

УДК 339.97

<http://doi.org/10.35854/1998-1627-2025-2-160-170>

Modeling the management of organizational projects in the field of environmental sustainability: Methodological approaches and comparative analysis of the experience of Iran and Turkey

Niloufar Mahmoudi

*Peoples' Friendship University of Russia named after Patrice Lumumba, Moscow, Russia,
niloofarmahmoudi@ymail.com, <https://orcid.org/0000-0002-8229-4852>*

Abstract

Aim. The work aimed to assess the management effectiveness of organizational projects in the field of environmental sustainability in Iran and Turkey, as well as to develop methodological approaches that combine policy mechanisms, financial incentives, and public participation to optimize the implementation of sustainable development initiatives.

Objectives. The work seeks to identify the key indicators of sustainable development; conduct a comparative analysis of national strategies; and characterize the use of structural modeling (SEM) to assess the effectiveness of policies.

Methods. The work employed structural modeling (SEM), comparative and correlation analysis, as well as statistical data processing. The information was collected from government reports, international environmental organizations and expert surveys. The analysis was performed using the SPSS and AMOS software packages to model the interdependencies between sustainable development factors.

Results. The analysis performed in the course of the study enables to conclude that Turkey demonstrates a more structured and proactive approach to sustainable development, especially in the field of implementation of renewable energy sources and digital management technologies. However, Iran faces challenges due to limited financial support and disadvantages in enforcement practices. The SEM analysis confirms the importance of an integrated sustainable development model and reveals that successful outcomes depend on a balanced combination of policy regulation, financial mechanisms, and public participation strategies.

Conclusions. Strengthening regulatory frameworks, integrating digital technologies into environmental management, and expanding alternative financing mechanisms such as green bonds are required to improve the effectiveness of sustainable development projects in Iran and Turkey. Achieving long-term environmental balance will be possible through the transition to an ecosystem approach and greater private sector participation in sustainable development initiatives.

Keywords: *sustainable development management, environmental policy, organizational projects, Iran, Turkey, structural modeling (SEM), resource management, public participation, digital management*

For citation: Mahmoudi Niloufar. Modeling the management of organizational projects in the field of environmental sustainability: Methodological approaches and comparative analysis of the experience of Iran and Turkey. *Ekonomika i upravlenie = Economics and Management*. 2025;31(2):160-170. (In Russ.). <http://doi.org/10.35854/1998-1627-2025-2-160-170>

© Махмуди Нилуфар, 2025

Моделирование управления организационными проектами в области экологической устойчивости: методологические подходы и сравнительный анализ опыта Ирана и Турции

Нилуфар Махмуди

Российский университет дружбы народов имени Патриса Лумумбы (РУДН), Москва, Россия,
niloofarmahmoodi@yml.com, <https://orcid.org/0000-0002-8229-4852>

Аннотация

Цель. Оценка эффективности управления организационными проектами в области экологической устойчивости в Иране и Турции, а также разработка методологических подходов, объединяющих механизмы политики, финансовые стимулы и участие общественности для оптимизации реализации инициатив в области устойчивого развития.

Задачи. Выявление ключевых индикаторов устойчивого развития; проведение сравнительного анализа национальных стратегий; характеристика применения структурного моделирования (SEM) для оценки эффективности политики.

Методы. Автором использованы методы структурного моделирования (SEM), сравнительного и корреляционного анализа, а также статистической обработки данных. Информация собрана из государственных отчетов, международных экологических организаций и экспертных опросов. Анализ проведен с применением программных пакетов SPSS и AMOS для моделирования взаимозависимостей между факторами устойчивого развития.

Результаты. Выполненный в процессе исследования анализ позволяет заключить, что Турция демонстрирует более структурированный и проактивный подход к устойчивому развитию, особенно в области внедрения возобновляемых источников энергии и цифровых технологий управления. Вместе с тем Иран сталкивается с трудностями вследствие ограниченной финансовой поддержки и недостатков в правоприменительной практике. SEM-анализ подтверждает важность комплексной модели устойчивого развития и свидетельствует о том, что успешные результаты зависят от сбалансированного сочетания регулирования политики, финансовых механизмов и стратегий общественного участия.

Выводы. Для повышения эффективности проектов устойчивого развития в Иране и Турции необходимы усиление нормативного регулирования, интеграция цифровых технологий в экологическое управление и расширение альтернативных механизмов финансирования, таких как «зеленые» облигации. Достижение долгосрочного экологического баланса станет возможным при переходе к экосистемному подходу и более активном участии частного сектора в инициативах по устойчивому развитию.

