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Quratul Aan, Jessica Geraldo Schwengber (eds.)



Transcultural Perspectives on Sustainability and Knowledge Exchange

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Transcultural Management Series

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Volume 12

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Transcultural Perspectives on Sustainability and Knowledge Exchange

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Preface

The challenges facing societies today are increasingly global, interconnected, and transcultural. Climate change, sustainable development, energy transitions, technological innovation, migration, and global supply chains transcend national boundaries and require collaborative responses that draw upon diverse forms of knowledge. At the same time, addressing these challenges is not merely a technical or economic endeavor; it requires dialogue across cultures, disciplines, and knowledge systems. In this context, sustainability and knowledge exchange emerge as two closely interconnected pillars for shaping more resilient and inclusive futures.

Sustainability cannot be achieved without effective collaboration across cultural, institutional, and geographical boundaries. Likewise, meaningful knowledge exchange depends upon the ability to engage with different worldviews, relate diverse epistemologies, and co-create solutions that are sensitive to local contexts while addressing global challenges. Indigenous knowledge, scientific expertise, organizational practices, and lived experiences each contribute valuable perspectives. Rather than privileging one form of knowledge over another, a transcultural perspective recognizes that innovation and sustainable development emerge through the interaction of multiple knowledge systems.

This volume represents the culmination of two consecutive editions of the Transcultural Students Research Group (TSRG) and brings together the research outcomes of the 2024 and 2025 cohorts. While the 2024 TSRG explored Transcultural Perspectives on Sustainability, the 2025 TSRG focused on Transcultural Perspectives on Knowledge Exchange. Bringing these two themes together reflects a fundamental insight: sustainable futures depend upon our collective capacity to exchange, integrate, and co-create knowledge across cultures.

The chapters included in this volume are the result of collaborative research conducted by international student teams participating in the TSRG. Throughout the program, students worked across national, disciplinary, and cultural boundaries, developing comparative research projects that address contemporary global challenges from transcul-

tural perspectives. The diversity of topics presented in this book reflects not only the complexity of sustainability and knowledge exchange but also the richness that emerges when multiple cultural perspectives are brought into dialogue. Over several months, students from Germany, South Africa, Vietnam, Poland, and Brazil collaborated on joint research projects that explored sustainability and knowledge exchange through transcultural perspectives.

Supported by the Baden-Württemberg Stiftung, this initiative combined collaborative academic research with international fieldwork. The 2024 cohort conducted its research trip in Pretoria, South Africa, while the 2025 cohort travelled to Ho Chi Minh City, Vietnam, where students engaged directly with local institutions, businesses, communities, and researchers. Each research journey concluded with a Transcultural Research Learning School, providing students with an opportunity to present, discuss, and further develop their research findings in an international academic environment.

The volume is organized into three thematic sections that reflect the breadth of the research conducted during both TSRG programs.

Section I, *Sustainable Energy Transitions* investigate comparative pathways towards sustainable energy futures through studies on community energy systems, hydrogen development, artificial intelligence in renewable energy, and the socio-economic implications of renewable energy adoption, as well as corporate sustainability. This section includes a chapter by David von Brück, Isadora Mendes de Moraes Soares and Nikita Sukhadeve on Sustainable Futures Beyond the Grid? A Relational Perspective on Energy and Communities: A Case Study of the Global South and the Global North a chapter by Zuzanna Bakalarz, Annemarie Reinet le Roux and Tram Diem Quynh on A Sustainable Hydrogen Future: Comparative Development Pathways in the Global North and South, a chapter by Hannah Brown, Johannes Sonneborn and Kashama Dodo Muyemba on Flows Beyond Borders: A Comparative Analysis of Artificial Intelligence Usage in the Renewable Energy Sector in South Africa and Germany and a chapter by Ferdinand Kohler and Shrinidhi Kamalakar on What are the Socio-Economic Implications of Renewable Energy Adoption in Vietnam for Investors and Residents?

Section II, *Business, Supply Chains, and Corporate Sustainability*, explores how organizations create sustainable value through transcultural knowledge management, corporate social responsibility, and intercultural competence within increasingly globalized supply chains. This section includes a chapter by Adivhaho Mudanalwo and Gian Luca Lunau on The Influence of National Culture on Corporate Social Responsibility: Insights from South Africa and Germany, a chapter by Omolemo Job and David Seeger on The Influence of Transcultural Knowledge Management in Sustainable Global Supply Chains: The Case of Food and Agricultural Corporations, and a chapter by Roxana Moshfeghnia, Patience Skosana and Nguyễn Phú Hồ on The Role of Transcultural Competence in Facilitating Knowledge Exchange in Global Supply Chains

Section III, *Indigenous, Transcultural, and Relational Knowledge*, examines the role of indigenous and local knowledge systems, relational approaches to sustainability, and transcultural dialogue as foundations for addressing global challenges. This section includes a chapter by Arushi Chakravarty on The Role of Indigenous and Local Knowledge in Shaping Sustainable Futures and a chapter by Columbo Kodzo Dilfe Amedekanya, Pedro de Melo Pinheiro Pinto and Onthatile Msweli on An Indigenous Contribution to Sustainable Development, a chapter by Jeanie Laubscher, Svenja Hoffmann and Võ Ngọc Nhân Nguyễn on Beyond Representation: Transcultural Dialogue as an Affective-Relational Process in a Vietnamese Women's Museum and a chapter by Viola Rochelle Sass, Sara Hakob and Phạm Trọng Quý on How are Mandatory School-Based Internships Organized in German Comprehensive Secondary Schools, and How Applicable Are These Practices to Vietnam and South Africa?

Although the chapters cover diverse research areas, they are united by a common objective: understanding how transcultural dialogue, collaborative knowledge creation, and international cooperation can contribute to more sustainable societies. The studies presented throughout this volume demonstrate that transculturality is not simply the coexistence of different cultures but a dynamic process of mutual learning, reflection, and innovation.

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- Dr. Quratul Aan and Dr. Jessica Schwengber from Zepplin University,
- Prof. Dr. Tomasz Kamiński from University of Lodz,
- Prof. Dr Julika Baumann Montecinos from HFU Business School,
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- Ms. Priscilla Morley (Late), Mr. Kamagano Sethono, and Dr. Olebogeng Selebi from the University of Pretoria,
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Finally, we extend our deepest appreciation to all students who participated in the TSRG. Their intellectual curiosity, commitment to intercultural collaboration, and willingness to engage with complex global challenges are the true foundation of this volume. This book is, above all, a testament to their collaborative research and to the belief that sustainable and inclusive futures can only be built through dialogue across cultures.

Friedrichshafen, July 2026

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Dr. Quratul Aan is a research fellow at the Chair of Institutional Economics and Transcultural Leadership at Zeppelin University in Germany. She also serves as the project manager of the Transcultural Caravan Network, playing a pivotal role in advancing research and projects focused on transcultural dynamics and leadership across different global contexts. In addition to her academic work, Dr. Quratul Aan has a strong interest in corporate governance and small and medium-sized enterprises (SMEs), where she aims to make significant contributions through her research and management expertise.

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Currently, at EOS Consulting, she developed and implemented mitigation, and adaptation plans for "hard-to-abate" industries, demonstrating her ability to address complex challenges in reducing environmental impacts in carbon-intensive sectors. Isadora also has practical experience with corporate, state, and national GHG inventories, directly contributing to the development of effective climate mitigation strategies.

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Section I

Sustainable Energy Transitions

Sustainable Futures Beyond the Grid? A Relational Perspective on Energy and Communities: A Case Study of the Global South and Global North

David von Brück, Isadora Mendes de Moraes Soares and Nikita Sukhadeve

1. Introduction

The energy market – in particular the electricity market – can be described as one of the most important markets of modern societies. The Kardashev scale even assumes that the degree of progress of a civilization can be measured by its energy consumption (Zhang et al., 2022). It is well known that energy is essential for sustainable growth and development (Mitra & Buluswar, 2015) and quality and cost of energy used for domestic and industrial purposes can directly affect people's welfare (Da Silva Neto et al., 2024). This notion gains support with SDG 7 – Clean and affordable energy – established in 2015 by the United Nations (UN). Since then, ensuring access to affordable, reliable, sustainable and modern energy for all has become one of the global priorities.

Along with that, countries have been adopting measures to reduce greenhouse gas (GHG) emissions and disseminate sustainable practices, which implies increasing use of renewable energy sources (RES) while decreasing the use of more polluting alternatives, a process known as energy transition (Dall-Orsoletta et al., 2022).

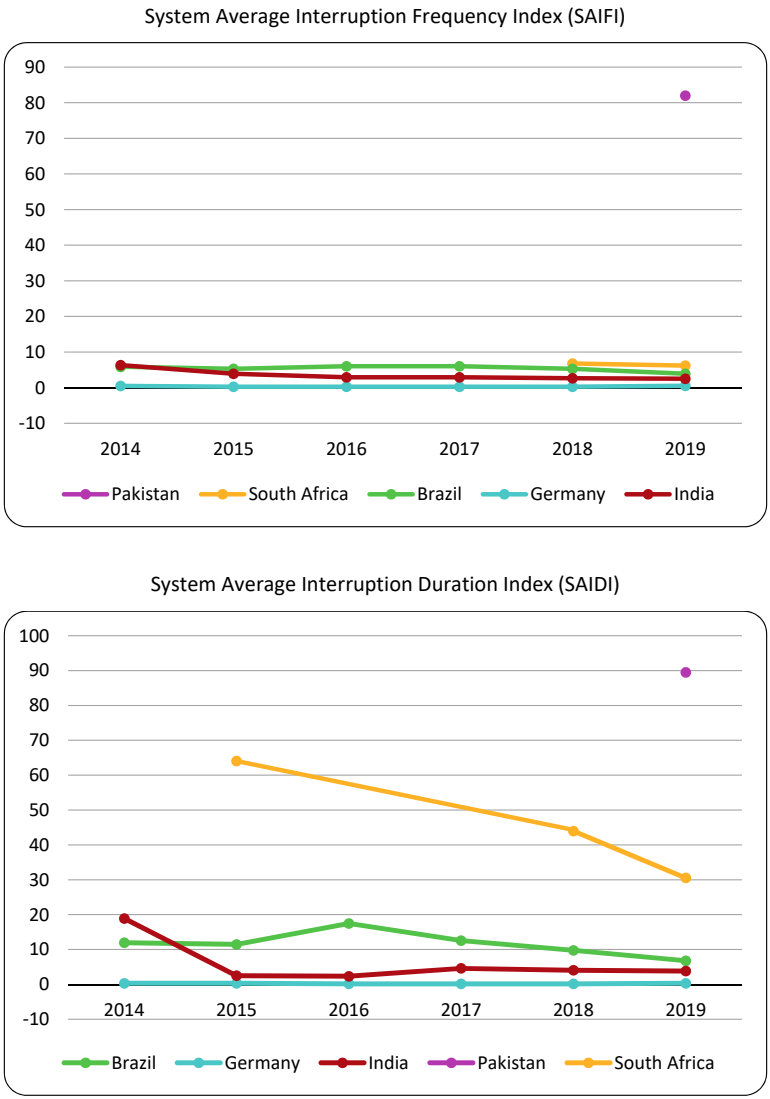
However, this process poses important socio-economic challenges if a truly sustainable energy transition is to be achieved (Dall-Orsoletta

et al., 2022). More than one billion people, concentrated mostly in rural Asia and sub-Saharan Africa, lack electricity, and low-income communities in developing countries have difficulty in meeting their electricity payment obligations (Sermarini et al., 2024; Mitra & Buluswar 2015). Interruptions in electricity supply cause significant economic losses for companies, industries and consumers, and impact essential services (Aweke & Navrud, 2022; Herman et al., n.d.). However Global North countries face very different problems. Germany's energy security concerns, for instance, revolve mostly around integrating renewables into an already stable grid, but one which is threatened by very high network charges and even the possibility of blackouts (German National Academy of Sciences Leopoldina et al., 2020).

Even with considerable progress in expanding access to electricity in developing countries in recent decades, with rural electrification programs in South Africa, China, India and Brazil, such as "*Luz para Todos*" (Piai Paiva et al., 2024; Piai Paiva et al., 2019), it has been observed frequently that millions of people, mainly in rural areas of developing countries, still don't have access to electricity. This lack of access limits opportunities for economic and social development, negatively impacting education, health, communication and productive activities (Sermarini et al., 2024).

As such, electricity affordability is a crucial challenge, even for those connected to the grid, since tariffs can be prohibitive for low-income populations, limiting consumption and the benefits of electrification (Aweke & Navrud, 2022; Mitra & Buluswar, 2015; Singh et al., 2015; Winkler et al., 2011; Pereira et al., 2011). It is crucial to recognize that access to electricity is not limited to mere connection to the grid. Reliability of supply, quality of electricity and the ability to consume a minimum amount of energy are essential elements of meaningful access (Mitra & Buluswar, 2015). Data from the World Bank Group shows that both SAIFI and SAIDI indexes are way lower in developed countries, such as Germany, than in developing ones, such as Brazil, South Africa, Pakistan and India. These indexes represent the average frequency and duration of system interruptions, respectively, which means the higher they are, the worse the quality and reliability of energy in the country.

Figure 1: SAIFI and SAIDI Indexes for the Countries Analyzed



Source: Adapted from the World Bank Group (2024a and 2024b)

That brings the question: how is this energy transition process contributing to a more sustainable future beyond the decarbonization of the grid, especially in Global South countries? Moreover, is this energy transition truly sustainable, and helping in the achievement of SDG 7? What are the main advantages and the main problems that this process can bring? To help answer that, this paper will explore how the current situation regarding electricity access, affordability and reliability, and the energy transition process in 4 Global South countries, as well as Germany as a means of comparison, to better understand this transition through a social sustainability lens.

It's important to note that, for this work, the energy transition will only be focused on electricity. Also, for the purpose of this paper, the community concept refers to civil society.

2. Literature Review

One of the most used 'sustainability' definitions uses three interconnected 'pillars', encompassing economic, social, and environmental (or ecological) aspects (Purvis et al. 2019). In that sense, it is important to understand how the energy transition affects not only environmental aspects, but also economical and societal matters.

When discussing energy transitions and the impact of policies, understanding the concept of community becomes particularly critical. Transitioning to renewable energy, for example, requires acknowledging the diverse communities affected by such changes, including workers, residents, and broader societal groups. Despite being essential for a more sustainable future, the energy transition can have a significant impact on communities, both positive and negative. Conversely, the impact of communities can also influence the energy transition. These impacts can vary depending on the local context, the technologies adopted, and the implementation methods (Lennon et al., 2019; Hoicka et al., 2021).

On the one hand, community-based energy systems are becoming more attractive among policymakers and practitioners as promising models for implementing a low-carbon society (Barabino et al., 2023) and promoting a fair energy transition (Yiasoumas et al., 2023). Com-

munities can have positive influences. For instance, participatory business models, such as decentralized energy communities, can bring more inclusive and deliberative approaches to the policymaking process and encourage greater citizen involvement in the energy transition, creating a local empowerment and enforcing energy democratization (Hoicka et al., 2021; Lennon et al., 2019). Jean et al. (2024) mention that the income that can be generated by low-income communities through local energy production, especially through photovoltaic systems, makes it possible to sell surplus energy to the grid.

This strategy can not only improve household budgets but also provide energy autonomy, often reducing dependencies. This perspective is put forward by Lennon et al. (2019) and O'Sullivan et al. (2020), who suggest that renewable energy projects can boost local development by creating jobs and encouraging sustainable economic growth. Local ownership models can ensure that economic benefits remain within communities. (Pereira et al., 2019) proposes that the energy transition can help improve access to electricity in rural areas, such as in rural communities in Brazil, which improves the quality of life of the population while also reducing CO2 emissions, which aids in the reduction of energy poverty. Additionally these decentralized energy systems based on renewables can increase the resilience of communities, reducing dependence on external energy sources and protecting against supply interruptions (O'Sullivan et al., 2020).

However, the energy transition still has a major impact on communities, especially on vulnerable ones. One strong example is the displacement and loss of territory caused by energy projects, especially hydropower plants. The construction of large hydro-electric plants can flood extensive areas, resulting in the loss of territory, livelihoods, and cultural heritage of traditional and indigenous communities (Jean et al., 2024). González et al. (2023a) also point out that these projects can cause social conflicts between different groups, including local communities, environmentalists, energy companies, and the government. Often, communities feel disempowered and excluded from decision-making processes, which leads to negative perceptions and opposition against the projects. This is corroborated in the work of Lennon et al. (2019).

Some other negative influences are also mentioned, such as resource disputes. An example can be seen in Chile and Brazil. Both countries have experienced socio-ecological conflicts related to renewable energy projects, especially hydropower plants, with an impact on indigenous communities and ecosystems (González et al., 2023a). It is also important to note that the existing inequalities that can be magnified with the energy transition process, benefit urban centers and large companies more, while rural and peripheral communities may be marginalized. The lack of access to new technologies and participatory business models can also widen these disparities (Lennon et al., 2019; O'Sullivan et al., 2020). Also, communities may experience injustices in the distribution of benefits and costs of the energy transition, which have led to disputes and challenges that influence the perception of justice for local populations (Lennon et al., 2019). Moreover, in various regions, rural communities are often marginalized in energy transition processes, even when there is an abundance of natural resources. This creates a situation of energy peripheralization, where the benefits of the transition are appropriated by external actors (O'Sullivan et al., 2020).

Finally, the disparities between the Global South and Global North countries regarding these topics are discussed. The literature proposes that the challenges faced by Germany in its energy transition differ markedly from those in the Global South owing to disparities in infrastructure, economic development, and social priorities. While Germany and most of the Global North countries focus on integrating advanced technologies, reducing emissions, and managing grid reliability, countries in the Global South often grapple with basic access to electricity, affordability, and socio-political barriers (Babayomi et al., 2022). For instance, the high availability of capital and advanced infrastructure in Germany facilitates rapid deployment of renewable energy projects, whereas the Global South must navigate financial constraints and limited technical expertise (Standal et al., 2023). Addressing these differing priorities requires tailored strategies that account for regional contexts and developmental stages (Babayomi et al., 2022).

This highlights the need for a relational and "just" approach to the energy transition, taking social and environmental justice into account to ensure that the benefits are distributed equitably and that negative

impacts are minimized (González et al., 2023a). The justice in the transition also involves recognition of the needs and rights of all stakeholders and ensuring participatory and transparent processes – citizen engagement in the development of new technologies and the implementation of energy projects is essential for a fairer transition (O'Sullivan et al., 2020).

2.1 Brazil

Brazil is recognized for its clean energy matrix (González et al., 2023a), largely driven by hydropower and bioenergy, which make up a significant share of its electricity generation. However, this apparent success masks critical challenges in ensuring equitable and high-quality electricity access, particularly for marginalized and rural communities.

Brazil has achieved nearly universal access to electricity, with 99% of the population connected to the grid (González et al., 2023b). This milestone, supported by initiatives like the "*Luz para Todos*" program, has extended electricity to millions (Piai Paiva et al., 2024). Yet, significant disparities persist in service quality across regions, and Brazil still faces challenges in ensuring reliable electricity supply. Although the national grid connects most regions, infrastructure gaps and maintenance deficits in remote areas lead to frequent interruptions and low-quality service and a resulting dependency on isolated systems, often powered by diesel thermos-electric power generators that are unreliable and environmentally detrimental (Barroco Fontes Cunha et al., 2021).

While reducing dependency on fossil fuels, large-scale renewable energy projects, such as hydropower and wind farms, have caused socio-environmental conflicts. Additionally, consumption patterns reveal socio-economic divides. The North and Northeast of Brazil, characterized by higher poverty rates, show the lowest energy consumption, while wealthier regions like the South east benefit from better access and reliability (Sermarini et al., 2024). Social electricity tariffs have been instrumental in subsidizing energy costs for low-income families, yet debates persist regarding their effectiveness and the need for more inclusive, innovative solutions (Sermarini et al., 2024).

In that sense, the energy transition risks exacerbating existing inequalities if it fails to prioritize inclusion. Distributed generation projects, such as rooftop solar installations, remain largely inaccessible to low-income families due to financial and informational barriers (Barroco Fontes Cunha et al., 2021). Without targeted interventions, these populations may continue to rely on less reliable and more expensive energy sources, perpetuating energy poverty (Sermarini et al., 2024).

On the other hand, energy transition initiatives involving communities, especially decentralized initiatives, represent a promising solution to address energy poverty and empower citizens. These initiatives enable collective ownership and management of renewable energy systems, fostering local participation and resilience (González et al., 2023b). Policies providing tax incentives and credit lines for renewable installations can spur private investment (Lazaro et al., 2022)

To ensure a just and sustainable energy transition, Brazil must overcome several key challenges. Infrastructure modernization, including the expansion of the national grid and integration of smart technologies, is essential for reliable energy distribution (Castro et al., 2022). Equally important is the development of policies that address regional disparities, support energy communities, and incentivize distributed generation while ensuring affordability for low-income populations (Barroco Fontes Cunha et al., 2021). Policymakers must prioritize social inclusion, fostering equitable access to renewable energy, and involving vulnerable groups in decision-making processes (Lampis et al., 2022).

2.2 South Africa

South Africa's energy sector is heavily influenced by government policies and the dominance of Eskom, the state-owned utility responsible for electricity generation and distribution. Historical mismanagement, corruption, and delayed diversification from coal have hindered progress (Mirzania et al., 2023).

Although South Africa has made progress in renewable energy adoption, technological and infrastructural limitations persist. The country relies on aging coal plants, with many operating beyond their expected lifespan, causing frequent supply disruptions (Xaba, 2023).

Load shedding – a strategy to help prevent power lines from becoming overloaded when the demand for electricity nears available supply levels and there is a shortage of electricity supply – has become a widespread issue, exacerbating economic instability (Bohlmann et al., 2023). Grid modernization, investment in microgrids, and battery storage solutions are critical to improving energy reliability, particularly in rural areas where centralized grid access remains limited (Prinsloo et al., 2016).

Energy poverty remains a significant challenge, particularly in underserved rural communities. Although 84% of South Africans had electricity access in 2020 – higher than the sub-Saharan African average of 48% – millions still lack reliable power (Bohlmann et al., 2023). Decentralized energy systems not only enhance reliability but also reduce dependence on the aging coal-based infrastructure (Xaba, 2023). Public participation is crucial in renewable energy projects to foster trust and ensure equitable benefit distribution, yet community engagement remains limited in major policy decisions (Winkler et al., 2011).

Employment is a central concern for South Africa. The transition threatens jobs in coal-dependent regions such as Mpumalanga, where the economy relies heavily on mining (Mirzania et al., 2023). Even though economic modeling suggests that renewables could ultimately generate more jobs than coal, particularly in installation, maintenance, and localized generation, a just transition framework is needed to retrain workers and create alternative employment opportunities in these new sectors (Bohlmann et al., 2023).

South Africa's energy transition faces pressing concerns such as energy access, economic inclusion, and infrastructure deficits (Mirzania et al., 2023). Unlike Germany, where community energy projects are often driven by environmental motivations, South African initiatives are centered on alleviating energy insecurity and economic disparities (Mohapatra et al., 2022). The country's energy transition is a complex process with profound socio-economic and infrastructural implications. Addressing regulatory inefficiencies, modernizing the grid, and ensuring a just transition for coal-dependent regions are critical steps toward a sustainable energy future.

2.3 India

The urgent global energy crisis, driven by reliance on non-renewable resources, underscores the need for a transition to renewable energy. Rapid population growth and industrialization have intensified energy demands, particularly in India, where fossil fuels make up 78% of the energy mix, with coal alone at 72.3%. This dependence poses environmental and economic challenges, including vulnerability to energy fluctuations and high carbon emissions, making India the third-largest global emitter (Jain et al., 2023).

Agriculture further increases India's energy needs, particularly for irrigation. Recognizing the potential of renewables, initiatives like the National Solar Mission aim to achieve 280 GW of solar capacity by 2030. Solar irrigation systems offer cost-effective solutions, reducing dependence on unreliable grids and fossil fuels while improving agricultural productivity (Kannan & Vakeesan, 2016).

Despite progress, challenges persist in scaling up solar power adoption due to high installation costs, solar waste disposal concerns, and affordability issues in rural areas. A survey by the Council on Energy, Environment, and Water found that while most households have grid access, many struggle with consistent electricity supply, particularly in states like Bihar, Rajasthan, and Madhya Pradesh (Agrawal et al., 2020). Load shedding further exacerbates rural energy gaps (Mani, 2023). Strong government support and community participation are essential to overcoming these barriers. Policies promoting subsidies, incentives, and decentralized solar systems can enhance energy equity, while investment in waste management infrastructure mitigates environmental risks. Innovative solutions, such as dual land use for farming and solar installations, optimize resources and boost energy efficiency. India also faces the challenge of balancing energy demands with a transition to renewables. In 2023, nearly 40% of energy subsidies went to fossil fuels, while less than 10% supported clean energy (Kamal, 2024). The global energy crisis, worsened by the Ukraine war, led to government measures stabilizing domestic energy prices, but also to increased reliance on fossil fuel subsidies. Redirecting a portion of fossil fuel tax revenue toward renewables and shifting to market-based pricing are key recommendations for a sustainable transition.

To ensure long-term energy security, India should prioritize investment in renewables, develop waste management systems, and encourage community involvement. With strategic reforms, the country can reduce its fossil fuel dependence while strengthening its role as a leader in sustainable development.

2.4 Pakistan

Energy is essential for economic growth and development. Advancements in energy production and consumption are crucial to meeting the demands of growing populations and economies. A reliable, affordable, and clean energy supply supports sustainable development, but achieving this requires a shift toward renewables. Between 1990 and 2019, global primary energy supply rose by 66%, while electricity consumption increased by 130%. Despite this, fossil fuels dominate energy use, contributing to environmental degradation and climate change (Khatri et al., 2023). Their excessive reliance exposes energy systems to economic and environmental risks, underscoring the need for a transition to renewables.

