JOJ Horticulture & Arboriculture
ISSN: 2641-8215

Research Article
Volume 6 Issue 1 - November 2025
DOI: 10.19080/JOJHA.2025.06.555679

JOJ Hortic Arboric

Analysis of Legal and Infrastructural Barriers to the Transfer of New Technologies for Green Product Production in Iran

Mohammad Taleghani[1]* and Mohammadreza Jabreilzadeh Sola[2]

[1]*Associate Professor, Department of Industrial Management, Rasht Branch, Islamic Azad University (IAU), Rasht, Iran*

[2]*Department of Management, Gorgan Branch, Islamic Azad University, Gorgan, Iran*

Submission: September 09, 2025; **Published:** November 26, 2025

***Corresponding author:** Mohammad Taleghani, Associate Professor, Department of Industrial Management, Rasht Branch, Islamic Azad University (IAU), Rasht, Iran Email: M.Taleghani454@yahoo.com

Abstract

The transfer of new technologies for green product production is essential for sustainable development in developing countries like Iran, where environmental degradation, resource constraints, and geopolitical factors present major challenges [1,2]. This paper examines the legal and infrastructural barriers impeding such technology transfer in Iran, incorporating insights from studies and policy developments between 2020 and 2025 [3,4]. Legal barriers encompass stringent intellectual property (IP) regulations, international sanctions, and insufficient environmental policies, while infrastructural barriers include unreliable energy grids, limited digital integration, and inadequate transportation networks [5,6]. Employing a qualitative methodology based on literature review and secondary data analysis, the study identifies core impediments and introduces a novel framework for mitigation through policy reforms, international collaborations, and domestic innovation [7,8]. The analysis demonstrates how sanctions intensify these barriers by restricting access to foreign technologies, resulting in elevated costs and delayed adoption [9]. Recommendations focus on enhancing local R&D, restructuring subsidies, and promoting public-private partnerships [10,11]. This research advances the discussion on green technology transfer in sanctioned economies, emphasizing the importance of tailored, original solutions to Iran's socio-political context [12]. The findings highlight the critical need to address these barriers to meet Iran's sustainable development objectives [13].

Keywords: Technology Transfer; Green Products; Legal Barriers; Infrastructural Barriers; Sanctions; Sustainable Development; Environmental Policy

Introduction

Amid rising climate change concerns, adopting green technologies for product production is vital for nations pursuing sustainability [14]. Green product production entails manufacturing processes that reduce environmental impact via renewable energy, waste minimization, and eco-friendly materials [15]. For Iran, endowed with abundant natural resources but facing issues like water scarcity, air pollution, and soil degradation, the transfer of such technologies could drive a greener economy [16,17]. However, legal and infrastructural barriers substantially obstruct this progress [18,19]. Iran's adherence to global accords such as the Paris Agreement and its national development plans prioritize greenhouse gas reduction and renewable energy promotion [20]. Yet, advancement is sluggish; recent data show Iran's renewable energy capacity at merely 1% of its total energy mix, well below global norms [21,22]. This delay stems from complex barriers, including international sanctions that curb technology imports and domestic infrastructures unsuited for innovation [23,9]. This paper provides a comprehensive analysis of these barriers, emphasizing legal elements like IP laws, regulatory frameworks, and sanctions, as well as infrastructural challenges Such as energy instability and logistical shortcomings [24,25]. Its novelty integrates post-sanction developments from 2020-2025 and proposes an original framework merging institutional reforms with technology localization [3,7]. The structure includes a literature review, methodology, barrier analysis with tables and figures, discussion, recommendations, and conclusion.

