



RESEARCH ARTICLE

COMMUNITY-BASED WATER STEWARDSHIP AND ENVIRONMENTAL PLANNING IN ARID LANDSCAPES: A CASE STUDY OF WADI RUM, JORDAN

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ABSTRACT

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The challenges posed by globalization in environmental resource planning often result in standardized development models that disregard the unique socio-cultural and ecological contexts of regions like Wadi Rum in southern Jordan. This top-down approach undermines local communities, resulting in perceptions of external interventions as intrusive and misaligned with their needs and identities. To address these challenges, contemporary scholarship emphasizes the necessity of context-specific, community-led approaches to sustainable development. This paper explores the potential of participatory environmental and social planning within Bedouin communities in Wadi Rum. It underscores the critical role of community engagement in water stewardship and ecosystem protection as fundamental components for enhancing resilience in arid landscapes. Additionally, the study introduces the concept of participatory laboratories, which serve as platforms for integrating indigenous knowledge with strategic environmental planning. By fostering collaboration among community members, these laboratories aim to empower local voices and facilitate the development of tailored solutions that align with regional characteristics. Ultimately, this approach seeks to bridge the gap between externally imposed development initiatives and genuine local empowerment, promoting a sustainable future that honors the unique heritage and ecological integrity of Wadi Rum.

KEYWORDS

Arid Regions; Bedouin Communities; Community Participation; Environmental Planning; Jordan; Local Sustainability; Participatory Laboratories; Wadi Rum; Water Resources Management; Water Stewardship.

1. INTRODUCTION

The Environmental deterioration in the Jordan desert region is increasingly affecting southern Jordan, necessitating a more balanced approach to the use of natural resources (Safran et al., 2018; Aideh et al., 2025). (Mansour Safran, Jerash University). Addressing this challenge requires a shift in planning strategies that prioritize the protection and recovery of the local ecosystem, focusing on critical elements such as water, soil, air, and energy. This shift calls for a profound innovation in traditional analytical and design tools, particularly regarding the integration of expert knowledge with local common-sense knowledge (Mosso et al., 2025).

Another key concept addressed in this paper is "local self-sustainability," which emphasizes that sustainability cannot be effectively achieved without the genuine participation and involvement of local inhabitants throughout all phases of the planning process (Garrido et al., 2024; Odeh et al., 2018). This concept can be framed as "laboratories of local self-sustainability," where community engagement is central to achieving sustainable outcomes. The purpose of this paper is to present a critical assessment of various planning projects implemented in southern Jordan and to evaluate why these projects have not successfully engaged the local population in a meaningful way (Garrido et al., 2024).

Despite the numerous planning models introduced in the area, none have fully garnered the support of local communities from inception to implementation (Strachan et al., 2012). A significant shortcoming of these initiatives is their tendency to present ready-made solutions, which often alienate local residents and lead to a lack of genuine involvement (Strachan, et al., 2012). For researchers, it is crucial to assess these experiences to bridge the gap between theoretical frameworks and practical applications when addressing sustainability issues relevant to the Bedouins in the region. This analysis may facilitate the development of a context-specific understanding of sustainability, termed "local self-sustainability" (Qumsiyeh, et al., 2024; Yeh et al., 2016).

The study aims to examine the natural resources available in southern Jordan to identify sustainable development opportunities through an integrated environmental perspective. It seeks to emphasize the critical role of local communities in resource management while developing planning models that merge technical and local knowledge for environmental protection. The research also aims to define key concepts related to "appropriate local sustainability" and establish operational methods for implementing these principles through local laboratories. To achieve these objectives, the research will first delve into the economic, socio-cultural, and ecological aspects of the study area (South of Jordan). It will analyze the interrelationships among various factors affecting local

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sustainability issues, enabling local residents to develop action programs that align with their needs. The research involves actively engaging with local residents through empirical investigations, where community input is integral to the planning process. Progression through different phases will depend on the completion and endorsement of previous stages by the local community, ensuring adjustments are made as necessary. This participatory approach will empower locals to create interventions that reflect their skills and priorities, fostering effective stewardship of their resources.