For developing nations like Pakistan, the energy crisis is a major concern. Persistent power shortages, known as load shedding, disrupt industries and daily life. Despite abundant renewable resources, Pakistan relies heavily on imported oil, meeting 85% of its energy needs at an annual cost of USD 14.7 billion. This dependency strains the economy and makes it vulnerable to fluctuations in the global oil price. The energy sector also faces inefficiencies such as circular debt, high production costs, and transmission losses. Per capita electricity consumption is only a quarter of the global average, highlighting accessibility gaps. Past policies have prioritized fossil fuels, limiting the growth of renewables (Sibtain et al., 2021).

Investing in renewable energy has also been an agenda for political reasons. The government tried to introduce various initiatives and invested in them but it could not garner results owing to mismanagement at various levels and other political hurdles (Tao et al., 2022). However, there are options of various renewable resources that can benefit Pakistan to reduce the environmental impact of fossil fuel-

based energy. It can utilize the coastline of Balochistan for raising wind energy. It can also increase its resources by tapping its potential for biomass energy so that its dependency on fossil fuels can be decreased (Ahmed et al., 2022). Pakistan is well-positioned to harness renewables, particularly solar energy, with over 300 sunny days per year. Photovoltaic (PV) technology offers significant potential, though its adoption remains limited owing to technical constraints. Private initiatives, such as Siemens Pakistan's solar electrification projects, demonstrate feasibility for wider implementation (Baloch et al., 2019). Hydropower, historically a key energy source, remains underutilized because of infrastructure limitations and water disputes. While the 2006 national energy policy aimed to address these challenges, its impact was minimal because of poor execution. A more consistent policy approach and public-private partnerships could accelerate renewable energy adoption and enhance energy security (Sibtain et al., 2021).

Pakistan's energy crisis presents an opportunity for transformation. By leveraging its renewable resources and adopting advanced planning tools, the country can ensure a sustainable energy future, reduce environmental impact, and strengthen economic stability.

2.5 Germany

Germany's energy transition ("*Energiewende*") represents a globally recognized effort to shift from fossil fuels and nuclear energy towards renewable energy sources. This transition is underpinned by ambitious climate targets and a commitment to sustainability, requiring significant structural, economic, and societal changes (Hassan et al., 2024). The literature on Germany's energy transition highlights key areas, including regulatory frameworks, community engagement, technological advancements, and socio-economic impact.

Germany's energy transition has been driven by robust policies, such as the Renewable Energy Sources Act (EEG), which incentivized renewable energy generation through feed-in tariffs, but causing also continuously increasing network charges (Plewnia & Guenther 2021). This results from Germany's aging grid infrastructure facing significant reliability challenges, particularly as renewable energy sources

introduce high variation in energy supply. Decentralized solutions, such as microgrids and local energy storage, have emerged as key strategies to enhance reliability and reduce dependency on centralized systems (Belmar et al., 2023). These systems allow for localized energy generation and consumption, mitigating transmission losses and network charges while improving the resilience of the energy system at the same time. Studies suggest that integrating decentralized technologies can address supply intermittency while fostering greater energy independence at the community level (Khojasteh et al., 2023). These developments are supported by Germany's focus on modern technologies for its energy transition. These include decentralized technologies, e.g., smart/microgrids, P2P trading/dynamic pricing, smart energy management, smart meters, balcony solar, and digital platforms, which help in enabling communities' access and participation (Hanke & Guyet, 2023; Neves et al., 2024).

Furthermore, community energy initiatives play a critical role in Germany's energy transition. Renewable energy cooperatives empower citizens to participate in energy generation and/or trade (P2P), enabling energy democratization and accelerating the adoption of green energy solutions (Hanke & Guyet, 2023). Studies even indicate that participation in community energy projects positively influences sustainable attitudes and behavioral patterns among project members (Radtke & Bohn, 2023). However, the success of these cooperatives depends on human and social capital, as well as supportive policies that mitigate risks for investors and participants (Cristóbal et al., 2023).

Nevertheless, regulatory challenges persist, particularly regarding the integration of decentralized energy systems. For example, legal barriers limit the scalability of neighborhood electricity sharing and constrain small power plant capacities, reducing the efficiency of decentralized systems (Gomes & Vale, 2024). While Germany leads in infrastructure availability and access, economic growth remains relatively low, partly due to high initial investment costs for renewable energy technologies (Khojasteh et al., 2023). Market restructuring is necessary to accommodate decentralized energy systems and implement alternative pricing mechanisms (Neves et al., 2024; Deutscher Bundestag, 2022).

Research projects such as CATENA X and GAIA showcase Germany's and Europe's focus on aligning technological innovation with workforce development and economic growth (IRENA, 2019). Large-scale renewable projects, including solar and wind farms, have created job opportunities in installation, maintenance, and technology development (RFF & EDF, 2021). Research highlights the role of energy cooperatives and citizen-led initiatives in fostering local employment while enhancing community engagement (Hanke & Guyet, 2023). However, challenges persist, such as ensuring equitable access to these opportunities and addressing regional disparities in job creation, particularly in areas affected by the decline of fossil fuel industries (Cristóbal et al., 2023).

Despite its progress, Germany faces several challenges in its energy transition. Grid modernization is a pressing issue, as existing infrastructure struggles to accommodate bi-directional energy flows from small-scale prosumers[1] (Belmar et al., 2023). Regulatory delays and conflicts of interest among stakeholders (e.g., utility companies) further complicate the transition process. Experts emphasize the importance of community-based approaches and regional flexibility to address these challenges (Hanke & Guyet 2023).

The literature shows that the energy transition is ongoing at different paces in each country, and this process also brings with it different challenges, impacts and opportunities in each place. However, there is no extensive work when it comes to understanding the relational sustainability of the energy transition through a lens of both environmental, social and economic aspects. This work is going to try and address this topic through a qualitative methodology, with interviews with specialists in the field, to better understand how this energy transition process is in fact contributing to a more sustainable future.

[1] A prosumer is a customer who produces electricity primarily for his own needs but can also sell the excess electricity.

3. Methods

This chapter outlines the methodological approach adopted for the study, covering the research design, data collection strategies – including the literature review and conducted interviews – as well as analytical techniques utilized to address the research question. The study employs an inductive and qualitative approach through a case study with focus on pre-defined geographical regions. This approach is based on literature reviews, interviews, and data analysis using MAXQDA.

3.1 Research Design

The research adopts an inductive reasoning framework, emphasizing exploratory and qualitative methodologies to help answer how the energy transition can contribute to a more sustainable future when seen from a social perspective as well. Grounded in a transcultural and relational approach, the study focuses on these key regions: South Africa, Brazil, India and Pakistan, as well as Germany as a global north reference. The countries representing this perspective were chosen for the following reasons: The scope is based primarily on the possible availability of interview partners provided by the TSRG network as well as personal contacts due to the diverse cultural backgrounds of the research team. For the global north, Germany was chosen for its role as a global leader in energy transition and is therefore a good example for the global north's perspective in a more general way (Hassan et al., 2024). However, this diverse sample of countries representing 4 continents helps to generalize the findings in some way but also limits the study due to the small sample size.

3.2 Data Collection

Within the study, the methodology for data collection is through a planned series of steps, which ensures both comprehensiveness and relevance to the research questions. The foundations of the data collection approach are the conducted interviews, supplemented by a

systematic literature search designed to gain insightful perspectives and verify data from existing reviews and studies.

3.2.1 Literature Review

In addition to the information missing in the interviews, but necessary for the cases, data was added from the literature. The initial step involved identifying pertinent keywords from prior research, which served as the cornerstone for constructing detailed database queries. For that process primarily Scopus was chosen. But as Scopus is Elsevier based, Google Scholar was also taken into account, so no important literature would be missing. Keywords that are not only prevalent in existing literature but also critical in defining the conceptual boundaries of this study were selected. The search query was carefully structured with a combination of keywords connected by logical operators like “OR” and “AND” commands. The timeframe of 2014 to 2025 was deliberately chosen to capture the most recent and relevant studies, reflecting the rapid advances and regulatory changes impacting the energy sector. Also, the decentralized movement of interconnected technologies came up in 2014/2015 which allowed P2P energy coordination via dApps and smart contracts. To further narrow the focus, the search was limited to articles within specific subject areas such as energy, environment, sociology, business, economics, and multidisciplinary studies, ensuring relevance to the thematic focus.

3.2.2 Interviews

The interviews aimed to explore the practical realities, challenges, and opportunities of energy transition and their impact on communities as well as the impact of communities influencing the energy transition. Therefore, an interview guide was developed, containing a questionnaire derived from the literature as well as questions derived from the interview progress.

The data sampling was largely collected through semi-structured interviews with people from different countries, different sectors of

society, and with different roles in the energy transition process, including people with knowledge and experience relevant to the research objectives from both public and private sectors.

Through an evaluation of over 40 potential contacts across a total of 12 countries in the global south and global north, key professionals were identified based on their knowledge, regional experience and contributions to the field. For privacy reasons, personal identifiers have been removed, and all direct references to individuals or organizations have been anonymized. Additionally, their background has been analyzed to identify possible biases for transparency reasons: The data has been gained through 9 interviews in total – 8 semi-structured online interviews and one in-person interview – with 8 interviewees from 5 different countries (Brazil, Germany, India, Pakistan, and South Africa) from July to December 2024 (two older German interviews from May and June were included as well). The interviews lasted on average one hour (approx. 40-80 mins).

Table 1: Interviewees Knowledge and Experience Data

Region	**Anonymized Expert**	**Background & Expertise**	**Stance on Central vs. Decentralized Energy**
Brazil	Founder in Renewables	Founder of renewable energy initiatives, focusing on decentralized microgrids for low- income communities	Neutral
Brazil	PhD in Energies	Researcher specializing in Brazil's grid reliability, energy access, and regulatory challenges	Neutral
South Africa	Economics Professor	Former Eskom employee + Researcher with expertise in economic modeling and financial inefficiencies in the energy sector	Favors Centralized
South Africa	Innovation and Policy Professor	Policy expert integrating energy projects into national frameworks, especially in the Northern Cape	Favors Centralized

India	Energy Transition Expert	Researcher on India's transition from coal to renewables, balancing centralized and decentralized models	Neutral
Pakistan	Business and Regulatory Expert	Expert in energy markets and regulations, advocating for off-grid renewable systems in remote areas	Strongly Favors Decentralized
Germany	Senior IT Architect	Digital infrastructure specialist focusing on smart grids and decentralized energy trading	Neutral
Germany	Smart Energy Expert	Expert on decentralized energy markets, supporting flexible pricing and grid management	Favors Decentralized
Germany	Senior Expert Renewable Energies	Financial and Governmental expert specializing in distributed energy and regulatory frameworks for local autonomy	Strongly Favors Decentralized

Source: Own Creation (based on interviewee data).

3.3 Data Analysis

The data was analyzed using the software MAXQDA. The interviews were transcribed using non-naturalized transcription. The three German interviews – originally conducted in German – were translated into English after transcription. The interviews were analyzed under the Grounded Theory Approach following Open Coding, Axial Coding, and Selective Coding methods. Therefore, inductive paragraphic coded segments were created. A coding framework was developed inductively while coding one interview after another to guide the ongoing analysis. The software features allowed for the creation and hierarchical organization of interviews and codes, ensuring that data was categorized efficiently and logically according to the derived coding system. The coding process involved annotating and categorizing segments to identify patterns, trends, and recurring themes. Once the data was coded, thematic analysis was conducted to uncover relationships and insights across the datasets. Therefore, variables derived

from the coding and related values were assigned inductively. Comparative analysis was also performed, allowing for the identification of thematic and regional differences and commonalities across cases. In addition to coding, MAXQDA's visualization tools were employed to enhance the understanding of the data. This includes mapping graphs, the Code Cloud and the Code Relations Browser as well as the Code Matrix Browser.

The integration of findings from interviews with insights from the literature further enriched the analysis. This process ensured that the data was not only analyzed in isolation but also contextualized within the broader academic and practical discourse on the role of communities within the energy transition. By triangulating data from different sources, the study achieves a comprehensive and nuanced understanding of how communities are engaging in energy transitions and the factors influencing their involvement.

4. Findings

On the findings, the main information gathered by the specialists' interviews will be presented according to five main categories: Infrastructure/Reliability; Economy; Energy Transition; Politics; and Community. It is important to note that, even though these findings are divided into different categories, many of them overlap. In fact, there is a considerable correlation between the different categories, as they are interdependent. It is also interesting to note that during the interviews there were no mentions of the SDG 7, despite its importance on the research theme, and thus, the SDG is not cited in the findings. This lack of discussion on this topic might have different reasons within the different countries. For instance, in the case of South Africa, the SDG aspects are so intrinsic to the matters studied by the faculty that mentioning this correlation with the SDG 7 might not even have been seen as necessary. In contrast, in the cases of India and Pakistan, this absence of the SDG 7 might indicate that the countries still need to pay more attention to this matter.

4.1 Infrastructure/Reliability

Brazil

Brazil's energy system is defined by near-universal access (99%), yet this achievement is undercut by significant reliability issues. The proximity to substations rather than power plants determines the quality of energy supply, with northern and Amazonian regions facing heightened challenges due to isolation, environmental constraints, and long transmission distances.

> "Running a grid through the Amazon is not okay […] you have to destroy a lot of forests to just run a grid through it." (Founder in Renewables, 2024)

Energy dependency is mitigated by Brazil's diversified energy mix, which incorporates substantial renewable sources such as solar, whose contribution to the energy mix has risen dramatically, now exceeding 20%. Programs like *Mais Luz Para Amazônia* aim to decarbonize isolated systems, although their slow scaling remains a critical challenge.

> "In favelas, for instance, and many other low-income communities, the energy is not of good quality, it's not reliable at all. There are many power outages and blackouts." (PhD in Energies, 2024)

While the government prioritizes energy accessibility and affordability, regional disparities persist, and there is a need to balance access and sustainability concerns.

South Africa

South Africa's energy system is dominated by coal, which secures grid stability but creates significant barriers to transitioning to renewable energy.

> "At the moment, we are probably about 86% reliant on coal, but there is a roadmap to bring about a transition." (Innovation and Policy Professor, 2024)

Despite notable progress, such as the Renewable Independent Power Producer Procurement Program (RIP), integrating solar and wind en-

ergy faces structural challenges, including grid constraints – particularly in regions ideal for renewable production like the Northern Cape – and limited storage capacity for renewable sources.

> "Provinces like the Northern and Eastern Cape are ideal for solar and wind, but they've essentially run out of grid capacity to connect to the grid." (Economics Professor, 2024)

Coal remains a cornerstone of energy security due to its cost-effectiveness, though the reliance on aging coal plants creates vulnerabilities in baseload supply.

> "The delay in building new capacity, along with underinvestment and mismanagement, has forced us to rely on old, inefficient infrastructure." (Economics Professor, 2024)

Affordability emerges as a critical issue, with widespread poverty limiting many households' energy access. While renewable energy prices are declining, marginalized communities still rely heavily on government subsidies, which are insufficient for sustained energy consumption. Decentralized energy solutions are urgently needed as interim solutions to balance reliability, affordability, and sustainability.

India

India's energy transition is characterized by ambitious goals, including achieving net-zero emissions by 2070 and generating over 50% of electricity from non-fossil fuel sources by 2030. While renewable capacity has grown to 45% of installed capacity, coal remains dominant, contributing 75% of electricity generation thanks to its reliability compared to intermittent renewables. Addressing this requires scaling renewable energy capacity threefold, integrating hybrid systems, and modernizing grid infrastructure to reduce outages.

> "Coal and lignite for the first time have come below 50% of India's overall installed capacity. But still, more than 75% of our actual electricity generation comes from coal." (Energy Transition Expert 2024)

The centralized energy system struggles to deliver equitable access, particularly in rural and tribal regions, where many communities face

limited energy availability. Decentralized solutions, such as village-level solar panels, offer promising alternatives that reduce transmission losses and stimulate local economies. These systems, alongside hybrid models combining storage and renewable sources, aim to bridge the gaps in availability and reliability.

India's transition strategy reflects a balance between coal's short-term necessity and renewable energy's long-term potential. Investment in grid modernization, hybrid energy systems, and localized renewable projects remains essential for addressing inequities and ensuring energy reliability nationwide.

Pakistan

Pakistan's energy reliability is undermined by seasonal demand fluctuations and systemic inefficiencies in transmission infrastructure.

> "Pakistan has the highest per-unit electricity cost in the region, largely due to transmission losses and inefficiencies." (Business and Regulatory Expert 2024)

Hydropower, a primary renewable source, faces seasonal variability, necessitating reliance on fossil fuel plants, which drives up costs and exacerbates energy affordability challenges. Off-grid renewable solutions, particularly solar, are gaining traction, providing cost-effective alternatives for remote communities. However, the halving of solar panel costs offers a potential solution, but inflation and systemic inefficiencies continue to impede affordability and reliability, especially for marginalized groups

> "More than 50% of Pakistan's electricity already comes from renewable energy, primarily hydropower and solar." (Business and Regulatory Expert 2024)

Efforts to decentralize energy and prioritize renewables are gaining momentum, but Pakistan's dependency on traditional energy sources persists. Investment in modern infrastructure, energy storage, and decentralized solutions is critical to achieving a more secure and inclusive energy future.

Germany

Germany's energy system faces unique challenges in integrating decentralized renewables into a grid designed for uni-directional energy flows. Small-scale renewable systems, such as rooftop solar, face capacity limits to prevent grid overload, highlighting the need for grid modernization. Decentralized energy trading and digital technologies are seen as key to enhancing reliability and efficiency.

Affordability is another focal point, with community-led initiatives like *Bürgerbeteiligungen* enabling public participation in renewable energy projects. Reducing network charges and introducing dynamic pricing models are critical to lowering costs and promoting decentralized renewable adoption. Regulatory adjustments to simplify energy sharing and align incentives with grid requirements remain essential for fostering a balanced energy system.

Germany's approach emphasizes balancing centralized and decentralized frameworks to achieve long-term sustainability. Investment in digital infrastructure, modernized grids, and dynamic market models is crucial for ensuring reliable and accessible energy in the country's transition to a renewable future.

4.2 Economy

Brazil

Financial challenges persist, particularly for low-income communities, due to the high initial costs of renewable energy systems. Banks and financial institutions often view these populations as high-risk, limiting their access to financing.

> "Banks will not provide loans for solar installations in low-income communities despite their low default rates." (Founder in Renewables, 2024)

Proposed solutions include government and multilateral interventions, such as loan guarantees and financial risk mitigation strategies, to support equitable renewable energy adoption. The energy transition also poses employment challenges, as Brazil's renewable energy jobs, particularly in decentralized solar systems, often attract skilled labor

from wealthier regions, leaving underprivileged areas with lower-quality opportunities.

Brazil's energy transition demonstrates its potential for economic growth but remains constrained by systemic financial and regulatory barriers. Addressing these challenges through inclusive financial mechanisms, regional capacity building, and equitable policies can drive sustainable economic development while fostering green energy adoption.

South Africa

South Africa's energy market is structured around a collaborative approach between public and private sectors, with private producers generating electricity that is purchased and integrated into the grid by the state-owned utility, Eskom.

> "ESKOM is making a loss because their electricity is underpriced – price increases are capped by the national energy regulator, forcing them to sell at a loss." (Economics Professor, 2024)

However, systemic inefficiencies and allegations of corruption, including sabotage at power plants, undermine energy reliability.

> "The fundamental problem of adding capacity to the grid was real… the delays in Kusile and Medupi, the aging power fleet, corruption, and mismanagement over the last decade have been horrendous." (Economics Professor, 2024)

These issues, coupled with mismanagement, hinder the energy transition and exacerbate economic challenges. Financially, South Africa struggles with macroeconomic stagnation and a lack of investor confidence, exacerbated by cost overruns in projects like Kusile and Medupi.

> "You cannot speak about energy transition while not reflecting on the broader economy. If the economy is growing, people will find jobs elsewhere." (Innovation and Policy Professor, 2024)

Despite declining renewable energy costs, the slow pace of grid expansion limits the integration of cost-effective solutions, impacting

affordability and industrial growth. Moreover, economic constraints delay job creation in the renewable energy sector, leaving workers from coal-related industries without immediate alternatives.

> "We import most of our solar panels and wind turbines. Shouldn't we localize some of that production to create jobs?" (Innovation and Policy Professor, 2024)

Efforts to localize renewable energy production and integrate small businesses into the value chain are essential to mitigating job losses and fostering economic growth.

South Africa's energy transition reflects a complex interplay of financial, social, and infrastructural challenges. Comprehensive reforms addressing grid expansion, investor trust, and workforce reskilling are vital to aligning the transition with economic growth and social equity.

India

India's energy market prioritizes renewable energy integration through a "merit order dispatch"[2] system, favoring the lowest-cost sources. However, long-term contracts with coal-based plants create financial bottlenecks, as distribution companies must pay fixed costs even when coal usage declines. To address this, India is transitioning to shorter-term agreements and incentivizing daytime energy use to optimize solar generation.

Financially, India faces challenges in balancing investments in renewable energy and coal infrastructure. High costs for renewable energy storage further complicate affordability, with stored solar energy exceeding coal costs for night-time supply. These financial dynamics necessitate innovative market mechanisms to improve economic feasibility. Employment opportunities in renewable energy offer socio-

[2] Merit order dispatch is a principle in electricity markets that determines the sequence in which power plants are used to meet demand, based on their marginal cost (the cost to produce one extra unit of electricity). Power sources with the lowest marginal costs are dispatched first, followed by those with progressively higher costs, which minimizes the overall cost of electricity generation.

economic potential but require diversified training and community-focused strategies to address job losses in coal-dependent regions

> "India is investing heavily in new coal mines and power plants while simultaneously expanding renewable energy. This dual strategy is unsustainable." (Energy Transition Expert 2024).

Pakistan

Pakistan's energy transition reflects a dual narrative of affordability challenges and expanding employment opportunities. Despite a significant reduction in solar panel costs, high energy prices remain a barrier for over 30% of the population, emphasizing the need for more affordable solutions. Structural inefficiencies in transmission and distribution exacerbate these challenges, with consumers bearing the financial burden of high transmission losses.

At the same time, the transition has fostered job creation in the renewable energy sector, particularly in solar energy, making renewable energy more inclusive and economically impactful. While Pakistan's energy transition offers potential for economic inclusion, addressing affordability and systemic inefficiencies is critical for sustaining momentum and achieving broader socio-economic benefits.

Germany

Germany's energy market operates at the intersection of centralized and decentralized systems, with legislative reforms playing a crucial role in supporting small-scale renewable energy projects. Regulatory barriers, particularly concerning energy storage and decentralized energy sharing, complicate market access for prosumers. Demonstration projects like Pebbles[3] showcase potential pathways for local energy and flexibility markets, though scalability and financial feasibility remain challenges.

The relationship between economic growth and energy transition in Germany is driven by research initiatives like Gaia and CATENA X,

[3] One of the major decentralised energy projects in Germany. More information can be found in the link: https://pebbles-projekt.de/en/

which focus on technological innovation and workforce training. However, initial costs and logistical complexities in adopting smart infrastructure pose barriers. Data-driven approaches and regulatory adjustments are essential to fostering a sustainable and inclusive energy market.

Germany's energy transition reflects a sophisticated interplay of regulatory frameworks, technological advances, and community participation. Addressing these dynamics through targeted investment and policy innovation will be key to sustaining economic growth and achieving renewable energy goals.

4.3 Energy Transition

Brazil

Brazil's energy transition reflects a commitment to addressing systemic inequalities and injustices, highlights the integration of socio-economic and territorial contexts into the transition, emphasizing a policy discourse aimed at reducing energy poverty and fostering inclusivity. However, challenges persist, particularly regarding private sector involvement in renewable energy development, which often results in violations of traditional rights and adverse impact on vulnerable communities.

> "If you can pass this huge transmission tower through my land, why can't you connect me to the national grid?" (PhD in Energies, 2024)

This paradox is evident in regions hosting renewable infrastructure, where local communities still lack reliable access and face conflicts over resources.

Modern technologies, particularly off-grid solar and battery storage systems, have become central to expanding energy access in remote regions like the Amazon. These systems reduce environmental impact compared to traditional grid expansion. While solar panel installations have surged globally, their growth in Brazil is accompanied by optimism about cost-effective energy storage solutions becoming viable in the next decade.

> "I believe Brazil will not only implement an energy transition but become a global leader and example." (Founder in Renewables, 2024)

Such advances are pivotal in bridging the gap between energy accessibility and sustainability.

Despite this progress, Brazil's transition is hindered by logistical and regulatory barriers. Achieving a just transition requires stronger coordination between government, private stakeholders, and local communities to ensure equitable access, minimize socio-environmental conflicts, and promote sustainable renewable energy development.

South Africa

South Africa's energy transition process began in earnest in the mid-2000s, but early renewable energy procurement efforts faced high costs and limited scalability. Recent advances, including the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP), have improved integration, but systemic challenges persist.

> "The Presidential Climate Commission has been tasked with managing this transition, but the challenge is huge given South Africa's socio-economic problems." (Economics Professor, 2024)

Notably, achieving a Just Energy Transition is prioritized to balance energy security with socio-economic stability, particularly in coal-dependent communities. However, coal will stay in the future:

> "We are not shutting down all the coal-fired power plants. Coal will remain in the energy mix, but with lower emissions." (Innovation and Policy Professor, 2024)

Modern technologies, such as battery storage, are gaining prominence as crucial complements to renewables like solar and wind for managing intermittency, particularly given the uncertainty surrounding the scalability of gas as a backup resource.

South Africa's transition underscores the importance of coupling technological readiness with robust policy frameworks and socio-economic safeguards. Efforts to integrate renewable technologies must

address infrastructural constraints and ensure that affected communities receive adequate support during the transition.

India

India's energy transition adopts a phased, systematic approach to balance sustainability and socio-economic stability. Long-term planning and annual execution strategies ensure gradual transitions while minimizing disruptions to coal-dependent communities. Hybrid renewable energy systems, combining solar, wind, hydro, and battery storage, are central to mitigating the intermittency of renewables and modernizing grid infrastructure, but current renewable energy capacity growth lags behind national targets.

