Stakeholder Management in Public-Private Partnerships for Territorial Innovation: The Case of Nouaceur Technopole in Morocco's Green Industrialization

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RÉSUMÉ

Les partenariats public-privé (PPP) apparaissent comme une nouvelle source d'innovation territoriale pour l'industrialisation verte dans les pays en développement, ce qui nécessite une gestion des parties prenantes dans les projets sociaux. Cet article examine la Technopole de Nouaceur au Maroc, une initiative d'innovation en PPP qui coproduit des ressources issues de l'État, du groupe OCP et de l'Université polytechnique Mohammed VI (UM6P) afin de construire des écosystèmes industriels durables pour l'hydrogène vert et les phosphates circulaires, dans le cadre d'un projet social visant l'inclusion et la résilience. En nous appuyant sur les modèles d'innovation territoriale et la théorie des parties prenantes (Freeman, 1984), nous formulons une question de recherche afin d'étudier comment la gestion des parties prenantes dans un partenariat public-privé (PPP) peut rendre un projet de développement industriel souverain, résilient et inclusif dans un contexte de pénurie de ressources. Une analyse qualitative des données secondaires de 2021 à 2024 montre des résultats significatifs : 300 millions d'euros de financement vert, trois usines pilotes d'engrais durables et 1 200 jeunes formés par an (Groupe OCP, 2023 ; UM6P, 2024). Ces résultats valident l'initiative d'innovation PPP comme renforçant la souveraineté et soutenant une trajectoire zéro carbone d'ici 2030, mais une conclusion troublante compromet l'inclusivité : 70 % des emplois qualifiés dans ce processus d'innovation n'impliquent pas les PME locales en raison de relations de pouvoir asymétriques (Région Casablanca-Settat, 2024). Cet article évalue la reproductibilité de l'initiative d'innovation hybride dans les pays du Sud et propose des mécanismes de gouvernance locale pour renforcer la durabilité aux niveaux territoriaux, des PME et de la gestion des parties prenantes, conformément aux exigences des projets sociaux (Freeman et al., 2010).

***Mots-clés** : Gestion des parties prenantes ; Partenariats public-privé ; Innovation territoriale ; Industrialisation verte ; Inclusion des PME ; Hydrogène vert.*

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ABSTRACT

Public-private partnerships (PPPs) are emerging as a new source of territorial innovation for green industrialisation in developing countries, necessitating stakeholder management in social projects. This paper investigates the Nouaceur Technopole in Morocco as a PPP innovation initiative that co-produces resources from the State, OCP Group, and Mohammed VI Polytechnic University (UM6P) to build sustainable industrial ecosystems for green hydrogen and circular phosphates, framed as a social project for inclusion and resilience. Drawing on territorial innovation models and stakeholder theory (Freeman, 1984), we formulate a research question to investigate how stakeholder management in a public-private partnership (PPP) can make an industrial development project sovereign, resilient, and inclusive in a resource-poor setting. A qualitative analysis of secondary data from 2021-2024 indicates significant outputs of €300 million in green finance, three sustainable fertilizer pilot plants, and 1,200 youth trained per year (OCP Group, 2023; UM6P, 2024). These outputs validate the PPP innovation initiative as reinforcing sovereignty and support a zero-carbon pathway by 2030. Still, one troubling finding jeopardises inclusivity: 70% of qualified jobs in this innovation process do not involve local SMEs due to asymmetric power relations (Région Casablanca-Settat, 2024). This paper evaluates the replicability of the hybrid innovation initiative in the Global South. It proposes local governance mechanisms to reinforce sustainability at the territorial, SME, and stakeholder-management levels, in accordance with social project requirements (Freeman et al., 2010).

***Keywords**: Stakeholder management; Public-private partnerships; Territorial innovation; Green industrialization; SME inclusion; Green hydrogen.*

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INTRODUCTION

In the face of rapid climate change, green industrialization is essential for the Global South to become increasingly resilient (UNIDO, 2025). This metamorphosis transforms developing economies from carbon-based to low-emission production systems powered by renewable energy and circular-economy principles (World Economic Forum, 2025). The uneven technological and financial means available to the North and South threaten to make the North-South divide insurmountable. The public-private partnership (PPP) finances technology transfer, but focuses on infrastructure rather than social inclusion, with mixed results in resource-poor settings (Hodge & Greve, 2007).

Morocco is leading the way with a pivot toward green hydrogen to achieve energy self-sufficiency and reduce its dependence on imported gray ammonia (UM6P, 2023). The Nouaceur Technopole is a hybrid institution in which the State, OCP Group, and Mohammed VI Polytechnic University (UM6P) collaborate to advance a circular economy. This partnership, aligned with the National Industrial Acceleration Strategy (2023-2030), aims to achieve a fully renewable supply chain by 2027, with a 70% local integration rate (Ministère de l'Industrie et du Commerce, 2024; OCP Group, 2025).

