1>	1-3	Acceptable Rate
1.33	Calculated	0.90	0.16	0.98	0.95	0.95	0.99	0.98	0.065	1.33	Calculated

The following is an examination of the impact of the identified factors on each other:

***Table 9.** Examination of the impact of the identified factors of the data-based model on each other*

Hypothesis	**t-statistic**	**Path coefficient**	**Hypothesis Result**
Causal factors on the main category	5.254	0.33	0.000
Contextual factors on strategies	6.113	0.76	0.000
Intervening factors on strategies	5.110	0.49	0.000
Main category on strategies	5.143	0.55	0.000
Strategies on outcomes	6.354	0.82	0.000

According to the table, the factors identified in the data-based model have influenced each other. The factor loading of causal factors on the main category is 0.33 and its T-statistic is 5.254, the factor loading of contextual factors on strategies is 0.76 and its T-statistic is 6.113. The factor loading of interfering factors on strategies is 0.49 and its T-statistic is 5.110. The factor loading of the main category on strategies is 0.55 and its T-statistic is 143.5. Finally, the factor loading of strategies on outcomes is 0.82 and its T-statistic is 6.354. Therefore, it can be said that the research model is approved.

5. Discussion

The present study designs and explains a cultural model for environmental protection with a sustainable development approach and examines the causal, contextual, interfering conditions, strategies, and outcomes of this model. In the causal conditions section, categories such as ecological, social and economic necessity, and ethical and political imperatives have been identified. These conditions clearly indicate the need to care for the environment and change behavior in protecting natural resources. In the contextual conditions section, the culture of sustainability and social governance have been identified as the main platforms, which include beliefs, norms, and social behaviors related to the environment. These conditions indicate the importance of cultural awareness and social responsibility in protecting the environment. Intervening conditions include cognitive and attitudinal factors, socio-cultural norms and values, and political and economic factors that affect action and response strategies. These factors clearly indicate the impact of individual and social attitudes on environmental behaviors. Finally, the model strategies include radical cultural changes, behavioral innovation, and sustainability strategies that aim to create positive changes in environmental behaviors and promote a culture of sustainability. The implications of this model include biodiversity conservation, positive environmental change, and socio-political consequences that lead to stronger environmental laws and stronger social bonds. Overall, this research shows that designing a cultural model for environmental protection requires attention to causal, contextual, and intervening conditions and can help create a sustainable and environmentally responsible society. Research shows that governance and social leadership play an important role in ensuring environmental sustainability.

Anderson et al. (2025) point to the importance of culture and cultural security in sustainable development and emphasize the need to pay attention to the opinions and needs of the community.

Also, Obydenkova (2022) points to the need for dialogue and collaboration between different literatures to better understand the challenges of sustainable development.

This alignment shows that effective governance and social leadership can help strengthen environmental actions and achieve sustainable development. Research emphasizes the importance of appropriate infrastructure and access to information in the field of environmental protection.

Saumi and Stromberg (2025) point out the socio-economic impacts of renewable energy deployment and emphasize the need to pay attention to the necessary infrastructure for this type of energy.

Also, Appanan et al. (2023) point out the role of environmental management accounting in improving environmental performance, which indicates the need for appropriate information infrastructure. This alignment shows that the existence of appropriate infrastructure and access to information can act as facilitating factors in environmental protection. Various studies emphasize the economic and political impacts in the field of environmental protection.

Mohammadipour & Mashhadi (2024) point out the importance of environmental laws and the role of regulatory institutions in environmental protection. Also, Adanma and Ogunbeyi (2024) show that regulatory and market-based environmental policies have a significant impact on sustainable development.

This alignment shows that strengthening environmental policies and paying attention to economic impacts can help improve the state of the environment and achieve sustainable development.

Hao et al. (2023) examined the impact of the media on awareness of environmental protection and showed that the media can help increase awareness and change attitudes. Also, ImamGholi et al. (2022) point to residents' perception of the ability to influence environmental outcomes, which indicates the importance of individual attitudes in environmental behaviors. This alignment shows that awareness and positive attitudes can act as intervening factors in changing environmental behaviors. Also, Khorasani and Niazi (2023) emphasize the importance of environmental education and green participation, which are somehow related to the need for behavior change. After designing the questionnaire, the desired model was validated using confirmatory factor analysis. After confirming the factor structure, structural equation modeling was used to examine the relationships between variables.