> "We had a target of 175 GW of renewable energy by 2022. Even two years past the deadline, we are at around 150 GW." (Energy Transition Expert 2024)

Additionally, to address storage challenges, time-of-day tariffs incentivizing daytime solar consumption are being piloted to balance demand and reduce reliance on coal for night-time energy.

India's transition highlights a dual challenge: rapidly scaling renewable capacity while ensuring affordability and socio-economic equity. Investment in hybrid systems, advanced storage technologies, and innovative market mechanisms will be pivotal in achieving its ambitious targets.

Pakistan

Pakistan's energy transition is marked by a reliance on renewables, which account for approximately 50% of the energy mix, including solar, wind, and hydropower. The affordability of solar technologies, facilitated by external market dynamics, has enabled the proliferation of decentralized energy systems in remote areas. Remote communities have increasingly adopted solar panels, spurred by declining costs.

> "Off-grid energy solutions have become very popular in Pakistan. Remote communities are shifting to solar energy as a way to escape high costs." (Business and Regulatory Expert 2024)

Decentralized solutions provide energy access to areas disengaged from broader policy frameworks, offering a cost-effective alternative to traditional grid expansion. However, seasonal demand fluctuations and the absence of grid-scale storage limit the reliability of renewables, especially during winter months and at night time.

Pakistan's transition reflects progress in adopting renewables but highlights the importance of addressing seasonal variability and storage limitations. A focus on policy alignment, technological advancement, and decentralized energy solutions will be essential for sustaining this trajectory.

Germany

Germany's energy transition is globally recognized for its ambitious targets and innovative approaches. A robust framework supports renewable energy adoption, including citizen participation in decentralized energy projects. Local initiatives demonstrate high public engagement, with citizen-funded projects rapidly raising investment. However, challenges persist in coordinating these efforts and ensuring equitable risk-sharing among stakeholders.

Modern technologies, such as smart meters, AI-based forecasting, and energy storage, are integral to the transition. These tools enhance energy management, load balancing, and participation in decentralized markets. However, regulatory barriers and infrastructure limitations hinder the full integration of decentralized systems into the grid. Additionally, Germany's renewable energy framework highlights the need for financial incentives and EU-aligned regulatory adaptations to foster scalability and inclusivity.

Germany's energy transition underscores the importance of digitalization, stakeholder collaboration, and tailored regulatory frameworks. Investment in grid modernization, advanced technologies, and community-based solutions remains pivotal to achieving a 100% renewable energy scenario.

4.4 Policy

Brazil

Brazil's energy policies emphasize affordable and reliable energy as a primary objective, with clean energy and decentralization as secondary considerations.

> "For the first time, Brazil has an energy transition policy that states the need to eradicate energy poverty." (PhD in Energies, 2024)

Brazil's energy subsidies are primarily implemented through the social tariff system, targeting economically vulnerable households.

> "The poor will always be double or triple punished – the social tariff scheme is not keeping up with social dynamics." (PhD in Energies, 2024)

Families under programs like "*CAD Único*" or *Bolsa Família* receive significant subsidies, sometimes covering 100% of consumption up to 50 kWh/month. However, rigid consumption limits perpetuate energy poverty by restricting access to essential services like education and internet connectivity, which could help families escape poverty. Additionally, disparities in maintenance and energy reliability between neighborhoods exacerbate systemic inequalities.

Brazil's energy sector is dominated by utility companies which hold monopolistic power and significant political influence through public-private partnerships.

> "Energy corporations have a strong grip on government, preventing decentralized solutions from scaling." (Founder in Renewables, 2024)

These companies' dual role as operators and regulators of decentralized systems creates a conflict of interest, hindering the adoption of localized energy solutions.

> "The National Electrical Energy Agency, ANEL, which regulates all electrical systems in Brazil, is a completely corrupt body." (Founder in Renewables, 2024)

Legislative and executive branch dynamics reflect mixed progress: while legislators show interest in advancing renewable energy, en-

trenched corruption and the influence of utility companies at the executive level remain significant barriers.

South Africa

Policies like the Integrated Resource Plan (IRP) emphasize balancing renewable and traditional energy sources, but implementation delays and insufficient policies influencing community awareness hinder progress.

> "South Africa's transition has been delayed because of populist politicians and resistance from interest groups benefiting from the old system." (Economics Professor, 2024)

Socio-political inequalities, especially in coal-dependent regions like Mpumalanga, remain key challenges. The government's political capital is constrained by competing priorities, with limited progress in fostering grassroots-level engagement or creating new local economic opportunities. Subsidies in South Africa play a critical role in facilitating the energy transition, especially for early-stage renewable energy projects.

> "Historically, South Africa's electricity has been cheap. But we are so poor, it doesn't matter if electricity is relatively cheap – it's still too expensive for the poor." (Economics Professor, 2024)

The challenge lies in maintaining affordability once subsidies are phased out, with strategic planning required to ensure price stability and avoid social tensions:

> "There is a national initiative to provide free electricity to vulnerable communities, but those subsidies cannot disappear during the transition." (Innovation and Policy Professor, 2024)

Systemic issues such as sabotage, corruption, and inefficiencies undermine South Africa's energy sector:

> "There have even been allegations of sabotage at several power stations during the Zuma years – an aspect that worsened our energy crisis." (Economics Professor, 2024)

These structural issues erode trust and create barriers to investment. Moreover, political narratives opposing renewables, often rooted in populism, frame the transition as a threat to jobs, further complicating public acceptance.

India

India has committed to international climate goals, including net-zero emissions by 2070, supported by subsidies and decentralized initiatives.

> "If we have to meet our 2030 target, we need to install at least 50-60 GW of renewable energy per year. But at our current pace, it looks very difficult." (Energy Transition Expert 2024)

Policies integrating renewables into agriculture and community-level grids are notable successes. However, local challenges, such as addressing coal dependency and mitigating environmental impacts, require stronger alignment between government priorities and implementation mechanisms. Political interests often emphasize short-term goals because of electoral cycles, leading to discrepancies between national renewable energy targets and on-the-ground implementation.

India's subsidy schemes focus on renewable energy integration, such as encouraging farmers to install solar-powered pumps with provisions to sell surplus energy back to the grid. However, the implementation of these schemes remains uneven.

Pakistan

Policy inefficiencies in grid management and generation exacerbate public disillusionment with state-led energy initiatives. Provincial resistance to decentralization creates additional barriers, with disparities in energy theft and line losses fueling tensions.

> "Provinces want the federal government to manage energy, but when it comes to decision-making, they resist delegation of power." (Business and Regulatory Expert 2024)

> "One province has a 30% grid loss, while another has only 10%. There's a political dispute over who should pay for the inefficiencies." (Business and Regulatory Expert 2024)

Short-term subsidies and targeted policies, while offering immediate relief, fail to address long-term sustainability challenges. Moreover, Pakistan's subsidies target specific groups and regions, reflecting socio-economic inequalities, and fossil fuel subsidies remain prominent.

Stakeholder conflicts are evident in Pakistan's energy policies. Private power producers with dollar-pegged contracts benefit disproportionately from currency devaluation, leading to public dissatisfaction. Efforts to renegotiate these contracts face legal and political hurdles. Political parties exploit public grievances against energy conglomerates, further polarizing policy discussions and complicating reforms.

> "Energy costs have skyrocketed, while grid reliability remains poor. This has led to mass frustration and political instability." (Business and Regulatory Expert 2024)

Germany

Germany's compliance with EU directives, such as RED II, reflects its commitment to enabling non-discriminatory energy sharing. However, the practical implementation of decentralized systems requires streamlined regulations and dynamic market mechanisms. Political capital is invested in fostering collaboration among stakeholders, addressing scalability challenges, and modernizing regulatory frameworks to align with technological advances. The country uses subsidies to incentivize renewable energy adoption, focusing on reducing network charges and promoting community energy projects. Subsidies for energy storage solutions are critical but face regulatory ambiguities, particularly around exemptions from grid fees and the role of prosumer systems. The energy transition faces tensions between short-term political cycles and long-term energy strategies. Policymakers often prioritize immediate public concerns, while technical experts emphasize stability and innovation.

4.5 Community

Brazil

Brazil's energy transition can pose significant environmental challenges, such as deforestation and disruptions to indigenous lands. Off-grid systems, that are seen as interim solutions, have their environmental trade-offs since they rely heavily on lithium-ion and lead batteries, raising concerns about global mining practices and waste management. However, they also have benefits.

> "Off-grid solutions are a better option than grid expansion because the environmental costs are lower." (Founder in Renewables, 2024)

These decentralized energy systems show potential for both rural and urban areas, such as *favelas*. However, wealth disparities exacerbate the benefits of decentralization, with wealthier populations disproportionately accessing these advances, leaving vulnerable communities further marginalized.

> "We are addressing how the renewable energy expansion affects communities and how this expansion can also enhance disparities and increase injustice in the social issue of Brazil." (PhD in Energies, 2024)

Energy poverty in Brazil is intertwined with economic and social inequalities. Despite high energy prioritization, low-income households often spend up to 30% of their income on energy. Social tariff schemes, while providing some relief, perpetuate poverty through restrictive consumption caps. Rural areas, particularly in the north, face severe access and reliability issues. Policy integration to align energy initiatives with socio-economic goals is urgently needed to address disparities and foster inclusivity.

> "Brazil has a growing skilled workforce in solar and could become a global leader in clean energy." (Founder in Renewables, 2024)

Brazil's renewable energy sector creates opportunities for skilled labor, particularly in solar installation and maintenance, yet systemic labor issues persist.

> "The transition is happening, but my son is still unemployed." (PhD in Energies, 2024)

While coal sector job losses are minimal, renewable energy jobs often lack stability and benefits, raising concerns about the quality of jobs in the sector. Resistance among traditional industry workers highlights the need for trust-building and better employment security during the transition.

South Africa

Off-grid solutions like rooftop solar and microgrids have gained traction owing to severe load shedding but remain limited in scale and their contribution to national energy needs.

> "All this rooftop solar that's been built in the last 2-3 years has been one of the biggest contributors to why we haven't had load shedding in the last 4 months." (Economics Professor, 2024)

These systems offer short-term relief, particularly in rural areas, but are seen as transitional measures rather than transformative solutions for large-scale energy stability. According to the interview partners, there is no consensus on which system should be prioritized within the debate between centralized and decentralized energy systems.

> "For vulnerable and disconnected communities, microgrid solutions can serve as a vital stop-gap measure – but they're not a replacement for a fully developed grid." (Innovation and Policy Professor, 2024)

However, South Africa's renewable energy shift addresses coal emissions but introduces concerns about rare metal sourcing for technologies like batteries. Ethical and sustainability issues, particularly regarding resource extraction in Africa, require attention. While less severe than fossil fuel reliance, renewable energy's environmental costs highlight the need for ongoing innovation and global accountability.

Also, the transition away from coal disproportionately affects regions like Mpumalanga, where job losses exacerbate already high unemployment rates.

> "South Africa has 40% unemployment, so shutting down coal plants without a job transition plan is politically unviable." (Economics Professor, 2024)

Geographic and skill-set mismatches between coal jobs and renewable energy opportunities complicate worker transitions.

> "For professionals, upskilling is easy. The bigger issue is for people working on the ground, like miners or boiler operators, who may struggle to transition." (Innovation and Policy Professor, 2024)

Populist narratives opposing renewable energy leverage these disruptions, emphasizing the need for robust retraining programs and social protections to ensure a just transition.

> "There will be job losses, and we need social protection for maybe three to five years as workers find their feet." (Innovation and Policy Professor, 2024)

Free electricity allocations for low-income households provide limited relief, often covering only a few days of basic consumption.

> "In the Northern Cape, renewable energy projects are coupled with social community trusts, giving communities ownership and involvement." (Innovation and Policy Professor, 2024)

Expanding allocations could reduce barriers to socio-economic growth and enable better access to modern energy services, but affordability challenges persist.

India

India's environmental challenges in the energy transition are linked to coal dependency and the need for sustainable renewable solutions. Efforts to reduce workplace accidents and air pollution are integral to improving community health and reducing environmental degradation, but progress remains uneven.

Rural communities often face inconsistent energy access, even in regions producing significant electricity. Decentralized renewable systems, such as village-level solar panels, offer a pathway to reliable electricity and economic participation.

> "The Kusum scheme is providing solar-powered water pumps for farmers, reducing agricultural reliance on coal-powered electricity." (Energy Transition Expert 2024)

These systems can create local economic opportunities through maintenance and repair jobs. However, automation in coal production has reduced jobs, affecting local economies that once thrived on coal-based employment.

> "In the last decade, automation has reduced manpower in coal mines while production has increased. Communities that relied on coal are losing jobs anyway." (Energy Transition Expert 2024)

Renewable energy offers opportunities for job creation but requires investment in vocational training and alternative sectors to support communities transitioning away from fossil fuels.

> "Automation is reducing coal jobs, but renewable energy has the potential to provide even more jobs in manufacturing, maintenance, and decentralized grids." (Energy Transition Expert 2024)

Pakistan

Rising electricity prices disproportionately impact low-income households, exacerbating energy poverty.

> "Electricity prices in Pakistan have tripled in the last 24 months. The lower and middle-income communities are struggling to pay their bills." (Business and Regulatory Expert 2024)

Solar energy has emerged as a practical solution for remote communities underserved by centralized systems. Supported by NGOs and financial institutions, decentralized energy systems provide a sustainable alternative to unreliable grids.

> "Off-grid energy solutions have become very popular in Pakistan. Remote communities are shifting to solar energy as a way to escape high costs." (Business and Regulatory Expert 2024)

> "Off-grid solar solutions are the future for Pakistan's remote communities. Since Pakistan is a net energy importer, off-grid solutions will always be green." (Business and Regulatory Expert 2024)

However, their limited night-time functionality and high initial costs hinder broader adoption. Community disengagement from energy planning further compounds these challenges. Besides, solar-powered tube wells have unintentionally led to over-extraction of subsoil water, highlighting a lack of regulatory frameworks for sustainable resource use. Declining water tables will pose long-term environmental challenges if left unaddressed.

> "Farmers with solar-powered tube wells are over-extracting groundwater because they have no incentive to turn off their pumps." (Business and Regulatory Expert 2024)

Solar energy's accessibility has democratized job creation, particularly for low-income and semi-skilled workers (e.g., maintenance). Also supportive is that Pakistan's fossil industry was never a dominant employer, allowing a smoother transition to solar energy jobs. Unlike traditional energy systems, decentralized solutions generate diverse employment opportunities in maintenance and sales, fostering economic inclusion in underserved regions.

> "The transition to solar has created more jobs in installation, maintenance, and sales, absorbing workers from traditional energy sectors." (Business and Regulatory Expert 2024)

Germany

In Germany, the impact of communities plays a significant role. Bottom-up approaches like community-driven initiatives gain popularity leading to concepts of energy sharing and renewable citizen cooperatives ("*Bürgerenergiegenossenschaften*"). These concepts also address energy affordability, renewable generation, and democratization. However, regulatory complexities and high infrastructure costs still limit participation, particularly among smaller players and urban residents without direct renewable energy access. Community-based approaches require flexible pricing structures and policies that incentivize participation. Stakeholders emphasized the need for iterative improvements, urging policymakers to advance community solutions even if initial frameworks are imperfect. Additionally, concerns about

the fairness of profit-driven motives highlight the need to balance economic gains with responsible practices.

However, Germany's energy transition focuses on minimizing environmental costs through regulatory and technological advances. Nevertheless, Germany's off-grid systems encounter technical and regulatory barriers, such as capacity limits on small-scale power plants to prevent grid overload. Advanced analytics and digital technologies are crucial for optimizing decentralized systems, but regulatory reforms are necessary to unlock their full potential.

5. Discussion

In the following part, the findings will be discussed and the research question "How can the energy transition contribute to a more sustainable future when seen from a social perspective as well?" will be examined using empirical data and linked to existing literature and theoretical frameworks.

5.1 Comparative Discussion

The energy transition is not just a technological shift but a geopolitical and economic race (IRENA, 2019: 26-49). While all countries aim to achieve decarbonization, their paths are shaped by vastly different historical, economic, and political contexts. Global North countries, particularly Germany, lead in technological innovation, regulatory frameworks, and financing mechanisms, whereas Global South countries, including Brazil, South Africa, India, and Pakistan, grapple with balancing economic growth, energy security, and social equity (Azubuike et al., 2024). These differences influence the priorities, policy decisions, and technological pathways pursued in each region. Despite shared goals of achieving sustainability, countries in the Global South and Global North exhibit starkly different challenges and strategies. The Global North prioritizes technological innovation, market liberalization, and regulatory frameworks, while the Global South focuses on affordability, job creation, energy security, and infrastructure development (Babayomi et al., 2022).

Table 2: Key Factors for the Energy Transition in the Global North and Global South

Key Factor	Global North (Germany)	Global South (Brazil, South Africa, India, Pakistan)
Primary Transition Driver	Decarbonization, technological advancement, market liberalization	Energy access, affordability, economic growth, energy security
Regulatory Frameworks	Highly developed but bureaucratically complex	Often inconsistent, conflict of interest, or politically resistant
Grid Infrastructure	Advanced but struggling with decentralization integration	Unreliable, outdated, prone to failures
Decentralization	Politically and Bottom-up driven, Market-driven, facing regulatory and financial barriers	Often the only viable alternative due to weak central grids
Employment & Just Transition	Structured policy-driven job transitions	Coal and fossil fuel jobs still dominate, and renewable jobs are unevenly distributed
Financial Models	Subsidies and tax incentives for decentralized and green energy	Limited financing options, high cost of transition
Environmental Challenges	Land-use conflicts	Mining for rare earth minerals, water depletion, deforestation
Political Influence	Driven by climate policies and public demand	Energy policies intertwined with economic development and political stability

Source: Own Table.

These differing priorities demonstrate that there is no universal one-size-fits-all approach to energy transition. Instead, transition models must be adapted to local economic, political, and infrastructural realities.

The debate between centralized and decentralized energy systems is not a purely technical question but an ideological and economic one as proposed by interview partners from Brazil and South Africa and the literature. Nevertheless, Germany, with its structured regulatory framework, aims to balance centralized and decentralized models (Ger-

man National Academy of Sciences Leopoldina et al., 2020). However, bureaucratic barriers prevent small-scale market participation. In contrast, Brazil, South Africa, India, and Pakistan are partly "forced" into decentralization due to unreliable national grids (at least in some rural areas), making off-grid solutions a necessity rather than a choice according to all of the interview partners and the literature. While decentralization is seen as an interim solution for energy security in the Global South, it is instead seen in the Global North as a potential long-term solution (Babayomi et al., 2022).

Germany's energy security concerns revolve mostly around integrating renewables into an already stable grid, which is threatened by very high network charges and even blackout possibilities (Hassan et al., 2024). However, for South Africa, India, and Pakistan, energy security focuses more on preventing daily blackouts and/or reducing reliance on expensive fossil fuel imports. In Brazil, the paradox of being an energy exporter while parts of the rural population suffer from chronic shortages illustrates the disconnect between national energy policies and local needs. South Africa and Pakistan exemplify the Global South countries' perspective where energy affordability, rather than sustainability, is the primary driver of the transition. For example, electricity costs have nearly tripled in Pakistan, forcing millions into energy poverty and fueling social unrest. By contrast, Germany's high energy prices are a result of market liberalization, dynamic pricing, and decarbonization policies rather than supply constraints (Deutscher Bundestag, 2022; Hassan et al., 2024).

The energy transition creates winners and losers in the labor market. In Germany, job losses in fossil fuel sectors are mitigated by structured retraining programs and financial incentives (RFF & EDF, 2021). Meanwhile, South Africa and India are facing severe labor disruptions, as coal-dependent communities lack economic alternatives. A unique case is Pakistan, where employment in renewable energy is expanding, not shrinking. Unlike South Africa's labor-heavy coal industry, Pakistan's transition has been relatively smooth because the fossil fuel industry was never a dominant employer. The solar sector is creating new jobs, especially for semi-skilled workers, demonstrating that economic transitions do not always lead to mass unemployment.

Job losses are also not a main concern for Brazil, since its energy mix is already predominantly hydro-electric, not a job-intensive industry. However, renewable energy jobs often lack stability and benefits, raising concerns about job quality. Resistance among traditional industry workers highlights the need for trust-building and better employment security during the transition. Moreover**,** Brazil presents other challenges related to employment in the field: skilled labor is often attracted from wealthier regions, leaving underprivileged areas with lower-quality opportunities, thus maintaining existing inequalities.

Financing is, according to the literature and all of the interviews, a major barrier to equitable energy transition in the Global South. Brazil, South Africa, India, and Pakistan struggle with infrastructure and financial mechanisms that exclude low-income populations from reliable and affordable access (Babayomi et al., 2022). While Germany uses tax incentives and subsidies to encourage decentralized participation, Pakistan and South Africa lack structured financial policies to support their transitions (Plewnia & Guenther, 2021; IRENA, 2019).

Energy transitions are as much about political interests as they are about technological advances. Germany's energy transition is driven by strong climate policies and public demand, whereas South Africa's transition is hindered by Eskom's monopoly and resistance from coal industry stakeholders (IRENA, 2019). Brazil's energy transition is shaped by regulatory barriers and monopolistic control (despite this topic being controversial among the Brazil interview partners), making it difficult to scale. India's transition is unique in that coal dependency is declining due to automation, rather than policy. This makes India's case different from South Africa's, where coal phase-outs are a contentious political issue. Future research must analyze how technological disruptions, rather than policy interventions, influence energy transitions in different economic contexts.

A critical emerging issue is the role of rare earth minerals in renewable technologies. South Africa is poised to become a global supplier of these materials, raising concerns about whether its transition will result in new forms of resource dependency. This applies similarly to many Global South countries that are rich in resources. Brazil, too, faces trade-offs, as wind and solar expansion encroach on indigenous lands, raising questions about environmental justice. Mean-

while, Germany's energy transition is largely independent of raw material constraints, as it focuses on grid integration and market reforms rather than resource extraction. However, reliance on imported solar panels and batteries still ties Germany's transition to global supply chains, making it vulnerable to geopolitical risks (IRENA, 2019).

5.2 Implications for the Future of the Global Energy Transition

The findings from the comparative discussion of energy transition processes in the Global North and Global South reveal substantial structural and systemic disparities that necessitate integrated practical solutions for policymakers and industry leaders as well as scientific advances for further research. Achieving a sustainable and just transition requires policymakers and practitioners to move beyond universal solutions and develop strategies that reflect local circumstances, including social, economic, political, and infrastructural realities. A key takeaway from the research is that energy transition must be tailored to each region's governance structure, grid reliability, and economic priorities. While Germany focuses on market liberalization and decentralized energy models, countries like South Africa, India, Brazil, and Pakistan prioritize energy security, affordability, and economic stability. This divergence necessitates region-specific transition strategies rather than a one-size-fits-all approach. Thus, policy decisions should integrate both centralized and decentralized models depending on regional conditions. Germany must work towards reducing regulatory barriers that currently limit small-scale market participation and decentralization. Brazil and India must balance grid expansion with decentralized investment to prevent market concentration while extending national energy infrastructure to guarantee access and affordability. In South Africa and Pakistan, where decentralization is sometimes the only viable alternative in rural areas due to unreliable national grids, hybrid models that integrate decentralized and centralized systems are required.

A major obstacle in the Global South remains the financing of energy transition. While Germany benefits from tax incentives and subsidies, Brazil, South Africa, India, and Pakistan face high capital costs

and limited access to private-sector financing. Financial mechanisms must therefore be tailored to address both centralized and decentralized energy models. For large-scale national grid expansion and utility-scale renewable projects, government-backed credit programs must be expanded to fund grid modernization and ensure that rural communities benefit from a stable energy supply. Public-Private Partnerships (PPPs) should be encouraged to attract investment in large-scale solar and wind farms, while blended finance models that combine government, private sector, and development finance must be promoted to reduce investment risks. For decentralized systems, microcredit and Pay-As-You-Go (PAYG) schemes, which have already been successful in Pakistan and India, must be scaled to allow low-income households to invest in solar and battery systems without upfront costs. Community-led financing models such as cooperative ownership of microgrids could be further developed in Brazil and South Africa, where rural electrification needs remain high. Additionally, financial de-risking mechanisms such as loan guarantees for decentralized energy projects should be introduced to attract private-sector investment into the Global South (IRENA, 2019).

A balanced approach between grid expansion and decentralized solutions is essential. In many Global South countries, significant portions of the population remain disconnected from the grid, making investments in transmission infrastructure necessary to ensure that rural and industrial zones receive equitable energy access. In Germany, smart-grid technologies must be prioritized to balance supply-demand fluctuations and integrate high shares of renewables into national grids. At the same time, decentralized energy solutions must be promoted as a complementary rather than competing strategy. South Africa's microgrid pilot projects and Brazil's rural solar electrification efforts need stronger policy backing to ensure affordability and long-term technical support. Pakistan's success with PAYG solar systems, which have been adopted without government intervention, demonstrates the potential of private-sector-led solutions that could be replicated in other Global South regions.

The social implications of energy transition are equally critical, as job losses and economic restructuring must be managed proactively. Workforce reskilling programs should be expanded to help fossil-sector

workers transition into renewable energy industries. In India and South Africa, specific programs must be introduced to focus on skill development for coal workers and marginalized communities. These should be linked to expanding research into renewable energy so that new technologies can be implemented on a broader scale. Comparative studies with both Global South and Global North countries should be encouraged to facilitate knowledge exchange and refine energy policies. Local hiring policies must also be enforced in Brazil and South Africa to ensure that skilled labor is not exclusively attracted from wealthier regions, leaving underprivileged areas with lower-quality opportunities. Pakistan provides a different perspective, as employment in renewable energy is expanding rather than contracting. Unlike South Africa's coal-heavy economy, Pakistan's transition has been smoother due to the limited dominance of the fossil fuel sector in employment, with the solar industry creating new jobs, particularly for semi-skilled workers. More government-backed facilities for modern technologies, enhanced subsidies for renewable projects, and community programs to raise awareness about decentralized solutions are necessary. Additionally, further research should explore the affordability and public acceptance of decentralized energy systems

Moreover, one key hypothesis emerging from the analysis is that if the Global North sets the benchmarks for energy transition – based on technological, economic, and perceptual priorities – it might risk marginalizing the realities of the Global South. Many Global South countries still struggle with issues that the Global North resolved during its industrialization phase (e.g., energy poverty, unreliable grids, and economic dependency on fossil fuels) (Babayomi et al., 2022). The one-size-fits-all approach to decarbonization could fail if it does not account for these local challenges. Rather than enforcing top-down transition models, the Global North should support locally driven solutions tailored to specific socio-economic conditions. Pakistan's decentralized solar adoption, Brazil's hybrid model of renewables, and South Africa's potential for rare earth mining all require unique transition strategies. Future research could explore whether Global South countries should develop entirely independent transition strategies rather than attempting to fit into existing Global North paradigms.