2. CASE STUDY

The case study focuses on the southern region of Jordan, specifically the Aqaba area. This region is ecologically fragile and is currently the site of a project aimed at supplying the capital city, Amman, along with other urban settlements in the north, with water sourced from the southern Jordan Basin (Al-Saqarat et al., 2017). If implemented, this project could disrupt various aspects of the local environment, endangering the ecological balance that has existed for generations. Additionally, the area is affected by numerous other projects arising from the "free zone," which threaten local villages, the environment, and the socio-cultural and economic foundations of the communities living there (Jawabreh, 2021).

One of the most critical issues facing southern Jordan, especially the Disi region, is water resource management (Hussein, et al., 2019). The Disi aquifer, which supplies significant portions of Amman and other northern cities with water, lies directly beneath these southern territories (Hussein, et al., 2019). Continuous extraction of water without involving local communities in its management poses a severe threat to the sustainability of the resource and the ecological balance of the area (Hussein, et al., 2019). Addressing the movement of water through these desert zones requires consideration of not only technical aspects but also socio-cultural dynamics and traditional Bedouin knowledge regarding water stewardship (Hussein, et al., 2019).

Despite being marginalized for a long time, the southern region of Jordan has been adversely affected by the introduction of various unfamiliar programs, including cultural, tourism, and construction initiatives (Sagie, et al., 2013). Given its environmental sensitivity, any actions taken in this area require careful consideration. Due to its vulnerability, this fragile environment cannot be managed sustainably without actively engaging the local population. While the ecosystem is delicate, it is also rich in natural features, biodiversity, and significant water reserve basins (Hussein, et al., 2019).

3. CONVERT FROM UNSUSTAINABILITY TO SUSTAINABILITY APPROACHES

During the 1970s, the issue of sustainability was dominated by the notion of an unlimited economic growth model (Rees, et al., 2021). The idea posits that for developing countries to catch up with the economic pace of developed nations, they must adopt the same economic model (Rees, et al., 2021; Nayyar, 2014). The increasing poverty rates in less developed nations, along with the concentration of the world's wealth in the hands of just 15% of its population, starkly illustrate the limitations of such a model (Nayyar, 2013; Ghannam, et al., 2019).

In the 1980s, alternative theories emerged, including the basic needs theory, the eco-development theory, and self-reliance theory, all representing a shift away from the unlimited growth paradigm (Deszczyński, 2022). Recent research findings indicate that these theories have contributed to the emergence of new forms of poverty, not only in poorer nations but also within wealthier ones, even after 2019. Studies show that while GDP may rise, the Index of Sustainable Economic Welfare (ISEW) has been declining (Zhu, et al., 2022). This suggests that economic growth continues to incur higher costs in terms of pollution and environmental damage (Zhu, et al., 2022). Additionally, individual and public health are increasingly at risk due to ongoing economic expansion (Zhu, et al., 2022). The gap between rich and poor nations is widening, as is the disparity within wealthier nations themselves (Zhu, et al., 2022).

Jordan faces a complex interplay between economic growth and water resource management as it looks toward 2030 (Al-Addous, et al., 2023). While GDP per capita is projected to continue its upward trend, potentially reaching around \$5,895 by 2029, this growth must be carefully balanced against the nation's persistent water scarcity (Al-Addous, et al., 2023; Hamaideh, et al., 2024). Jordan is already one of the world's most water-scarce countries, a challenge that is expected to persist (Beithou, et al., 2022). Although efforts to promote water conservation and efficient use are ongoing, their ultimate impact on overall water consumption remains

to be seen. The country may need to explore alternative water resources, such as desalination and wastewater treatment, to meet increasing demand (Albatayneh, 2024; Alazaiza, et al., 2025). Successfully navigating the balance between economic development and sustainable water management will be crucial for Jordan's future. Long-term projections are inherently uncertain and influenced by various factors, so these figures should be considered within the broader context of Jordan's economic, social, and environmental landscape.