Ключевые слова: управление устойчивым развитием, экологическая политика, организационные проекты, Иран, Турция, структурное моделирование (SEM), управление ресурсами, общественное участие, цифровое управление

Для цитирования: Махмуди Нилуфар. Моделирование управления организационными проектами в области экологической устойчивости: методологические подходы и сравнительный анализ опыта Ирана и Турции // *Экономика и управление*. 2025. Т. 31. № 2. С. 160–170. (На англ.). <http://doi.org/10.35854/1998-1627-2025-2-160-170>

Introduction

The sustainability of urban environments has become a dominant research area due to the profound environmental pressures imposed by escalating urbanization, industrial expansion, and population growth [1]. Urban regions account for over 70 % of worldwide greenhouse gas emissions, a trend that is particularly prominent in fast industrializing countries like Iran and Turkey [2].

Despite differences in political and economic environments, both Iran and Turkey

face similar sustainability challenges, including high fossil fuel dependence, inefficient resource management, inadequate waste disposal systems, and low public engagement in environmental initiatives [3].

Both countries exhibit distinct approaches to sustainability management in the energy sector. Iran heavily relies on fossil fuels, while Turkey has implemented progressive regulations and invested in renewable energy sources such as solar, wind, and marine energy. According to the International Energy Agency (IEA) [4], Iran is one of the world's

major consumers of nonrenewable energy resources, relying heavily on fossil fuels. According to the studies undertaken, Turkey has more progressive regulations regarding fossil fuel extraction than Iran does. With reference to large expenditures in the shift to renewable energies, such as solar, marine, and wind energy [5]. The implementation of these renewable initiatives in Istanbul, one of Turkey's major cities, has established a viable framework for sustainable urban practices that might be applied to Iranian metropolises.

Another critical concern is waste management efficiency, a parameter crucial for assessing a city's sustainability trajectory. Empirical studies indicate that regions that integrate waste-to-energy conversion programs effectively minimize landfill reliance while optimizing economic sustainability [6]. Notably, Turkish municipalities — particularly in Istanbul and Ankara — have successfully developed structured circular economy models, elevating their waste recovery rates to 30 %, whereas Iranian cities, such as Tehran and Mashhad, continue to experience infrastructural deficiencies in recycling initiatives [7].

Beyond waste and energy sectors, water management strategies play a fundamental role in determining the ecological resilience of urban environments. Iran is classified among the world's most water-stressed countries, with recurrent drought conditions imposing substantial strain on urban water supplies [8]. Comparatively, Turkey has adopted a multi-tiered water governance model, integrating desalination technology and large-scale water recycling facilities, positioning itself ahead in this domain [9]. Nevertheless, both countries require policy convergence mechanisms to harmonize municipal, regional, and national sustainability initiatives [10].

This study is dedicated to developing a comprehensive methodological framework that allows for structured sustainability project management, leveraging SEM analysis to provide an empirical evaluation of environmental policies. By focusing on a comparative assessment of Iran and Turkey, the research explores practical governance models and policy recommendations that can enhance sustainable urban development.

Literature Review

Sustainability management has become a crucial area of research due to its implica-

tions for environmental resilience, economic stability, and social well-being. The growing recognition of sustainable development as a multidimensional challenge has led to extensive scholarly investigations into policy mechanisms, governance structures, and technological innovations that drive sustainability across different nations.

1. *Theoretical Foundations of Sustainability Management*

Sustainability management ideas highlight the interplay of environmental, economic, and social variables. In this regard, the Triple Bottom Line (TBL) paradigm has been cited as one of the most important study techniques in sustainable development. This paradigm focuses on the balance of environmental preservation, economic sustainability, and social justice, emphasizing the importance of aligning environmental policies with economic and social goals [10; 11]. Furthermore, analytical methodologies such as Life Cycle Assessment (LCA) and Multi-Criteria Decision Analysis (MCDA) are important methodological tools for assessing and optimizing sustainable development initiatives.

2. *Policy and Governance in Urban Sustainability*

Governments play a pivotal role in shaping sustainability policies through regulatory frameworks, incentive mechanisms, and urban planning initiatives. Countries that have integrated stringent environmental regulations with economic incentives have demonstrated greater success in achieving sustainability goals [12]. For instance, the European Union's Green Deal serves as a model for embedding sustainability into policy frameworks, fostering green technology investments, and incentivizing corporate environmental responsibility [13].

Iran's sustainability policies have been largely focused on energy conservation and industrial waste management. However, gaps in policy enforcement and economic sanctions have impeded significant progress [14]. Turkey, by contrast, has implemented ambitious strategies such as its Renewable Energy Action Plan and smart city initiatives, which have contributed to improved sustainability performance [15].

3. *The Effect of Technological Innovations on Sustainable Management*

Significant technological developments have occurred in recent years, particularly in artificial intelligence (AI) and the Internet of Things (IoT), both of which have played vi-

tal roles in maximizing sustainability management. One of the most significant applications of technology in sustainability management is the development of smart energy networks (Smart Grids), which leverage advanced data analytics and machine learning algorithms to enhance energy efficiency, minimize transmission losses, and reduce operational delays. Moreover, intelligent infrastructures, including energy-efficient buildings and data-driven waste management systems, play a crucial role in optimizing resource utilization, mitigating greenhouse gas emissions, and minimizing environmental impact.