This model consists of two parts: a structural model that specifies the causal relationships between latent variables and a measurement model that defines the relationships between latent and observed variables. Using this model, we can examine the relationships between latent variables and the measurement items of each variable. The results of the model fit indices show that all factor loadings are higher than 0.3 and the model is statistically acceptable. Finally, examining the effects of the identified factors on each other shows that all hypotheses have been confirmed and the research model has been validated.

6. Conclusion

The urgency of global environmental crises has made it increasingly clear that technological solutions and regulatory frameworks alone cannot guarantee sustainability. What is required is a deep cultural transformation that embeds environmental protection into the everyday practices, values, and worldviews of societies. In this regard, knowledge structures emerge as the critical mediating systems that determine how environmental culture is generated, validated, transmitted, and sustained. They serve as the scaffolding through which information becomes shared meaning, scientific insights are transformed into social norms, and cultural values are transmitted across generations. Understanding their role is therefore not merely an academic endeavor but a practical necessity for achieving sustainable development.

This study has highlighted that knowledge structures are multidimensional, encompassing formal education systems, informal community networks, media channels, digital technologies, and indigenous knowledge traditions. Each of these dimensions contributes uniquely to the transfer of environmental culture, yet their effectiveness depends on how they are integrated and aligned with broader social and cultural contexts. Fragmentation, epistemic inequality, and the marginalization of local knowledge often weaken the potential of knowledge structures, leaving

gaps in cultural transfer. Conversely, when these structures are designed inclusively and systemically, they can act as powerful engines of transformation, ensuring that environmental culture becomes embedded in the social fabric of sustainable societies.

A key conclusion is that knowledge transfer is not a linear process of information dissemination but a dynamic process of translation, negotiation, and adaptation. Environmental knowledge must resonate with existing cultural frameworks, values, and emotions to become meaningful and actionable. This requires knowledge structures that are flexible, context-sensitive, and dialogical—capable of bridging global sustainability discourses with local traditions, integrating scientific knowledge with cultural narratives, and connecting generational experiences with emerging digital literacies. Only through such integrative approaches can environmental culture achieve the durability and legitimacy needed to guide long-term sustainable development.

Another significant insight concerns the role of inclusivity and democratization within knowledge structures. Power relations shape whose knowledge is recognized and whose voices are marginalized. By valuing diverse epistemologies—including indigenous wisdom, community practices, and emotional experiences—knowledge structures can foster a richer and more resilient environmental culture. Such inclusivity not only strengthens the legitimacy of sustainability initiatives but also provides practical solutions that are grounded in lived realities. Therefore, the effectiveness of knowledge structures depends not only on their capacity to disseminate information but also on their ability to create spaces for dialogue, collaboration, and mutual learning.

The conclusion also underscores the importance of systemic design. Compartmentalized or siloed knowledge structures limit the transformative potential of environmental culture, as they fail to capture the interconnectedness of ecological, social, and economic dimensions of sustainability. In contrast, systemic knowledge structures—those that promote interdisciplinary education, cross-sector collaboration, and holistic communication—can generate integrative cultural narratives that align environmental protection with broader aspirations for equity, justice, and prosperity. Designing such systemic structures is thus an essential step in embedding sustainability as both a cultural and developmental paradigm.

Ultimately, the central argument is that sustainability is not merely about achieving ecological balance but about cultivating cultural systems that continuously reproduce and strengthen environmental values. Knowledge structures are the vehicles through which this cultural cultivation occurs. Strengthening them requires attention to inclusivity, adaptability, emotional resonance, systemic integration, and intergenerational continuity. By advancing knowledge structures that embody these qualities, societies can create the conditions for environmental culture to flourish, thereby advancing sustainable development not as an abstract policy goal but as a lived cultural reality.