4. LOCAL SUSTAINABLE DEVELOPMENT

Understanding the social context and lifestyle of the local population is crucial before embarking on any planning project in a specific area. The region under study is inhabited by Bedouins, who lead a lifestyle markedly different from that of urban settlers (Shryock, 1997). This distinction compels planners to consider the unique social dynamics of these communities and their relationship with their territory and environment. For Bedouins, territory extends beyond physical boundaries such as walls or buildings; it encompasses all the space that they and their kin can exert some form of control over. Others also recognize this space as their property. In Bedouin culture, individual property rights are less significant than social property rights, and property is viewed as indivisible (Shryock, 1997).

The concept of "territory" is an essential tool for achieving successful local environmental self-sustainability (Granata, et al., 2018). It refers to a specific place characterized by unique historical, socio-cultural, and natural attributes (Granata, et al., 2018). These particular characteristics provide the local community with the cognitive framework necessary to undertake and manage sustainable actions at the local level (Granata, et al., 2018). The Bedouin understanding of local territory may encompass areas as large as entire regions and can even include transnational spaces that cross political boundaries. Therefore, while the term "local" is used, it does not imply localism; instead, it highlights the uniqueness of a place and its values, whether they are geographic, historical, cultural, or environmental (Shryock, 1997; Granata, et al., 2018).

5. PUBLIC PARTICIPATION

Over the last decade, public participation in planning has gained significant momentum worldwide (Beithou, et al., 2022; Safran, 2020). When social groups feel included as key players in the planning process, planning actions become more credible and legitimate in their eyes. Engaging the public can help mitigate many problems and conflicts that arise during planning (Granata, et al., 2018).

The rapid growth in industrialized and multiracial societies has fostered a sense of exclusion among lower social strata regarding planning decisions (Chaskin, et al., 2012). The widening gap between the private and public sectors, exacerbated by a lack of dialogue, interaction, and trust, highlights the need for new approaches within the planning profession (Chaskin, et al., 2012). Such approaches should prioritize participation as a fundamental element throughout the entire planning process. Public participation aims to reduce potential conflicts among different social groups and stakeholders, fostering common ground for resolution (Chaskin, et al., 2012). It also ensures that all parties are well-informed about the objectives and outcomes of planning actions, enabling them to form their own opinions and advocate for or against proposals (Chaskin, et al., 2012). Recent international summits have reached a consensus on the critical role of public participation in advancing sustainable development agendas. These summits recommend participation as an essential tool for effective planning program implementation and for legitimizing planning actions (Spijkers, et al., 2015). The summit recommends participation as an important tool for effective planning program implementation and for the legitimization of its actions (Spijkers, et al., 2015).

The shortcomings of current planning practices in promoting public participation have underscored the unsustainable nature of traditional approaches. Various factors call for the inclusion of participation in planning, including the limited success of imposed planning actions by outsiders, the failures of top-down approaches, and the disappointing results of welfare policies.

6. PARTICIPATION IN THE SOUTH OF JORDAN AREA

For planners, participation is essential for the comprehensiveness and sustainability of the development process (Hassan, et al., 2011). When local community members engage in planning, they feel a sense of responsibility for the program's success, making efforts to create favorable conditions for achieving positive outcomes (Hassan, et al., 2011).

Participation also raises awareness about the challenges they face and fosters cooperation among individuals and groups within the society. The Bedouin population is familiar with the concept of participation, having practiced it for centuries (Shryock, 1997). Mutual aid, known locally as takaful or feza'a, is a significant aspect of their culture (Shryock, 1997). Community members collaborate to build shelters, mosques, schools, and other essential services, reflecting values deeply rooted in Bedouin tradition (Shryock, 1997).

This paper emphasizes the need to empower local people by providing genuine opportunities for involvement in sustainable development. Key actions to achieve this include education, awareness-raising, transparency, and training. The concept of self-mobilization, as described by Oakley, is also crucial, enabling locals to seek the necessary technical, financial, and institutional support for their projects (Oakley, 1999).