Predictive analytics, which uses big data and artificial intelligence algorithms, has had a substantial impact on predicting resource consumption trends, anticipating environmental catastrophes, and improving urban ecosystem resilience. These technologies allow policymakers and sustainability managers to make data-driven decisions and optimize sustainable development strategies [16].

In Turkey, digital governance tools have been integrated into sustainability initiatives to improve urban management, while Iran's technological adoption has been hindered by infrastructural limitations [17]. Nevertheless, recent pilot projects on renewable energy and smart agriculture in Iran signal a potential shift towards a more technology-driven sustainability strategy [18].

4. Structural Equation Modeling (SEM) in Sustainability Research

The application of Structural Equation Modeling (SEM) has advanced the assessment of sustainability strategies by enabling quantitative evaluation of policy interactions, economic impacts, and public participation [19]. Studies utilizing SEM have demonstrated that integrated policy measures that align economic growth with environmental responsibility yield higher sustainability performance [20].

The present study extends previous research by applying SEM to compare the effectiveness of sustainability governance in Iran and Turkey, with a focus on identifying policy gaps and recommending data-driven interventions.

Methodology

1. Research Design

This study employs a mixed-method approach that integrates qualitative and quantitative research methods to assess sustain-

ability management strategies in Iran and Turkey. Structural Equation Modeling (SEM) is used as the primary analytical tool to measure relationships between key sustainability indicators. Additionally, comparative case study analysis is conducted to examine real-world applications of sustainability policies.

2. Data Collection

Primary data is collected through structured surveys distributed to policymakers, urban planners, and sustainability professionals in Iran and Turkey. Secondary data sources include national sustainability reports, government policy documents, academic literature, and industry reports.

The key variables in this study include:

- **Energy Consumption Efficiency (ECE)** — The effectiveness of energy management policies and renewable energy adoption.
- **Waste Management Performance (WMP)** — The implementation of recycling programs and waste-to-energy initiatives.
- **Greenhouse Gas Reduction (GGR)** — The extent of emission control measures and carbon offset programs.
- **Public Participation Index (PPI)** — The level of community engagement and awareness regarding sustainability efforts.
- **Economic Incentive Effectiveness (EIE)** — The impact of financial incentives such as tax credits and subsidies on sustainability projects.

3. Data Analysis

Structural Equation Modeling (SEM) is used to identify correlations and causal relationships among sustainability factors. The model assesses the direct and indirect effects of governance, economic incentives, and public participation on environmental performance.

Additionally, correlation analysis and multiple regression analysis are applied to validate findings from SEM. A comparative analysis between Iran and Turkey highlights the effectiveness of different sustainability policies and provides insights into best practices.

4. Research Limitations

This study is subject to several limitations. First, data availability varies between Iran and Turkey due to differences in transparency and reporting standards. Second, while SEM provides robust quantitative insights, it does not fully capture qualitative aspects of governance effectiveness. Lastly, policy changes occurring after data collection may affect long-term sustainability trends.

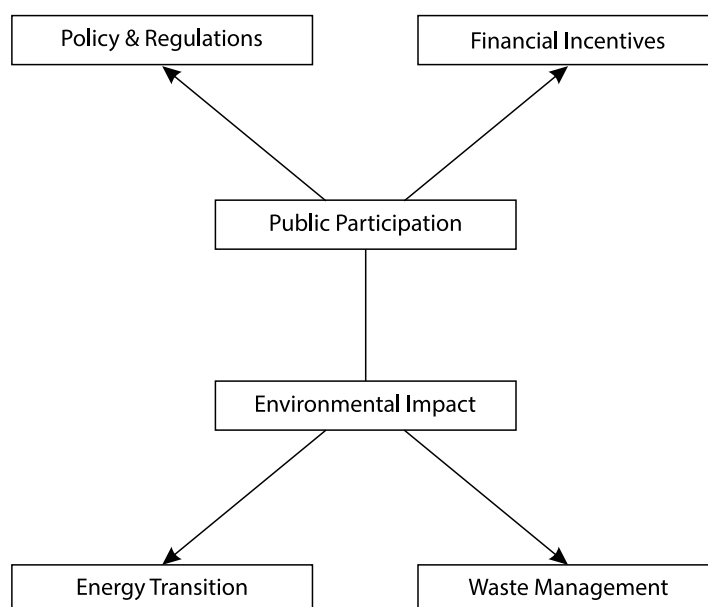


Fig. 1. Structural Equation Model (SEM) for sustainability management
Рис. 1. Структурная модель управления устойчивым развитием

Source: Compiled by the authors using IBM SPSS AMOS software, version 29.0.

Results and Discussion

1) *Structural Equation Modeling (SEM) Results*

To evaluate the relationships between sustainability policies, economic mechanisms, and environmental performance, Structural Equation Modeling (SEM) was applied to the dataset. This approach allows for a structured examination of how policy regulations, financial incentives, and civic engagement contribute to sustainability outcomes (Figure 1).

