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Environmental Governance in Jordan: Addressing Legislative Gaps, Preserving Natural Heritage, and Aligning with Global Climate Commitments

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Abstract

Environmental legislation in Jordan has evolved significantly since the establishment of the country in 1921 to cope with growing local environmental challenges and international commitments. Still, there are significant gaps in enforcement and integration among different sectors. This paper examines Jordan's environmental policies by tracking the historical evolution of local environmental legislation with a particular focus on important issues including integrated water management, air quality, soil conservation, and sustaining natural and cultural heritage. We also analyze the effectiveness of Jordanian frameworks of environmental legislation, detecting gaps and inadequacies in areas such as implementation, policy consistency, and coping with international environmental obligations and commitments. Actionable recommendations recognized in international best practices, such as the Polluter Pays Principle as well as the Integrated Environmental Management (IEM) model are offered to fill gaps in local environmental governance, improving Jordan's legislative framework and ensuring long-term sustainability. Implementing the presented recommendations would lead to a referendum on the local legislative framework, enhance environmental practices, promote long-term sustainability, and address gaps in legislation and implementation to preserve natural and cultural heritage.

Keywords: *Environmental governance, Azraq wetland, Soil degradation, Pollution, Environmental policy, Cultural heritage.*

1. Introduction and Geologic setting

Jordan which is characterized by an arid climate and scarce natural resources, faces significant environmental challenges (Hadadin & Tarawneh, 2007; Al-Qinna et al., 2011). Since the establishment of the country in 1921, local environmental policy has evolved to address growing worries, including water scarcity, air pollution, soil contamination, and conserving cultural and natural heritage (Al-Momani, 2010; El-Anis and Poberezhskaya, 2023). Local environmental legislations face challenges in enforcing environmental laws, especially sustainable resource management and the prevention of industrial pollution (MoEnv, 2021). Recent years witnessed increased efforts at all levels to strengthen local environmental policies to align with global climate commitments including the Montreal Agreement to protect ozone, the Kyoto Protocol, the Paris Accord, and the outcomes of COP27 and COP28. However, the contamination of the food chain due to the overuse of herbicides and pesticides and the deterioration of some important natural ecosystems, such as the Jordan River and the Azraq Wetland, draws attention to significant gaps that need to be addressed and resolved in local environmental legislation.

The main questions of this research is to find out how efficient environmental legislative frameworks are in managing Jordan's key environmental challenges and what they lack to guarantee effective enforcement, consistency, integrity, and coping with international climate obligations.

The paper follows a dual approach: Firstly, it tracks the evolution of Jordan's environmental legislation since the British mandate to Transjordan, focusing on important areas such as the preservation of natural and cultural heritage, integrated water management, soil conservation, and air quality management. Secondly, it examines the effectiveness of frameworks of the existing laws and instructions, detecting shortcomings and gaps that need to be addressed and filled. It also assesses responses of Jordan's legislation to COP28–30 and other global climate initiatives. The Integrated Environmental Management (IEM) model and the Polluter Pays Principle are among the best practices that are highlighted in the paper and are recommended to strengthen the environmental legislative framework in Jordan and promote long-term sustainability.

2. Evolution of Jordanian Environmental Legislation

Environmental issues in Jordan are increasingly attracting the attention of competent authorities and public sectors to increase resilience and face vulnerability and stressed water bodies and scarce natural resources (Hadadin & Tarawneh, 2007; Alshamaila et al., 2024). Local environmental policies have evolved tremendously,reflecting Jordan's commitment to international climate treaties including the Paris Accord (MoEnv, 2017). However, the nation faces growing pressure to enhance its environmental governance, particularly in

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sectors that contribute to global warming, in order to cope with the goals and outcomes of COP27-COP30 (UNEP, 2023; MoEnv, 2022).