However, despite this institutional support, a paradox motivates this study's research question: How can stakeholder management in a public-private partnership (PPP) make an industrial development project sovereign, resilient, and inclusive in a resource-poor setting? Conceptualized as a social project prioritizing fairness in the community over efficiency (Freeman, 1984), the Nouaceur PPP risks becoming a mere "innovation enclave." The Triple Helix model (Etzkowitz & Leydesdorff, 2000) successfully links the State, Industry (OCP), and Academy (UM6P), but highlights the asymmetric distribution of power that excludes Small and Medium-sized Enterprises (SMEs). In Nouaceur, despite increasing sovereignty driven by innovation in the high-tech industry, local SMEs have no access to 70% of qualified jobs within the innovation loop (Région Casablanca-Settat, 2024). High entry barriers lock them out of the innovation process, undermining the supply chain's resilience by preventing them from adjusting to external disruptions (Soni et al., 2024).

The État-OCP-UM6P model prioritizes territorial development but maintains SMEs in asymmetric dependency relations (Boutaleb et al., 2024). This study assesses the Nouaceur Technopole as a hybrid social project. It recommends shifting to a Quintuple Helix model of stakeholder engagement that includes SMEs and civil society, so that stakeholder management in Nouaceur aligns with the goals of a sovereign and socially focused project (Freeman et al., 2010; Carayannis & Campbell, 2010).

The article is structured as follows: theoretical approaches to PPP and stakeholder management are explored; the research methods are outlined; the results of the Nouaceur Technopole research are presented; and inclusive local governance is recommended.

I. LITERATURE REVIEW

I.1. A Transformation of PPP Perspective: From Financial Risk-Sharing to Knowledge Transfer and Sovereignty

Public-private partnerships (PPPs) have conventionally been understood as mechanisms for financial risk-sharing and infrastructure development, enabling the lower-resource public sector to draw on the private sector's expertise to reduce fiscal burdens (Hodge & Greve, 2007). This framework for understanding PPPs reflects an "accounting" view that prioritizes cost-effectiveness and contractual obligations within partnerships, often at the expense of considering the long-term impacts of these project-based initiatives as compared to their more immediate, short-term outcomes (Hodge & Greve, 2007). The contemporary literature, however, proposes a perspective on PPPs that focuses on their capacity to transfer knowledge and foster innovation, particularly in contexts that support the development of sovereign knowledge in strategic sectors (Oguamanam, 2010). In public health emergencies, for example, it is argued that PPPs can aid in consolidating patents and R&D efforts, extending their role from a financial initiative to one that focuses on the public good (Oguamanam, 2010). Such a transformation of PPPs is evident in data-driven PPPs, which have adopted official statistics as a guiding principle, thereby emphasizing responsible access to data and centering transparency and data sovereignty within data ecosystems (Borgogno et al., 2024).

A similar pattern can be observed in procurement, where PPPs apply the concept of data sovereignty to integrate it into their approaches, enabling these social initiatives to ensure that public objectives are aligned with private innovations (Vandercruysse, 2022). In the context of green industrialization as a social project, this same transformation of PPPs can be understood as positioning these initiatives as "innovation PPPs" that facilitate the co-development of necessary technologies between the state and the firm. The État-OCP-UM6P partnership at the Nouaceur technopole can already be considered such a hybrid institution, now focused more on negotiating frontline orders of sufficient time-space than on time-space infrastructures (Bishop & Waring, 2016; Ministère de l'Industrie et du Commerce, 2024).

From the perspective of stakeholder management – which is inherently tied to the concept of social projects (Freeman, 1984) – this transformation of PPPs requires a new focus on managing the power dynamics between primary stakeholders (states; firms) in relation to their outcomes. This factor suggests that insufficient attention to a specific category of stakeholders remains a problem in the existing PPP literature. These critiques fail to examine how these organizations neglect relational dynamics in their development, aiming to reduce dependence on other nations for foreign knowledge and technologies (Pereira et al., 2019; Freeman et al., 2010).

I.2. Territorial Innovation Models and the Enclave Effect

The literature on territorial innovation models (TIMs) highlights the role of geographic proximity in spillovers of innovation from a cluster to its surrounding environment, emphasizing the creation of collaborative ecosystems that promote regional competitiveness (Moulaert & Sekia, 2003). These models focus on mechanisms such as shared infrastructure and networks and suggest that geographic proximity facilitates positive externalities, including technology spillovers from an innovation cluster back to its "surrounding ecosystem" (Moulaert & Sekia, 2003). In practice, however, these relationships are often neither readily visible nor effective.

The literature observes that while geographic proximity can enable spillover effects, organizational proximity is often absent or insufficient, resulting in innovation enclaves in which high-tech ecosystems fail to benefit their broader environmental ecosystems (Boschma, 2005). The enclave effect occurs when innovation clusters prioritize an ecosystem with high levels of technological

competence and barriers to access for others who lack such competencies (Boschma, 2005).