Beyond the design of this study, future research could explore also how Relational Economics and Transcultural concepts can improve energy transition strategies. Traditional models assume linear, policy-driven progress toward sustainability, but relational economics proposes a holistic approach of interconnected socio-economic and transcultural processes (vid. Wieland, 2020; Wieland et al., 2024; Baumann Montecinos et al., 2023). By analyzing energy transition through relational models, future studies could examine how different stakeholders (e.g., governments, private investors, and communities) can collaborate to create integrated solutions and enforce trust. Future research should analyze whether relational economics can provide a more holistic framework for understanding energy transition by incorporating community involvement/engagement, economic equity, sustainability, and political governance and understanding how transcultural approaches could enrich solution-building in energy transitions globally. Addressing the challenges of energy justice in the Global South, ensuring inclusive financing mechanisms, and preventing new forms of resource dependency must be central to energy transition policymaking. By adopting a multidimensional approach, global energy transition strategies can better reflect the diverse realities of different regions and cultural complexities, ultimately ensuring that the shift to renewable energy is both sustainable and just.

6. Limitations

While this study provides insights into the sustainability of the ongoing energy transition from a relational perspective, several limitations must be acknowledged. First, the availability of literature on this specific topic remains limited. The existing body of research does not yet provide comprehensive data on the intersection of environmental, social, and economic sustainability within the energy transition, posing challenges in forming conclusive findings. Additionally, incomplete data coverage in some datasets restricted the depth of analysis, as certain categories or codes lacked sufficient information.

The study also faced challenges related to empirical data collection. The number of interviews conducted across different countries was

relatively small, which may not fully capture the diversity of perspectives on the energy transition. Furthermore, the representation of interview participants was somewhat constrained. While valuable insights were obtained, a more extensive inclusion of stakeholders – such as community members, policymakers, and government representatives – would enhance the comprehensiveness of the findings. Another limitation lies in the comparative analysis across different regions. A larger number of case studies would be required to draw robust conclusions about the varying approaches and impacts of the energy transition across different continents. This limitation affects the ability to generalize findings across diverse socio-political and economic contexts.

Lastly, the study faced constraints in accessing practical data on solutions. While challenges and barriers to a sustainable energy transition were identified, there was insufficient real-world data on effective strategies to address these issues. This limitation restricts the study's ability to propose concrete, evidence-based solutions for ensuring a more just and sustainable transition.

Despite these limitations, the findings contribute to the broader discussion on the relational aspects of the energy transition and highlight areas for further research. Expanding empirical studies, increasing stakeholder diversity in data collection, and improving cross-regional comparative analyses would strengthen future work in this field.

7. Conclusion

The conclusion of this study underscores that the global energy transition extends beyond CO_2 reductions to include socio-economic justice and long-term resilience. Without careful planning, renewable energy shifts may reinforce existing inequalities. A successful transition requires region-specific approaches rather than a one-size-fits-all model supported by Global North standards.

The findings highlight stark contrasts between regions. Each country must tailor its energy strategy based on governance structures, grid reliability, social dimensions, and economic priorities. A key concern might be the risk of the Global North imposing universal transition benchmarks that do not reflect the realities of the Global South. Many

developing nations still struggle with energy poverty, unreliable grids, and economic dependence on fossil fuels – challenges the Global North largely resolved during its industrialization. Rather than exporting a singular transition model, policies should prioritize localized, community-driven solutions tailored to socio-economic conditions. Pakistan's decentralized solar adoption, Brazil's hybrid renewable-hydro model, and South Africa's emerging role in rare earth mineral mining each require distinct approaches.

Future research should explore how Relational Economics and Transcultural approaches can provide a more holistic framework for energy transition. New studies should examine how different stakeholders can collaborate to create integrated solutions that enhance trust and engagement. Transcultural complexity might also offer a lens to understand how energy policies function in diverse socio-political settings, bridging the gap between Global North and Global South perspectives.

Ultimately, energy transitions must be co-created with communities rather than imposed by external actors. Adaptive, context-sensitive policies and inclusive financial mechanisms are necessary to ensure the transition is both sustainable and socially just. Addressing energy justice, inclusive financing, and preventing new forms of resource dependency must remain central to global policymaking. A multidimensional approach that integrates economic, social, political, and cultural factors will ensure that the transition to renewable energy is equitable and benefits all communities.

Use of Artificial Intelligence Tools

AI tools (e.g., ChatGPT) were used exclusively for language editing and improving the clarity and readability of the manuscript. All scientific content, analysis, and conclusions remain the responsibility of the authors.

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A Sustainable Hydrogen Future: Comparative Development Pathways in the Global North and South

Zuzanna Bakalarz, Annemarie Reinet le Roux and Tran Diem Quynh

1. Introduction

African countries are aggressively seeking clean energy initiatives; nonetheless, the immediate reality of pervasive energy poverty compels them to maintain a dependence on fossil fuels to drive economic growth. Energy security, climate action, and sustainable development need to be balanced through a multi-faceted strategy that expands oil, gas, and renewable energy production and alleviates energy poverty through targeted partnerships (PricewaterhouseCoopers, n.d.).

South Africa illustrates these dilemmas contrast with its current energy crisis. Eskom, the source of 95% of the country's electricity, has been under scrutiny for mismanagement, soaring debt (450 billion rands), and operational inefficiency, exacerbating the crisis (Nguyen, 2023). Outdated coal power plants caused catastrophic shortages in 2023. In response, Energy Minister Gwede Mantashe outlined a 2024 agenda promoting gas over more affordable options like solar and wind. This decision has caused environmental worries and potential delays in the transition to cleaner energy. To deal with the energy issue in South Africa, there is a pressing need to reduce coal consumption while promoting sustainability (Winkler, 2024).

In contrast, Namibia is experiencing notable developments in renewable energy. Namibia's Green Hydrogen Project and Southern Corridor Development Initiative, championed by Hyphen Hydrogen Energy,

are focused on driving economic growth and supporting global decarbonization through the export of green hydrogen (Hyphen Hydrogen Energy, n.d.). Similarly, Europe has placed significant emphasis on hydrogen energy under its Green Deal, with a vision to become climate-neutral by 2050. In an attempt to diversify and ease the burden and dependency on fossil fuels, the EU aims to produce and make use of 10 million tonnes of green hydrogen per year by 2030. Rotterdam has become an important logistics hub, and Iberdrola's Puertollano factory, Europe's largest green hydrogen factory, aims to expand its capacity to 800 MW (CORPORATE, I., n.d.).

Despite the regional differences, Europe and Africa share common goals of sustainable development and green hydrogen energy transition. While Africa focuses on balancing economic development, decarbonization, and reducing energy poverty, Europe aims to decarbonize industry and improve energy security. Cooperation, technology, and inter-regional investment will be decisive in creating a global green hydrogen economy. Companies are progressively adopting Environmental Corporate Social Responsibility (ECSR)[1] principles to integrate ecological actions, drive innovation, and strengthen stakeholder confidence founded on environmental and ethical accountability (Chodyński et al., 2008).

Notwithstanding this, South Africa's energy transition has enormous fiscal challenges. The country requires grants to enable it to fund its $95 billion energy transition plan without increasing its debt burden. Finance arrangements with France and Germany have been agreed upon, yet climate debt concerns persist. In addition, the coal industry, which is at the heart of black-owned businesses, is a bone of contention, with governmental divisions over phasing it out within a specific timeframe. A transition to clean energy risks the loss of 102,000 jobs by 2050, so investment needs to be strategic to prevent socio-economic impacts (Raji, 2023).

[1] ECSR stands for Environmental, Social, and Corporate Responsibility. It's a strategic concept that involves building company value by incorporating ecological criteria. ECSR focuses on a sustainable approach to business, considering not only shareholder interests but also other stakeholders and the environment. By integrating ecological criteria into the company's development strategy, ECSR aims to generate innovation, enhance organizational efficiency, and build a positive corporate image.

The purpose of this study is to compare and contrast the renewable energy markets of Europe and South Africa to establish the feasibility of implementing ECSR principles in the energy sector in South Africa. The research will address the following questions:

- What are the sustainable steps that South African and European businesses are taking to implement ECSR and facilitate hydrogen energy development?
- What are the alterations that manufacturers can make to the production process of hydrogen energy to render it more economical and to facilitate broader adoption?
- Which technologies can be employed in South Africa as part of the ECSR rollout, and how do they stand in comparison with European breakthroughs?

These questions will examine the hypothesis that the uptake of ECSR principles can speed up South Africa's energy transition. By employing hydrogen energy and harnessing European innovations, South Africa is capable of ending its energy crisis, providing employment opportunities, and helping in the worldwide decarbonization effort.

2. Literature Review

2.1 ECSR and ESG

Environmental Corporate Social Responsibility (ECSR) and Environmental, Social, and Governance (ESG) frameworks represent two distinct approaches for businesses to integrate ethical and sustainable practices.

ECSR expands on traditional CSR by advocating for long-term sustainable impact that extends beyond the immediate interests of the corporation. While CSR generally encompasses philanthropic activities and community engagement, ECSR seeks to integrate sustainable development into the strategic goals of a business, creating lasting changes within the environmental and social spheres (Barcena-Ruiz, 2023).

In contrast, ESG is an investment-focused approach that assesses a company's commitment to sustainable and ethical practices across three

specific dimensions: environmental, social, and governance (Li et al., 2024). (Environmental factors evaluate an environmental and ecological impact, including carbon emissions and resource efficiency; social criteria assess labour standards, diversity, and community relations; and governance scrutinizes a company's adherence to ethical standards, transparency, and leadership structure. ESG criteria are primarily utilized by investors to evaluate the sustainability and ethical risk profile of companies, influencing investment decisions (P.P. Edwards, 2007).

A fundamental distinction between ECSR and ESG lies in their target audiences and applications. ECSR initiatives are often internally driven by companies aiming to foster sustainable development, while ESG is externally driven, serving as a tool for investors to assess ethical and financial risks associated with potential investments (Koohi-Fayegh & Rosen, 2016). Nonetheless, both frameworks reflect an increasing recognition of corporate responsibility in addressing global environmental and social challenges. As consumer expectations and regulatory pressures for ethical conduct continue to rise, the convergence of ECSR and ESG appears likely, establishing new standards for corporate accountability and sustainable business practices.

2.2 Hydrogen Energy in the Energy Sector

Hydrogen energy is consistently recognized as a vital component in the global movement towards a national and global low-carbon energy system. As a fuel source, hydrogen has the potential to reduce greenhouse gas emissions significantly, as its only by-product is water. The energy sector currently categorizes hydrogen into three primary types based on production methods: grey, blue, and green (Yaroslavtsev, 2021). Grey hydrogen is produced from natural gas, resulting in substantial carbon emissions. Blue hydrogen follows a similar process but includes carbon capture and storage technologies to mitigate emissions. Green hydrogen, however, is produced through electrolysis powered by renewable energy sources, generating zero emissions (Sadeq et al., 2024).

Globally, hydrogen energy is gaining momentum across various high-emission industries, including heavy transportation, manufacturing, and energy production. Governments and industries worldwide

are increasingly incorporating hydrogen into national and corporate energy strategies, acknowledging its potential to minimise emissions in sectors that have traditionally been heavily reliant on fossil fuels (Veziroğlu & Şahin, 2008). For instance, hydrogen shows promise as a fuel source for heavy-duty vehicles, such as trucks and buses, as well as in industries like steel production, where transitioning away from fossil fuels remains challenging (Staffell et al., 2019).

The feasibility of hydrogen's large-scale adoption within the energy sector is contingent upon developments and advances in production technologies and reductions in production costs for green hydrogen. Investment in hydrogen infrastructure – such as storage, distribution, and refuelling networks – will also be essential to support this transition (Le et al., 2024). The increasing focus on hydrogen energy underscores a broader commitment to achieving a diversified, secure, and sustainable energy landscape, aligning with global ambitions for a low-carbon future (Momirlan & Veziroğlu, 2002).

2.3 Hydrogen Energy in the Energy Sector in the Global South – South Africa and Namibia

The energy sectors of South Africa and Namibia are undergoing profound transformations as both countries strive to shift towards cleaner, more sustainable sources of energy. South Africa, long dependent on coal for over 70% of its energy needs, faces power cuts and frequent blackouts due to its ageing coal-fired electricity infrastructure. In response, the country has taken steps to diversify its energy mix, incorporating natural gas, renewable energy, and nuclear power. On the other hand, Namibia, which has a more stable energy mix largely dominated by hydro-electric power and fossil fuels, is increasingly turning to renewable energy sources such as solar and wind, leveraging its abundant natural resources. This focus positions Namibia as an emerging leader in renewable energy development (Nwokolo et al., 2024).

Both South Africa and Namibia have implemented policy frameworks to encourage the use of renewable energy. South Africa's Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) has spurred private-sector investment, resulting in the de-

velopment of solar and wind farms across the country (Pollet et al., 2016). Similarly, Namibia's national energy policies emphasize efficiency and renewable energy, attracting foreign investment and aid to enhance energy access and sustainability (International Monetary Fund, 2023). Both nations are also prioritizing solar and wind energy schemes, with South Africa expanding its network of solar and wind farms, while Namibia is focusing on off-grid solar products and the development of wind farm sites. Biomass programs in rural areas are being considered in both countries to further diversify their renewable energy portfolios (Pollet et al., 2016).

A crucial element of both nations' long-term energy strategies is the development of green hydrogen. South Africa has already begun producing green hydrogen through renewable energy sources and carbon capture technologies. However, this transition is challenged by path-dependent infrastructure, an unreliable electricity supply, high capital costs, and an unclear regulatory framework. The country's historical reliance on cheap coal makes the shift to green hydrogen costly and complex. Moreover, the national power utility, Eskom, is struggling with significant debt, limiting its ability to invest in new power generation capacity. For South Africa, transitioning away from coal also presents social and economic challenges, particularly for communities heavily dependent on coal, making a just transition essential (Nwokolo et al., 2024). Additionally, while institutions like the EIB and World Bank provide support, the long-term sustainability of funding is questionable. Regulatory hurdles, particularly strict environmental rules and regulations, pose a challenge to South African manufacturers, and environmental concerns highlight the need to guarantee equitable revenue-sharing. Intensive dependence on foreign companies calls into question local economic gains, and Namibia's green ammonia deals spark regional rivalry. But South Africa's infrastructure and Namibia's natural resources make them vital players in the global hydrogen economy. With targeted policies, investment, and collaboration, both countries can spearhead sustainable growth and industrialization (Cassidy & Quitzow, 2023).

Nevertheless, Namibia, with its access to abundant natural, is already conducting feasibility studies to explore the potential of green hydrogen production (International Monetary Fund, 2023). The Namibian

government sees green hydrogen as an opportunity for industrialization, economic diversification, skills development, and improved public services. The Green Hydrogen Council oversees the country's hydrogen strategy, with Germany playing an important role in providing technical assistance and financial support. (Cassidy & Quitzow, 2023).

Thanks to its good climate, Namibia has turned out to be a country that has high potential for renewable energies, for companies and feasibility for implementation. With all the rich resources in solar and wind, it is well-positioned to exploit these energies in the production of green hydrogen. With its favourable climate and abundant renewable resources, Namibia has the ideal setup to exploit solar and wind energies for green hydrogen production at low cost. Equally, with its developed infrastructure and supportive policies for both renewable and hydrogen technologies, South Africa is becoming a strong partner in the global hydrogen market. This international cooperation in national hydrogen strategies strengthens their positions in the global hydrogen economy. Green hydrogen projects may spur economic development, attract investment, and offer job opportunities in South Africa.

Through the Africa Green Hydrogen Alliance (AGHA), both nations have continued to advance green hydrogen technologies across Africa. Namibia's vast renewable potential, particularly its solar and wind resources, gives it a strong advantage in green hydrogen production (Komorowski & Grzywacz, 2023).

Emerging opportunities notwithstanding, financial constraints, infrastructural demands, and complex regulations pose considerable challenges to South Africa and Namibia in their quest to develop green hydrogen. Nonetheless, it is important to support their efforts toward reducing greenhouse gas emissions, improving economic resilience, and meeting goals for global climate change. By making this commitment, they will become leading members of the Global South in terms of sustainable energy development and, thus, valuable role models for many countries interested in cleaner energy systems.

2.4 Hydrogen Energy in the Energy Sector in the Global North – Europe

The roadmap to Europe's leadership in hydrogen technology emanates from the continent's commitment to a zero-carbon future as outlined in the European Green Deal, placing hydrogen at the very center of the sustainable energy transition. Huge funding, including an initiative worth €9 billion from Germany, has been pledged to hydrogen projects, as part of the post COVID-19 economic recovery (Quitzow & Zabanova, 2024).

These are two major types of hydrogen that the continent is focusing on: green hydrogen produced through the electrolysis of water powered by renewable energies and blue hydrogen derived from natural gas with carbon capture and storage that limits emissions. To begin with, green hydrogen is favoured since its zero-carbon profile rings. Hydrogen production is needed for those industries in which the reduction of emissions is tough, such as heavy industries and transport. Europe has the most extensive infrastructure for natural gas, on which a foundation of hydrogen transport and storage can be laid. Adaptation and readiness vary from leading in Germany to lagging in Eastern European countries (Quitzow & Zabanova, 2024).

The European hydrogen economy is government-policy-driven, coupled with funding, particularly under the European Green Deal. Many countries have developed national hydrogen strategies, including Germany, France, and the Netherlands. For example, Germany was more focused on hydrogen importation from resource-rich countries due to the impossibility of satisfying demand from national production (Quitzow & Zabanova, 2024). The Netherlands, positioned as a traditional energy hub, pursues a strategy based on intensive use of offshore wind sources and reutilization of gas infrastructure for hydrogen value chains (Stam et al., 2024). With sound policy support, scaling up hydrogen faces a number of challenges, including huge costs, restricted storage, and transportation difficulties. Innovations, especially in efficiency related to electrolyzers and new materials in storage, are yet to be found after addressing these challenges. The European comprehensive approach links investment with supportive policies and technological development toward seizing global hydrogen market leader-

ship to enable a low-carbon, sectoral economy (Oxford Institute for Energy Studies, 2021).

Despite the promise of green hydrogen, several challenges must be addressed. High investment costs for production, storage, and transport, along with moderate efficiency in hydrogen technologies, limit its economic feasibility. The region's limited renewable energy capacity also restricts large-scale production. Economic viability is also still in question, since cost reductions for hydrogen will only be possible through future developments. Second, hydrogen infrastructure is underdeveloped; water use also has implications, especially in water-scarce regions. And finally, hydrogen needs supporting policies and long-term strategies, without which investing will not be very attractive (Ajanovic et al., 2024).

The European hydrogen strategy also emphasizes cross-border collaboration, renewable energy integration, and the alteration of low-carbon hydrogen production. All these are ways that the potential to reach significant hydrogen capacity by 2030 in order to create a low-carbon interconnected energy system for climate neutrality can be ensured (Centre for International Energy Policy, 2021).

2.5 Compare Global North to Global South

In making a comparison between the energy sectors of the Global North (Europe) and the Global South (Africa), two notable contrasts are present in the areas of infrastructure and regulatory development. Europe has advanced energy infrastructure backed by very strong climate policies. Hydrogen technologies are receiving considerable investment in the context of the transition to climate neutrality in Europe. The continent has existing transmission networks that allow easier retrofitting for hydrogen adoption, as proven by the German government's initiative, which is currently financing €9 billion of hydrogen projects (Quitzow & Zabanova, 2024). In Africa, there are abundant renewable resources in terms of solar, wind, and biomass; however, the infrastructure is lacking that would otherwise allow for large-scale hydrogen production and distribution. The energy problems in Africa can also yield viable opportunities for developing a renewable energy

sector, particularly hydrogen, which may be expected to create jobs and stimulate economic growth, as seen in Namibia and South Africa (Nwokolo et al., 2024).

Both regions need massive investment in hydrogen infrastructure. For Africa, this translates into long-term financing options from development banks while Europe envisions a mix of research, public-private financing, and innovation to fast-track the operationalization (International Energy Agency, 2023). Africa has less defined regulatory frameworks than Europe, which already has binding policies in favour of energy transition (OECD, 2024; Nwokolo et al., 2024). Yet, Africa is increasingly becoming relevant to the world hydrogen market and is envisaged to compete in hydrogen supply for Europe by 2030 (International Energy Agency, 2023).

South Africa and Namibia exemplify Global South opportunities for and challenges to hydrogen development. South Africa is faced with outdated infrastructure, high capital costs, and an uncertain regulatory framework in its transition from coal to renewable energy, while with Namibia's phenomenal solar and wind capabilities, it is becoming a figure that runs the green hydrogen production show worldwide on account of foreign investment attraction (International Monetary Fund, 2023; Cassidy & Quitzow, 2023). Thus, while the two are focusing on renewable energy and hydrogen, they still have to deal with overlapping challenges such as funding-related issues and infrastructure (Komorowski & Grzywacz, 2023). Working through collaborative approaches and policy options, they have the opportunity nevertheless, to carve themselves stronger roles in the global hydrogen economy.

Europe has committed itself to hydrogen through ambitious policies such as the European Green Deal and national strategies, with Germany and the Netherlands taking the lead. However, significant hurdles still exist, including elevated costs, insufficiently developed infrastructure, and low renewable capacity (Quitzow & Zabanova, 2024; Oxford Institute for Energy Studies, 2021). In spite of these challenges, Europe's plan to scale hydrogen production through 2030 reinforces the establishment of an interconnected low-carbon energy system, facilitating cooperation and innovation at an international level (Centre for International Energy Policy, 2021).

To establish, Europe boasts with an established infrastructure, policies, and investments, while Africa's potential is only gaining traction in nations such as South Africa and Namibia, which use their renewable resources to drive economic growth and industrial activities.

2.6 Global Perspective on Hydrogen Energy

> "Hydrogen can play an effective role as a climate solution" (Hydrogen Council, 2021).

Over the past decade, hydrogen has increasingly gained attention for its role in decarbonizing transportation, industry, and energy production. This progress is reflected both nationally and globally, as "indeed, robust competition has emerged between nations as diverse as Iceland, China, Germany, Japan, and the US in the race to commercialize hydrogen energy vehicles in the 21st century" (Solomon & Banerjee, 2006, p. 782). Alongside this perspective, the International Energy Agency (IEA) reported that global investment in hydrogen R&D exceeded USD 500 million in 2020, with significant contributions from Germany, South Korea, and Australia (International Energy Agency, 2021).

In the Global North, the European Union has positioned itself as a leader in hydrogen technology development by launching the *EU Hydrogen Strategy,* aiming to install at least 6 Gigawatt (GW) of renewable hydrogen electrolysis capacity by 2024 and 40 GW by 2030 (European Commission, 2020). In Asia, Japan and South Korea were the first countries to adopt a hydrogen framework into their national energy transition strategies for the innovation of hydrogen-powered vehicles and fuel cells. Specifically, Japan's carbon neutrality strategy relies heavily on hydrogen, with the target of producing 12 million tonnes of low-carbon hydrogen by 2040 in the transportation and power generation sectors (DLA Piper, 2024). South Korea, by contrast, intends to produce 30,000 hydrogen-powered commercial vehicles by 2030 and construct 70 liquid hydrogen fuelling stations (Baker McKenzie, n.d.). These ambitious strategies illustrate how advanced economies are placing hydrogen at the core of their decarbonization pathways, setting the benchmark against which expansion in the Global South can be investigated.

The *Global Hydrogen Review 2024* highlighted positive trends in global hydrogen demand, which reached nearly 100 megatons (Mt) in 2024 (International Energy Agency, 2024). Moreover, 19 new national hydrogen strategies were published, emphasizing objectives such as decarbonizing existing hydrogen production, establishing transparent certification systems, and promoting hydrogen use in hard-to-abate sectors. Collectively, these strategies targeted countries that account for more than 84% of global energy-related CO_2 emissions (International Energy Agency, 2024). A significant share of new policy initiatives originated from emerging markets and developing economies, with a strong focus on production targets..

The potential of hydrogen as a zero-emission energy carrier holds considerable promise. Nonetheless, Joan M. Ogden (1999) advises that building such large-scale hydrogen infrastructure faces technical and economic obstacles, incurring vast expenditure compared to conventional liquid fuel systems (e.g., liquefied natural gas, liquid biofuels…). Thereby, the study underscores the importance of efficiency gains from scale and technological innovation to minimize costs and enhance competitiveness in low-emissions hydrogen deployment.

2.7 Environmental Corporate Social Responsibility (ECSR) in the Energy Sector

Environmental Corporate Social Responsibility (ECSR) in the energy sector indicates the implementation of sustainable and ecologically accountable practices, involving a range of initiatives targeted at minimizing environmental impact. The initiatives also cover reducing production costs, investing in renewable energy, and promoting energy access across nations (WeChronicle, 2024).