In the following sections, we will trace the development of Jordanian environmental laws and instructions, identify deficiencies in regulatory frameworks, and analyze Jordan's environmental policy in the global context to develop a climate action plan for climate goal attainment (Babiker & Fehaid, 2012).

2.1. Early Environmental Regulation (19211946-)

Environmental governance, declared and enforced upon the establishment of the nation in the twenties of the 20th century, was limited aiming at protecting public health and natural resources. This is evident in the Health Law of 1926, the early regulatory framework that established provisions for sanitation and waste management in urban areas and laid the foundation for later environmental laws (Al-Momani, 2010, Al-Shamaileh, 2016, Combaz, 2019).

2.2. Post-Independence Developments (19461980-s)

The earliest post-independence law that influenced environmental governance was the Municipalities Law of 1955 which forced municipalities to manage urban planning and waste disposal to control solid waste and prevent pollution (Arabeyyat, 2024). The Water Resources Law of 1977 followed suit, forming a benchmark for protecting water resources to address the emerging water scarcity crisis.

2.3. Institutionalization of Environmental Policy (1990s)

The 1990s witnessed active governmental and public mobilizations to consolidate the environmental regulatory framework, culminating in the creation of the Jordanian Ministry of Environment (MOENV) in 1995, which enabled the centralization of efforts to address environmental pollution and waste management, and promote sustainable development. In that era, Jordan became more actively engaged in global efforts to protect the planet, including the 1992 Earth Summit in Rio de Janeiro, which significantly influenced Jordan's environmental legislation by promoting the principles of sustainable development (Combaz, 2019). The Environment Protection Law of 1995 strengthened Jordan's commitment to addressing environmental challenges and formed the milestone for subsequent regulations to address pollution control, waste disposal, and ecosystem preservation (MoEnv, 2020).

2.4. Modern Environmental Governance (2000s-present)

In the 2000s, Jordanian legislators passed more comprehensive laws: the Environment Protection Law of 2006, which replaced the 1995 Environment Protection Law, and the Agricultural Law of 2015. The amendments, made to the 2006 Environment Protection Law, established a comprehensive environmental management framework. They aimed at safeguarding all environmental components from anthropogenic pollution by introducing stricter controls on industrial pollution and hazardous waste, along with practices such as environmental impact assessments and environmental audits. The Agricultural Law of 2015 regulates the use of agrochemicals to protect agricultural lands by preventing (or minimizing) soil contamination, resulting from the excessive use of fertilizers, pesticides, and herbicides (MoAg, 2020). The nationwide ratification of the Paris Agreement in 2016 underscores Jordan's commitment to reducing greenhouse gas emissions. It also highlights the country's awareness of the global challenges, posed by ongoing climate change, with particular emphasis on its vulnerability to extreme weather events and decreasing rainfall, which negatively impact its fragile ecosystems and depleted water resources. Nevertheless, the enforcement of the best agricultural practices remains limited and insufficient to prevent soil degradation, hindering Jordan's efforts to increase agricultural productivity and strengthen food security (El-Anis and Poberezhskaya, 2023). This underscores the need for stricter enforcement, robust compliance mechanisms, and improved coordination among government agencies (UNDP, 2021). Achieving these targets presents significant challenges in strengthening regulatory governance and promoting inter-agency cooperation (El-Anis and Poberezhskaya, 2023).