Analysis: The Structural Equation Model (SEM) depicted in Figure 1 provides an insightful representation of the interdependent relationships between policy measures, financial incentives, public engagement, and environmental outcomes. The model illustrates how regulatory mechanisms and financial support serve as primary drivers for sustainability initiatives, influencing both direct and mediated pathways toward improved environmental impact.

- **Regulatory Mechanisms as a Primary Driver:** Countries with well-structured regulatory frameworks exhibit a more efficient implementation of sustainability policies. Effective governance structures establish the foundation for the enforcement of environmental laws, carbon reduction initiatives, and waste management policies [1].

- **Financial Incentives as an Enabler:** The presence of economic mechanisms, such as green bonds, tax credits, and investment subsidies, fosters the adoption of clean energy and waste recycling initiatives [2, p. 45–47]. The SEM results confirm that financial incentives play a crucial role in encouraging businesses and industries to transition toward environmentally sustainable operations.

- **Public Participation as a Mediator:** The findings emphasize that civic engagement in sustainability programs significantly enhances policy effectiveness. Countries where governments actively involve citizens in decision-making processes, for example, by offering tax reductions for green practices or promoting social campaigns — exhibit higher levels of compliance and environmental responsibility [9].

Managerial Implications:

- Policymakers should align regulatory measures with financial incentives to create a balanced approach to sustainability management.
- Governments should enhance public-private collaborations by offering incentives for green investments to accelerate sustainability transitions.
- Citizen engagement should be promoted through public awareness campaigns and incentive-driven participation models, en-

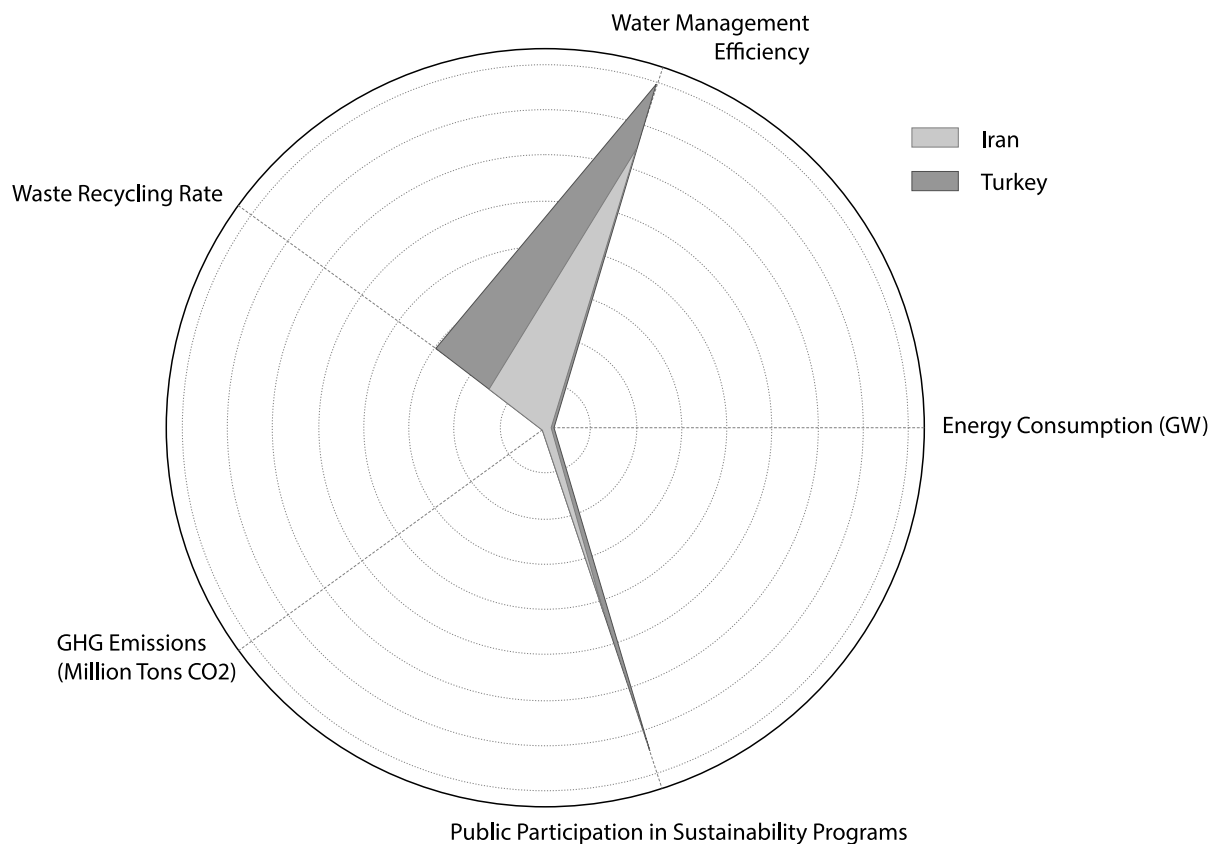


Fig. 2. Comparative radial graph of sustainable development factors in Iran and Turkey
Рис. 2. Сравнительный радиальный график факторов устойчивого развития в Иране и Турции

Source: Compiled by the authors using Python software (Matplotlib), version 3.10.0.

sureing greater acceptance and compliance with sustainability policies.

