

博士論文審査結果報告
Doctoral Dissertation Defense Results

審査委員会を代表し、以下のとおり、当該学生が博士論文審査に合格したことを報告します。
On behalf of the Examination Committee, I am pleased to report that the student indicated below has successfully defended her/his dissertation.

政策研究大学院大学 教授 飯塚 倫子
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プログラム名 Program	科学技術イノベーション政策プログラム Science, Technology and Innovation Policy Program	
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論文タイトル/ Dissertation Title	Science, Technology, Innovation in the Gulf: Security, Institutions, and Agents of Change in the GCC	
(和訳/ English Translation)	(中東湾岸国における科学技術とイノベーション： 制度、安全保障、変革の担い手)	
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1. 論文概要と判定理由

1. Summary of the Dissertation and the Committee's Evaluation

This thesis examines the development of science, technology, and innovation (STI) in the Gulf countries amidst the ongoing energy transition. As technological innovations and global efforts for carbon neutrality reshape the energy market, Gulf nations—heavily reliant on fossil fuel exports—find themselves in a unique and challenging position. These countries must navigate the energy transition while simultaneously building new technological capabilities. This process requires balancing external pressures, such as international climate goals, with internal political and security considerations.

A key challenge in the Gulf is the region's heavy dependence on oil and gas, which sustain their domestic economies. The push for global decarbonization and the need to diversify away from fossil fuels are driving the energy transition. However, Gulf economies, traditionally based on resource exports, lack alternative sectors to support sustainable economic activities. Internal and external geopolitical factors, including security concerns, significantly influence the region's STI development and determine the trajectory of its energy transition. As global energy systems evolve, there is a shift from public-sector-driven growth to private-sector-led initiatives aimed at securing long-term economic stability and national security.

This thesis explores these complex dynamics in two main chapters. The first chapter investigates the relationship between STI development and levels of internal and external security threats. Using composite indicators and Ordinary Least Squares (OLS) regression, the study analyzes the correlation between STI levels and security threats across eight Gulf countries: Bahrain, Iran, Iraq, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates. Qualitative case studies on Iran and Iraq further complements the analysis. The findings show that while external threats can drive innovation, internal conflicts often hinder technological progress. This highlights the complex relationship between security, innovation, and economic growth in the Gulf.

The second chapter focuses on a firm-level case study of ACWA Power, a Saudi Arabian engineering, procurement, construction, and management (EPCM) firm that specializes in energy-related projects. ACWA Power offers an illustrative example of how a business can transition from an oil and gas-focused portfolio to one centered on renewable energy. This shift was particularly difficult in Saudi Arabia, where government subsidies for fossil fuels created an unfavorable environment for renewable energy development. To overcome these challenges, ACWA Power strategically leveraged global energy trends and sought opportunities in external markets. By collaborating with international partners, ACWA Power acquired new technologies and enhanced its innovation capabilities. This case is unique because it highlights how firms can build technological capabilities not through domestic policy-driven incentives, but through international collaboration and external market engagement.

The thesis concludes with policy recommendations, emphasizing the need to integrate security considerations into STI policies. It argues that Gulf countries can use the global energy transition as an opportunity to foster innovation and build technological capabilities. By strategically navigating this transition, Gulf nations can position themselves as leaders in renewable energy, diversifying their economies and ensuring long-term

sustainability. This approach will help the region shift from its reliance on oil and gas, paving the way for future growth and stability in a rapidly changing global energy landscape.

2. 論文の内容（手法や結論など）と学術的貢献

2. The Dissertation's Findings, Methodologies, and its Academic Contribution

Key Contributions of the Thesis

Contributions of the thesis can be listed as below.

1. Political economy and ST&I

A central contribution of this thesis is its introduction political approach in **ST&I policy** combined with the context of the GCC's energy transition. In the face of increasing external and internal threats—from geopolitical instability in the region to the global demand for decarbonization—the thesis argues that **external security concerns** can serve as a powerful driver for technological innovation.

Traditionally, studies of energy transitions have focused on economic and technological factors alone, with little attention to how geopolitical concerns intersect with the development of ST&I policies. However, this aspect would become an important theme with the emergency of **technological sovereignty**—the ability to independently control and develop key technologies.