In the context of the Nouaceur technopole, when considered as a social project, its focus on green ammonia pilot projects can be seen as contributing to this effect. While local stakeholders such as local SMEs may be in close geographic proximity to these clusters, their eligibility for this project may still be out of reach due to high barriers to entry (Région Casablanca-Settat, 2024). The literature on Global South technopoles critiques this phenomenon, questioning its capacity to diffuse innovation and information rather than to deepen inequalities within these environments, particularly in the absence of an established mechanism for inclusion (Lagendijk & Cornford, 2000). Using these arguments to link the enclave effect to concepts within stakeholder theory—especially regarding its relation to social projects—allows for the conceptualization of "innovation enclaves" as a flaw within territorial innovation models that may be overcome through hybrid institutions that incorporate these factors into their policies with a focus on bridging proximities rather than creating enclaves. This can ensure a socially just outcome for all parties involved in initiatives such as green industrialization.

I.3. The Helix Frameworks: From Triple to Quintuple Helix for Sustainability

The Triple Helix framework conceptualizes innovation as a product of synergistic interactions among universities, industry, and government; each stakeholder plays a distinct role in knowledge production and commercialization (Etzkowitz & Leydesdorff, 2000). The Triple Helix model views universities as driving R&D, industries as providing market applications, and government as providing enabling policies, as exemplified by hybrid organizations such as technology transfer offices (Etzkowitz, 2007).

In the case of Nouaceur as a social endeavor, the État-OCP-UM6P partnership reflects this approach: the UM6P's research platforms, the OCP's industrial application capacities, and the state's governmental strategies combine to produce green technologies (UM6P, 2024). Extending the framework to the Quintuple Helix, however, is necessary for sustainable green industrialization. Recent interpretations of the model extend it to include nature itself and civil society as additional helices to address ecological needs and social sustainability (Carayannis & Campbell, 2010). Thus, conceptualizing innovation as quadrupling (with society) or quintupling (with nature) the Triple Helix framework positions global warming as an impetus for eco-innovation (Carayannis et al., 2012). Empirical studies of entrepreneurial ecosystems reveal that the Quintuple Helix fosters sustainable business models by including nature and civil society in its networks (Grigoroudis et al., 2021). In energy governance, ICT-enabled Quintuple Helix models leverage civil society's participation in energy access networks to enhance system resilience (Galan, 2022).

Applying a stakeholder management approach (Freeman, 1984) to critique Nouaceur's apparent Triple Helix model reveals that its lack of a nature helix makes it vulnerable to overlooking secondary stakeholders such as SMEs and citizens, which leads to some exclusionary tendencies even in social projects (Acikdilli et al., 2020; Pattberg et al., 2012). Transitioning to a Quintuple Helix model is thus necessary to support durable, sovereign development grounded in optimal stakeholder engagement (Freeman et al., 2010).

I.4. Supply Chain Resilience, SME Inclusion, and Green Industrialization

Green industrialization also relies on supply chain resilience, defined as the ability of a supply chain to combine sustainability and operational resilience—strategies focusing on mitigation and recovery—especially in developing economies vulnerable to disruptive events (Soni et al., 2024). Recent publications increasingly identify SME inclusion as a factor associated with supply chain resilience, arguing that local supply chains reduce dependence on larger firms and provide greater flexibility and a more substantial capacity to recover from disruptive events, whether due to regional

challenges or global phenomena such as pandemics or wars (Mousa, 2023). For SMEs in China, the lack of institutional systems and resource availability represents major failure factors in green supply chain management (Qiao et al., 2020; Gao et al., 2020). In industrialized construction projects, the exclusion of SMEs has left these supply chains vulnerable, as they lack the capacity to diversify and enhance sovereignty (Owusu et al., 2021).

A supply chain resilience strategy entails digitalization; digitized energy supply chains can achieve both resilience and carbon-neutrality targets (Mousa, 2023). In the context of Morocco and OCP's solar energy program, "local content," a metric that quantifies the proportion of a product supplied by locally produced parts and services, may be used to link the theory of supply chain resilience to OCP's practices. The OCP credits OCP Green Energy with achieving a 70% local content level in its solar plants, likely to increase Morocco's capabilities and reduce its vulnerabilities (IM Mining, 2025; OCP Group, 2025).

Inviting SMEs into Nouaceur's green hydrogen supply chains would shorten them and enhance their resilience, while advancing sovereignty through localized value chains (OCP Group, 2023). This recommendation aligns with Soni et al.'s call for green supply chain managers to empower small and medium-sized enterprises (SMEs) to enhance their SME-focused green supply chain management strategies by reducing risks and facilitating smooth transitions over time (Soni et al., 2024). Resilience requires engaging secondary stakeholders, such as SMEs, to address power imbalances among stakeholders; failure to do so can leave non-profit organizations vulnerable to exclusion by primary stakeholders (Pinheiro et al., 2019; Freeman et al., 2010).