The SEM analysis reveals several critical insights:

1. Policy and Financial Mechanisms:

Regulatory frameworks and financial support mechanisms demonstrate the strongest direct impact on environmental sustainability indicators. Countries with well-defined policies and economic incentives — such as tax benefits for green investments — achieve higher efficiency in sustainability programs.

2. Public Engagement as a Mediator: The role of public engagement is significant in ensuring the success of sustainability programs. The findings confirm that programs with a structured public participation model yield better environmental result.

3. Country-Specific Observations:

- Turkey has successfully integrated policy incentives with financial support mechanisms, leading to a higher rate of renewable energy adoption and waste management efficiency.
- Iran, on the other hand, faces limitations due to insufficient financial backing and

regulatory inconsistencies, which hinder the implementation of sustainability programs.

The SEM model highlights that sustainability governance should not rely solely on legislative measures but must also incorporate economic and social incentives to drive progress effectively [15].

2) Comparative Analysis of Sustainability Factors in Iran and Turkey

To further illustrate the impact of different sustainability strategies, a comparative analysis of key environmental performance indicators in Iran and Turkey was conducted. The radar chart depicted in Figure 2 visually represents these differences, highlighting variations in sustainability performance between the two countries.

The radar chart comparison of sustainability factors shows that Turkey consistently outperforms Iran in areas such as energy efficiency, water management, and waste recycling rates. However, both countries exhibit similar trends in greenhouse gas (GHG) emissions due to their industrial structures and economic dependencies.

Sustainable development indicators in Iran and Turkey
Таблица 1. Индикаторы устойчивого развития в Иране и Турции

Factor	Iran (Average)	Turkey (Average)	Key Observations
Energy Consumption (GW)	1.2	1.8	Turkey has higher renewable energy integration
Water Management Efficiency	65 %	80 %	Turkey's infrastructure supports better water recycling systems
Waste Recycling Rate	15 %	30 %	Turkey benefits from an advanced circular economy model
GHG Emissions (Million Tons CO ₂)	1.0	0.7	Higher emissions in Iranian cities due to reliance on fossil fuels
Public Participation in Sustainability Programs	40 %	75 %	Turkey has established structured citizen engagement strategies

Source: Compiled by the authors using Microsoft Excel software, version 2021.

Analysis: The comparative radar chart in (Figure 2) offers a multi-dimensional evaluation of sustainability performance in Iran and Turkey. The disparities in sustainability indicators highlight policy-driven inefficiencies and the impact of governance structures on environmental performance.

• **Energy Consumption and, Transition Dynamics:**

Turkey outperforms Iran in energy efficiency, primarily due to its higher adoption rate of renewable energy technologies. This aligns with Turkey's national policies promoting solar and wind energy integration, supported by economic incentives and international investments [4].

• **Water Management Efficiency:**

The higher water recycling efficiency in Turkey (80 %) compared to Iran (65 %) suggests the presence of superior water governance mechanisms, including desalination plants, efficient irrigation policies, and waste reduction strategies. Iran, facing severe drought conditions, requires more effective water conservation policies and infrastructural investments [5].

• **Waste Recycling Performance:**

The waste management efficiency in Turkey (30 %) significantly surpasses that of Iran (15 %). This is largely attributed to Turkey's successful implementation of circular economy models, including waste-to-energy conversion and advanced recycling programs. Iran, in contrast, lacks sufficient infrastructure and public awareness campaigns for effective waste segregation and recycling [6].

3) Managerial Implications

- Iran should prioritize investments in renewable energy infrastructure and seek international collaborations to facilitate technology transfers.

- Water management policies should be aligned with best practices in digital water governance to improve efficiency and resilience against climate change.
- Circular economy models should be integrated into Iran's national sustainability strategy, ensuring higher waste recovery rates and economic benefits. Sustainability indicators in Iran and Turkey are presented in Table 1.

This comparative analysis reinforces the need for policy-driven interventions in Iran to bridge the gap in environmental sustainability performance. By adopting lessons from Turkey, Iranian cities can enhance their resource efficiency and waste management systems.

Analysis: Table 1 provides a quantitative assessment of sustainability performance in Iran and Turkey. The key findings from the comparative analysis illustrate the strategic importance of policy-driven environmental initiatives and their impact on national sustainability outcomes.

- **Higher Renewable Energy Integration in Turkey:** Turkey's proactive approach to renewable energy adoption has resulted in higher energy efficiency and lower carbon emissions compared to Iran. The presence of financial incentives, regulatory enforcements, and public-private sector collaborations has facilitated a smooth transition toward sustainable energy [7].
- **Water Infrastructure for Recycling Efficiency:** The superior water management efficiency in Turkey (80 %) highlights the role of technological advancements, digital governance, and efficient policy frameworks in ensuring water sustainability. Iran, despite facing severe water shortages, lacks an integrated national policy for water conservation [8].