For the GCC, which has long relied on natural resource exports as the backbone of its economy, the transition to a sustainable, knowledge-based economy requires more than just investment in renewable energy technologies; it also necessitates a strategic effort to **enhance technological capabilities** that can underpin economic resilience and national security. This novel integration of geopolitics into ST&I policy provides a framework for understanding how geopolitical instability and external threats shape the innovation agendas of resource-rich countries.

2. Private Sector's Role in Innovation and Transitions

Another important contribution of this thesis is its examination of the role of the **private sector** in fostering innovation during the energy transition, particularly through the case study of **ACWA Power**, a Saudi Arabian company. This case study challenges the conventional narrative that technological development in emerging economies must be driven by the state or government-led initiatives. Instead, the thesis argues that the private sector can play a pivotal role in building **organizational capabilities** that foster technological innovation and sovereignty.

ACWA Power's success story is particularly significant because it demonstrates how a private-sector firm from a resource-rich country can leverage **international project-based activities** to develop the capabilities necessary to innovate and lead in the renewable energy sector. By securing contracts in international markets and building on project-based experiences, ACWA Power has been able to cultivate the **organizational**

capabilities required to foster technological growth, develop competitive advantages, and eventually contribute to the region's broader energy transition.

This case challenges the conventional wisdom that technological innovation in the GCC can only emerge from government-led initiatives or through direct state involvement in technology development. Instead, it highlights the importance of **organizational learning**. This finding broadens the understanding of how energy transitions can be achieved, especially in countries where state-owned enterprises have traditionally played the dominant role in energy sectors.

3. Policy Implications for Resource-Rich Emerging Economies

The thesis also provides important **policy recommendations** for GCC countries and other resource-rich emerging economies. As these countries face the dual challenges of decarbonization and economic diversification, it is critical that they rethink their **ST&I policies** to account for geopolitical considerations.

One key recommendation is that **GCC governments should prioritize investment in strategic technological sectors** such as renewable energy technologies, energy storage, and green hydrogen, which are likely to become central to global energy systems. However, it is equally important that these countries develop the **institutional frameworks** necessary to **support innovation ecosystems** and foster collaboration between public and private sectors.

Additionally, the thesis highlights the need for **private sector involvement** in the innovation process. While state-led initiatives remain crucial, the involvement of private firms—like ACWA Power—can offer valuable insights into how organizations can develop technological capabilities through international project experience, partnerships, and innovation. Therefore, the **policy focus should include fostering innovation-friendly environments**, creating incentives for private-sector engagement, and supporting the development of organizational and technological capabilities that enable these firms to compete on a global scale.

In conclusion, the contribution of this thesis lies in its interdisciplinary approach to understanding the challenges and opportunities facing the GCC during the global energy transition. By integrating geopolitical concerns into the analysis of ST&I policy, examining the role of international relations, and highlighting the private sector's role in innovation, this research provides a comprehensive framework for understanding how these countries can navigate the complexities of energy transitions. The policy recommendations offered by the thesis contribute to ongoing debates on how resource-rich emerging economies can build competitive, sustainable, and resilient economies in an era of global decarbonization.

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3. 審査員からの主要コメントおよび修正内容

3. Comments by the Examiners and the Revisions Made

The thesis presents two substantial chapters that explore important issues. All the examiners concurred it is better to improve the coherency between two main chapters, chapter 2 and 3. At the initial stage, two chapters seemed to have different orientations: One had focused on geopolitical impact on STI, while the other looked at firm level catching up on renewable energy sector.

More specifically, other comments addressed following questions: Why has the selected approach chosen? How does political economy influence STI policy in the Gulf? What impact does the transition to renewable energy have, and how might political economy shape this transition?

Additionally, the comments were made to make roles of the state and private firms should be considered, so that hypotheses for Chapters 2 and 3 are clearer. It was also being mentioned that a section outlining the thesis structure, the overarching research questions, and an overview of the methodology should be included.

To respond the above comment, chapter 1 was substantially redrafted to lay detailed background of the Gulf countries, explaining relationship between the STI, geopolitics and energy transitions, bringing in the concept, “technological sovereignty” to connect these two chapters of energy transitions and the relationship between geopolitics and STI capabilities.

In the conclusion, the replicability of the case discussed in Chapter 3, exploring how organizational capability upgrading could benefit Gulf countries with small manufacturing sectors and whether this approach could apply to other similar regions was being mentioned as being advised. Moreover, despite the thesis combines political economy and environmental transition approaches, this was not clearly mentioned as academic contribution, so this point was being included in the last chapter.