To effectively implement participation among Bedouins, several conditions must be met. First, participation should encompass the entire planning process, not just marginal aspects. It should also serve as a means to make significant decisions throughout all phases of the project. Effective involvement of Bedouins is essential for ensuring project success. Furthermore, all forms of knowledge—both expert and local—should be included in the negotiation and participation processes, allowing less powerful segments of society to voice their interests and contribute to the project. To achieve the objectives of the participation process, specific steps must be taken. The first step involves organizing Bedouins into committees to determine the extent of their participation. The second step is granting local communities some control over the planning process, thereby enhancing their role and reducing the influence of intermediaries

such as NGOs.

Local Bedouin involvement in various programs has proven crucial for project implementation. Their participation, whether as individuals or groups, has strengthened relationships with planning officials, particularly those responsible for development in the area. However, many initial participation experiences revealed shortcomings, as numerous individuals and groups were marginalized during the program phases. Despite the use of significant volumes of drinkable water for unsustainable farming projects, local communities did not benefit from these initiatives. Such projects pose a threat to locals and the future of their generations, compromising the entire ecosystem. A participatory approach is needed, allowing local inhabitants to define water use priorities, monitor water flow in the Wadi Rum area, and develop sustainable alternatives such as community-based water conservation systems or micro-desalination technologies.

In previous planning processes, locals were excluded from the initial stages of project discussions. Decisions were typically made by officials and experts without local input. Although Bedouins were later included during design, implementation, and management phases, their involvement remained limited. In many cases, such participation merely served to placate potential opposition rather than empower the community. The assessment of social, economic, and environmental impacts has revealed significant shortcomings, particularly concerning sustainability. Intensive resource use, such as water reserves for irrigation, has primarily benefited outsiders, with profits not reinvested into the local economy. Community members were often relegated to minor roles, failing to gain significant benefits from these projects. Table 1 summarizes the case study and participation experiences undertaken in the southern Jordan area.

Table 1: Summary of participation experiences and outcomes in the Southern Jordan area.

Activity	Description	Level of Local Participation	Outcomes and Impact
Project Inception	Decisions made solely by outsiders without local input.	Minimal	Lack of local ownership; decisions did not reflect community needs.
Design Phase	Inclusion of Bedouins decided late in the process.	Marginal	Local concerns were not adequately addressed.
Implementation	Local community involvement was limited to minor roles.	Limited	Locals primarily used for safeguarding farms.
Economic Impact	Produce was exported, profits not reinvested locally.	None	Local economy did not benefit; wealth accrued to outsiders.
Environmental Sustainability	Intensive uses of water resources for irrigation	None	Threatened local ecosystems; unsustainable practices.

Table 1 summarizes the key aspects of participation in the projects undertaken in the southern Jordan area, highlighting the limited involvement of local communities and the resulting negative impacts on sustainability and local economies.

7. DESCRIPTION AND ASSESSMENT

Table 2 provides a critical assessment of community participation across various phases of development projects in Wadi Rum. It reflects the extent of engagement by Bedouin communities and local NGOs in water-related and social planning initiatives, highlighting gaps and missed opportunities. The evaluation emphasizes the importance of transitioning toward participatory laboratories that foster genuine, community-led development in arid regions like Wadi Rum.

Table 2: Assessment of community participation and NGO involvement in development planning in Wadi Rum, Southern Jordan.

Activity	Preparation	Design	Implementation	Management	Final Assessment
Water Projects	No Participation	Marginal Participation	Intensive use of water, no local benefit	Decisions made by outsiders	Locals excluded from benefit and decision-making
Officials–Locals Relations	Selective dialogue with leaders	No Participation	Limited NGO involvement	Locals offered minor roles	Distrust and exclusion of community
Local Public Participation	Limited initiation	Committees forming	Active in later stages with women’s involvement	Some presence in meetings	Promising start undermined by weak influence
Monitoring and Evaluation	No local input	-	-	Limited NGO role	Evaluation controlled by officials
Proposed Participatory Laboratories	Locally initiated concepts	Co-designed with community input	Led by Bedouin groups with expert facilitation	Self-managed by local structures	High potential for sustainable and inclusive development

8. PARTICIPATIVE LABORATORIES

Participation has often been regarded as a vague and uncertain concept, especially in the context of development projects. In the study area, the concept of participative laboratories was proposed as either closed or open spaces designed for knowledge sharing, action, and training specifically for local Bedouin communities. These laboratories aimed to reinforce local self-sustaining practices that would foster genuine and effective engagement. It is crucial to understand that participation is not a universal solution; it requires adaptation to the unique cultural and social contexts of each community. The primary goal of local participation was to reduce conflicts and divergent views among stakeholders by aligning their efforts toward a common objective. What might initially appear as weaknesses in the process could be transformed into strengths through structured participation. Therefore, the design of the participative laboratories focused on fostering communication, consultation, and self-management processes.