Literature Review

Literature on technology transfer for green production in developing countries identifies legal and infrastructural barriers as primary obstacles [26,6]. Technology transfer involves sharing knowledge, skills, and equipment from developed to developing nations, often via foreign direct investment (FDI), licensing, or joint ventures [10,27]. In green technologies, IP protection plays a dual role, potentially facilitating or impeding transfer; robust IP regimes may discourage sharing due to infringement risks, especially in climate technologies [24]. In developing contexts, weak enforcement exacerbates this [28,29]. Barriers to renewable energy adoption include economic, technical, and regulatory issues, with Iran encountering unique geopolitical challenges [4,30]. Sanctions feature prominently in Iran-specific research, diminishing energy efficiency by restricting clean technology access and increasing emissions and costs [9,31]. Environmental impacts of sanctions include greater dependence on obsolete, carbon-heavy methods [1]. Infrastructurally, grid instability and absent digital tools hinder smart energy management [8,22]. Studies from 2020-2025 on Iran's energy policies highlight reform efforts, like the 6th Development Plan aiming for 7,500 MW of renewable capacity by 2030 [2]. However, subsidy inefficiencies and governance stall implementation [20]. Comparative cases, such as Ghana's green building barriers, stress government incentives and financing [5,25]. Novel contributions include SWOT analyses for green hydrogen in Iran, noting solar opportunities amid sanction threats [3]. Barriers to renewable penetration, like high costs and regulatory voids, are prioritized using methods like AHP [30]. Organic agriculture studies in Iran reveal motivations and conversion challenges, underscoring educational needs [12,13,32-34]. This review synthesizes these, addressing gaps in legal-infrastructural interactions in Iran.

Analysis of Barriers

Legal Barriers

Iran's legal frameworks pose major hurdles to green technology transfer. IP laws misalign with international standards, complicating licensing [24]. Existing IP law lacks strong enforcement, discouraging foreign firms [11]. US-led sanctions restrict green technology imports, inflating costs by up to 10 times [9,23]. Post-2020 reimpositions worsened this, affecting industrial energy efficiency [31]. Environmental policies, like the Third National Communication to UNFCCC, seek to aid transfer but suffer bureaucratic gaps [20]. Table 1 summarizes these.

Infrastructural Barriers

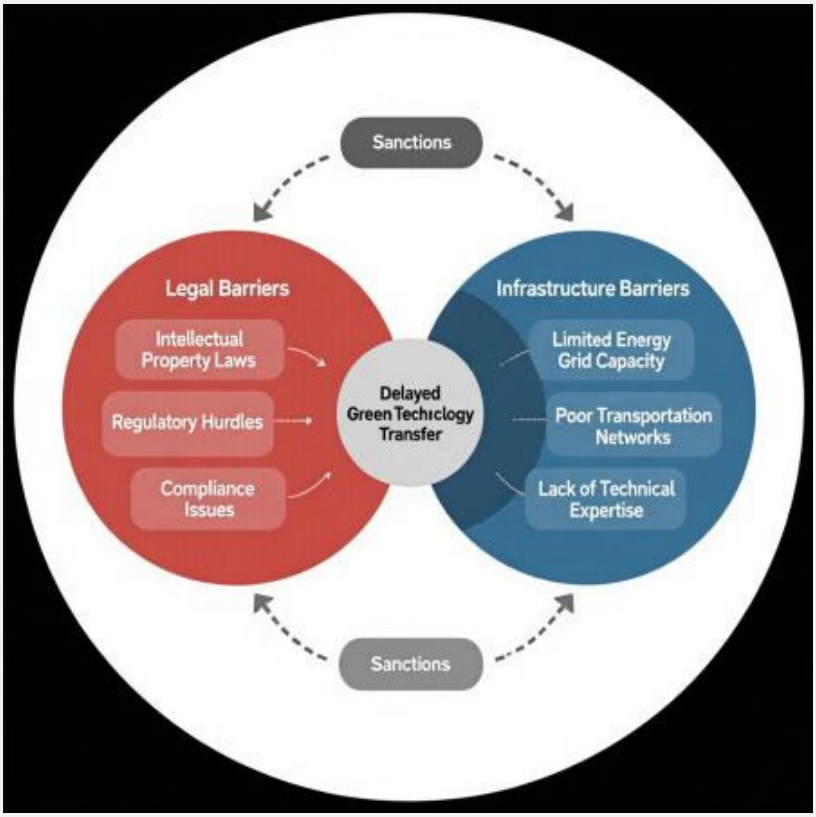

Figure 1: Illustrates the framework of these barriers, showing their interconnections (based on TOE model; Sharma et al., 1999).