I.5. Synthesis and Gaps in Previous Research

PPP literature evolves to portray them as innovation facilitators (Pereira et al., 2019), TIMs reveal them to showcase enclave perils (Boschma, 2005), Helixes require sustainability modifications for ecological concerns (Carayannis et al., 2021), and supply chain research regarding SME-centered resilience stories (Soni et al., 2024). Coupled through stakeholder theory, these align to suggest a growing imperative to govern the diversity of parties in social projects toward representativeness, durability, and inclusivity, as asymmetric power in such scenarios tokenizes secondary stakeholders such as SMEs (Freeman, 1984).

However, gaps persist in legacy models that do not consider power dynamics or civilian-oriented helices that deny SMEs a green evolution, and in recent supply chain research, where mismanaged stakeholder relationships amplify vulnerabilities in emerging markets by neglecting civil society (Mousa, 2023). This research addresses these gaps by treating Nouaceur as a hybrid PPP social project and by proposing improved stakeholder management to enhance its replicability and equity (Freeman et al., 2010).

II. METHODOLOGY

A qualitative single-case study approach was employed in the present study, which is most applicable to "how" and "why" questions posed in a complex contemporary setting where the phenomenon cannot be distinguished from its context (Yin, 2018). The Nouaceur Technopole can be conceptualized as a revelatory case and therefore a means through which to theorize a form of public-private partnership (PPP) in terms of its role in green industrialization innovation in resource-constrained settings of the Global South through a theory-building approach combining literature-based knowledge with data, achieving analytical generalization of results to similar contexts, thereby adding internal validity (Eisenhardt, 1989).

II.1. Case Selection and Boundaries

The case of the Nouaceur Technopole has been selected purposely as an extreme/deviant case as a hybrid of a PPP involving the State, a corporation (OCP Group), and a university (UM6P), and with a unique observability through the Triple Helix (Etzkowitz & Leydesdorff, 2000) applied to the context of phosphate resource sovereignty and green hydrogen production. This can be justified in relation to the study of the national strategy to pivot towards a circular economy (adopted in 2021) and with reference to inclusion paradoxes in green PPPs (Etzkowitz & Leydesdorff, 2000). Although the research would also be pertinent to other industrial sites in Morocco (e.g., Jorf Lasfar) where PPPs with the OCP Group are being rolled out, these sites do not face the same inclusivity concerns, given the lack of an integrated university. Without this element, the site also does not embody the essence of a Triple Helix. In contrast to the Jorf Lasfar site, which focuses on industrial-scale production and thus inclusivity is not an issue, this location is a hybrid ecosystem that incorporates an R&D center, a pilot production center, and an education center. The Technopole thus provides a visible setting for exploring the enclave effect and the exclusion of local SMEs from skilled positions. The inclusion of this case is tied to the decision to adopt circular economy practices in its approach to phosphates and hydrogen resources, framing the Technopole as a bounded system through which to observe innovation enclaves and the exclusion of SMEs.

II.2. Data Collection (Triangulation)

To improve construct validity and limit the influence of researcher bias, triangulation of sources was employed (Denzin, 1978). A total of 25 documents were collected between 2021 and 2024 across various categories of data to enhance objectivity:

- Institutional and strategic documents (n=10), e.g., public OCP Group reports on its adoption of a $12bn net-zero strategy (OCP Group, 2023), state archives related to national strategies (Ministère de l'Industrie et du Commerce, 2024).
- Technical and performance-related documents (n=8), e.g., quantitative reports on green hydrogen production provided by the Green H2A platform (e.g., production units at the level of 4 MW, ammonia production units at the level of 4 t/day, solar infrastructures totalling 202 MWp at the sites in Benguerir and Khouribga); sites affiliated with UM6P; UM6P (2024).
- Financial and employment-related documents (n=4), e.g., €300mn provided in green financing; 70% rate of exclusion for local SMEs from skilled positions in contracts; Régions Casablanca-Settat (2024)
- Independent reports to reduce potential bias of self-reports by OCP on their contributions; these independent sources were often press clippings from neutral media relating to specific topics (n=3), e.g. Morocco World News (2025), updates on the development of green ammonia; and NGO reports on issues related to socioeconomic inclusivity in Moroccan industrial zones (e.g., ECDPM, 2023; SMEs in Africa).

Data were collected iteratively through theoretical sampling, with saturation achieved. Techniques included accessing public document repositories and institutional archives.