In conclusion, this study reaffirms that the cultural dimension of sustainability is inseparable from the epistemological foundations of knowledge transfer. It calls for a deeper recognition of knowledge structures as vital mediators in this process, shaping how societies internalize and act upon the imperative of environmental protection. Future research and policy must therefore focus on designing, strengthening, and democratizing these structures to ensure that environmental culture is effectively transferred and sustained across generations and communities. Only then can the vision of sustainable development move beyond rhetoric and become a collective way of life.

Recommendations

1. Develop comprehensive educational programs

Design and implement educational programs in schools and universities to increase public awareness of environmental issues and promote sustainable behaviors.

2. Strengthen inter-agency cooperation

Establish and strengthen cooperation between government, non-governmental, and

local organizations to exchange information and resources on environmental protection.

3. Develop supportive policies

Design and implement supportive policies for local producers and green businesses, including subsidies and tax exemptions.

4. Promote a culture of ethical consumption

Launch public campaigns to promote ethical and sustainable consumption, emphasizing the importance of choosing sustainable products and supporting local producers.

5. Prospective research

Conduct further research on the long-term effects of cultural models on environmental protection and identify successful models and existing challenges.

6. Creating environmental social networks

Setting up online platforms to exchange experiences and ideas in the field of environmental protection and encouraging public participation.

7. Developing green technologies

Supporting innovation and development of green technologies in order to reduce negative impacts on the environment and promote sustainability.

8. Encouraging local participation

Creating opportunities for local communities to participate in environmental protection projects and promoting sustainable lifestyles.

9. Developing environmental standards

Developing and implementing environmental standards for industries and organizations in order to reduce negative impacts on the environment.

10. Forming local advisory committees

Establishing advisory committees consisting of representatives of local communities, experts and environmental activists to review and propose effective solutions for environmental protection.

These suggestions can help design and explain an effective cultural model for environmental protection with a sustainable development approach and lead to the creation of an environmentally aware and responsible society.

Acknowledgements

Finally, I would like to thank and appreciate all those who participated in the research and were interviewed.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

Adanma, U. M., & Ogunbiyi, E. O. (2024). A comparative review of global environmental policies for promoting sustainable development and economic growth. *International Journal of Applied Research in Social Sciences*, *6*(5), 954-977.

Andersen, B., Skrede, J., & Grevstad-Nordbrock, T. (2025). The significance of culture for social sustainability–a discussion of cultural security and insecurity in neighbourhoods. *Local Environment*, *30*(1), 1-15.

Appannan, J. S., Mohd Said, R., Ong, T. S., & Senik, R. (2023). Promoting sustainable development through strategies, environmental management accounting and environmental performance. *Business Strategy and the Environment*, *32*(4), 1914-1930.

Armaghan, S. (2018). Strategies to increase public participation in improving the environmental indicators of rural areas (Case study: Mallard Central District villages). *Journal of New Attitudes in Human Geography*, 10(2), 131-150.

Arthington, A. H., Bhaduri, A., Bunn, S. E., Jackson, S. E., Tharme, R. E., Tickner, D., ... & Ward, S. (2018). The Brisbane declaration and global action agenda on environmental flows (2018). *Frontiers in Environmental Science*, *6*, 45.

Botkin, D., & Edward, K. (2015). *Environmental Knowledge, Living Planet Earth*, translated by Abdul Hossein Vahabzadeh, Mashhad, University of Mashhad Academic Press, third edition.

Dabiri, F., Shakeri, M. R., & Bani Mahmoudi, H. (2019). Analysis of the concept of sustainable development in international environmental law. *Comparative Law Researches*, 23(2), 809-832.

Farhang, A., Kianpour, S., & Shamsollahi, R. (2023). The Impact of Globalization Dimensions on Economic Growth and Environmental Quality in Iran. *Economics and Modeling*, 15(2), 149-182. [In Persian]

Green, K. W., Inman, R. A., Sower, V. E., & Zelbst, P. J. (2019). Impact of JIT, TQM and green supply chain practices on environmental sustainability. *Journal of manufacturing technology management*, *30*(1), 26-47.

Hao, Y., Yasin, M. A. I., & Boon Sim, N. (2023). A study on the influence of media use on college students' environmental protection behaviors. *Management of Environmental Quality: An International Journal*, *34*(1), 177-191.

Heyd, T. (2016). *Encountering nature: Toward an environmental culture*. Routledge.