- **Public Participation as a Success Factor:** Turkey's higher levels of citizen engagement (75 %) reflect the successful implementation of sustainability awareness campaigns. Public participation has proven to be a key determinant of long-term environmental policy success [9].

Managerial Implications:

- Policymakers should enhance financial and policy incentives for the renewable energy sector to accelerate the transition to a low-carbon economy.
- Governments must focus on strengthening regulatory frameworks and enhancing investment in smart water management solutions.
- Educational initiatives and social campaigns should be expanded to foster a culture of sustainability and increase civic engagement.

4) Policy and Public Engagement Impact

Public participation plays a crucial role in environmental policy effectiveness. The data indicates that Turkey's structured awareness campaigns and economic incentives have significantly contributed to higher citizen engagement in sustainability initiatives. In contrast, Iran's lack of well-defined public participation strategies has resulted in lower engagement levels.

Key Findings on Public Participation:

- Turkey's localized policy programs have encouraged businesses and communities to actively contribute to sustainability efforts.
- Iran requires better education and incentive mechanisms to improve citizen engagement in green initiatives.
- SEM analysis confirms that public involvement has a direct correlation with policy success, indicating that greater engagement enhances environmental outcomes.

5) Practical Implications and Policy Recommendations

Based on the findings of this study, the following policy recommendations are proposed:

- 1. Strengthening Regulatory Frameworks:** Iran must focus on enforcing its existing environmental policies to improve policy compliance.
- 2. Expanding Financial Incentives for Green Investments:** Introducing subsidies and tax benefits for sustainability projects

will encourage businesses and industries to adopt cleaner energy solutions.

3. Enhancing Public Awareness and Engagement: Implementing structured environmental education campaigns and community-driven initiatives will significantly improve Iran's sustainability outcomes.

4. Leveraging Digital Governance Tools: AI-driven data analytics and IoT-based environmental monitoring systems should be integrated into both countries' sustainability strategies.

Conclusions

This study highlights the importance of integrated sustainability strategies that incorporate regulatory, financial, and public participation frameworks. While Turkey serves as a model for effective environmental governance, Iran has the potential to significantly improve its sustainability performance through structured policy interventions and incentive mechanisms.

Future research should focus on longitudinal studies assessing the effectiveness of newly introduced sustainability policies, as well as exploring cross-border collaborations between Iran and Turkey to enhance regional sustainability efforts.

The comparative analysis of SEM modeling results, sustainability radar charts, and key performance indicators reinforces the importance of policy-driven interventions in achieving national sustainability goals. While Turkey serves as a model for integrated environmental governance, Iran has the potential to enhance its sustainability performance by adopting structured regulatory frameworks and economic incentives.

Key Strategic Takeaways:

- Regulatory and financial incentives should be synchronized to ensure effective policy implementation.
- Public participation should be prioritized as a key determinant of policy success.
- Smart technologies and digital governance can enhance environmental management efficiency.
- Cross-country collaborations and knowledge-sharing initiatives can facilitate Iran's transition to a more sustainable environmental governance model.