II.3. Analytical Framework: Thematic Content Analysis

Analytical data was reflexively analyzed using thematic content analysis methods as per Braun & Clarke, (2006), based on the researcher's six-phase model of analysis (with a combination of inductive and deductive methods), comprising: (1) Familiarization with data; (2) coding; (3) identifying themes; (4) Review themes; (5) Definition/naming; (6) Producing report). The analysis identified patterns outlined in the data, informed by the theoretical structure provided in the

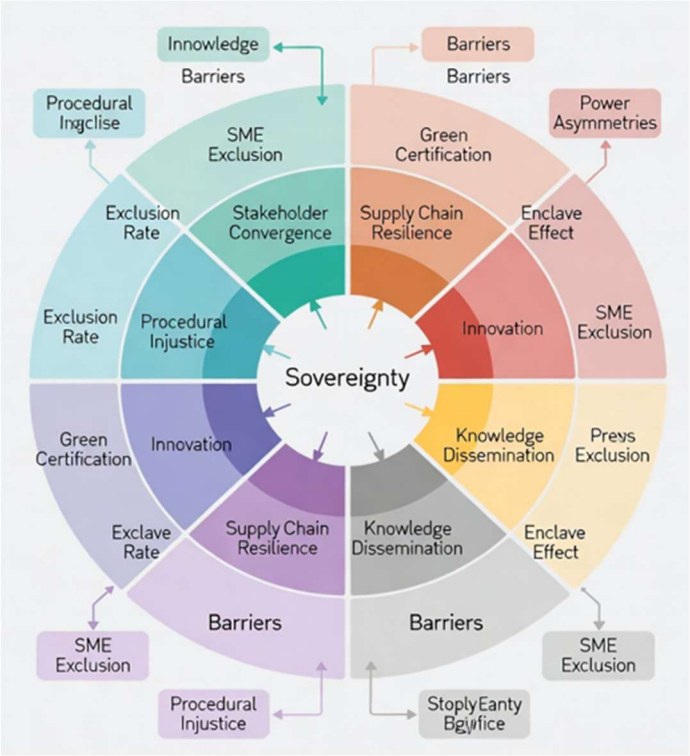
literature review. Pre-determined categories were established within this structure through a review of background literature (e.g., "Triple Helix" strengths/dynamics). In contrast, emergent categories emerged from inductive readings of data sources: predetermined categories included core relational dimensions such as "Triple Helix dynamics", such as stakeholder convergence between State/industry/academia around shared goals such as Sovereignty over Phosphates or H2 production resilience within supply chains; emergent categories included more direct barriers such as procedural injustices excluding SMEs from participation. Analysis was performed using NVivo v.14 for reliable coding, data management/map generation.

The code book can be provided on request for traceability/scrutiny purposes.

The effects of saturation included new candidate dimensions for existing themes not emerging from the analysis - e.g., filtering any new dimensions to well-established pre-existing ones, such as SME procedural barriers relevant to access being limited/filtered to those relating to green certification requirements that excluded SMEs with annual turnover levels lower than €50k;

To observe the hierarchy established by the coding procedures, Figure 1 presents a sunburst chart that organizes the themes under the study's "Findings".

Figure 1. Schematic depicting the hierarchical nature of theme captures



Source:Authors

Inter-coder reliability was calculated using NVivo's built-in functions, with Cohen's kappa exceeding the cut-off of 0.80 across two coding instances between two researchers. An audit trail indicated that, in NVivo, subsequent adjustments to the kappa calculations were made for each researcher based on their experience.

II.4. Reliability, Validity, Ethics, and Limitations

The internal constructs of reliability involved examining whether internal reports corroborated or challenged the OCP Group's self-reporting from independent perspectives on their contributions to

external matters; codes were developed using NVivo's tools, enabling an audit trail for individuals updating the documents. Construct validity was ensured by triangulating across valid sources and avoiding pattern-finding from unnecessary documents.

The researchers ensured that no ethical breaches occurred in handling the data; they anonymized sensitive documents before processing them, and they declared their formal affiliations with the USMBA Fez in accordance with the Moroccan General Data Protection Regulation.

There were no threats to human participants; however, none of the researchers is affiliated with the OCP Group or a public institution. Possible limitations involved inherent biases regarding self-reported documents from the OCP Group. Follow-up studies may use mixed-methods designs and multiple cases, helping ofaddress issues with limited generalizability.

While secondary data triangulation provides a robust collection of publicly accessible data, it limits opportunities to reveal stakeholder sentiment, informal negotiations, and conflicts (Yin, 2018). Therefore, conclusions about power differentials and exclusion are interpretive and grounded in the record, driven by a desire to facilitate a more compelling argument later on through primary means (i.e., interviews) to lessen normative bias.

While secondary data sources allow for ethical, replicable, and verifiable analysis, they limit the ability to delve deeper into stakeholder sentiments. Thus, future research using primary data sources is needed to confirm informal relationships and reduce normative risk.