Holmberg, J., & Sandbrook, R. (2019). Sustainable development: what is to be done?. In *Policies for a small planet* (pp. 19-38). Routledge.

Imamgholi, L., Salehi, S., Rezaei, A., and Feizi, A. (2023). Sociological Analysis of Environmental Protection Behavior. Sociological Studies, 16(60), 143-163. [In Persian]

Kang, J., Aletta, F., Gjestland, T. T., Brown, L. A., Botteldooren, D., Schulte-Fortkamp, B., ... & Lavia, L. (2016). Ten questions on the soundscapes of the built environment. *Building and environment*, *108*, 284-294.

Khorasani, M., & Niazi, M. (2023). Scenarios of Environmental Justice and Sustainable Development Goals (Case Study: Kashan County). *Sociology of Culture and Art, forthcoming*. [In Persian]

Koul, B., Yakoob, M., & Shah, M. P. (2022). Agricultural waste management strategies for environmental sustainability. *Environmental Research*, *206*, 112285.

Kour, D., Kaur, T., Devi, R., Yadav, A., Singh, M., Joshi, D., ... & Saxena, A. K. (2021). Beneficial microbiomes for bioremediation of diverse contaminated environments for environmental sustainability: present status and future challenges. *Environmental Science and Pollution Research*, *28*, 24917-24939.

Lange, F., & Dewitte, S. (2022). The Work for Environmental Protection Task: A consequential web-based procedure for studying pro-environmental behavior. *Behavior Research Methods*, *54*(1), 133-145.

Liu, P., Teng, M., & Han, C. (2020). How does environmental knowledge translate into pro-environmental behaviors?: The mediating role of environmental attitudes and behavioral intentions. *Science of the total environment*, *728*, 138126.

Mohammadipour, M., & Mashhadi, A. (2024). The Role of the Constitutional Supervisory Body in Environmental Protection within the Framework of Article Fifty of the Constitution of the Islamic Republic of Iran. *Public Law Research, forthcoming*. [In Persian]

Mohammed, M. K. (2024). Environmental crises and narrative consciousness in Maja Lunde's the History of Bees. *Social Sciences & Humanities Open*, *9*, 100763.

Mousavi, M., Boroumand, A., & Tabatabaei Yazdi, F. (2015). Studying the impact of rural women empowerment on achieving sustainable development and environmental protection (a synthesis study). *Geography and Environmental Hazards, ready for publication*. [In Persian]

Nosrati, S., Kim, S. S., & Leung, J. (2023). Moderating effects of cultural values on the relationship between individual values and pro-environmental behavior. *Journal of Hospitality and Tourism Management*, *57*, 158-169.

Obydenkova, A. (2022). Strategies and challenges of sustainable development in Eurasia. *Post-Communist Economies*, *34*(7), 835-846.

Ozili, P. K., & Iorember, P. T. (2024). Financial stability and sustainable development. *International Journal of Finance & Economics*, *29*(3), 2620-2646.

Ruggerio, C. A. (2021). Sustainability and sustainable development: A review of principles and definitions. *Science of the Total Environment*, *786*, 147481.

Sekhar, S. J., Samuel, M. S., Glivin, G., Le, T. G., & Mathimani, T. (2024). Production and utilization of green ammonia for decarbonizing the energy sector with a discrete focus on Sustainable

Development Goals and environmental impact and technical hurdles. *Fuel*, *360*, 130626.

Silvestre, B. S., & Ţîrcă, D. M. (2019). Innovations for sustainable development: Moving toward a sustainable future. *Journal of cleaner production*, *208*, 325-332.

Su, F., Song, N., Shang, H., Wang, J., & Xue, B. (2021). Effects of social capital, risk perception and awareness on environmental protection behavior. *Ecosystem Health and Sustainability*, *7*(1), 1942996.

Tomislav, K. (2018). The concept of sustainable development: From its beginning to the contemporary issues. *Zagreb International Review of Economics & Business*, *21*(1), 67-94.

Virah-Sawmy, D., & Sturmberg, B. (2025). Socio-economic and environmental impacts of renewable energy deployments: A review. *Renewable and Sustainable Energy Reviews*, *207*, 114956.