3. Cross-Sectoral Influence on Environmental Policy

3.1. Health Sector Contributions

Public health is closely tied to Jordanian environmental legislation, as exemplified by the 2003 Instructions for Hazardous Waste Handling and Management enacted by the Ministry of Environment (MOENV). These instructions outline comprehensive guidelines for the safe storage, transportation, treatment, and disposal of hazardous materials, particularly chemicals and toxic substances, to ensure full protection of public health and occupational safety (MoENV, 2006). The instructions require contractors responsible for collecting, transporting, and disposing hazardous substances to sort, label, and securely containing them at their sources to prevent chemical spills and environmental contamination. They also emphasize using the best available technologies and disposal facilities that comply with international environmental guidelines and directives to minimize the risks of environmental degradation and health hazards (MOENV, 2006). The Public Health Law No. 47 of 2008 complements these instructions by requiring the safe disposal of hazardous waste and the controlled release of air contaminants. It requires systematic monitoring and management of local pollution sources to minimize the risks of public health exposure to toxic substances, thereby, reducing the potential for respiratory illnesses, cancers, and other chronic diseases (MoH, 2008). The Ministry of Health took a step forward by providing stricter and more detailed instructions (The Hazardous Materials Management Instructions of 2015) to enhance the effective management of hazardous chemicals and toxic substances. Capacity building and regular training of professionals, involved in handling hazardous materials, are vital components of the instructions and practices enforced by the Ministry of Health to ensure compliance with strict safety standards (MOH, 2015).

Together, the Hazardous Waste Handling and Management Instructions (2003) and the Hazardous Materials Management Instructions (2015) provided a robust regulatory framework that supported the environmentally responsible management of hazardous waste. These measures

reflect Jordan's commitment to improving environmental governance and safeguarding public health by minimizing the risks associated with the hazardous substances.

3.2. Role of Municipalities

Municipalities play a pivotal role in managing urban environmental issues, with responsibilities outlined in the Municipalities Law of 1955, revised in 2015. This law covers areas such as waste management, urban planning, and the enforcement of local environmental regulations. It serves as the foundation for local governance and environmental initiatives, aiming at improving urban sustainability and quality of life (Alshamaila et al., 2024).

In conjunction with the National Solid Waste Management Strategy (2015), municipalities have implemented initiatives to enhance environmental sustainability, such as creating green spaces and introducing recycling programs in cities like Amman and Irbid. These initiatives contribute to Jordan's broader environmental objectives by improving air quality, reducing waste, and promoting resource sustainability (United Nations, 2018).

Municipalities are also responsible for enforcing environmental regulations related to urban development, zoning, and land use. They ensure that construction projects comply with environmental standards, manage urban sprawl, and encourage green building practices. This role has become more critical as Jordan faces challenges related to rapid urbanization and the environmental impacts of climate change, including increased air pollution and waste generation (MOENV, 2020; Al-Kraimeen et al., 2024).

Collaboration between municipalities and central government agencies has been vital in aligning local and national environmental objectives, facilitating the implementation of policies at the local level, and strengthening municipalities' capacity to address urban environmental challenges effectively (MOENV, 2019).

3.3. Internal Affairs and Civil Defense

The Civil Defense Law No. 18 of 1999 is the cornerstone of disaster response in Jordan, addressing environmental hazards such as floods, droughts, and other climate-related risks. It establishes a framework for national coordination in disaster preparedness, response, and recovery, safeguarding communities from environmental hazards. As climate change intensifies, particularly with water resources and agricultural land, the importance of this legislation in protecting public safety and minimizing environmental damage has grown (McMurray, 2023).

Amendments to the Civil Defense Law in 2002 (Law No. 57 of 2002) strengthened the legal framework by introducing additional guidelines for managing large-scale disasters, including environmental emergencies. These provisions improve disaster response capacity and enhance coordination among government agencies, municipalities, and the private sector. As climate change exacerbates environmental challenges, such as water scarcity and land degradation, the law remains essential for addressing the increasing frequency of natural disasters.

Climate change consideration into disaster response policies is critical to ensuring Jordan's preparedness for the growing frequency of extreme weather events like heatwaves, droughts, and floods. These climate-induced disasters often worsen the vulnerabilities in water resources, agriculture, and public health. The evolution of the Civil Defense Law reflects Jordan's growing recognition of these risks and its efforts to build a more resilient disaster response framework (Al-Kharabsheh, 2020).