III. RESULTS

III.1. Stakeholder Convergence and Sovereign Outcomes

Data support stakeholder convergence around sovereign outcomes (État, OCP Group, UM6P). The project contributed €300 million from 2021 to 2024 to develop these outcomes through state policy, industrial input from OCP, and an R&D budget from UM6P (Ministère de l'Industrie et du Commerce, 2024, p. 15; OCP Group, 2023, p. 28). Stakeholders converge through a colocational mechanism in the form of the Green H2A platform, located at UM6P, enabled by OCP funding, and through state policies regulating green energy tax incentives (evidence of a functioning Triple Helix) (UM6P, 2024, p. 42; OCP Group, 2023, p. 35). Its technological infrastructure includes the Green H2A platform, which produces 4 tons of green ammonia per day using 4 MW of electrolysis (Morocco World News, 2025; UM6P, 2024, p. 42). The project has constructed three pilot plants for sustainable fertilizers, indicating advances in materials development in this area to achieve a circular phosphate economy (OCP Group, 2023, p. 35).

The €300 million investments are intended to cap Morocco's dependence upon imported gray ammonia and address anticipated green production targets (200,000 tonnes in 2026, increasing to 3 million tonnes per year by 2032) with a more independent solution to fertilizer supply (OCP Group 2023, 50; Ministère de l'Industrie et du Commerce 2024, 25).

III.2. Knowledge Dissemination and Human Capital Ecosystem Resilience

The data demonstrate that knowledge-dissemination mechanisms ensure the resilience of the human capital ecosystem. The project educates 1,200 youth annually through UM6P initiatives and serves as an indicator of ecosystem resilience in human capital development. The training "formations" encompass initiatives in R&D, design, and maintenance, according to UM6P curricular reports (UM6P, 2024, p. 18). The technology assimilation processes for international partners (Shell, Proton Ventures) supported the zero-carbon project agenda to complete the project by 2030, which involves PEM electrolyzer systems and ammonia testing (Proton Ventures, 2022; UM6P &

OCP, 2022, p. 22; OCP Group, 2023, p. 45). However, this does not seem to diffuse into other engineering firms, remaining limited to the university (without spillover effects) (OCP Group, 2023, p. 45).

III.3. An Inclusivity Gap—Barriers to SME Involvement

The data indicate gaps in inclusivity among the second-order stakeholders involved. According to data from the Région Casablanca-Settat council (2024, p.56), the project caused a failing of the ecosystem resilience indicator because the 70% of skilled labor positions created on site in this context exclude local small and medium-sized enterprises; this involves a range of barriers related to elevated technological requirements, H2A safety requirements, and green certification requirements (Région Casablanca-Settat, 2024, p. 58). The certification barriers involve costs averaging around 50,000 €, which exceed their earning power of under 100,000 € per year (a threshold barrier) (Région Casablanca-Settat, 2024, p. 60). This does not imply that they lack reasonable geographical proximity to the technopole in Nouaceur; however, it entails a pronounced organizational distance that leaves them isolated from their economic ecosystem (Boschma, 2005; Région Casablanca-Settat, 2024, p. 60).

The €300 million investments have enabled a 15% decrease in gray ammonia imports for Morocco since 2022 (OCP Group, 2023, p. 50); they serve secondary stakeholders by enhancing sovereign control over fertilizer supply chains (Ministère de l'Industrie et du Commerce, 2024, p. 25).

Table 2. Project Goals Versus Observed Outcomes for SME Inclusion

Aspect	Project objectives	Observed reality	Source
Job access	Full integration of local SMEs in skilled roles	70% bypass due to barriers	Régions Casablan Settat (2024,p.56)
Tech transfer	Diffusion to territorial stakeholders	Limited by norms and certification	OCP Group (2023, p.45)
Local content	100% ecosystem inclusion	70% achieved, but enclave effect persists	UM6P (2024, p.30)

Source: Authors

These findings indicate that first-order stakeholders capture value while second-order stakeholders (SMEs) are addressed in discourse but actively excluded from value generation opportunities (Région Casablanca-Settat, 2024, p. 62).

IV. DISCUSSION

The qualitative case study of the Nouaceur Technopole is situated at the paradoxical interface of stakeholder management, territorial innovation, and green industrialization in the Global South. This section develops the theoretical contribution by specifying the main asymmetries and paradoxes, while adjusting the management implications to promote inclusiveness and resilience.