How to cite this article: Mohammad T, Mohammadreza Jabreilzadeh S. Analysis of Legal and Infrastructural Barriers to the Transfer of New Technologies for Green Product Production in Iran. JOJ Horticulture & Arboriculture, 6(1). 555679. DOI: 10.19080/JOJHA.2025.06.555679

Table 1: Key Legal Barriers to Green Technology Transfer in Iran (Adapted from Authors, 2025; Chan et al., 2017; Salehi-Isfahani, 2016).

Barrier	Description	Impact
Sanctions	Restrictions on imports and FDI	Limits access to clean tech, raises costs
IP Regulations	Weak enforcement and misalignment with WTO	Deters foreign collaboration
Regulatory Gaps	Inadequate incentives for green adoption	Slows policy implementation
Bureaucratic Delays	Complex approval processes	Hinders timely

Table 2: Key Infrastructural Barriers to Green Technology Transfer in Iran (Adapted from Authors, 2025; Mahama & Asante, 2016; Asante et al., 2020).

Barrier	Description	Impact
Grid Instability	Frequent outages and low capacity	Disrupts renewable integration
Transportation Deficits	Poor roads and ports	Increases logistics costs
Digital Gaps	Lack of IT infrastructure	Hinders tech adoption
Water/Energy Scarcity	Resource mismanagement	Limits production scalability

Infrastructural shortcomings amplify issues. Energy grids face instability with outages disrupting green processes [22]. Aging plants hinder renewable integration like solar PV [17,21]. Transportation deficits raise logistics costs for green equipment, worsened by sanctions [6,19]. Digital lags limit cloud adoption for smart manufacturing [8]. Resource mismanagement constrains scalability [13]. Table 2 details these (Figure 1) [35].

Discussion

Legal and infrastructural barriers interlink in a vicious cycle in Iran; sanctions block transfer channels and erode infrastructure funding [9,22]. This differs from successes like China's policy-driven green innovation [11,15]. Novelty here includes post-2023 insights, such as green hydrogen potential despite barriers [3]. Original recommendations propose hybrid models of local R&D and partnerships [7,10]. For stakeholders, policymakers should reform subsidies for green investments, while industries emphasize domestic bypasses [36,37]. Recent X posts highlight Iran's atomic software advancements and green hydrogen progress, suggesting pathways for innovation [38-40].

Recommendations

To overcome these barriers:

- Reform IP laws to international standards with green tech incentives [5,24].
- Upgrade infrastructure like smart grids via public-private partnerships [22,26].
- Counter sanctions through diplomacy and local development, as in recent advancements [10,40].
- Initiate awareness campaigns and subsidies, inspired by agricultural models [12,32,34].
- These foster Iran-specific innovations [7,41-43].

Conclusion

Legal and infrastructural barriers, intensified by sanctions and policy gaps, obstruct green technology transfer in Iran [6,9]. This analysis, rooted in recent data, offers a reform framework emphasizing localized solutions [2,3]. Tackling these is vital for sustainability, potentially establishing Iran as a regional green leader [17].

References

1. Afshari H, Agnihotri S, Searcy C, Jaber MY (2022) Social sustainability indicators: A comprehensive review with applications in the energy sector. Sustainable Production and Consumption 31: 686-702.
2. Alipour M, Hafezi R, Rani P, Hafezi M, Mardani A (2021) A new Pythagorean fuzzy-based decision-making method for assessing regional energy sustainability. Sustainability 13(19): 10510.
3. Ahmadi M, Abdolkhani A, Asgary A (2025) Green hydrogen development in Iran: A SWOT analysis of opportunities and barriers. J of Open Innovation: Technology, Market, and Complexity 11(1): 100581.
4. Asante D, He Z, Adjei NO, Asante B (2020) Exploring the barriers to renewable energy adoption utilising MULTIMOORA-EDAS method. Energy Policy 142: 111479.
5. Chan AP, Darko A, Olanipekun AO, Ameyaw EE (2018) Critical barriers to green building technologies adoption in developing countries: The case of Ghana. J of Cleaner Production 172: 1067-1079.
6. Luthra S, Kumar S, Garg D, Haleem A (2015) Barriers to renewable/sustainable energy technologies adoption by Indian power sector: An Indian perspective. Renewable and Sustainable Energy Reviews 41: 762-776.
7. Hafezi R & Alipour M (2021) Technology selection for safeguarding intangible cultural heritage. Technological Forecasting and Social Change 170: 120872.
8. Numata M, Sugiyama M, Mogi G (2020) Barrier analysis for a solar photovoltaic mini-grid system in Myanmar. Energies, 13(6): 1400.
9. Salehi-Isfahani D (2016) Energy subsidy reform in Iran. In Economic Welfare and Inequality in Iran pp. 177-200.