For decades, the energy industry has been the biggest catalyst for global carbon emissions, owing to its dependence on fossil fuels. According to the Global Risk Report 2024, “extreme weather events” are ranked first among the top 10 global risks for the next 10 years (World Economic Forum, 2024), emphasizing the significance of proactive initiatives and policies. Since the consequences of climate change on human health, ecosystems, and economies are obvious, the increasing

demand for companies to adopt sustainable practices as ECSR is crucial nowadays (Kemp et al., 2022). A key illustration of ECSR in the energy sector is the shift towards renewable energy sources. Germany, as a leader in energy development, has planned to achieve an amount of 40-50% of its energy coming from renewables in 2050, outlined by its Renewable Energy Sources Act (BMWK, n.d.; International Energy Agency, 2023). Meanwhile, in South Africa, €400 million is being invested in the country, led by the European Investment Bank (EIB) and FirstRand Bank to support renewable initiatives (European Investment Bank, 2024). The European Commission and the Republic of South Africa, in collaboration with Global Citizen, have launched a campaign called "Scaling up Renewables in Africa" with the target to provide affordable energy access and contribute to global emission reductions (European Commission, 2023).

The involvement of NGOs and communities in ECSR within the energy sector also plays an important role in promoting sustainable development. Companies may participate in supporting local environmental projects and reforestation campaigns, for example. In Germany, several initiatives effectively illustrate this involvement. A successful example of integrating ECSR is the *Bioenergy Village* of Jühnde in Lower Saxony, where the local community collectively owns and operates renewable energy systems, ensuring that at least 50% of their energy needs come from bio-based sources. These efforts not only contribute to clean energy consumption, which is key to a sustainable future, but also foster local engagement, generate shared economic benefits, and enhance the reputation of both the communities and the partnering companies involved (Reason to Be Cheerful, 2024).

2.8 Economic Growth Potential

The advancement of sustainable energy, particularly through hydrogen technology, holds substantial economic growth potential, especially for countries like South Africa and Namibia. These nations possess extensive renewable resources, such as solar and wind energy, making them well-positioned for green hydrogen production (Meiling Yue, 2021). By capitalizing on these resources to produce hydrogen, South

Africa and Namibia can reduce their dependence on coal and other fossil fuels, advancing both energy independence and environmental sustainability (Chapman et al., 2019).

Incorporating hydrogen energy into the economy can stimulate growth by creating jobs across various sectors, from renewable energy production and infrastructure development to industrial applications. In South Africa, where the energy sector remains heavily reliant on coal, there is mounting international pressure to transition to cleaner energy sources. Investment in hydrogen technology presents an opportunity for South Africa to diversify its energy sector, reduce air pollution, and fulfil its climate commitments (Sharma, 2023). Furthermore, the development of a hydrogen economy could revitalize regions economically dependent on fossil fuels, offering employment in hydrogen production, research, and distribution.

Namibia similarly stands to benefit from the economic opportunities associated with green hydrogen production (Abe et al., 2019). Given its abundance of renewable energy resources, Namibia is strategically positioned to become a significant exporter of green hydrogen. The Namibian government has shown considerable interest in hydrogen initiatives, recognizing that these projects could attract foreign investment, drive infrastructure development, and promote economic diversification (Hoaeb, 2022). Green hydrogen exports present a unique opportunity for Namibia to participate competitively in the global energy market, fostering international partnerships and establishing a new pillar of economic growth.

In both South Africa and Namibia, hydrogen energy projects also have potential for strengthening regional energy cooperation. Collaborative efforts in hydrogen production, storage, and distribution could facilitate the creation of an integrated energy economy, enhancing resilience and competitiveness on an international scale (Midilli et al., 2005). As the world accelerates efforts to decarbonize, hydrogen energy offers a promising avenue for economic growth, emissions reductions, and energy security. By positioning themselves as leaders in hydrogen technology, South Africa and Namibia can serve as models of sustainable development, promoting long-term economic and environmental benefits for the region.

3. Methodology

This research aims to explore the sustainable initiatives companies undertake to implement Environmental, Social, and Corporate Responsibility (ESCR) principles and advance the development, implementation, and progression of hydrogen energy. The focus will be on businesses operating in South Africa and Namibia. A qualitative approach, specifically semi-structured interviews paired with case studies and thematic analysis, will be employed to gather in-depth insights from key stakeholders within these companies. This methodology section outlines the research design, sampling strategy, data collection methods, and ethical considerations.

3.1 Qualitative Approach

The study adopts a qualitative research design, which is well-suited for exploring complex phenomena such as sustainable initiatives and ECSR implementation. Qualitative methods allow for a deeper understanding of the subjective experiences, motivations, and challenges faced by companies. By utilizing semi-structured interviews, the research design ensures flexibility and depth, enabling the exploration of key themes while maintaining some consistency across interviews. This approach is particularly effective for understanding the nuanced and context-specific strategies that companies use to navigate the multifaceted landscape of hydrogen energy and ECSR principles.

The qualitative research design also facilitates the capturing of rich, detailed narratives that can reveal the underlying motivations and decision-making processes of businesses. This is essential for understanding how companies perceive and implement ESG principles in their hydrogen energy projects. The use of semi-structured interviews will allow the researcher to probe deeper into specific areas of interest as they arise during the conversations, providing a more comprehensive understanding of the topics under investigation.

The target population for this research involved businesses engaged in hydrogen energy projects in South Africa and Namibia. Purposive sampling was used to select participants who were knowledgeable and

actively engaged in ESG initiatives and hydrogen energy development. The inclusion criteria for the sample were as follows:

- *Active involvement in hydrogen energy projects:* Companies had to be engaged in the development or deployment of hydrogen energy technologies or infrastructure.
- *Commitment to ECSR principles:* Companies were required to demonstrate a commitment to implementing ECSR principles within their operations or projects.
- *Relevant roles:* Participants were selected from managerial or decision-making positions related to sustainability or energy projects to ensure they possessed the necessary insight and influence within their organizations.

3.2 Data Sources

By targeting businesses that meet these criteria as well as individuals who are experts in the field, the research aims to gather a diverse range of perspectives from different sectors, individuals, and company sizes. This diversity is critical to capturing the full spectrum of experiences and strategies employed in the field. The goal is to interview approximately 3-5 participants, as outlined by the guidelines provided for this research project (Quratul, 2024).

The primary data collection method will be through the use of semi-structured interviews. These interviews will assist the research by allowing participants to express their views openly while ensuring that key topics are still covered in depth. An interview guide will be developed by the team of researchers for the interviewees, consisting of various open-ended questions related to the field of research. There will also be a few closed-ended questions to assist with narrowing down specifics surrounding certain topics. The flexibility of semi-structured interviews allows for the exploration of unexpected topics that may arise during discussions, providing a richer understanding of the participants' experiences and perspectives. The closed-ended questions allow for in-depth knowledge surrounding certain topics and areas of research. All interviews will be conducted via video confer-

encing to accommodate the various participants' preferences and logistical constraints, as well as in person where possible (Quratul, 2024). Each interview is expected to last between 45 and 60 minutes. With the consent of the interviewees, these interviews will be audio-recorded to ensure accurate transcription, concise knowledge compositions, and analysis for findings and discussions later.

3.3 Ethical Consideration

Ethical considerations are a crucial component of this research methodology. This study will adhere to the ethical guidelines as outlined by the programme, the respective universities, and the guidelines provided. This is to not only adhere to ethical research practices but also, for any research involving human participants, to ensure that the rights, privacy, and well-being of the participants are protected throughout the research process (University of Pretoria, 2023). Key ethical considerations include:

1. *Informed Consent:* Before participating in the research and interviews, each participant will be provided with detailed information about the study's purpose, procedures, potential risks, and benefits. These participants need to agree to participate in the study. Informed consent will also be obtained in writing, ensuring that all the participants involved in the research understand that their involvement is voluntary and that they can withdraw from the study at any time without consequence (University of Pretoria, 2024).
2. *Confidentiality:* The anonymity and confidentiality of the participants will be maintained throughout the research. This will be done by anonymizing the data and ensuring that any information that could prove identifying in any way is securely stored and only accessible to the research team. Data will be reported in a manner that does not reveal the identities of the participants or their organizations.
3. *Data Security:* Audio recordings, raw interview data, and transcripts will be securely stored in password-protected files. Only the research team will have access to the raw data, and it will be used solely for this study ((University of Pretoria, 2024).

4. *Minimizing Harm:* The research, the questions, and any findings thereof will be designed to make sure that any potential harm or discomfort to the participants and everyone involved is minimized. Questions will be framed in a sensitive manner, and participants will have the option to not answer any questions they find uncomfortable, feel that they are not relevant or that they believe will cause harm.

3.4 Data Analysis

After all the interviews, analysis will be employed to analyse the raw interview data. This method involves reviewing the transcripts, going back over the audio-recordings to look for any identifying trends or patterns. The team will also look for potential analysis based on common themes within the data during this stage (Braun & Clarke, 2006). The steps of analysis include:

1. Interview transcription and review of transcripts multiple times by each team member individually to familiarise and understand the topic in depth.
2. Using various datasheets, sets of data, and tracking relevant codes to systematically code interesting features across the entire dataset.
3. Sorting the different codes and sets of data into potential themes and collecting and placing all data related to specific themes together.
4. Making sure that these themes aid the specific purpose of the research and creating a cohesive plan of action to create unity on which to base any analysis.
5. Consistently and continuously analyse the data to refine each theme as well as the overall research questions.
6. Weave together the analytic narrative and data extracts, relating the analysis to the research questions and literature (Vappingo, n.d.)

By employing semi-structured interviews (Kvale & Brinkmann, 2009) and thematic analysis, this study aims to generate rich, detailed insights into the challenges and successes of ESCR initiatives and hydrogen energy projects. This approach will contribute valuable knowledge

to the field of sustainable energy and corporate social responsibility, offering practical recommendations for businesses and policymakers in South Africa, Namibia, and beyond.

4. Findings and Reporting

Reporting for this research project was done by conducting three interviews with experts in fields linked to hydrogen energy. These interviews were 45 minutes to 1 hour each and consisted of key questions developed to understand the complexity, accessibility, and developments within the field of hydrogen energy in the global north and south.

4.1 Hydrogen Energy

Hydrogen energy is gaining traction as a cornerstone of the global shift towards sustainable energy. In this interview, a double Master's degree student in nanotechnology from the University of Twente (Netherlands) and Lodz University of Technology (Poland) shares insights into hydrogen production, storage, and the challenges facing this promising field. With a background in analytical chemistry and current research focused on photocatalytic water splitting (PWS), the expert provides valuable perspectives on the state of hydrogen energy technology and its prospect.

Hydrogen energy is still in its infancy. While research and commercial initiatives show promise, the technology requires significant advances to achieve large-scale adoption. According to the expert,

> "a lot of work still needs to be done, but current research is very promising, and I think things are going to get hot soon."

Hydrogen production methods are rapidly evolving, with researchers exploring various techniques to improve efficiency and sustainability. Among the most notable methods, Photocatalytic Water Splitting (PWS) shows great potential for directly converting sunlight into hydrogen, though it remains in the early stages of development with limited commercial viability. Water Electrolysis (WE) is more advanced, of-

fering sustainable solutions when powered by renewable energy, though its environmental impact varies depending on the electricity source. Meanwhile, Steam Reforming remains the most efficient method but heavily relies on fossil fuels, producing significant CO2 emissions. Alternative methods like thermos-chemical water splitting and gasification face environmental and technical challenges, limiting their appeal.

The efficiency and environmental impact of hydrogen production vary significantly depending on the method used. Steam Reforming is highly efficient but contributes heavily to CO2 emissions, making it environmentally unsustainable. In contrast, Water Electrolysis offers cleaner alternatives, particularly when powered by renewable energy sources. Recent advances in nanotechnology have improved its efficiency by reducing the reliance on costly noble metals like platinum. Meanwhile, Photocatalytic Water Splitting (PWS) is the most eco-friendly option, utilizing sunlight, water, and minimal catalysts without external electricity. However, its low efficiency continues to be a major obstacle to broader adoption. Below (Table 1) is a summary of the pros and cons of hydrogen energy.

Table 1: Overview of the advantages of hydrogen as an energy source

Positives	Problems
Renewable and abundant energy source	High initial production and operational costs
Clean energy with minimal emissions (e.g., PWS)	Low efficiency in methods like PWS
Can be produced using renewable energy sources	Storage is complex due to low density and explosiveness
Potential for decarbonization in transport and industry	Some methods (e.g., Steam Reforming) produce significant CO2 emissions
Advancing technologies improve efficiency	Dependency on expensive catalysts like noble metals
Promising applications in ammonia synthesis for storage and transport	Requires government subsidies and investments for scaling

Source: Own table from the interview.

Hydrogen storage remains a complex task due to the element's low density, explosiveness, and handling challenges. While the experts do not specialize in storage technologies, they note that ammonia synthesis offers a promising alternative for hydrogen storage. Ammonia is easier to store and transport, can be used as fuel, and has applications in fertilizer production.

4.2 Challenges

The primary challenge lies in producing hydrogen sustainably and cost-effectively. Research focuses on improving electrode materials to enhance stability, efficiency, and affordability. Efforts include reducing the use of noble metals, exploring cheaper alternatives like nickel and cobalt, and experimenting with synthetic polymers.

Hydrogen energy faces high initial capital and operational costs. While costs are decreasing due to technological advances, the sector requires more funding and investment. Government subsidies, private investment, and financial incentives play crucial roles in accelerating the development of hydrogen technology.

Looking ahead, the expert is optimistic about hydrogen's potential to revolutionize energy storage. Key opportunities include:

- Integrating hydrogen into transportation and industry to support decarbonization efforts.
- Advancing technologies for hydrogen production, storage, and fuel cells.
- Strengthening policy support to attract investment and innovation.

Countries leading the way in hydrogen adoption are leveraging hydrogen to address climate change and achieve sustainability goals. Collaboration between the private sector and governments is essential to overcome barriers and establish hydrogen energy as a vital component of the global energy mix (DAJ Rand, 2007).

Hydrogen energy holds transformative potential, but its widespread adoption depends on overcoming technical, financial, and policy challenges. With continued research and innovation, hydrogen could be-

come a cornerstone of a sustainable energy future. As the expert concludes, “Hydrogen will revolutionize the way we store energy. The main question is when that will happen.”

4.3 Production

Based on the interviews we conducted, the following key findings stand out. One key element that stood out during the interviews was the fact that hydrogen production is still largely privatized within South Africa and Namibia. While efforts are being taken by the government to implement this into the public sector through partnerships and collaborations, this is still in the initial phase and won’t see tangible results till 2030. The production of hydrogen energy currently in the global south – South Africa and Namibia – is favoured because of the abundant access to resources vital to the process, like platinum. Alyssa Janse van Rensburg, Master’s student at the University of Pretoria and expert in the field of development practices with a specific focus on the hydrogen mobility sector, emphasizes that private companies are aware of this and are planning to act on it; however, this will take time to develop and implement further. Hydrogen energy production also poses a massive environmental impact in South Africa, due to the facilities it requires and the number of resources it uses. According to the interviewee: “South Africa currently does not have all the necessary facilities for hydrogen energy production.” Some major challenges for hydrogen energy development are linked to struggling government institutions, lack of infrastructure and storage facilities, as well as outdated policies, uncertain sustainability, environmental concerns, and, of course, the financial burden it presents.

Based on this, it can be concluded that, while the global south has favourable conditions for hydrogen energy development and production, these conditions will not be favourable within the next few decades. The environmental corporate social responsibility of hydrogen energy development in South Africa and Namibia exists and is growing, but the rate is hindered by the immediate challenges faced in the global south.

4.4 Funding and Financial Impacts

Another key point was the amount of funds being invested into the pursuit of natural hydrogen sources within the global south. Professor Adam Bumby, a geology professor at the University of Pretoria who is an expert in the field of natural hydrogen energy in South Africa, is part of an international research team that is currently focusing on and exploring the natural hydrogen energy potential in South Africa. Natural hydrogen is in abundance within the global south, with massive patches that could provide easy access. The major long-term benefit of this could be renewable, consistent, and sustainable energy for consumption, through plants that will be powered by hydrogen energy. While the funding is from the government as well as private sector businesses, the goal currently, about natural hydrogen energy development in the global south, is to explore it and study it, not to actually implement it yet.

The biggest issue concerning natural hydrogen is the fact that to get the best possible access to the source, companies need to dig and drill extremely deeply. This has massive financial as well as environmental concerns as, currently, it is much more feasible in the global south to stick to fossil fuel production and development. The other issue that came to light in this interview is the fact that, while natural hydrogen is abundant, the process of producing water and energy from it does not yield much in terms of output. Because hydrogen has a very low volumetric energy density, much larger volumes of hydrogen are needed to deliver the same amount (U.S. Department of Energy, 2017). Professor Bumby states: “The problem with hydrogen energy is it does not transport well.” Lack of knowledge on a global scale about natural hydrogen energy exploitation and development is also an issue that was discussed in depth.

Based on this element, it can be deduced that natural hydrogen energy development within the global south and the world is still a fairly new concept (China Geology Editorial Office, 2022). As environmental corporate social responsibility in this sector remains in its early stages with nothing concrete to report on, it could have a significant impact on the global south, positively and negatively (Renewable and Sustainable Energy Reviews, 2024).

5. Discussions

Comparative examination of hydrogen energy development in the Global North and the Global South captures the different pathways and challenges facing each region to further develop the role of hydrogen as an important component of global energy transformation. This chapter weaves together conclusions drawn from previous research and interviews with experts to identify the dominant determinants of development, infrastructure, and adoption of hydrogen energy and highlight the nexus between technological, economic, environmental, and policy determinants.

As revealed in our findings, the water electrolysis methods in producing green hydrogen not only function as cleaner substitutes powered by renewable energy sources but have also presented higher efficiency as a result of the latest enhancement in nanotechnology. This perspective aligns with Zhang and Wang's research (2023), highlighting that nanostructured stimulants have substantially improved electrochemical reactions, which leads to greater hydrogen outputs with a reduction in energy consumption.

In 2024, the Hydrogen Infrastructure Report demonstrated that Europe has made a huge leap in hydrogen production and storage technology, with Germany and the Netherlands being two of the frontrunners. Green hydrogen, generated from renewable energy-driven electrolysis, is at the top of the agenda in the region, aided by enormous investment and a robust research ecosystem (Hydrogen Europe, 2024). As proved, the Dutch Research Council (NWO) indicates five collaborative projects between Dutch and German institutions concentrating on electrochemical materials and processes for green hydrogen and green chemistry (Dutch Research Council [NWO], n.d.). Additionally, Europe's existing energy transport and storage infrastructure, such as converted gas pipelines and nodes like Rotterdam, facilitates such breakthroughs.

Conversely, interviews with experts revealed that South Africa and Namibia are in the initial stages of developing green hydrogen technology. The rich solar and wind resources of Namibia make it a possible leading country in the hydrogen global market, but both nations have significant issues in increasing output and adopting frontier tech-

nologies. Cassidy and Quitzow (2023) support this affirmation, pointing out the natural advantages of Namibia along with its shortage of essential infrastructure and technological expertise. Respondents indicated that South Africa lacks the necessary infrastructure, and needs to break its addiction to old energy systems to build a hydrogen economy. Moreover, the use of fossil fuels for hydrogen production (e.g., grey hydrogen) remains a significant challenge, which is a trade-off between economic viability and environmental sustainability. The study of Cassidy and Quitzow (2023) also agrees with these points, revealing that South Africa acknowledges its dependence on coal and the need for vast investment in renewable energy in order to achieve its ambition to integrate green hydrogen.

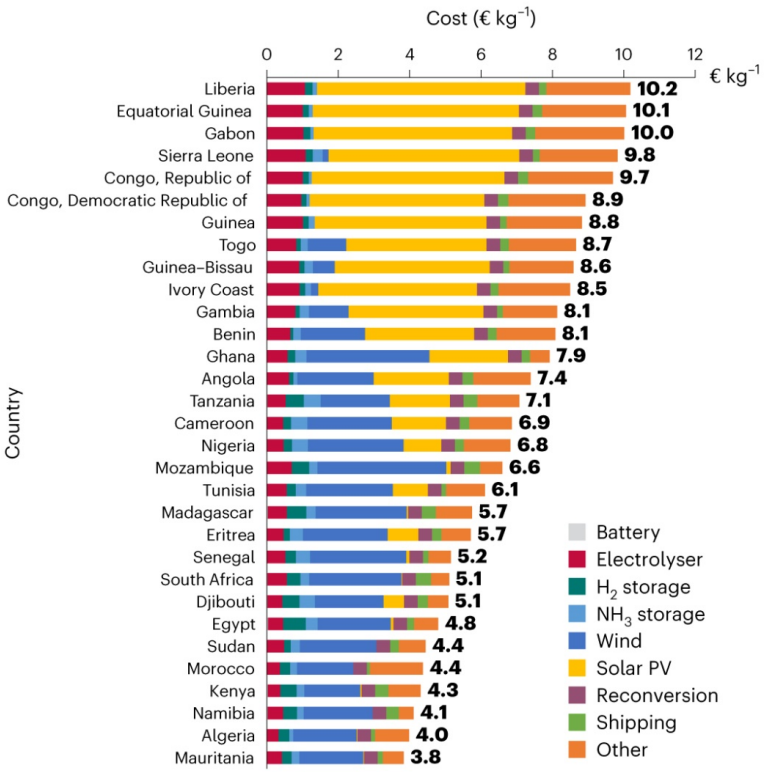
However, projections regarding the competitiveness of African green hydrogen are highly divergent. According to the European Investment Bank, the continent's potential could reach 50 million tonnes annually by 2035 at costs below €2/kg (AfriCatalyst, 2024). More recent research, however, suggests actual costs are closer to €4.2-4.9/kg, with only a handful of countries (e.g., Algeria, Kenya, Mauritania, Morocco, Namibia, Sudan) potentially competitive – and only if guaranteed offtake by Europe is secured (Bellini, 2025) (cf. Figure 1).

The literature cites high up-front capital expenses as a barrier to the uptake of green hydrogen. Europe has eased these barriers somewhat through the European Green Deal and massive public and private investment. For example, Germany's €9 billion hydrogen plan illustrates the enormous financial outlay needed to spur technological innovation and economic viability.

In contrast, our interviews pointed to the fiscal tightness experienced by South Africa and Namibia, where green hydrogen development is curbed by finite access to finance and insufficient inward investment in domestic renewable energy infrastructure. A report by the Research Institute for Sustainability (RIFS) lines up with these perspectives, emphasizing that both nations encounter limited pre-existing infrastructure, necessitating substantial capital investment for projects such as the Hyphen project in Namibia and the Boegoebaai project in South Africa (Research Institute for Sustainability, n.d.). The national treasuries in both countries are constrained by competing demands, including alleviating energy poverty and reviving economic growth.

Despite investment and partnership from global partners like Germany and France that have provided some degree of cushioning, doubts over climate-induced debt and long-term feasibility continue to persist.

Figure 1: Cost for the Least-Cost Location in Each Country



Source: Technical University of Munich, Nature Energy, CC BY 4.0

An additional barrier lies in Africa's high cost of capital, 2-3 times higher than in advanced economies – which significantly limits scalability. Currently, Africa accounts for only 1% of installed renewable capacity and 2% of global clean energy investments (International

Energy Agency, 2023). Scholars argue that de-risking mechanisms, such as green bonds and guarantees from international financial institutions, will be necessary to attract sustained investment (Matthäus & Mehling, 2020).

Environmental Corporate Social Responsibility (ECSR) has emerged as an important platform for reconciling corporate interests and sustainable energy production. The scholarly evidence bears out that European companies have been successful in integrating the elements of ECSR, thus ensuring that economic competitiveness is compatible with ecological stewardship. This integration can be observed with Europe's focus on green hydrogen compared to other, more environmentally unsound varieties such as grey hydrogen.

However, in the Global South, the practices of ECSR are embryonic. The interviews stressed that, although South African and Namibian private enterprises recognize the value of sustainable business, they are faced with structural barriers, including gaps in regulations and the substantial environmental footprint associated with hydrogen plants, which hamper their use. A study by the Research Institute for Sustainability (RIFS), consistent with these points of view, reveals the regulatory environment in South Africa as "confusing, complex, and inefficient", an obstacle to the adoption of hydrogen energy (Research Institute for Sustainability, 2024). In addition, experts identified that, although natural hydrogen discovery has potential, it poses a large-scale environmental issue due to the extensive deep drilling required and considerable use of resources. Still, efforts at integrating ECSR into hydrogen proposals are gaining momentum, fuelled by a growing awareness of its importance in attracting foreign investment and spurring domestic development. Because of unclear policies and environmental concerns, private corporations are slowed down from integrating sustainable business models in both South Africa and Namibia (Research Institute for Sustainability, 2024; German Institute of Development and Sustainability, 2024). Nonetheless, critics argue that European investments in North Africa risk becoming a form of "greenwashing," whereby local communities remain locked into fossil-fuel dependency and water scarcity while hydrogen production is primarily exported to Europe (Sokona et al., 2023). Policy structures have a tremendous impact on the structure of the hydrogen energy market.

European countries have crafted inclusive hydrogen policies, supported by well-crafted legislation, subsidies funded by the government, and ambitious production targets. These policies have made Europe a pioneer in the use of hydrogen, setting a standard for other regions of the world.

South Africa and Namibia, on the other hand, were found not to possess integrated and enforceable policies needed to direct the deployment of hydrogen energy. The South African Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) has encouraged the growth of renewable energy; however, legacy energy policies and governance issues still prevent the large-scale application of hydrogen technologies. Namibia, with its aggressive pursuit of foreign investment for green hydrogen initiatives, is still grappling with regulatory ambiguities that may prevent sustainable development in the long term. Experts have pointed to the necessity for more robust policy frameworks, accompanied by incentives designed to encourage private-sector engagement, to address these issues.

The need for coherent frameworks has also been recognised at the continental level. At the African Green Hydrogen Summit 2025, the African Union called on member states to adopt national strategies aligned with the continental vision (African Union Commission, 2025). In parallel, the Africa Green Hydrogen Alliance – bringing together Egypt, Kenya, Mauritania, Morocco, Namibia, and South Africa – has sought to coordinate regional cooperation and link African hydrogen ambitions with the EU's Repower EU plan (GFA Consulting Group GmbH, 2025).