IV.1. The Sovereignty Paradox: From Triple Helix Efficiency to Institutional Lock-in

Empirically, the Triple Helix model is too efficient for sovereign industrial outcomes, e.g., a €300 million investment and a 15% reduction in gray ammonia import (OCP Group, 2023). As Etzkowitz and Leydesdorff (2000) claim, this efficient synergy of the State, industry (OCP), and academia (UM6P) propels innovation through their equal standing in knowledge production and commercialization. However, this efficiency gives rise to an enclave-vulnerability paradox in which hermetic partnerships capture rather than share novation (Boschma, 2005). The center of the

paradox is the contradiction between organizational/cognitive proximity and geographical proximity, the first theoretical contribution. Local SMEs are geographically proximate to the Nouaceur Technopole, permitting spillover effects in an ecosystem-like cluster (Moulaert & Sekia, 2003). However, they are insurmountably organizationally/cognitively distant, e.g., due to high-tech entry barriers (H2A safety standards) and greenness certification standards that exclude them from any transfer/integration possibilities (Région Casablanca-Settat, 2024). This paradoxical proximity (Boschma, 2005) manifests itself as institutional lock-in: geographical proximity ≠ , cooperation, and access. Closure renders the non-institutionalized in-collocation without spillover effects. Local SMEs may be geographically proximate to the solar plants that OCP's 70% local content rate facilitates (OCP Group, 2025). However, they are denied passports for 70% of job market positions due to asymmetrical norm-setting that privileges incumbent stakeholders (Région Casablanca-Settat, 2024). Stakeholder theory (Freeman, 1984) must henceforth not only consider "secondary stakeholders" (inferior local SMEs) but also pay attention to "powerful stakeholders" (State/OCP) for cognitive inclusivity that shares novation sovereignty beyond elite geographies.

IV.2. Stakeholder Imbalance and "Tokenization" of SMEs

The 70% exclusion of substantive SME participation is a stakeholder imbalance in favor of primary stakeholders according to Mitchell et al.'s (1997) stakeholder salience model. In the salience model, the dependent stakeholders have legitimacy (as local economic agents promoting resilience) and urgency (as a remedy for the enclave's unemployment and supply chain problems), but lack the power to influence the ecosystem (Mitchell et al., 1997). Their dependency is what gives rise to their "tokenization": where SMEs are recognized in policy discourse (e.g., National Industrial Acceleration Strategy) as necessary for the enclave's resilience, they are excluded by the €50,000 cost of green certification (Région Casablanca-Settat, 2024).

Literature connects tokenization to procedural justice and partnership legitimacy. Bäckstrand (2006) demonstrated how multi-stakeholder partnerships in environmental governance legitimize elite actors while including procedural injustices for dependent actors. These procedural injustices involve rules that favor primary stakeholders (e.g., norms of standardization) and alienate dependent stakeholders. In Nouaceur, procedural injustice manifests as further alienation, as H2A norms create an "extractive" atmosphere that favors primary stakeholders while sidelining SMEs (ECDPM, 2023). Empirical evidence of this situation is the failure of the 1,200 youth-focused training programs that UM6P provides each year to benefit the local economy; these programs are confined to the enclave and do not involve SMEs (UM6P, 2024). In the salience model, moving from "dependent" to "definitive" stakeholders entails reconfiguring governance arrangements that position SMEs as powerful (Mitchell et al., 1997). This restores the partnership's legitimacy and ensures that stakeholders do not revert to an extractive relationship (Freeman et al., 2010).

IV.3. A Quintuple Helix for Territorial Resilience

Problems with the Triple Helix framework led to the adoption of a Quintuple Helix framework that recognizes civil society (SMEs) and the natural environment as active helices (Carayannis & Campbell, 2010). Where the Triple Helix produces incomplete forms of human capital resilience by introducing youth training projects (UM6P, 2024), it does so at the expense of SMEs, who are excluded from supply chains, rendering the ecosystem vulnerable to disruptions (Pinheiro et al., 2019). In Global South contexts, resilience is achieved by diversifying stakeholders instead of relying on a few (elite) actors (Mousa, 2023).

The Quintuple Helix framework is based on generative processes that ensure equitable resource distribution among stakeholders (Carayannis et al., 2012). For Nouaceur, this means involving civil society and factoring in ecology so that H2A limits SMEs' vulnerabilities rather than continuing

business as usual (solar energy initiatives), which account for 70%+ of the project's resource envelope, rather than imported goods and services like labor and materials (OCP Group, 2025). Optimal stakeholder engagement (Freeman et al., 2010) ensures that the industrial development of Nouaceur benefits all stakeholders rather than adopting an extractive firm-community relationship.

Resilience will be assessed by local content percentage (baseline before 2021 compared with after resilience is implemented), SME contract percentage (aim: >30%), supply chain diversification (number of local providers), and shock risk mitigation (import substitution). Evaluation will occur through an annual count of procurements, an SME assessment, and a resilience review.

IV.4. International Examples: Comparative Insights for the Global South

The Nouaceur model should be studied in other Global South resource-based economies pursuing green transition. Comparative views from Chilean and Namibian lithium production hotspots reveal a "Green Resource Curse" in PPPs, creating "islands of excellence" in underdeveloped regions (ECDPM, 2023). This is a far cry from a more distributive approach that links large-firm contracts to SMEs (6%-35%) in ASEAN Special Economic Zones (ECDPM, 2023)—assimilation in Nouaceur risks enclave economies. If Morocco addresses the tokenization of SMEs, it can lead the way in inclusive green industrialization, become a model for other sub-Saharan mining industries, and support south-south integration.