How to cite this article: Mohammad T, Mohammadreza Jabreilzadeh S. Analysis of Legal and Infrastructural Barriers to the Transfer of New Technologies for Green Product Production in Iran. JOJ Horticulture & Arboriculture, 6(1). 555679. DOI: 10.19080/JOJHA.2025.06.555679

10. Arasti M, Khaleghi M, Noori J (2017) Corporate-level technology strategy and its linkage with corporate strategy in multi-business companies: IKCO's self-sufficiency strategy. Technological Forecasting and Social Change 122: 10-21.

11. Huang X, Hu Z, Liu C, Yu D, Yu L (2016) The role of government in corporate green innovation: Evidence from China. J of Cleaner Production 131: 663-672.

12. Mahmoudi H, Carolan MS, Alipour A (2017) Exploring the motivations and problems of farmers for conversion to organic farming in Iran. International J of Agricultural Sustainability 15(3): 303-312.

13. Azadi H, Schoonbeek S, Mahmoudi H, Derudder B, De Maeyer P, et al. (2011) Organic agriculture and sustainable food production system: Main potentials. Agriculture, Ecosystems & Environment 144(1): 92-94.

14. Dangelico RM & Pujari D (2010) Mainstreaming green product innovation: Why and how companies integrate environmental sustainability. J of Business Ethics 95: 471-486.

15. Guoyou Q, Saixing Z, Chiming T, Haitao Y, Hailiang Z (2013) Stakeholders' influences on corporate green innovation strategy: a case study of manufacturing firms in China. Corporate Social Responsibility and Environmental Management 20(1): 1-14.

16. Shobeiri SM, Omidvar B, Prahallada NN (2007) A comparative study of environmental awareness among secondary school students in Iran and India. International J of Environmental Research 1(1): 28-34.

17. Bagheri Moghaddam N, Mousavi SM, Nasiri M, Moallemi EA, Yousefdehi H (2011) Wind energy status of Iran: Evaluating Iran's technological capability in manufacturing wind turbines using the DEA approach. Renewable and Sustainable Energy Reviews, 15(9): 4200-4211.

18. Williams K & Dair C (2007) What is stopping sustainable building in England? Barriers experienced by stakeholders in delivering sustainable developments. Sustainable Development 15(3): 135-147.

19. Mondal MAH, Kamp LM, Pachova NI (2010) Drivers, barriers, and strategies for implementation of renewable energy technologies in rural areas in Bangladesh-An innovation system analysis. Energy Policy 38(8): 4626-4634.

20. Ghazizadeh MS, Khosroshahi KA, Azizi S (2007) Electricity restructuring experiences in Iran. Iranian J of Electrical and Electronic Engineering 3(1-2): 1-14.

21. Nasiri M, Ramazani Khorshid-Doust R, Bagheri Moghaddam N (2015) The status of the hydrogen and fuel cell innovation system in Iran. Renewable and Sustainable Energy Reviews 43: 775-783.

22. Khosroshahi KA, Jadid S, Shahidehpour M (2009) Electric power restructuring in Iran: achievements and challenges. The Electricity J 22(2): 74-83.

23. Crémer J & Salehi-Isfahani D (1989) The rise and fall of oil prices: A competitive view. Annales d'Economie et de Statistique (15/16): 427-454.