The study highlights the potential of international collaboration to bridge the gap between the technological and economic capabilities of the Global North and the potential of the Global South to hold resources. Scholarly literature points towards the enthusiasm of Europe for the importation of green hydrogen from regions like Africa, utilizing the latter's bountiful renewable resources. Interviews reinforced that South Africa and Namibia have the potential to be large sources of green hydrogen supply to Europe if adequately supported in terms of infrastructure development, technical capability, and capacity development. In this context, infrastructure plays a decisive role. The South H_2 Corridor initiative foresees the conversion of approximately 70%

of existing pipelines and the construction of new sections, creating a 3,300 km renewable hydrogen network to import up to 4 Mt annually from North Africa to Europe (SoutH$_2$ Corridor, 2024).

Experts noted that investment and knowledge transfer from the Global North could drive hydrogen uptake in the Global South. For example, collaboration aimed at training indigenous populations, the transfer of cutting-edge technology, and long-term institution-building capacity could enable Africa to become a world-class hydrogen hub. It is also critical to highlight environmental constraints. Studies suggest that, in Mauritania, hydrogen costs could start at €1.6/kg, with a potential of 259 TWh annually by 2050 at below €2/kg. Yet, limited groundwater availability necessitates desalination, adding roughly 1% to overall costs. Scholars further emphasise the lack of robust social and technical data, pointing to the importance of multidisciplinary approaches to project planning (Winkler et al., 2025).

By combining conclusions from the scholarly literature with the views of experts, the debate reveals a stark contrast between the readiness and potential of the Global North and Global South to make the shift to hydrogen energy. While Europe is a paradigm of technological innovation and policy experimentation, the dilemmas of South Africa and Namibia reflect more fundamental systemic inequalities to be resolved through collaboration.

While our findings contribute insights into the opportunities and challenges that South Africa and Namibia have encountered in the sustainable development of green hydrogen energy transitions, they do not fully represent the entire landscape. Due to time limitations and data restrictions, our research scope was constrained, particularly from experts in the private sector. Although efforts were made to expand the diverse perspectives of the data through over 30 interview requests, many remained unanswered, limiting the depth of industry aspects in our analysis. Therefore, greater openness among experts in sharing critical data will significantly contribute to wider beneficial sources. Hydrogen energy is a breakthrough opportunity for both regions, but achieving its full potential requires ongoing investment, research, and international cooperation.

6. Conclusion

Hydrogen development is an underpinning prospect for the achievement of global sustainability imperatives, and enormous disparities exist between the Global North and the Global South. In Europe, advanced infrastructure, integrated policy packages, and high levels of investment have enabled the continent to become the leader in the global hydrogen economy, demonstrating how a robust regulatory framework can support innovation and uptake. Conversely, South Africa and Namibia, which are richly endowed with renewable resources and potential, are faced with enormous challenges like poor infrastructure, outdated policies, financial constraints, and environmental risks.

The comparative analysis emphasizes the importance of Environmental Corporate Social Responsibility (ECSR) norms in ensuring equitable and sustainable transition in energy. The norms have a key responsibility in reconciling corporate and social objectives, elevating stakeholder confidence, and advancing innovation. Europe demonstrates a stage of advancement in integrating ECSR in a hydrogen advance stage, while the Global South presents incremental advancement bedevilled by systemic issues.

Global North-South cooperation in the areas of knowledge transfer, investment, and technology will be instrumental in closing these gaps. Such strengthened international collaboration has the potential to unlock Africa's renewable energy resources, thereby establishing itself as a significant global player in the green hydrogen market while addressing urgent issues such as energy poverty and economic diversification imperatives.

Finally, the adoption of hydrogen energy offers a massive transformative potential for both regions. While Europe can be a technological showcase and model of policy coordination, the Global South can be a leader in sustainable resource governance, thus repositioning itself in the global energy sector. Once the challenges that have been listed are overcome, hydrogen energy can be a basis for more inclusive economic growth and increased climate resilience globally.

Use of Artificial Intelligence Tools

AI tools (e.g., ChatGPT and Gemini) were used to support language editing and provide drafting assistance for explaining complex concepts. All research design, analysis, interpretation, and conclusions were developed independently by the authors.

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Flows Beyond Borders: A Comparative Analysis of Artificial Intelligence Usage in the Renewable Energy Sector in South Africa and Germany

Hannah Brown, Johannes Sonneborn and Kashama Dodo Muyemba

1. Introduction

The global energy landscape is characterized by a high demand for energy, primarily attributable to the escalating economic growth of emerging powers such as India and China (Wang et al., 2024), the invasion of Ukraine by Russia (IEA, 2023), and the lack of investment in energy infrastructure in developing countries (Inglesi-Lotz, 2023; Iwayemi, 2008). The World Energy Outlook (2021) report published by the International Energy Agency (IEA) underlines that "pressure on the energy system will not ease in the decade to come," highlighting the impending challenges exacerbated by a projected global population increase of nearly 2 billion individuals by 2050 (IEA, 2021). This projection is not without consequences for the depletion of energy resources, which, for the most part, remain non-renewable, as well as for the environmental footprint generated by greenhouse gas (GHG) emissions. Consequently, the energy question is at the heart of the debate on sustainable development, positioning energy, and more precisely the energy system, as a real societal issue (Roser, 2020).

Several African countries are experiencing an energy crisis and therefore find themselves facing multiple challenges linked to the transition to green energies, with emphasis on the technical, economic, social, and political challenges associated with this transition. For instance, South Africa and Nigeria, two of the most industrialized countries in Africa, have been experiencing temporary power cuts, known as load shedding, for more than ten years. This situation has a negative impact not only on businesses and the economy in general, but also especially on low-income households (Inglesi-Lotz, 2023; Iwayemi, 2008; Steenkamp et al., 2016). For example, load shedding has led to an overwhelming amount of food wastage, thus increasing food insecurity in a country that already experiences hunger and poverty (De Lange, 2022). Due to households, catering businesses, restaurants and grocery stores not having backup electricity sources, countless amounts of food are wasted weekly, if not daily, in heavy load shedding periods (De Lange, 2022). Where businesses do rely on backup diesel generators, these generators are themselves bad for the environment, as they emit toxic pollutants that contribute to increased CO_2 emissions (Borofsky, 2021).

Temporary or prolonged power cuts further exacerbate the socio-economic situation and undermine the sustainable development of many African countries. One of the key topics covered in the World Energy Outlook 2022 explored how digital technologies and innovation, such as Artificial Intelligence (AI), could facilitate a transition to an energy system with net zero emissions while mitigating potential risks and managing potential conflicts between various policy objectives (IEA, 2022).

A transition to a green energy economy is essential for the mitigation of the effects of climate change, as well as for boosting the shift to a more sustainable future. As human activity is the main reason why climate change exists and is what is endangering the planet so gravely, a green transition will reduce the human race's negative impact, thus halting the progression toward a depleted and damaged earth beyond repair (UNDP, 2023). As such, it is imperative that research efforts are dedicated to finding strategies and practices to limit greenhouse gases and reduce our reliance on burning fossil fuels. In addition, sustainable solutions include using renewable and "greener" energy that do not add to the problem.

The transition to renewable energy, aided by AI, fosters the growth of the technology sector, particularly in AI development and brings economic growth with it. It significantly contributes to environmental preservation, which the world depends on. Moreover, while initial installation costs might be higher, renewable energy proves to be cheaper in the long run (Allen, 2023). In regions like South Africa, efficient use of funds can be ensured, maximizing the impact of investment (Stander, 2023). But most importantly, communities plagued by power outages stand to gain reliable access to electricity, improving their quality of life (Stander, 2023). Currently, AI is mainly used for modelling, prediction, simulation, and optimization in the process of generating energy (Yap, Sarimuthu & Lim, 2020). In maximizing power extraction from solar panels, AI-based Maximum Power Point Tracking (MPPT) methods ensure efficient energy generation (Yap et al., 2020). Additionally, AI techniques enhance high-impact weather prediction, aiding in renewable energy forecasting (Hassan, Algburi, Sameen, Salman & Jaszczur, 2023). In Power Quality (PQ) monitoring, AI methods enable automatic classification of disturbances, enhancing grid reliability (Samanta, Mohanty, Parida, Rout, Panda, Bajaj, Blazek, Prokop & Misak, 2025). In stand-alone Hybrid Renewable Energy Systems (HRESs), AI-driven optimization algorithms enable reliable, cost-effective power supply, especially in remote areas (Hassan et al., 2023). Hybrid microgrids, combining wind, solar, and storage, benefit from AI-based optimization for optimal component placement and operation, ensuring grid reliability without extensive weather data (Hassan et al., 2023). Overall, AI plays a vital role in optimizing renewable energy systems, improving predictability, efficiency and reliability (Khosa, 2024).

This research study is the output of the "Transcultural Student Research Group" project coordinated by the Zeppelin University in Germany, and in collaboration with other universities, notably University of Pretoria, University of Lodz, Vietnamese-German University and Pontifíca Universidade Católica do Rio de Janeiro. Whilst many research papers have investigated the potential that AI has to contribute to a greener economy, as well as to remedying the load shedding crisis in South Africa (Khosa, 2024: 345), little research effort has been dedicated to a comparative analysis of two countries that are in

different stages of transitioning to a greener economy. Given that the researchers of this study live in Germany and South Africa, it was appropriate to collect data in both countries and conduct a comparative analysis in an effort to identify opportunities for countries in earlier stages of transition by examining the best practices of AI implementation in green energy.

Focusing on current challenges such as the variability of renewable energy sources, generation intermittency, and storage requirements, this research will explore how AI algorithms can be used to maximize operational efficiency, improve predictability of production, and reduce costs associated with green energy. Furthermore, this study will analyze the socio-economic and environmental implications of the use of AI in the context of the energy transition, highlighting the opportunities and challenges related to the widespread adoption of these technologies.

This research study will be guided by the following research questions:

Q1: How can AI aid in a smoother transition to green energy?

Q2: What key characteristics of AI can be useful in the transition to green energy?

Q3: How is AI impacting income inequality in the energy sectors of Germany and South Africa?

Q4: What labor skills are needed in a country that has transitioned to green energy? Which ones are no longer needed?

2. Literature Review

2.1 A Background Overview of Artificial Intelligence

Artificial Intelligence (AI) has gained more traction than ever in the past three years. This has been thanks to the launching of ChatGPT, OpenAI's Large Language Model, which was released on November 30th, 2022 (Peller, 2024). Artificial Intelligence allows machines to mimic human intelligence, including problem-solving capabilities, decision-making, comprehension, the ability to understand speech, amongst many other features (Stryker & Kavlakoglu, 2024). AI has

the potential to be beneficial by solving contemporary issues faced by humanity in a multitude of areas and sectors (Mehryar, Yazdanpanah & Tong, 2024: 3). AI can be used to combat climate change impacts through its early warning systems and predictive capabilities (Mehryar et al., 2024: 3). Through AI's ability to gather copious amounts of data and analyse this data efficiently, along with its ability to gain insights and identify patterns, users can make more accurate data-driven decisions (Shah, 2024). The use of AI in healthcare can be incredibly beneficial, as it could improve the efficiency of healthcare professionals and other workers allowing these employees to pay more attention and time to more pressing matters and tasks that need prioritising (Bajwa, Munir, Nori & Williams, 2021: 193). The usage of AI in finance has allowed financial institutions not only to automate tasks, analyze data to assist with creditworthiness scoring of customers, and predict loan risks, but also, and perhaps most importantly, it can help businesses detect fraud, as well as cyberattacks, thereby enhancing security (Finio & Downie, 2023).

While AI has revolutionized many processes and is proving to be a very exciting innovation, there are still some concerns, about which researchers urge users to be cautious. These include the way in which AI (specifically, generative artificial intelligence) arrives at conclusions is unclear, thus leaving space for inaccuracies (Preuss, Alshehri & You, 2024). AI has been found in some cases to spread misinformation, which can be incredibly dangerous (Preuss et al., 2024). Some AI has also had instances where it displays biases and discrimination, which is said to be a result of the developers who trained the AI and data they used to train the AI (González-Rodriguez, Izquierdo-Bueno, Cantoral, Carbú & Garrido, 2024). There is a big issue with the inaccessibility of AI, in the sense that countries that don't possess good-quality data, speak low-resourced languages and have a lower access to resources are essentially being left behind in this new AI age (González-Rodriguez et al., 2024). Additionally, there are extreme concerns amongst users and researchers alike about the privacy provided by AI, if any at all, and the ethical concerns resulting from this. Finally, there are major concerns with how the adoption of AI will impact employment and whether it will make certain roles redundant because of automation capabilities, thus exacerbating unemployment (Thomas, 2024).

2.1.1 Adoption of Artificial Intelligence in Germany

Despite Germany's early interest and activities in AI, the country fell behind the American competition in the 1960s (Bibel, 2020). This was partly due to a focus on computer construction and programming technology rather than the emerging field of AI. This resulted in a delay in the development of computer science as a subject, leading to Germany lagging in both computer technology and AI (Bibel, 2020).

Germany needs to keep pace with technological advances, especially as the U.S. and China are significant players in AI development (Bertschek, 2023). While Germany has a thriving AI startup scene and ranks highly in AI technology application within the EU, it must create research- and innovation-friendly frameworks to remain competitive. Improving data availability, building AI expertise, and enabling flexible regulation are crucial steps in this direction (Bertschek, 2023).

The initial national AI strategy, set up by the German government in 2018, aimed to use AI for the benefit of society while maintaining a leading position as a research center and building competitiveness in German industry. To monitor and analyse the impact, a German AI observatory was proposed (German Federal Government, 2018).

While promoting 'Trustworthy AI' (TAI) as a distinguishing feature for German and European AI solutions in the global technology race is a promising approach, critical voices question its emphasis on regulation (Hirsch-Kreinsen & Krokowski, 2023). The rapid expansion and unmanageability of AI applications may render TAI efforts merely a 'whitewashing' of the technology. Additionally, the existence of comparable statements and ideas related to ethical and trustworthy AI in other countries, including the USA and China, challenges the notion of TAI being a unique European or German concept (Hirsch-Kreinsen & Krokowski, 2023).

In the updated 2020 national AI strategy the German Federal Government emphasized the need for broader AI applications across various fields and increased collaboration. It acknowledges the dynamic growth in global AI research and highlights the need to expand German research facilities (German Federal Government, 2020).

A report by the OECD (2024) on the overall progress in the field of Artificial Intelligence highlights Germany's mixed position within the

global AI landscape. Although the country has made notable progress in implementing its national AI strategy, further advances are necessary to fully capitalize on opportunities and address associated risks. Key areas for improvement include attracting and retaining AI talent, strengthening research efforts, facilitating the transfer and application of AI technologies, addressing labor market impact, refining the policy and regulatory framework, and fostering societal trust in AI. While Germany demonstrates excellence in research, it faces challenges in translating this research into practical AI applications (OECD, 2024).

The Kreditanstalt für Wiederaufbau (short: KfW, Engl.: Bank for Reconstruction) sees this evidenced by a significantly lower share of global AI patent applications compared to leading countries (Zimmermann, 2024). Germany also faces challenges in digital technology adoption, indicated by its average scores on the EU's 'DESI 2023 Dashboard for the Digital Decade' (Zimmermann, 2024).

The successful implementation of AI in German businesses is contingent upon companies' digitalization and data economy readiness (Engels, 2023). The limited adoption of AI in 2022, with only 19% of companies utilizing it, underscores the need for increased efforts in these areas. To fully capitalize on AI's potential and prevent future competitive disadvantages, businesses need to strengthen their ability to efficiently harness data for AI applications (Engels, 2023).

It is made clear by the German Federal Ministry for Research and Education that the development and application of AI methods have immense potential across numerous scientific disciplines, including energy, mobility, climate, environment, bioeconomy, physics, biology, biotechnology, medicine, material development and production processes (Federal Ministry of Education and Research, 2023). To unlock this potential, bolstering the interdisciplinary nature of AI research and combining AI expertise with sector-specific knowledge is crucial. Germany's quality infrastructure, including metrology, accreditation, and market surveillance, is essential for guaranteeing economic success and trust in products and services, particularly for AI applications.

2.1.2 Emerging Uses of Artificial Intelligence in South Africa

In South Africa, some academics and practitioners maintain that AI remains in a nascent stage despite its impressive development in the Global North countries such as the USA and China (Arakpogun et al., 2021; Media Institute of Southern Africa, 2024; Olaitan et al., 2021; Patel & Ragolane, 2024). These authors contend that the development of AI in South Africa is still hindered by factors including infrastructure deficiencies, insufficient funding and investment, and the prevailing socio-economic inequalities in the country. Nevertheless, the advent of the COVID-19 pandemic has accelerated the adoption and integration of artificial intelligence and other digital technologies across various sectors in South Africa (Brand, 2022; Patel & Ragolane, 2024).

Various studies indicate the acknowledgement of the adoption and advantages of AI across multiple industries in South Africa (Mamela et al., 2020; Ndoro & Johnston, 2020; Chilunjika et al., 2022; Behara et al., 2022; Nzama et al., 2024; Tjebane et al., 2022). The energy sector in South Africa can also significantly benefit from the adoption and implementation of AI and other digital technologies (Mlambo & Mhlanga 2022). AI offers prospects for the energy industry to optimize the production, distribution, and consumption of renewable energy, thus advancing the country's efforts towards the United Nations Sustainable Development Goal 7 (Bhagwan & Evans, 2022). Similarly, Dong et al. (2021) argue that AI has the capability to develop smart solutions for both the supply of and demand for renewable energy. AI can facilitate the exploration of energy sources, optimize power generation, manage grids, and enhance predictive maintenance, in addition to providing energy efficiency in residential and commercial buildings (Mlambo & Mhlanga, 2022). Predictive maintenance, for example, can avert catastrophic breakdowns of the aged infrastructure of the power utility "Eskom" and reduce failures in other renewable energy facilities (Mlambo & Mhlanga 2022).

Moreover, escalating electricity demand and illegal connections to the electricity grid are identified as significant challenges faced by electricity producers in South Africa. Mhlanga (2023) suggests that South Africa stands to gain from the adoption and implementation of

AI technology in grid management via smart grids. Smart grids have the advantage of connecting and facilitating communication between energy producers and consumers. In addition, smart grids, also referred to as intelligent grids, assist energy producers in monitoring consumption and preventing unauthorized power connections, which is one of the major issues in South Africa (Mhlanga, 2023).

Some academics believe AI can be used in the energy sector to make energy more sustainable in terms of efficiency and reliability and with minimal harm to the environment (Dong et al., 2021; Opesemowo & Adekomaya, 2024). Currently, the literature reveals a lack of research regarding the utilization of Artificial Intelligence within the South African energy sector. It remains unclear whether this technology enhances efficiency, energy production, and plant productivity in this specific context (Bhagwan & Evans, 2022; Bhagwan & Evans, 2023; Ndoro et al., 2020). In a literature review study conducted by Bhagwan and Evan (2023) it was found that South Africa accounted for only 3% of research into AI and energy technology, while China represented 82% and Germany 15%. With regard to the publications on AI and energy production, China achieved 63% of the publications and Germany accounted for 37%, while South Africa produced no publications in this topic. In addition, Yin et al. (2023) noted that there is a dearth of studies on the effects of the use of AI in the transition to green energy in the literature. Leal Filho et al. (2022) observed that only 4% of the studies on the relationship between AI and climate change had addressed the issue of energy transition. Antonopoulos et al. (2020) noted that only a few empirical studies had used observational data to investigate the impact of Artificial Intelligence on renewable energy transition. According to these authors, most existing studies primarily investigate the applicability of AI in the transition to renewable energy through case studies and literature reviews. The above results indicate that South Africa requires further investigations to assess the utilization of AI across various sectors, particularly in the renewable energy sector.

2.2 Global Developments in the Green Energy Transition

Green energy, or renewable energy, is energy generated from natural resources or renewable energy sources. These energy resources are environmentally friendly in the sense that they are not harmful by releasing greenhouse gases during extraction, and do not deplete essential resources (Collins, 2022). With the inevitable reality and onset of climate change, it is important to realise that things will not get better unless more sustainable steps are taken to prevent further damage (United Nations, 2024). Thus, the adoption and implementation of, as well as the transition to, greener energy alternatives is not only highly encouraged and being implemented in many developed countries but is also essential to the sustainability of the planet and the survival of humanity (Collins, 2022). It is a resource that is non-exhaustible and can be used more extensively than non-renewable energy sources. The energy produced from these methods is cleaner and has almost no carbon footprint, allowing users to be self-sustainable (Collins, 2022).

There is an array of different renewable energy sources. Solar energy is energy extracted from the sun and is already used naturally by plants for photosynthesis. It can be converted into thermal or electrical energy. The radiation from the sun is incredibly powerful and has the potential to supply all of Earth's energy requirements. However, the actual collection, conversion and storage of said energy limits accessibility to only those people who can afford it (Ashok, 2024). Wind energy is energy sourced from wind. Electricity is produced by converting kinetic energy from air in motion (also known as wind), and transferring this energy to a generator (IRENA, 2024). Wind energy is most commonly extracted via wind turbines, and the power potential that can be harvested often depends on the turbine's size: the bigger the turbine, the more energy generated. Hydropower resources originate from water. It is one of the oldest renewable energy sources, and through the harnessing of water movements from sea currents, streams or rivers, mechanical power is produced (Telefónica, 2023). It is clean energy that can be safely extracted; however, it depends on how much rain an area has received and hydropower plants can be very expensive to build. Fitting within the same realm of hydropower is tidal energy, which is extracted from tides. It extracts power by harnessing

the natural rise and fall of tides and converting that to energy (Smith, 2024).

Whilst the prospect of green energy seems very promising, there are some major challenges that come with its adoption. The implementation of most renewable energy sources is incredibly expensive from the outset, which deters most potential customers from switching from their normal non-renewable energy source (Dente, 2024). In countries that are heavily dependent on fossil fuels, the green energy transition can be incredibly disruptive, including increases in unemployment and economic problems (Dente, 2024). The successful extraction of energy from renewable sources is heavily reliant on favourable weather conditions, meaning that some periods yield less electricity generation than others in a year (Dente, 2024). Finally, the actual demand for land and resource requirements can complicate the transition to green energy, as making space for these energy sources can disrupt essential agriculture or disrupt residential areas, which is also an important aspect to consider (Dente, 2024).

2.2.1 The Pathway to Green Energy in Germany

The imperative to switch to renewable energy is underscored by the comparative impacts of different energy sources on environmental quality (Chen, 2024). Specifically, studies of Germany's Energiewende (the country's transition to renewable energy) reveal that while renewables have a positive impact on environmental quality, increasing the Load Capacity Factor (LCF), fossil fuels substantially reduce it (Chen, 2024). Load Capacity Factor describes a country's ratio of its ecological footprint to its ability to produce renewable biological materials while absorbing waste material (Duran & Saqib, 2024).

When discussing the transition, it is important to note that climate preferences and the strictness of environmental policies positively influence investment in renewable energy. In contrast, uncertainty in energy policies tends to have a negative impact on this investment. This highlights the need for policies that provide a stable investment environment and raise public awareness of climate issues (Meo, 2024).

Research into renewable energy in Germany can be categorized in three distinct phases, each characterized by varying levels of intensity: a nascent phase (2008-2014), a period of significant growth (2015-2021), and a subsequent decline from 2022 onwards (He et al., 2024). Studies have highlighted the negative impact of factors such as resource efficiency, renewable energy research and development (R&D) expenditure, and the adoption of green technologies on energy-based carbon intensity. This suggests that these elements play a crucial role in reducing the carbon emissions associated with energy production (Ozkan, 2024).

By outlining a pathway for achieving a 100% renewable energy system in Germany by 2030 across all sectors (electricity, heat, and mobility), Traber, Hegner and Fell (2021) demonstrate the possibility of a cost-effective transition. They also emphasize that a "business as usual" approach to energy policy will prove to be expensive, particularly regarding wind power, and show that not expanding wind power in the south leads to immensely high grid expansion needs. The simultaneous development of onshore wind power in southern and northern Germany achieves a levelized cost of energy (LCoE) as low as 76 Euro per MWh, which is not higher than that of the current system (Traber et al., 2021).

The expansion of renewable energy has a significant positive economic effect, with strong growth in the renewables sector (ZSW, 2024). Successful renewable energy expansion is more likely to occur in states with high renewable energy potential and lower financial prosperity, particularly when a feed-in tariff policy is in place. Poorer states use renewable expansion as part of an economic modernization strategy supported by subsidies provided by the central government (ZSW, 2024).

Dominant energy providers initially lost some control over the rapidly evolving renewable energy sector due to policies that threatened their competitive edge (Levi, 2024). However, they regained control by concentrating their power over the shrinking conventional generation capacity, which allowed them to increase differential prices and profits. This coincided with spatial centralization, ownership concentration, and decreasing penetration rates of renewable energy resources in Germany (Levi, 2024).

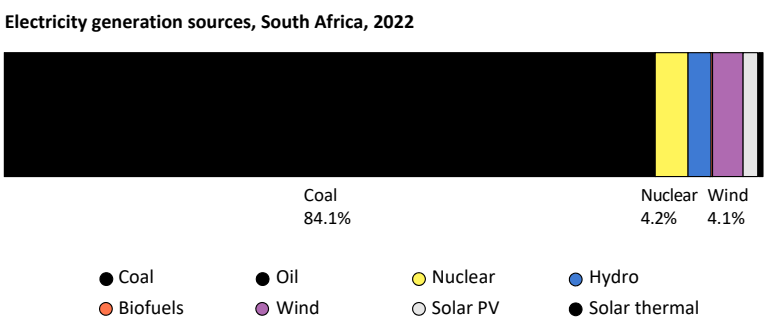
Alongside these developments, local authorities also play a crucial role in the energy transition, engaging in measures such as energy saving, renewable energy generation (solar, wind), and district heating (Wurster & Hagemann, 2020). Municipal utilities and energy cooperatives are also significantly involved (Wollmann, 2024).