Replicability needs certain boundary conditions: influential national industrial promoters (OCP), natural resource endowments (phosphate reserves to rein in the value chain), preexisting university-industry connections (UM6P), and positive regulatory frameworks (national green plans). Absent these, enclave risks are probable; scenarios in the lithium of Chile or the green mining of Namibia are similarly relevant but require more alterations ECDPM, 2023.

To translate Quintuple Helix inclusion into action, facilitate procurement innovation: set-asides that dedicate specific percentages of contracts to SMEs, unbundling contracts so big tenders become lots accessible to SMEs, aggregator models for bidding as a collective effort, tolling/service contracts which allow for SMEs to lend their specialized services (maintenance, for example) without the requirement of dedicating the entire contract to ownership (maintenance is different from ownership, different goals) as there is a reduced risk in ownership (Pereira et al., 2019). These practicalities extend lower thresholds of access to procedural justice.

To prevent a purely compliance mentality, tie qualification evolution to certification maintenance and hold technical assistance projects, paid safety training opportunities, and joint quality systems creation with UM6P/OCP (certification levels available for SMEs, for example). This ensures SME investment is not performative but instead creates an extended, future-forward relationship (Freeman et al., 2010).

IV.5. Managerial Aspects: An Inclusive Governance Mechanism

Managerial aspects pertain to restructuring the PPP's governance to prioritize distributional justice over procedural efficiency. An inclusive governance mechanism is practical: a "Green Certification Fund", as Paris-based Regionale de Casablanca-Settat shows that certification costs €50,000 and would permit SMEs to enter the innovation loop (Regionale de Casablanca-Settat, 2024). This could come from a minimal tax (0.5%-1%) on green hydrogen exportation or a carbon compensation fund that links the PPP to OCP's net-zero emissions commitment and has emitters pay proportionally to their emissions rate to offset the costs that local actors have to absorb (OECD, 2021; its implications for a digital divide, not just for SMEs). This would increase local integration by 20%-30% compared to similar programs in the ASEAN region (ECDPM, 2023).

The quintuple helix has specific requirements for integrating citizens into the governance

mechanism. This might mean a steering committee that includes a representative of the Confédération Générale des Entreprises du Maroc (CGEM) to lobby to integrate SMEs, as well as other representatives of locally relevant groups (alliances in forestry that connect to the Moroccan Alliance for Climate and Sustainable Development) who can keep the PPP ecologically focused. This steering committee could oversee the parity in resource allocation between Ghrib and Nouaceur (in multiple sites for the integration of SMEs in Nouaceur projects), audit the PPP with respect to its commitment to local development at scale once a year, and organize workshops on H2A norms in the area that Nouaceur operates, which Freeman et al. (2010) stipulate for public projects. Otherwise, it risks being an elite value-generating project, as defined by Freeman (1984). It would be interesting for future research to adopt mixed-methods approaches to interview SMEs to gain their perspectives on these frameworks in practice.

CONCLUSION

The Nouaceur Technopole PPP is assessed as a sovereign-paradox PPP because it fosters technological sovereignty, as evidenced by a €300 million investment and a predicted decrease in gray ammonia imports (OCP Group, 2023). However, it does not address social inclusivity, as 70% of the required skilled positions are not filled by local TPMEs, as expected, due to asymmetric obstacles (Région Casablanca-Settat, 2024). It answers the research question of whether stakeholder engagement in PPPs facilitates sovereign and sustainable development in resource-poor contexts. However, without deliberate efforts to promote equity, the social pillar will not be deemed successful.

Theoretically, this extends stakeholder theory (Freeman, 1984) to Global South energy transitions, demonstrating that proximity does not guarantee stakeholder inclusion, as power relations constrain the value of primary stakeholders (Mitchell et al., 1997). By proposing a transition from the Triple Helix (Etzkowitz & Leydesdorff, 2000) to the Quintuple Helix (Carayannis & Campbell, 2010), incorporating the civil society and ecology helices, this framework offers a significant resilience framework for local SMEs in the green ecosystem, reducing their dependence.

Managerially, this implies a new SME Green Certification Fund to share costs for the green ecosystem to meet the €50,000 requirement (Région Casablanca-Settat, 2024) and to align with the H2A norm at the industrial level. Politically, however, low-tech labor content requirements must be imposed alongside local content requirements for high-tech engineering roles to ensure a just process within the green ecosystem (Freeman et al., 2010).

Limitations include an overreliance on secondary data, which may overlook informal influence games. Future strategy research should conduct stakeholder interviews to gain insights into real-time stakeholder engagement and to track effectiveness. This opens the possibility of a study on a Green Hydrogen Hub in Chile or Namibia (ECDPM, 2023). Engage other Global South contexts to test the Quintuple Helix for South-South Cooperation Frameworks for green industrialization, so that the global energy transition remains sovereign.

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