24. Hall BH & Helmers C (2010) The role of patent protection in (clean/green) technology transfer. Santa Clara Computer & High Tech. LJ 26: 487.

25. Mahama A & Asante FA (2016) Barriers to renewable energy technologies adoption in Ghana. Energy Policy 93: 64-74.

26. Sarkis J, Gonzalez-Torre P, Adenso-Diaz B (2010) Stakeholder pressure and the adoption of environmental practices: The mediating effect of training. J of Operations Management 28(2): 163-176.

27. Karipidis P, Tselempis D, Tsironis LK (2017) Driving agribusiness with technology innovations. IGI Global.

28. Chuen Chan AP, Darko A, Ameyaw EE (2017) Strategies for promoting green building technologies adoption in the construction industry-An international study. Sustainability 9(6): 969.

29. Nguyen HT, Skitmore M, Gray M, Zhang X, Olanipekun AO (2017) Will green building development take off? An exploratory study of barriers to green building in Vietnam. Resources, Conservation and Recycling 127: 8-20.

30. Amirkhani S, Nasirpour A, Nazari A, Mohammadi S (2021) Identification and ranking of barriers to sustainable development in small and medium industries using multi-criteria decision methods: Case study of industrial parks in Markazi Province. J of Environmental Studies 47(1): 51-74.

31. Djavad Salehi-Isfahani (2016) Energy subsidy reform in Iran. In Economic Welfare and Inequality in Iran pp. 177-200.

32. Etehadi M, Rusta K, Mashhadi Bandani N (2010) Farmer Field School, an appropriate strategy to developing organic agriculture. The 3rd Congress on Agricultural and Natural Resources Extension and Education, Mashhad, Iran.

33. Veisi H, Mahmoudi H, Sharifi-Moghaddam M (2010) Identifying farmers' adoption of integrated pest management technologies. J of Agricultural Science and Technology 12(3): 305-316.

34. Razzaghi-Borkhani F, Rezvanfar A, Shabanali Fami H (2010) The role of educational and communicational factors on the knowledge of Integrated Pest Management (IPM) among paddy farmers in Sari County. J of Agricultural Education Management Research 13: 2-17.

35. Sharma S, Pablo AL, Vredenburg H (1999) Corporate environmental responsiveness strategies: The importance of issue interpretation and organizational context. The J of Applied Behavioral Science 35(1): 87-108.

36. Lin CY & Ho YH (2010) Determinants of green practice adoption for logistics companies in China. J of Business Ethics 98: 67-83.

37. Zhang X, Shen L, Wu Y (2011) Green strategy for gaining competitive advantage in housing development: a China study. J of Cleaner Production 19(2-3): 157-167.

38. Arya (2024) Iran succeeded in developing... [X post].

39. Phoenix Project of Iran. (2024). Phoenix Project energy & political science group... [X post].

40. Phoenix Project of Iran. (2025). Phoenix Project energy & political science group... [X post].

41. Liu Z, Anderson TD, Cruz JM (2012) Consumer environmental awareness and competition in two-stage supply chains. European J of Operational Research 218(3): 602-613.

42. Samari M, Godrati R, Petridis P, Petridis K (2013) A green building assessment tool for developing countries-Case of Jordan. Building and Environment 82: 112-118.

43. Sinkula JM (1994) Market information processing and organizational learning. J of Marketing 58(1): 35-45.

How to cite this article: Mohammad T, Mohammadreza Jabreilzadeh S. Analysis of Legal and Infrastructural Barriers to the Transfer of New Technologies for Green Product Production in Iran. JOJ Horticulture & Arboriculture, 6(1). 555679. DOI: 10.19080/JOJHA.2025.06.555679

DOI: 10.19080/JOJHA.2025.06.555679

How to cite this article: Mohammad T, Mohammadreza Jabreilzadeh S. Analysis of Legal and Infrastructural Barriers to the Transfer of New Technologies for Green Product Production in Iran. JOJ Horticulture & Arboriculture, 6(1). 555679. DOI: 10.19080/JOJHA.2025.06.555679