2.2.2 The Challenges and Opportunities of Green Energy Transition in South Africa

Over the last eighteen years, South Africa, one of the few industrialized economies on the African continent, has been experiencing regular power outages and significant acute power shortages. The country relies heavily on fossil fuels, particularly coal, to meet its energy needs. According to the latest publication by the International Energy Agency (IEA, 2022) Energy Atlas, South Africa ranks as the world's seventh largest producer of coal and the largest producer in Africa. Coal represents the predominant source of energy in South Africa, accounting for over 84% of the country's electricity generation (Akinbami et al., 2021; International Energy Agency, 2025). The country's dependence on fossil fuel-based energy has also positioned South Africa among the ten greenhouse gas emitters in the world and number one in Africa, with 394,069 Mt CO2 emissions in 2022 (Akinbami et al., 2021; Bekun et al., 2019; Cohen et al., 2018; International Energy Agency, 2025; Smarte Anekwe et al., 2024). Moreover, according to Urban (2018), South Africa incurs an economic loss of income ranging between USD 253 million and USD 282 million as a result of the energy crisis.

Figure 1 shows the mix of electricity generation sources in South Africa in 2022 and the clear predominance of coal in the electricity generation mix. The negative environmental impact of generating electricity from fossil fuels in South Africa and the impact renewable energy could have on income inequality have prompted efforts to look into diversifying the country's energy sources (Akinbami et al., 2021; Mertz et al., 2009; Topcu & Tugcu, 2020). Furthermore, the effects of climate change, air pollution, and the depletion of natural resources have necessitated a transition to renewable and cleaner energy sources (Akinbami et al., 2021; Ojo et al., 2020; Smarte Anekwe et al., 2024).

Figure 1: The Energy Mix in South Africa
Electricity generation sources, South Africa 2022



Source: International Energy Agency (2025).

To address the negative effects of fossil-based energies, the South African government launched the Integrated Resource Plan (IRP) in 2010, a strategy aimed at diversifying the energy mix of the country and ensuring a secure energy supply that aligns with the country's emissions reduction objectives. This plan aligns with global trends and advancements and has been consistently evaluated in accordance with evolving conditions (Department of Minerals Resources and Energy, 2023). The IRP presents a strategy for the long-term diversification of the energy mix by 2030, aiming to decrease the proportion of electricity generated from coal to 49%. The plan also addresses the rising energy demand and promotes an equitable socio-economic transition (Department of Minerals Resources and Energy, 2023). Currently, renewable energy sources have become a reality in South Africa and are gaining increasing interest from the public, investors, and academia (Smarte Anekwe et al., 2024). Renewable energy sources in South Africa include solar, biomass, biofuel, hydro, and wind energy (Adebiyi & Moloi, 2024; Akinbami et al., 2021).

The pursuit of lower emissions and the availability of diverse clean energy generation options have initiated the country's transition to renewable energy. Since 1992, several international treaties have been signed with the aim of combating global warming and reducing carbon

dioxide emissions, including the Kyoto Protocol, the United Nations Framework Convention on Climate Change (UNFCCC), the United Nations Climate Change Conference (COP26), and the Paris Agreement (Smarte Anekwe et al., 2024). All these agreements have been established to promote the reduction of greenhouse gas emissions and to manage their adverse effects on the planet (Balibar, 2017; Fahimi et al., 2018; Mutezo & Mulopo, 2021). South Africa has also committed to the United Nations Sustainable Development Goal (SDG) 7, which aims to provide access to affordable, reliable, sustainable, and modern energy for all. These initiatives are vital for the industrialization, development, and the socio-economic growth of South Africa (Kumba et al., 2023; Wang et al., 2024). Furthermore, Chetty et al. (2023) posit that the development of the renewable energy sector in the country may result in increased job creation, thereby enhancing the South African economy.

The development of the renewable energy sector in South Africa is in line with the increase in global initiatives focused on transitioning from a high-carbon to a low-carbon economy (Mutezo & Mulopo, 2021; Yin et al., 2023). Adebiyi and Moloi (2024) and Akinbami et al. (2021) state that South Africa has dedicated itself to reducing its carbon footprint, advancing renewable energy sources, enhancing energy efficiency, executing emission reduction strategies, and engaging in international agreements and initiatives to address climate change, such as the Paris Agreement. Smarte Anekwe et al. (2024) posit that South Africa is confronted with numerous socio-economic challenges, including high unemployment and significant inequality among its population. These, among other things, explain the country's initiatives to shift towards a low-carbon future to tackle several of these pressing challenges. Although the production of renewable energy increased to reach a total installed capacity of 6.2 GW in 2022, the contribution of renewable energy to the total energy mix was 7.3%, which is still very low (Adebiyi and Moloi, 2024). The country still, therefore, has a lot of work to do to move away from fossil-based energy sources towards more diversified and sustainable renewable sources.

In summary, the literature review suggests that AI possesses considerable potential to optimize the energy sector and facilitate the transition to green energy by enhancing forecasting, grid management, infrastructure maintenance and employees upskilling. Despite Germany's

significant progress in the adoption and implementation of AI within the energy sector, the literature shows that the country is trailing behind other Global North countries, notwithstanding its robust research potential. Conversely, in South Africa, the adoption and implementation of AI in the energy sector remain nascent due to infrastructural inadequacies, insufficient investment, and socio-economic disparities. Furthermore, research into the role and impact of AI on the energy sector remains scarce. This research seeks to address these gaps by assessing how AI can aid the transition to green energy in both countries, drawing on comparative insights and experiences from each country.

3. Methodology

3.1 Research Design

A generic qualitative research design was deemed fit to address the above questions, and therefore, applied to conduct this research and collect data. Generic qualitative research involves investigating and analyzing the subjective views of participants on specific topics (Merriam & Grenier, 2019: 6). As it is commonly used in generic qualitative research (Neergaard, Olesen, Andersen & Sondergaard, 2009: 2), semi-structured interviews were conducted with 7 participants. The researchers aimed to understand the current progress towards the green energy transition, as well as the potential for Artificial Intelligence to aid in this shift becoming more effective and efficient.

3.2 Sampling

The study population for this research was academic and industry experts specializing in energy. This ensured that the researchers had access to both a practical perspective of the shift towards green energy and theoretical and more academic opinions. Purposive sampling, also known as non-probability sampling, is when participants are selected due to the possession of characteristics needed for the study, and was the sampling method chosen (Campbell, Greenwood, Prior, Shearer, Walkem, Young, Bywaters & Walker, 2020).

3.3 Data Collection

Online semi-structured interviews were the main instrument used for data collection. Interviews consisted of twelve open-ended semi-structured questions to seven academic and industry experts in renewable energy and AI technology. In South Africa the participants are two academic experts and one industry expert. In Germany the participants were three industry experts and one academic expert.

The semi-structured interviews allowed researchers to gain invaluable insight into the current transition to green energy and the potential that AI offers in facilitating this transition towards green energy (Akel & Noyan, 2024). Semi-structured interviews are widely used in qualitative research in social sciences (Mashuri et al., 2022; McGrath et al., 2019). The semi-structured interview technique serves to collect data in a more in-depth and detailed manner, allowing the researchers to better understand the problem being investigated (McGrath et al., 2019). According to Kallio et al. (2016), semi-structured interviews are a versatile method for gathering in-depth information from participants. This instrument allowed the researchers to provide a flexible framework that combines pre-determined questions with the freedom to explore emerging topics and delve deeper into the participants' thoughts and experiences. The use of semi-structured interviews in qualitative research provides advantages such as flexibility, adaptability, and an in-depth exploration (Mashuri et al., 2022).

However, semi-structured interviews also have disadvantages. One of these disadvantages is the possibility of bias or influence from the researcher, and this may compromise the objectivity of the data collected (McGrath et al., 2019; Mashuri et al., 2022). Another drawback is that processing semi-structured interviews can sometimes take a long time. Indeed, conducting interviews, transcribing them, and analysing the collected data can be a lengthy process that requires significant time and resources (McGrath et al., 2019). To address these drawbacks, the researchers formulated a semi-structured interview guide comprising twelve open-ended questions that remained consistent to ensure uniformity throughout the interviews. Secondly, the researchers engaged in self-reflection to recognize and mitigate personal biases and assumptions that could have affected data collection and

interpretation (Kallio et al., 2016). These strategies enhanced the credibility, reliability, and validity of data collected while also minimizing potential biases or influences (Cridland et al., 2015).

Table 1: Interview Questions

Research questions	**Associated interview questions**
Q1: How can AI aid in a smoother transition to green energy?	1: How would you describe the current usage of AI (in SA/Germany) in aiding the transition to green energy? 2: What potential does AI have to help achieve the UN Sustainable Development Goals? 3: What are the limitations of AI when it comes to the energy transition?
Q2: What current inventions in AI exist to aid in the transition to green energy?	4: What are the advantages of AI in facilitating the transition to green energy that other technologies don't have? 5: What have been the obstacles faced in transitioning to greener energy? 6: To what extent does South Africa/Germany have the resources to facilitate the use of AI in the transition to green energy?
Q3: How is AI impacting income inequality in the energy sector of both Germany and South Africa?	7: Can/Has the use of AI in green energy help(ed) reduce income inequality in South Africa/Germany? 8: What is the country doing correctly in the transition to greener energy?
Q4: Regarding labour skills, what is required, as well as no longer required, in a country that has transitioned to green energy?	9: How similar/different are the skills and competencies required for non-renewable versus renewable energy jobs? 10: How does AI change the barriers to entering the energy sector through different technical knowledge being required? 11: How can and should the skills required for the energy transition be taught? 12: How can AI help to retrain people for most tech-focused jobs?

Source: Own table.

Expert	Nationality and career
P01	German academic, expert and researcher in energy and resource economics with a focus on sustainability and transformation governance in competitive economic systems.
P02	South African academic, Professor, and senior research associate specialising in energy innovation, industrial policy, and sustainable development.
P03	South African academic, Professor, and researcher specialising in sustainability management, techno-economics, and energy systems.
P04	German industry expert in energy innovation, smart energy solutions, sustainable transformation, Internet of Things-enabled devices, and smart home markets.
P05	German industry expert, specialist in intelligent energy systems, with a focus on sustainable energy solutions' development and optimisation through AI, software and hardware innovation.
P06	German industry expert, with a background in industrial engineering and energy networks, expert in digital transformation, innovation management, regulatory frameworks, and smart city development in the public sector.
P07	South African and industry expert, specialist in sustainable power systems and energy transition.

Source: Own table.

3.4 Data Analysis

Given that the interviews were conducted with only seven participants, it was deemed preferable to employ the semi-structured interviews method. Indeed, this method appears to yield more valuable data, particularly when the sample size is relatively small Drever (2003). The author further stated that analyzing data collected through semi-structured interviews can be done in three stages namely data preparation, data analysis, and summarization of the results. For this study, the data collected through semi-structured interviews was first prepared. In this stage video and audio recordings were converted into written form to facilitate the analysis of data (Mashuri et al., 2022; McGrath et al., 2019). The second stage involved analysis; in other

words, the collected data was coded, categorized and counted. At this stage, the transcribed data had to be carefully looked over to find themes, recurring patterns, and categories that fit with the research questions (Akel & Noyan, 2024; McGrath et al., 2019). This process allowed the researchers to organize and give meaning to the information obtained. To streamline this task, the process was done using Atlas.ti, software specialized in interview coding. The final stage involved the analysis of the data collected. This study employed thematic analysis, a prevalent method for qualitative data analysis that involves the identification, organization, and interpretation of significant themes from data transcripts (Braun & Clarke, 2024; Castleberry & Nolen, 2018; Naeem et al., 2023). This method is particularly effective for examining the perceptions, experiences, and meanings articulated by the research participants.

Furthermore, thematic analysis offers flexibility, applicable to diverse data types including interviews, written documents, and focus groups (Naeem et al., 2023). Braun and Clarke (2024) outline a six-step framework that directs researchers in the analysis process. The steps include (1) familiarization with the data, (2) generation of initial codes, (3) searching for themes, (4) refining the themes, (5) defining and naming the themes, and (6) writing the report. This process helps to ensure rigour and transparency in the analytical procedure.

To reduce biases, the researchers employed data triangulation and validated the results with participants.

The final step was to summarize the results (Mashuri et al., 2022). Once the coding process was completed, the coded data was analyzed and summarized to obtain meaningful information. The procedure enabled the researchers to conduct an in-depth exploration, uncover valuable insights, and establish connections between themes and patterns to formulate a comprehensive understanding of the interview results (Mashuri et al., 2022).

3.5 Trustworthiness

Certain actions need to be fulfilled in order to ensure that the study is trustworthy and reliable for readers. As stipulated in the research of Lietz and Zayas (2010: 191), four criteria need to be used to ensure

trustworthiness, namely Credibility, Transferability, Dependability, and Confirmability. To ensure that credibility is present in this study, we acquired background information, and information and encouraged honesty from the participants and allowed them the option of ending the interview (Shenton, 2004: 67). Additionally, we probed participants, by clarifying subjects of matter, to gain a deeper understanding of answers (Polit & Beck, 2012: 591). This study provided detailed information about seven participants during the semi-structured interviews. By doing this, readers will be able to look at the data provided and determine the extent to which findings in the study can be applied to different settings or contexts, enhancing transferability. To strengthen the dependability of this study, peer debriefings were used. We worked closely with our supervisor, Dr Olebogeng Selebi, throughout the decision-making process, consulting her on key decisions and seeking her expert guidance. She was regularly kept up to date on the development and progress of our project, ensuring she was informed of all significant milestones and changes. Steps taken to ensure confirmability included asking participants open-ended questions, enabling them to answer in their own way, and probing for clarification (Milne & Oberle, 2005: 415). Given the context of team members from South Africa and Germany researching both countries, we thoughtfully considered potential biases related to the subject of our work and divided tasks accordingly.

4. Findings

This section presents the main findings of the study based on semi-structured interviews conducted with academics and industry experts in South Africa and Germany. The questions centered around four major research questions which address the current and potential role of AI in the energy transition, the benefits and limitations of AI, its socio-economic implications, and the transformations in terms of skills and employment. The objective was to provide a comparative analysis between the two countries in order to identify conditions, practices, and learning opportunities favouring a sustainable energy transition driven by AI.

4.1 Understanding the Role of Artificial Intelligence in the Energy Transition

Participants expressed nuanced perspectives on the integration of Artificial Intelligence (AI), emphasizing the need to address misconceptions and clarify objectives before adopting such technologies. One participant highlighted that AI is often misunderstood in South Africa due to its popularity as a "buzzword", which creates the impression that significant advances are being made, even when this may not align with reality:

> "I think because AI is very much a buzzword, and then in the topic, people misunderstand what AI really is. […] That creates an impression that there is quite a lot of work going on about AI. […] which may not be the case if we were to actually look at what AI really is. So, from that perspective, I don't think there is much work going on" – (P02).

Another participant stressed the importance of first establishing clear goals before introducing AI or any other technologies. They pointed out that technology cannot be effectively utilized unless its purpose is well-defined:

> "Once you have then defined within, what are the tools available to help us achieve this better, faster, scale it – and that's where then technology comes in. If we just say we have Artificial Intelligence or any other technology, it becomes very difficult to just push it when we have not first and foremost clarified what is it we want to achieve" – (P03).

Providing insights into the contextual challenges of implementing AI in South Africa's renewable energy sector, one participant suggested that the industry is still focused on foundational growth. This sentiment is shared amongst other researchers in the literature, namely Olaitan et al., 2021 and Patel & Ragolane, 2024. They noted:

> "Renewable energy or energy in general in South Africa is still in its growing phase as well. I think there's the idea that they need to get past this phase first before moving to the next phase, which will now be implementing different energy efficiency solutions, which can be in terms of AI or the like that would sort of also support that" – (P07)

In comparison, German participants paint a more diverse picture with different progress speeds in different areas. One participant emphasized that large, well-resourced players in Germany's energy industry are better positioned to leverage AI effectively, contrasting this with smaller municipal utilities that are more likely to act as "fast followers":

> "But I believe that, because we already have the resources […] and especially, I believe, the big players in Germany, meaning less the local utility XY, […] they will probably be more like fast followers […] But I do think that we have […] great capacity to make use of this, especially because we also have deep energy industry knowledge." – (P04).

This aligns with the perspective presented by Levi (2024), who argues that a small number of large energy providers exert significant control over the renewable energy market. Another participant reflected on the implementation of AI at the municipal level in Germany, describing its current use as nascent and often focused on peripheral rather than core business activities. They noted:

> "We are definitely still at the beginning when it comes to the use of AI. […] There are individual areas where AI is already being used, but these aren't the real ones where it's about the core business. […] For example, in customer service, it's nice to have an AI that sorts the emails […] but it's not the game-changer in the energy transition. […] When we talk about the game-changer in the energy transition, we are, as mentioned, still at the beginning. […] On a global scale […] I would say we are still in the discussion phase with our data protection officers, the works council […], and with our IT management." – (P06).

Looking at the demand side, there is rather slow progress in AI adoption in Germany, linked to systemic challenges. A participant highlighted the ongoing delays in rolling out key enabling technologies, such as smart meters:

> "In particular, we are still reliant on the smart meter rollout […]. There are so many […] projects that are looking into the possibilities, but less about that. There hasn't been a large rollout yet, in contrast to many other European countries, so I would say we are still a bit behind." – (P01).

Talking about limitations in the South African energy supply presents a significant challenge to the implementation of AI solutions, particularly given the technology's high electricity consumption. As one participant observed:

> "This is something that is not talked about as much, [but] the level of electricity consumption that comes with AI solutions […] is a growing trend. AI applications [are] consuming more electricity than even some nations. Now, imagine that application being implemented in a country that is still coming to terms with its electricity demand and supply as well" – (P07).

This highlights a critical tension: while AI holds potential for improving energy efficiency and other critical functions, its deployment risks exacerbating existing energy constraints in contexts like South Africa.

While data privacy was not a prominent theme in the South African interviews, it emerged as a significant concern in the German context, particularly regarding energy-related data. One participant highlighted the sensitivity of such data, noting its potential to reveal personal information about customers:

> "Energy-related data actually […] says a lot about the customers and people. That's why I think data protection, legally speaking, is […] already something where you have to check […] when do I reach my limits. […] Especially because you have […] a lot of personal data […], not just energy flows, but also, in the customer [context], we obviously have a large mass-market business." – (P04).

The participant further emphasized that privacy concerns remain a dominant issue in discussions about AI in Germany, frequently shaping conversations and decisions:

> "The topic of data protection is still really dominant in Germany […] no matter what discussion or meeting I'm in about AI, the question always comes up: 'Is this data protection compliant?' […] and of course, you limit yourself […] in a few areas." – (P04).

Reflecting on the role of AI one participant explained the complementing existing processes rather than completely replacing them:

> "Before, I used different methodologies with various data […] and I processed them in a different way, with thousands of different variations. […] Essentially, it's not really a direct replacement, but rather a complement." – (P05).

In discussing the limits of AI, another participant emphasized that while AI has significant potential for decision-making within energy systems, its implementation will not eliminate the need for human involvement. They remarked:

> "I believe that in the energy system, AI will actually have to make decisions. […] But I think it will go in that direction […] customer contact and so on, also a CEO who leads such a company, of course, […]. But on a technical level, I believe AI could already be used quite extensively." – (P06).

From a German perspective, participants further highlighted the advanced maturity of AI applications in the energy sector, describing self-learning algorithms as highly automated and reliable tools:

> "One can imagine something similar with self-learning algorithms in the energy sector; it just works, and it has a high level of maturity." – (P05).

Another participant reinforced this sentiment, pointing to the availability of resources and international competitiveness:

> "The [resources] are 100 percent there. […] You just have to use them. [Internationally] fully competitive." – (P05).

This aligns with the OECD report, which highlights Germany's high level of technological advancement (OECD, 2024).

When it comes to the biggest fields where AI can assist in the energy transition, participants highlighted the role of AI in leveraging forecasting to identify growth opportunities and optimize energy planning. One participant explained how AI could use existing data to map future potential industries and areas of growth:

> "We've got data about the different communities, […] skills and care and capabilities, and […] artificial intelligence could be used to […] map out future possible industries in those particular spaces

> based on what we see currently happening and […] potential growth areas […] in future" – (P03).

Another participant elaborated on forecasting as a key use case for AI, emphasizing its potential to enhance transparency, efficiency, and long-term planning in climate and energy transitions:

> "AI can help manage and optimize data-driven insights that can ensure transparency and efficiency in terms of climate financing and development goals. […] Using your AI solution, you can forecast for the next 10 years to say this is what we expect, and this is the areas where we think renewables will be required, or […] where we can start descaling our coal generation" – (P07).

They also pointed to the predictive capabilities of AI in operational contexts, such as identifying equipment failures in renewable energy infrastructure:

> "You also have the aspect of predictive analysis and predictive maintenance […] AI technologies can help detect and predict equipment failures" – (P07)

Grid management emerged as a critical use case for AI, particularly in the context of advancing energy transitions in both South Africa and Germany. In South Africa, AI is being explored for the development of smart grids, which could address pressing challenges in the country's aging transmission and distribution networks. One participant explained:

> "Now, South Africa is […] in a phase where, okay, we have enough capacity, but our transmission and distribution network is failing and struggling. […] Implementation and development of smart grids that can help manage electricity distribution and improve the stability of energy supply across the country […] is also important" – (P07).

Similarly, in Germany, grid management was framed as a key aspect of the energy transition, particularly in managing the increased demand for flexibility in energy systems. One participant described how intelligent grid management could balance the dynamic nature of renewable energy generation:

> "If I have generation on one side that […] is no longer as static due to fixed power plants, I have to intelligently [balance] it in the grid […] Honestly, the energy transition […] is a very big grid issue […] it has to be intelligent." – (P04).

With these quotes it becomes clear how smart grid technology, supported by AI, is increasingly seen as essential to stabilizing energy systems and enabling the broader shifts required for the energy transition. The benefits of AI are reflected in the literature by Mehryar et al. (2024).

The potential for flexible energy markets supported by AI drew contrasting perspectives in South Africa and Germany. In South Africa, the limited applicability of such systems for the broader population was emphasized due to the nature of the country's electricity market. One participant explained:

> "We don't really need it in South Africa at this point in time because our electricity market is not dynamically priced. […] In some instances in Europe, it gets traded like that. […] But dynamic pricing would at least suit a very small part of our market. […] Those prices wouldn't reflect, or make sense, for the majority of the people in the country. […] Like, what value would they get? […] It just wouldn't" – (P02).

In contrast, participants from Germany highlighted how flexible tariffs, if implemented effectively, could offer financial benefits, particularly for individuals with fewer resources. One participant noted:

> "If there are flexible electricity tariffs or real-time tariffs at some point, one could imagine that […] people with fewer resources would shift their electricity consumption accordingly and thus [spend] less money." – (P01).

Smart home technologies emerged as a relevant topic in both South Africa and Germany, albeit with different emphases. In Germany, the focus centred on the foundational role of smart meters as a key component of digitalization efforts in the energy sector. As one participant noted:

> "In my view […] when it comes to digitalization, we will eventually need smart meters. That's a big dimension." – (P01).

In South Africa, the discussion extended beyond infrastructure to highlight how AI-powered smart home technologies could empower consumers to manage their energy usage more efficiently. One participant explained:

> "On a consumer level as well, you have where AI can help consumers manage their energy usage more efficiently. […] Smart home technologies [can provide] insights and recommendations on how you can reduce your energy consumption, and things like that […] are ways where AI […] can play a role" – (P07).

4.2 Innovation and Application of Artificial Intelligence in the Transition to Green Energy

Research question 2 aimed to assess current AI innovations that support the transition to green energy. This research question investigates the advantages of AI in facilitating the transition to green energy, the obstacles encountered during this transition, and the resources accessible to the country to support the application of AI in this process. Numerous scholars have argued that AI possesses exceptional advantages in tackling multiple challenges, including issues such as process automation, the ability to analyze large amounts of information, the intelligent optimization of complex systems, and the generation of predictions related to the transition to renewable energy sources (Mehryar et al., 2024; Peng et al., 2024; Yin et al. 2023). Interview participants confirm that AI technology plays a pivotal role due to its capacity to process large datasets and effectively optimize complex systems.

> "Um, and I think artificial intelligence, you know, as part there to be part of, um, uh, uh, advanced control or automation, it, it's quite key in enabling the that integration of, um, of, uh, of, of, of variable energy sources. Especially when they start to perhaps, you know, where in some instances your, your energy in the system, um, you know, from a balance point of view might come more from the vari-

> able energy sources... Um, yeah. So I think that that's an important piece in terms of, um, uh, uh, of that, so that the entire system, it's smoothened. Otherwise, then you, you might have quite a lot of, of, uh, instability. I think balancing the, both the demand and the, and the supply side and, you know, knowing what eventually must be put off or must be brought online so that there is, because constantly you want to have that balance." – P03, South African Academic

> "Yeah, I think like I mentioned, in terms of, we can look at it from the data aspect of it, right? So, AI can help manage and optimize data-driven insights that can ensure transparency and efficiency in terms of climate financing and development goals…" – P07, South African industry expert.

Furthermore, participants P04 and P6 in Germany express a similar view and sentiment, emphasizing the enhancement that AI contributes to process automation, which gives it an advantage over other technologies.

> "…where, of course, via voice bots with AI functionalities and things like that, and when we add value, on the one hand for the company, because it somehow becomes faster, more automated. Um, that means automation is such a big keyword in all the processes, but that also applies to, um, contract design, for price adjustment, um, which is of course always a big topic for us and things like that..." – P04, German

> "Yes, um, uh, so first of all, I'm not an absolute AI expert, but I would say that the advantage it offers, um, is that if you train it properly and create a good model for the specific use case for which you use it, um, uh, that is trained for it, then it ends up being a system that gets better and better with the data. So, it learns while it, um, makes decisions, while it acts. And so, it might go from an initial 80 percent accuracy in making the right decisions to 90, 95, well 100 per cent at some point. Um, that's obviously an advantage over any other system that, um, doesn't have that kind of capability…. This gives AI an advantage over any other technology…. that, that seems to me to be a great advantage." – P06, German expert

In addition to facilitating the processing of large amounts of information and automating processes, participants also discussed AI being

useful for forecasting; all participants, from both Germany and South Africa, affirmed that AI can forecast energy supply and demand.