The laboratories sought to protect local identity from the influences of dominant cultures. Through negotiation processes facilitated in these labs, local Bedouins were empowered to assert their self-determination and equipped with tools to articulate their community's demands and expectations effectively. This setting served as a platform for integrating the efforts of various social actors into self-sustainable planning, grounded in both theoretical and methodological frameworks.

To promote socioeconomic and environmental sustainability, the laboratories prioritized territorial and environmental quality as fundamental indicators. This focus not only enhanced local social identity but also fostered a deeper sense of place among community members. Collaboration among locals, along with coordination with public institutions, was essential for nurturing new social actors committed to sustainable ecosystems.

The proposed participative laboratories in southern Jordan were envisioned to be managed by the Bedouins themselves. They were to include elements such as a documentary cultural center, a specialized research center, a data bank, training facilities, an eco-museum, and local benevolent associations—such as a tourist guide association for men and an arts and tapestry association for women.

One of the key components of these laboratories was the inclusion of water resource education and monitoring programs. These initiatives aimed to raise awareness among local residents, particularly youth and women, about water conservation practices, the significance of water sources in Wadi Rum, and the risks associated with over-extraction in arid conditions. Training would enable locals to document water usage, observe seasonal patterns, and participate actively in decision-making regarding water allocation and protection within their communities.

Participative laboratories represent structured environments—both physical and social—where local communities can learn, experiment, and plan collaboratively. In the Wadi Rum region, these labs should:

- Be managed by Bedouins themselves to ensure local ownership and relevance.
- Incorporate water conservation education tailored to the specific environmental conditions of Wadi Rum.
- Establish community-run centers, including cultural hubs, research spaces, eco-museums, and data archives.
- Support sustainable economic activities, such as local arts, women's cooperatives, and eco-tourism initiatives.

The overarching goal was to cultivate localized resilience while preserving cultural identity, ecological diversity, and traditional knowledge. Participation in Wadi Rum was framed not as an imported model but as a practice deeply rooted in local customs and adaptive strategies for desert living. This approach underscores the importance of integrating scientific understanding with local knowledge, ensuring that development initiatives are both contextually relevant and sustainable.

9. CONCLUSIONS

This area has led to many projects being imported as a consequence of the sweeping globalization. However, these "globalized" projects have had limited success, leading to a loss of local identity, threats to cultures, values, and habits, and significant environmental damage. The concept of

appropriate local sustainable development emphasizes the effective use of local resources while considering their reproduction rates to ensure long-term availability. Achieving this requires clear objectives, standards, tools, and indices defined by local people. Their involvement is crucial in determining policies and actions for their environment.

Each place possesses unique values, cultures, histories, and characteristics that must be respected. Local communities need to feel responsible for their environment and the success of their planning projects. Creating the necessary conditions—institutional, social, political, economic, and environmental—is essential for success. Raising awareness among local people and stakeholders through knowledge, information, and communication is vital. It is important for them to see themselves as active participants and drivers of development. This concept of appropriate local sustainability is central to this study.

RECOMMENDATIONS

To achieve appropriate local sustainability in arid regions like Wadi Rum, the following recommendations should be prioritized:

- Utilize local resources based on ecological limits.
- Allow locals to define their needs, values, and futures.
- Develop institutional, social, and political support systems.
- Empower local knowledge systems.
- Strengthening collaborative governance.
- Enhancement of awareness and capacity building.

In arid and ecologically sensitive regions like Wadi Rum, water should be protected through collaborative and community-led governance. Bedouins must be recognized as stewards of their environment, and their engagement is essential for long-term viability and ecological balance.

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