4. Environmental Policies Since the Paris Agreement

Jordan's National Climate Change Policy (2013-2020) and its updates offer a comprehensive framework for mitigating and adapting to climate change (El-Anis and Poberezhskaya, 2023). The policy emphasizes reducing greenhouse gas emissions and boosting renewable energy production, particularly in energy, water management, and agriculture—the sectors most vulnerable to climate impacts. These efforts aim to transforming Jordan to a low-carbon economy while enhancing resilience to climate challenges, especially water scarcity and agricultural productivity (MoEnv, 2013).

In line with international commitments, Jordan submitted its Nationally Determined Contribution (NDC) to the UNFCCC in 2016, with an updated version in 2021. The 2021 NDC includes more ambitious targets, particularly for resilience and adaptation in sectors like water and agriculture. These targets are essential for tackling climate challenges such as improving water efficiency, developing sustainable agriculture, and promoting climate-resilient infrastructure. The NDC reflects Jordan's determination to reduce emissions while acknowledging the unique challenges posed by its geographic location, limited resources, and reliance on external water sources (World Bank, 2020).

4.1. Renewable Energy and Energy Efficiency

Jordan has made significant progress in renewable energy development through the Renewable Energy and Energy Efficiency Law of 2012, which aims to expand the country's renewable energy capacity. It enabled various solar and wind energy projects, such as the Tafila Wind Farm and the Shams Ma'an Solar Plant, supporting the nation's commitment to reduce its carbon footprint and enhance energy security (MOEMR, 2012). To further support these efforts, Bylaw No. 13 of 2015 introduces financial incentives, including exemptions from customs duties and sales taxes on renewable energy equipment (MOEMR, 2012).

Jordan's renewable energy initiatives should have benefited from broader regional projects in the Middle East and North Africa (MENA) region such as Morocco that developed the renowned Noor Solar Complex, which enabled the country to reduce its carbon footprint while attracting international investment. Noor Solar Complex demonstrates the economic and environmental benefits of large-scale renewable energy projects and offers a potential model for Jordan and other developing countries (Hamouchene, 2016).

4.2 COP and Jordan's Path Forward

The outcomes of COP27-COP29 underscored the need for Jordan to revise and strengthen its environmental policies, particularly in the climate change resilience. This section introduces a roadmap to improve the country's resilience and adaptation to climate change.

4.3. Adaptation to Climate Change

Fresh water availability, which is increasingly impacted by global warming and regional instability, is a vital issue in Jordan. Therefore, water management is critical for Jordan as climate risks intensify. The National Water Strategy (2016-2025) integrates climate resilience into water conservation and wastewater management to sustain water resources nationwide. It emphasizes the improvement of water infrastructure for water harvesting, desalination, and the reclamation of domestic wastewater (MOWI, 2016).

4.4. Financing and International Cooperation

Securing climate finance to Jordan as well as other developing countries to support climate resilience efforts is one of the main actions called upon by COP27. Green Climate Fund (GCF) and the Adaptation Fund are crucial mechanisms for helping Jordan to ratify its water strategy and other climate resilience initiatives. Therefore, competent authorities are encouraged to participate in established funding bodies to secure external financial resources for large-scale projects in water management, renewable energy, and agricultural adaptation. This would strengthen Jordan's adaptive capacity, ensuring the well-preparedness of its economy and ecosystems for climate impacts. These efforts will also help the country to meet its commitments to the Paris Agreement regarding financing for mitigation and adaptation initiatives.

5. Critical Analysis of Current Environmental Legislation

As can be readily seen from previous sections, it is evident that Jordan has made progress in environmental legislation. However, there exist many challenges in the effectiveness of laws addressing environmental pollution and control of effluents. In addition, there are gaps between legislative goals and practical outcomes, which requires stronger enforcement, better coordination, and increased public awareness and involvement.