References

1. Renewable energy market analysis: GCC 2019. Abu Dhabi: International Renewable Energy Agency (IRENA); 2019. 154 p. URL: https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2019/Jan/IRENA_Market_Analysis_GCC_2019.pdf (accessed on 02.02.2025).
2. Circular economy in Europe: Developing the knowledge base. EEA Report. 2016;(2). URL: <https://www.socialistsanddemocrats.eu/sites/default/files/Circular%20economy%20in%20Europe.pdf> (accessed on 02.02.2025).
3. Human development report 2020: The next frontier — human development and the Anthropocene. New York, NY: United Nations Development Programme; 2020. 412 p. URL: <https://hdr.undp.org/system/files/documents/hdr2020.pdf> (accessed on 02.02.2025).
4. Marchau V.A.W.J., Walker W.E., Bloemen P.J.T.M., Popper S.W., eds. Decision making under deep uncertainty: From theory to practice. Cham: Springer-Verlag; 2019; 405 p. DOI: 10.1007/978-3-030-05252-2
5. Paunovic I., Müller C., Deimel K. Citizen participation for sustainability and resilience: A generational cohort perspective on community brand identity perceptions and development priorities in a rural community. *Sustainability*. 2023;15(9):7307. DOI: 10.3390/su15097307
6. Borhani F., Motlagh M.S., Ehsani A., Rashidi Y. Evaluation of short-lived atmospheric fine particles in Tehran, Iran. *Arabian Journal of Geosciences*. 2022;15:1398. DOI: 10.1007/s12517-022-10667-5
7. Eden S. Public participation in environmental policy: Considering scientific, counter-scientific and non-scientific contributions. *Public Understanding of Science*. 1996;5(3):183-204. DOI: 10.1088/0963-6625/5/3/001
8. Tawiah V., Zakari A., Adedoyin F.F. Determinants of green growth in developed and developing countries. *Environmental Science and Pollution Research*. 2021;28(29):39227-39242. DOI: 10.1007/s11356-021-13429-0
9. Farajzadeh Z., Ghorbanian E., Tarazkar M. H. The shocks of climate change on economic growth in developing economies: Evidence from Iran. *Journal of Cleaner Production*. 2022;372:133687. DOI: 10.1016/j.jclepro.2022.133687
10. Schneider S., Spieth P., Clauss T. Business model innovation in the aviation industry. *International Journal of Product Development*. 2013;18(3-4):286-310. DOI: 10.1504/IJPD.2013.055010
11. Osterwalder A. The business model ontology: A proposition in a design science approach. PhD thesis. Lausanne: Université de Lausanne; 2004. 172 p. URL: <https://www.academia.edu/download/30373644/thebusinessmodelontology.pdf> (accessed on 02.02.2025).
12. Busch T., Bruce-Clark P., Derwall J., et al. Impact investments: A call for (re)orientation. *SN Business & Economics*. 2021;1(2):33. DOI: 10.1007/s43546-020-00033-6
13. Manuel M., Lightfoot D., Fattahi M. The sustainability of ancient water control techniques in Iran. *Water History*. 2018;10(1):13-30. DOI: 10.1007/s12685-017-0200-7
14. Ediger V.Ş. Climate change and sustainable energy in Turkey. İstanbul: ENIVA Publications; 2013. 146 p.
15. Novikov S.V., Solodova A.D. Key trends in the aviation industry: Digital economy and new technologies. *Gumanitarnye, sotsial'no-ekonomicheskie i obshchestvennye nauki = Humanities, Social-Economic and Social Sciences*. 2018;(5):276-278. (In Russ.). DOI: 10.23672/SAE.2018.5.14156
16. On currency regulation and currency control. Federal law of December 10, 2003 No. 173-FZ. Konsul'tantPlyus. URL: http://www.consultant.ru/document/cons_doc_LAW_45458/ (accessed on 10.02.2025). (In Russ.).
17. Mahmoudi N. Indicators of efficiency for environmental NGOs in promoting environmental sustainability in Iran. In: Contemporary research in the context of global transformation. Proc. 3rd Int. sci.-pract. conf. (Petrozavodsk, September 02, 2024). Petrozavodsk: Novaya nauka; 2024:73-79. (In Russ.). DOI: 10.46916/04092024-978-5-00215-512-5
18. Global energy review 2021: Assessing the effects of economic recoveries on global energy demand and CO emissions in 2021. Paris: International Energy Agency; 2021. 36 p. URL: <https://iea.blob.core.windows.net/assets/d0031107-401d-4a2f-a48b-9eed19457335/GlobalEnergyReview2021.pdf> (accessed on 02.02.2025).
19. Tonyaloğlu E.E. Future land use/land cover and its impacts on ecosystem services: Case of Aydın, Turkey. *International Journal of Environmental Science and Technology*. 2025;22(2):4601-4617. DOI: 10.1007/s13762-024-05907-y
20. Kaya E.B., Erbaş İ. The relationship between urban transformation and sustainability: A bibliometric analysis and exploring existing trends. *Journal of Asian Architecture and Building Engineering*. 2024;23(5):1756-1775. DOI: 10.1080/13467581.2023.2270033