5.1 Air Quality

Ambient air pollution is a pressing issue in urban centers where anthropogenic activities contribute significantly to pollution. Despite regulations like the Public Health Law No. 47 of 2008, enforcement remains inconsistent, and air pollution levels occasionally exceed national standards or international guidelines (World Health Organization, 2021; Al-Kraimeen et al., 2024; World Bank, 2018). Ground-level ozone (O3) and CO levels also remain a concern in urban areas, particularly during peak traffic times (UNEP, 2020).

Developed countries like Germany and France imposed stringent regulations, forced carbon taxes, and promoted investments in renewable energy, which resulted in significant reductions in harmful emissions. Jordan's Renewable Energy and Energy Efficiency Law No. 13 of 2012 have promoted investment in solar and wind energy, but they did not foster integrating air quality management with renewable energy projects. This demonstrates the importance of strengthening law enforcement, integrating air quality with renewable energy policies, and introducing a carbon tax to help Jordan reduce air pollution and meet national climate goals and international obligations.

5.2 Water Management and Legislative Gaps

Jordan, which is classified as one of the poorest nations in fresh water resources, faces unprecedented challenges due to declining precipitation, increasing evaporation, and the high rates of population growth due to cultural inheritance and regional political instability. Water crises are exacerbated by unsustainable water management practices, weak enforcement, increasing demand from various sectors, and the fragmentation of responsibilities between authorities (Al-Kharabsheh, 2020). Integrated water management practices to link water management with agriculture, energy, and climate adaptation are essential for sustainable water use.

The Water Resources Law of 1977 and the National Water Strategy (2016-2025) regulate the extraction, allocation, distribution, and reclamation of traditional and nontraditional water resources, but they failed to prevent vandalism or overexploitation of water resources, which depleted most surface and ground water aquifers. hinders effective governance. Technologies, although recognized in the National Water Strategy, have not been expanded sufficiently. The government should invest in the best available technologies for desalination and water recycling to maximize water efficiency.

5.3 Soil Degradation and Pollution in the Food Chain

Excessive use of agrochemicals in fertilizers, herbicides, and pesticides continues to harm soil and the food chain. Agricultural Law No. 13 of 2015 is meant to regulate chemical use, but enforcement remains weak, which hinders the efforts of the agricultural sectors to take part in international markets. Tarawneh et al. (2019) pointed out that a ban in 2017 by neighboring countries on Jordanian vegetables due to pesticide residues resulted in a $100 million export loss. This implies that Jordan must strengthen its regulatory framework and promote organic farming, integrated pest management, and other sustainable farming practices to maintain a high quality of agricultural products, protect population and retain its international reputation. Additionally, a comprehensive review of Jordan's sectoral laws, including those for agriculture, water, and health is needed to align with climate goals and ensure effective, integrated responses to environmental challenges.

6. Preserving Cultural and Natural Heritage

6.1 Cultural Heritage Conservation

Jordan's cultural heritage, including unique sites like Petra, is integral to the nation's identity and economy, particularly through tourism. However, these sites face environmental pressures from urbanization, mass tourism, air pollution, and climate change. Rapid urban development and infrastructure projects threaten archaeological sites due to land confiscation and environmental deterioration which place immense strain on ecosystems. Acid rain and global warming intensify these issues, with extreme weather and fluctuating temperatures that accelerate the erosion of ancient structures and monuments (Abu-Allaban and El-Khalili, 2014).

6.1.1 Legislation and Challenges

The Antiquities Law No. 21 of 1988 was enacted to protect Jordan's cultural heritage sites. While it provides a framework for heritage protection, enforcement has been inconsistent, leaving sites vulnerable to environmental threats. The law lacks sufficient provisions to address the environmental aspects of heritage conservation, and inadequate monitoring and limited resources hinder enforcement.

6.1.2 Policy Recommendation

Jordan should strengthen legal frameworks by integrating environmental considerations into heritage site management. Comprehensive site management plans that address both conservation and sustainability are necessary. Sustainable tourism practices should be prioritized to reduce the ecological footprint of tourism and encourage eco-friendly behaviors among visitors. Stricter regulations, such as limiting access to fragile areas, controlling waste disposal, and mandating low-impact materials for site maintenance, would prevent further environmental damage. Strengthening collaboration between the Ministry of Antiquities, the Ministry of Environment, and other stakeholders would foster a more integrated approach to heritage protection.

6.2 Azraq Wetland

The Azraq Wetland, a vital natural habitat in Jordan's eastern desert, has suffered severe degradation due to excessive groundwater extraction. Since the 1960s, overexploitation of the Azraq Aquifer for agricultural, industrial, and domestic use has led to the near-total depletion of the wetland. By the 1990s, over-extraction had dried it up almost entirely, severely impacting biodiversity, including migratory birds and endemic plants (Damhoureyeh et al., 2004). Despite restoration efforts, including reducing water extraction and rehabilitating the ecosystem, the wetland has not fully recovered. Water levels remain critically low, and ecological imbalances threaten its long-term viability.

6.2.1 Restoration Efforts

The Azraq Wetland has faced significant degradation due to groundwater over-extraction, urbanization, and climate change. Since the 1990s, restoration efforts have focused on reducing groundwater extraction and restoring the wetland's natural hydrology. Despite these efforts, the wetland has not fully recovered, with water levels remaining low.

The scarcity of water in the region, exacerbated by population growth and agricultural expansion, continues to strain the aquifers feeding the wetland. Jordan's low per capita water availability makes it increasingly difficult to allocate water for environmental conservation (Mohammad, 2023). Additionally, climate change has altered the natural hydrological cycle, reduced aquifer replenishment, and increased evaporation rates (Wehrey et al., 2023). This creates a feedback loop, where the wetland's degradation worsens due to direct and indirect climatic effects.

To enhance restoration efforts, it is essential to integrate climate change adaptation into water management strategies. These should include using climate-resilient crops, improved irrigation technologies, and techniques to enhance water retention (UNEP, 2020). Artificial wetlands and wastewater treatment systems could help restore some functions of the wetland, reducing pressure on groundwater extraction. Additionally, modern irrigation systems surrounding the wetland would alleviate excessive groundwater extraction.

Effective governance and coordination between stakeholders, including the Ministry of Environment, the Ministry of Water and Irrigation, and local communities, are critical to the success of restoration efforts. Financial support from international funding sources for climate adaptation and conservation is also necessary to sustain rehabilitation initiatives.

A comprehensive approach, combining water management, sustainable agriculture, climate change adaptation, and innovative technologies, is essential for restoring the Azraq Wetland and preserving its ecological functions for future generations.

7. Summary and Conclusion

Jordan has made notable strides in environmental legislation since the establishment of the nation in the twenties of the previous century. However, significant gaps remain in enforcement, policy coherence, and the protection of both natural and cultural heritage. To meet the targets of the Paris Agreement and the outcomes of COP27-COP30, Jordan must address these gaps by strengthening climate change integration across sectors, improving air quality legislation, and expanding efforts in renewable energy.

By comparing Jordan with developed nations, it becomes clear that there are areas where its legal frameworks can be enhanced. Additionally, lessons from other developing countries provide valuable insights into scaling up renewable energy and climate adaptation initiatives. The degradation of critical ecosystems, such as the Azraq Wetland, further underscores the urgency for robust policy interventions.

Looking ahead, Jordan must prioritize institutional capacity building, secure international climate finance, and engage the public to ensure a sustainable environmental future. By adopting the best international practices like the Integrated Environmental Management (IEM) model and the Polluter Pays Principle, Jordan can strengthen its environmental governance and legislative framework. These steps will safeguard the country's natural and cultural heritage for future generations. Immediate action is essential to address these challenges and ensure a resilient and sustainable future for the environment and society.

Conflict of Interest

The authors declare no conflict of interest.

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