СПИСОК ИСТОЧНИКОВ

1. Renewable energy market analysis: GCC 2019. Abu Dhabi: International Renewable Energy Agency (IRENA), 2019. 154 p. URL: <https://www.irena.org/publications/2019/Jan/Renewable-Energy-Market-Analysis-GCC-2019> URL: https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2019/Jan/IRENA_Market_Analysis_GCC_2019.pdf (дата обращения: 02.02.2025).
2. Circular economy in Europe: Developing the knowledge base. EEA Report. 2016. No. 2. 37 p. URL: <https://www.socialistsanddemocrats.eu/sites/default/files/Circular%20economy%20in%20Europe.pdf> (дата обращения: 02.02.2025).
3. Human development report 2020: The next frontier – human development and the Anthropocene. New York, NY: United Nations Development Programme, 2020. 412 p. URL: <https://hdr.undp.org/system/files/documents/hdr2020.pdf> (дата обращения: 02.02.2025).
4. Marchau V. A. W. J., Walker W. E., Bloemen P. J. T. M., Popper S. W., eds. Decision making under deep uncertainty: From theory to practice. Cham: Springer-Verlag, 2019. 405 p. DOI: 10.1007/978-3-030-05252-2
5. Paunovic I., Müller C., Deimel K. Citizen participation for sustainability and resilience: A generational cohort perspective on community brand identity perceptions and development priorities in a rural community // Sustainability. 2023. Vol. 15. No. 9. Article No. 7307. DOI: 10.3390/su15097307
6. Borhani F., Motlagh M. S., Ehsani A., Rashidi Y. Evaluation of short-lived atmospheric fine particles in Tehran, Iran // Arabian Journal of Geosciences. 2022. Vol. 15. Article No. 1398. DOI: 10.1007/s12517-022-10667-5
7. Eden S. Public participation in environmental policy: Considering scientific, counter-scientific and non-scientific contributions // Public Understanding of Science. 1996. Vol. 5. No. 3. P. 183–204. DOI: 10.1088/0963-6625/5/3/001
8. Tawiah V., Zakari A., Adedoyin F. F. Determinants of green growth in developed and developing countries // Environmental Science and Pollution Research. 2021. Vol. 28. No. 29. P. 39227–39242. DOI: 10.1007/s11356-021-13429-0
9. Farajzadeh Z., Ghorbanian E., Tarazkar M. H. The shocks of climate change on economic growth in developing economies: Evidence from Iran // Journal of Cleaner Production. 2022. Vol. 372. Article No. 133687. DOI: 10.1016/j.jclepro.2022.133687
10. Schneider S., Spieth P., Clauss T. Business model innovation in the aviation industry // International Journal of Product Development. 2013. Vol. 18, No. 3-4. P. 286–310. DOI: 10.1504/IJPD.2013.055010
11. Osterwalder A. The business model ontology: A proposition in a design science approach. PhD thesis. Lausanne: Université de Lausanne, 2004. 172 p. URL: <https://www.academia.edu/download/30373644/thebusinessmodelontology.pdf> (дата обращения: 02.02.2025).
12. Busch T., Bruce-Clark P., Derwall J., et al. Impact investments: A call for (re)orientation // SN Business & Economics. 2021. Vol. 1. No. 2. Article No. 33. DOI: 10.1007/s43546-020-00033-6
13. Manuel M., Lightfoot D., Fattahi M. The sustainability of ancient water control techniques in Iran // Water History. 2018. Vol. 10. No. 1. P. 13–30. DOI: 10.1007/s12685-017-0200-7
14. Ediger V. Ş. Climate change and sustainable energy in Turkey. İstanbul: ENIVA Publications, 2013. 146 p.
15. Новиков С. В., Солодова А. Д. Главные тренды в авиационной отрасли: цифровая экономика и новые технологии // Гуманитарные, социально-экономические и общественные науки. 2018. № 5. С. 276–278. DOI: 10.23672/SAE.2018.5.14156
16. О валютном регулировании и валютном контроле: федер. закон от 10 декабря 2003 г. № 173-ФЗ // Справ.-правовая система «КонсультантПлюс». URL: http://www.consultant.ru/document/cons_doc_LAW_45458/ (дата обращения: 10.02.2025).
17. Mahmoudi N. Indicators of efficiency for environmental NGOs in promoting environmental sustainability in Iran // Современные исследования в контексте глобальной трансформации: сб. ст. III Междунар. науч.-практ. конф. (Петрозаводск, 2 сентября 2024 г.). Петрозаводск: Новая наука, 2024. С. 73–79. DOI: 10.46916/04092024-978-5-00215-512-5
18. Global energy review 2021: Assessing the effects of economic recoveries on global energy demand and CO₂ emissions in 2021. Paris: International Energy Agency, 2021. 36 p. URL: <https://iea.blob.core.windows.net/assets/d0031107-401d-4a2f-a48b-9eed19457335/GlobalEnergyReview2021.pdf> (дата обращения: 02.02.2025).
19. Tonyaloğlu E.E. Future land use/land cover and its impacts on ecosystem services: Case of Aydın, Turkey // International Journal of Environmental Science and Technology. 2025. Vol. 22. No. 2. P. 4601–4617. DOI: 10.1007/s13762-024-05907-y
20. Kaya E., B., Erbaş İ. The relationship between urban transformation and sustainability: A bibliometric analysis and exploring existing trends // Journal of Asian Architecture and Building Engineering. 2024. Vol. 23. No. 5. P. 1756–1775. DOI: 10.1080/13467581.2023.2270033

Сведения об авторе

Нилуфар Махмуди

кандидат биологических наук, аспирант по специальности «Управление в организационных системах», кафедра инновационного менеджмента в отраслях промышленности Инженерной академии

Российский университет дружбы народов имени Патриса Лумумбы

117198, Москва, Миклухо-Маклая ул., д. 6

Поступила в редакцию 03.02.2025
 Прошла рецензирование 24.02.2025
 Подписана в печать 24.03.2025

Information about the author

Niloufar Mahmoudi

PhD in Biology, postgraduate student on the specialty “Management in Organizational Systems”, Department of Innovative Management in the Industries of the Engineering Academy

Peoples’ Friendship University of Russia named after Patrice Lumumba

6 Miklukho-Maklaya st., Moscow 117198, Russia

Received 03.02.2025
 Revised 24.02.2025
 Accepted 24.03.2025

Конфликт интересов: автор декларирует отсутствие конфликта интересов, связанных с публикацией данной статьи.

Conflict of interest: the author declares no conflict of interest related to the publication of this article.