> "It's a bit about the topic that I've already mentioned, of bringing consumption and production into line with AI-generated forecasts when it comes to renewable energies, what energy will they generate in the next quarter of an hour, in the next two hours, but also in the next two days. What load situation do I have in the grid and then I have an energy data platform that decides whether it generates the energy generated, whether it gets the energy from consumers in the market or sells it on the stock exchange. Or maybe it's only sold on the stock exchange because it assumes that I can buy the electricity again at a cheaper price in two days. Well, um, there is a, um, AI is used in various places, um, in the, um, production forecast of renewable energy plants and in the decision as to whether I, um, how I should deal with the available electricity, yes, it's all about electricity, um, um, whether I should use it, sell it or store it. Um, these are decisions that a human can make and with a sensible AI forecast model, optimal, um, decisions can be made…." – P06, German

> "… So I think from that perspective, uh, then what then becomes the, uh, uh, the role of artificial intelligence is, is precisely in, um, in those, in those spaces, right? Yeah. We've got data about the different communities, um, about the different, um, uh, uh, skills and care and capabilities and, you know, artificial intelligence could be used to, to map out, um, uh, you know, future possible, um, industries in those particular spaces based on what we see currently happening. And I suppose what we see, uh, potential growth areas, um, uh, being in future. Yeah. So you could, you could utilise that, um, um, uh, from that perspective." – P03 South African

> "… for example, I look at control logic in energy management. PV, consumption of charging infrastructure, heat pumps, heating rods. And I have to program it in a logic-based manner. Difficult. But it is usually done in a logic-based manner. But I can only get the added value out of it if I have reasonable heat demand forecasts, electricity demand forecasts…." – P05, German

Along the same lines, participant P07 emphasizes that AI solutions can be used for forecasting short-, medium-, and long-term periods.

> "…. you can have situations where you're forecasting solutions for the years and you're able to see where applications are required. So, okay, using your AI solution, you can forecast for the next 10 years to say, this is what we expect, and this is the areas where we think renewables will be required, or this is areas where we can start descaling our coal generation and things like that." – P07, South African industry Expert

These findings align with existing literature, which suggests that AI solutions significantly outperform traditional forecasting methods in terms of accuracy and flexibility (Aderibigbe et al., 2023; Mehryar et al., 2024; Stryker & Kavlakoglu, 2024).

Participants noted that another benefit of AI is its ability to facilitate the prediction of infrastructure maintenance and equipment malfunctions. As noted:

> "…So, that's one side where it can help. You also have the aspect of predictive analysis and predictive maintenance as well. So, AI technologies can help detect and predict equipment failures in renewable energy infrastructures…. So, you have where AI technologies can help do predictive equipment failures, and then you have pre-emptive maintenance to avoid situations where the country's plunged into blackouts because the system failed." – P07, South African expert

Nonetheless, the energy transition process presents challenges and obstacles, especially for a country like South Africa, where coal has been the primary source of energy and a significant contributor to carbon dioxide (CO_2) emissions on the continent. The findings reveal obstacles and challenges related to the high cost of storage of energy because of the intermittency of wind and solar energy as well as the substantial resource consumption associated with the manufacturing process. As stated by participants:

> "So technically, renewables have challenges, uh, because of the intermittency. Yeah. It, it's not consistent. Uh, solar and wind are the primary renewable technologies. So from that perspective, storage is an, is… is an issue. Storage is still expensive. And when you have highly intensive manufacturing, uh, which has been going down progressively in South Africa…. I mean, manufacturing is primarily done in China. No one can compete with those prices at which they

> can do their manufacturing. So, the manufacturing industry has been going down and manufacturing is a resource intensive process. Yeah. And renewables are still not there in terms of providing, uh, highly intense, uh, electricity or consistent electricity. That's a technical issue." – P02, South African academic

Participants also referred to other socio-economic challenges that South Africa is facing:

> "…We have major social challenges as well because the mining industry is a major employer in, in our, in our country. It's a large industry. You cannot shift miners to become renewable energy experts overnight…. And coal is a major resource Mm-Hmm. That is generating income for the country." – P02, South African academic

> "…. Right. Which means you, you, you cannot just walk out of a coal power station and now you are an expert in, uh, in a power plant as a, in a renewable energy facility. Um, some of these things, even though we made some attempts on the R and D side of, you know, I think we did a lot of work on thin film panel or something along that in the, in the 2000s. But these technologies, especially, uh, solar line wind mm. You know, are largely, uh, driven externally. You know, the, the, the original equipment manufacturers are in Europe or in China and the like Mm-Hmm. Um, which has serious implications for localization. Um, yeah. You know, so, so I, so I, so I think that's perhaps one of the, you know, one of the key challenges, uh, in that." – P03, South African academic

Amrouche et al. (2016) corroborated these findings, highlighting the substantial capital expenditure associated with renewable energy storage. This is also supported by Smarte, Anekwe et al. (2024) who assert that higher initial capital expenditures and inadequate infrastructure, primarily designed for fossil fuel energy facilities, constitute significant impediments to the development of the renewable energy sector in South Africa.

In contrast, the challenges and obstacles associated with the energy transition in Germany are distinct in nature from those in South Africa. Participants interviewed in Germany indicated that:

> "Yes, legal regulatory uncertainties, um, legal regulatory, mh, maybe misconduct or inappropriate things or so, I say, um, some specifica-

> tions for smart meter gateway rollouts that are then not complied with, but on this rollout that was not complied with, some other laws happen that then cannot be complied with either. So that's one issue, for example. The other is, of course, greater political uncertainty, mh, especially now more topical than ever due to the new elections. Then, if you look at the global structure, that's another thing. Um, that's where we come to the table of discussions, nuclear power, yay, yay. So that's, that's one, it's such a global political uncertainty and looking at neighbouring countries that perhaps don't have the drive for renewable energies or climate protection." – P05, German expert

Germany is also faced with data protection challenges, as highlighted by participant P06:

> "Well, we are, we are in Germany, so of course we have, uh, relatively large, uh, data protection hurdles, and I think that's the one thing that you have to be careful about, um, because, uh, as silly as it always sounds, energy-related data actually says a lot about the customers and the people, which is why I think data protection is legal,… I think, these are the kind of issues that you, that you have there. I don't think you have so many ethical questions, I don't think you have them there, in the, I don't see them there so much, so you see them with the topic of AI, but not specifically in the energy industry now, but I think it's mainly data protection issues and employee issues, um, where you reach the limit." – P06, German expert.

However, like South Africa, Germany also encounters challenges regarding financing, albeit to a lesser degree. Some participants, both in South Africa and Germany, indicated that financing constitutes a significant impediment for the renewable energy sector in their respective countries.

> "…yeah, um, financing, so actually, actually we know the, the technical solutions are basically there. So we know that it's developing into a more decentralised energy system, now, we would now have to expand grids, expand storage, we would also have to revolutionise the heating market for a short time, switch from gas heating to, for example, um, heat pumps that then run on electricity, which would again result in grid expansion. So technologically, it's reasonably clear where the journey is going and it's completely open as to who

> is going to pay for it all and how it will be financed…. but that involves huge investment volumes and, um, so the financing of the whole thing is simply a huge issue and currently dominates every meeting between the Federal Minister of Economics and representatives of the industry, um, who want support from the federal government." – P06, German Expert.

> "The number one would be, and I'll just have to go back to it, it would have to be finance. And that is mainly because South Africa on its own is quite debt-ridden. We are looking at the utilities that are subject to high levels of debt. Even the country as a whole also already has high levels of debt and borrowing costs from lenders like the IMF and the like." – P07, South African Expert.

4.3 The Socio-economic Impact of Artificial Intelligence in the Energy Transition

The purpose of research question 3 was to determine whether the use of AI in the energy transition contributed to reducing or increasing income inequality in both Germany and South Africa. Interestingly, it appears there are differences in the perceptions of the interview participants based on the country context.

In Germany, one participant does not expect AI to have a significant impact on income inequality, suggesting that its effects are likely to be non-correlational. As the participant stated:

> "…Now I'm wondering whether AI could, um, have an influence on that…. So, I would say for now, well, I, I, I don't see any, any huge leverage." – P06, German industry expert

In contrast, two other participants in Germany believe that AI has the potential to reduce the income gap. They emphasize the benefits AI can offer to companies, particularly highlighting the potential reduction in the cost of offerings. One participant explicitly mentioned the lower price of products as a result of AI. As noted by participant P04,

> "So, the topic of AI, if you ask me, it will be more conducive to mitigating this, would now be my, my hypothesis, because I believe that the, that the companies are getting smarter, that you, and, your

> products can somehow, I think, at the end of the day, offer cheaper, because they are somehow supported by AI, um, certainly everyone will still make their margins, …" – P04, German industry expert

This potential reduction in product costs is particularly relevant for many households, as it could lower operational expenses for companies. We assume that this would, in turn, allow companies to allocate more resources to employee benefits and wages, contributing to a reduction in income inequality. Conversely, some South African experts view AI's role in the energy transition as potentially exacerbating income inequality. One participant expressed concern that if AI is narrowly implemented with a focus solely on efficiency, while overlooking its social and economic benefits for people, the outcome may be detrimental. As stated by one of the experts:

> "But I think if it is implemented very narrowly and just focused on efficiency and people are left out of it, economic benefits to the people are left out of it, social benefits to the people are left out of it, then we are going back in the same circle and possibly even regressing in terms of socio-economic benefits for the country." P07, South African industry expert

The differing perceptions between Germany and South Africa could be explained by insights from research question 1, which revealed that AI is not a major focus in South Africa and is only minimally integrated into internal processes within companies. As highlighted by Participant 07, South Africa faces significant socio-economic challenges, such as an unstable energy supply and low purchasing power due to high unemployment rates. These factors contribute to the limited integration of AI into business practices in South Africa, as concerns about job losses and the strong emphasis on maintaining high levels of employment outweigh the drive to compete with other countries. In contrast, Germany, as a major industrial power, is focused on staying competitive in the global innovation race to maintain its position in international markets and trade. This explains why experts in Germany tend to have a more optimistic outlook on the topic, as competitiveness is a far greater concern in public discourse than employment rates.

4.4 Workforce and Skills Transformation in the Renewable Energy Sector

Research question 4 was formulated to investigate what skills are critically needed and what skills will be rendered virtually useless as the country transitions to greener energy. Additionally, this research question focused on how AI can assist in the shift from non-renewable energy to renewable energy jobs.

It was acknowledged that even though renewable jobs fit together into one category, skills can vary. Within the renewable energy sector, different energy types exist. With each different type of energy, different skills come with the jobs associated. This is highlighted by a South African academic participant:

> "there are subtleties with technologies […]. Wind is either a big power plant or nothing. […] And that's different. So wind energy as such, you have a lot of installation right at the beginning. And then the plant runs, and then it's occupation and maintenance just to check. The plants are, the turbines are turning, the generators are fine, the turbines are, the wiring to the turbines are okay. And that is a specialized skill because not everyone can climb up a wind turbine and do that, uh, maintenance. […]" – P02, South African Academic expert

Conversely, it was acknowledged that skills can be transferable. This conveys the complex relationship that comes with the transition from non-renewable to renewable.

> "… So any kind of plant technology where you use heat to convert heat into electricity, which is similar to what a coal power plant does, can have transferable skills." – P03, South African Academic expert

With the energy transition comes the acceptance of AI. AI has become a part of our lives that we can choose two options: sink or swim. At the intersection of skills required for renewable energy jobs and skills required for the AI age, a few valuable insights were gained from the data collection. Findings indicate that using AI has benefits.

> "Um, regardless of whether it is a PV system or a wind turbine, with a hydroelectric power station someone still has to be on site, okay, um, but I think the work is shifting a lot from, from, um, being

> on site in the field, um, keeping the system running, to being in the office and monitoring things, um, I would simply say that it takes a lot less work in the company itself and that makes a big difference over a long period of 20 years, um, exactly, and this kind of monitoring is something that an AI can probably do very well and detect anomalies, initiate measures, etc." – P06, German Industry expert

On the same line of thought, it was discussed in interviews that AI can be a tool used to upskill employees in the shift to renewable energy. In fact, six of the seven participants interviewed stated that they believed that AI could be used to retrain and upskill employees. Participant 7 for example, stated:

> "So I think it depends on the application across the board. If implemented with the intention to upskill people, I think there is a good case for AI being beneficial" – P07, South African Industry expert

Talking about a concrete implementation case, one German industry expert talked about an initiative in their company that is starting up right now

> "We have a learning platform that uses it and looks at what your skillset is. What would be useful for you? But I think these are mainly recommendations, in the sense of, I would suggest that you learn this now. Learning this is also a self-learning model that does this, but it's still in its infancy, to be honest." – P04, German Industry expert

Experts spoke about how AI can alter the barriers to enter a job in the renewable energy sector. They expressed the view that AI could present a problem for job security.

> "… because if you're using AI in maintenance to understand patterns of maintenance, then you don't need a human to do that monitoring. So there're the barrier, it becomes a barrier for [-] a human." – P02, South African Academic expert

In relation to research question 4, the importance of teaching and training people to have certain skills that are essential as we move forward was emphasised.

> "Um, so within the solar PV industry, […] we're really retraining. If you're taking a coal miner and trying to turn the miner into a solar installer, that's where the retraining comes in. Otherwise, you're just training. Mm. Um, so training would be installation of panels, wiring. Um, and it's not complicated stuff. […] Uh, technicians can be trained to do that." – P02, South African Academic expert

Experts spoke of the opportunity as well as the importance of teaching these skills in the university curriculum. It was noted that, as far as the researchers were aware, there is very little emphasis on the importance of teaching people about AI and green energy.

> "[…] I think that's a big task for a company, yes, we have a lot of upskilling initiatives internally, uh, internal universities, etc., which means that you have to make massive offers to people to deal with the topic, uh, to get there, because honestly, no matter where you are, it somehow suits you now, I think that also comes intrinsically from the employees, no, but you clearly need different skills in the energy industry than you needed 20 years ago." – P04, German Industry expert

Talking about specific programs in South Africa one expert noted:

> "Not necessarily for energy, but just as an, as an overall thing. I think they, they, there are a lot of qualification now related to, you know, the energy transition. Uh, the first business school I lectured there as well, offers a qualification and energy LE leadership, which begins to expose the students to that. I, I know the University of Johannesburg as well offers something around sustainable development. I believe University of Stellenbosch even has a climate change school that they've initiated. Oh, wow. I think universities have responded in offering a number of qualifications. And remember for a while there was always a qualification in environmental science, which is supposedly the base for some of these conversations. So I think universities have continued to do, to engage those possibilities." -P03, South African Academic expert

4.5 Key Findings

The main findings revolve around the following:

- While the extent of its adoption and usage differs significantly between South Africa and Germany, Artificial Intelligence is generally regarded in both countries as a tool capable of enhancing the optimization of renewable energy systems by improving efficiency, predictability and reliability.
- Regulatory frameworks and data protection concerns are the major challenges facing the adoption of AI in Germany, whereas in South Africa, obstacles are due to inadequate infrastructure, socio-economic inequalities, and funding challenges.
- In both countries, the benefits of AI application in forecasting, network management, and predictive maintenance are widely recognized.
- Funding is regarded as a major concern in both countries, although to different degrees. South Africa's already high debt levels and borrowing costs restrict investment in renewable energy, while Germany is facing challenges with regard to cost allocation across government, consumers, and industry.
- The potential of AI in addressing income inequality remains ambiguous. In Germany, AI can reduce income inequalities by reducing costs, whereas in South Africa, AI can worsen income inequality if its implementation does not take into account existing social inequality.
- AI has the potential to contribute to the transformation, reskilling and upskilling of the workforce in the green energy sector. In addition, through automation, AI can replace traditional roles.
- The effective integration of AI into the renewable energy sector depends not only on infrastructure and technological innovation but also on specific sociopolitical and economic contexts in each country.

5. *Discussions*

This study, in essence, aimed to explore the role of AI in what was deemed a less developed (in this case, South Africa) and a further progressed green energy transition (Germany) and the potential of AI to assist in this change. A key aim of this study is to evaluate the differences between Germany and South Africa, not only in each country's transition to green energy, but also in how AI has been used to aid these transitions. Additionally, this study aimed to understand the difference between how AI usage in green energy is perceived by academics versus professionals working in industry. The findings suggest that both academics and industry experts agree that AI can help smooth the transition to green energy. According to the findings, Germany finds itself in a better position to smoothly integrate AI into their operations, along with an open mindset of most stakeholders to adopt AI. From the South African participants' perspective, AI has not entered the energy sector on a country-wide level. This could be, as one participant pointed out, due to the government's lag in adopting AI. Whereas in Germany, it was acknowledged that while AI adoption is still in its earlier stages, there are instances of implementation. This somewhat contradicts the OECD's (2024) perspective that AI adoption in Germany is mixed. The fact that German participants claimed that AI implementation is in early stages was a very fascinating observation, as while a Global North country such as Germany might perceive its AI usage as still very premature, Global South countries, such as South Africa, perceive AI implementation in the Global North to be far more advanced, as discussed by Arakpogun et al. (2021).

South African participants acknowledged that there was not an overwhelming presence of AI being used as a tool to aid the green energy transition as things currently stand, which supports the claims made by Patel & Ragolane (2024). Findings indicated that it was acknowledged regularly by participants that South Africa will have and does currently have issues that limit the ability, the implementation and usage of AI, due to infrastructural challenges and load-shedding, which supports the claims made by Arakpogun et al. (2021), Olaitan et al. (2021), and Patel & Ragolane (2024). Whether or not this is factually correct or merely within the perceptions of the participants, it still

provides valuable insights. This highlights a stark reality that South Africa has other bigger priorities, such as poverty, where resources (that are already scarce, as it is) are being allocated. A South African expert introduced a best practice to increase the impact of of AI tools. AI deployments should start with clearly defined objectives and small, local pilots that use domestic data then scale by iteration. This 'define → pilot → learn' cycle helps adapt algorithms to local contexts and improves outcomes over time.

Additionally, it was acknowledged that South Africa struggles with good quality data, as well as corruption, problems that are not so prominently discussed by German participants. However, a German participant did talk about the data protection difficulties within the country, indicating that Germany might also struggle with data-related issues. It was found that, while for academics, good, reliable, and readily available data is needed to optimize the use of AI in the transition to renewable energy, industry expert participants, on the other hand, note that data security is a factor that limits the development of AI. This emphasizes that the participants in both countries are very much aware that data governance and data integrity play a central role in reaching a successful AI adoption in the renewable energy transition. The researchers aimed to assess the status of AI innovations in the renewable energy sector, and it was found that AI can assist in many ways, given its ability to process extensive amounts of data and optimize the operations of current renewable energy systems that are complex, which is supported by the works of Mehryar et al. (2024). Furthermore, findings indicate that a major benefit is perceived in AI's ability to forecast, which is mentioned in the literature of Mehryar et al. (2024). Many of the participants also spoke of the disadvantages of AI. It was found that while for academics, good, reliable, and readily available data is needed to optimize the use of AI in the transition to renewable energy, industry expert participants, on the other hand, note that data security is a factor that limits the development of AI. These issues were also addressed in the research of González-Rodriguez et al. (2024). As there is little known about what can and will be done to remedy these disadvantages, this provides a direction for further research.

On the topic of how AI will impact the workforce, German participants expressed excitement at the prospect of AI entering the energy sector and highlighted the efficiency benefits stemming from its usage. However, South African participants expressed concern over AI potentially causing some workers' jobs to become redundant and thus replacing them. This difference makes sense, given that South Africa's unemployment rate was at 32.1% in 2024, which is significantly more than Germany's rate of 6%. This theory is also reflected in the literature by Thomas (2024). Both academics and industry experts note that Artificial Intelligence can help with the upskilling of employees. Participants repeatedly highlighted skills gaps; a cost-effective response is to prioritise 'train-the-trainer' schemes alongside targeted university master's and short-course offerings that focus on applied energy use-cases. This creates multiplier effects: local trainers scale skills across utilities and industry, universities provide theoretical depth, and short courses upskill technicians quickly. Also, participants from both categories indicated that flexible markets can greatly benefit from AI applications. Furthermore, academic and industry expert participants are of the opinion that AI helps with process automation, forecasting of, for example, infrastructure maintenance and prediction of equipment failure. However, the two categories differ in terms of data. Additionally, academic experts indicate that although AI can help with the optimization of infrastructure, it cannot replace it. This indicates a potential gap between how Germany understands AI's potential impact on employees, versus the understanding of South Africans.

6. Limitations and Further Research

This study, like any other scientific research, has its limitations. This study is limited by its small sample size. Indeed, the study relied on interviews with a limited number of academic and industry experts, which may not adequately capture the perspective of all stakeholders in both countries. A further limitation of this study is the insufficient quality of data and its availability. Limited access to high-quality data and AI infrastructure, especially in South Africa, restricts the generalization of the findings and recommendations of this study. Finally, the

comparative approach employed in this study did not account for all the socio-economic and political dynamics at the local level that affect the adoption of AI in each country. Additional research that considers the full spectrum of political and socio-economic dynamics is essential for a comprehensive understanding of the topic. Subsequently, additional research involving a larger number of interview participants may enhance data saturation and facilitate the generalization of results.

Additional research is required to validate our findings. Future studies should involve a larger number of participants from varied backgrounds, including policymakers, engineers, and energy consumers, to gain a comprehensive understanding of the role and impact of AI in the energy sector and in the renewable energy transition. Furthermore, longitudinal studies examining the adoption and implementation of AI in the energy sector would effectively track the progress of AI implementation in both countries over time. These may provide more profound insights into the long-term effects of AI integration within the renewable energy industry. Additionally, subsequent research should investigate the potential of AI to generate new job opportunities instead of displacing workers, especially within the context of South Africa's high unemployment environment. Furthermore, more research needs to be done to assess the trade-off between the high energy consumption of AI and the efficiency improvement resulting from its applications to prevent exacerbating current energy crises.

7. Conclusions

The study examines the differing perspectives of South African and German experts on the integration of artificial intelligence (AI) into the energy sector. While both countries recognize the potential of AI to support the transition to green energy, they face distinct challenges and concerns regarding its implementation. South Africa's obstacles are primarily rooted in economic and social issues, while Germany's challenges are more closely tied to technological and regulatory barriers. Reading these country differences through the Transcultural Learning Model (Medium, 2023) helps explain how local socio-economic reali-

ties and institutional norms shape AI trajectories and why technical potential alone does not determine outcomes.

In South Africa, AI adoption in the energy sector is perceived to be limited, a situation attributed to delays in government-led implementation and the prioritization of more immediate socio-economic issues, such as poverty. In Germany, while AI adoption remains in its early stages, there are examples of implementation, particularly among large, well-resourced companies. These differing contexts shape the priorities in each country. South Africa's energy sector is constrained by issues such as poverty, corruption, and the lack of high-quality data, which collectively overshadow efforts to incorporate AI. Meanwhile, Germany's concerns are largely focused on data protection and regulatory uncertainties, reflecting a more mature technological landscape.

When considering the impact of AI on the workforce, German participants generally express optimism, emphasizing its potential to enhance efficiency. However, South African participants voice concerns about possible job losses, a particularly pressing issue given the country's high unemployment rate. Despite these concerns, experts in both countries agree on AI's potential to facilitate the green energy transition. They highlight its capacity to support workforce upskilling, enable flexible energy markets, and improve processes such as automation, forecasting, and predictive maintenance. AI is seen as valuable for leveraging existing data to optimize energy planning, predict renewable energy needs, and identify potential equipment failures. Additionally, its role in grid management is crucial, as it can contribute to the development of smart grids that enhance energy distribution and balance renewable energy generation.

Differences also emerge in the perception of AI-powered technologies at the consumer level. In Germany, smart meters are regarded as integral to the broader digitalization of the energy sector. In South Africa, by contrast, AI-powered smart home technologies are valued for their potential to improve consumer energy management, reflecting a more direct focus on immediate, practical benefits.

Both countries face significant challenges in realizing the full potential of AI in their energy transitions. In South Africa, technical obstacles such as the intermittency of renewable energy sources and the

high cost of energy storage are compounded by socio-economic challenges. For example, the transition away from coal presents a significant hurdle, as coal remains a major employer and source of income for many South Africans. In Germany, regulatory and political uncertainties create barriers, with data protection also emerging as a key concern. Financing challenges persist in both contexts, underscoring the importance of addressing economic and structural barriers to AI integration.

The issue of income inequality also reflects diverging perspectives on AI's broader societal impact. Some experts believe AI has the potential to reduce inequality by lowering costs and encouraging renewable energy adoption, while others warn that if the benefits of AI are not distributed inclusively, existing inequalities could worsen.

Skills development and workforce training are identified as critical components of the energy transition, with many of the required skills being transferable from existing roles. AI offers opportunities to support this transition by enabling the upskilling of employees, facilitating training in new technologies, and allowing for remote monitoring of systems. However, concerns remain about job security, as AI's ability to recognize patterns and automate tasks could create barriers to entry for human workers, particularly in roles such as maintenance.

The research in this study underscores the complexity of integrating AI into the energy sectors of South Africa and Germany. It highlights the need to address critical factors such as data quality and security, workforce upskilling, and ensuring that the benefits of AI are distributed inclusively and equitably.

7.1 Implications

This study may influence the formulation of policies and regulations regarding the adoption and implementation of AI, applicable to both South Africa and Germany. This implies investing in programmes that create structured opportunities for reciprocal knowledge exchange and skill transfer across cultural and institutional boundaries. The policies and regulations developed must guarantee data protection while promoting technological advances in renewable energy. The integration

of AI technologies in the energy sector has the potential to improve efficiency, optimize grid management and generate new employment opportunities in both countries. Nonetheless, the economic impact must consider concerns about the displacement of jobs in South Africa and even Germany. Finally, this study could have implications for social equity. AI adoption should be executed with a social equity and inclusiveness approach to prevent marginalized communities from being excluded from technological advances by ensuring accessibility and usability of this AI technology for all.

Use of Artificial Intelligence Tools

AI tools (e.g., ChatGPT) were used to support literature exploration and language editing. All research decisions, analysis, interpretation, and conclusions were independently developed by the authors.

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What Are the Socio-Economic Implications of Renewable Energy Adoption in Vietnam for Investors and Residents?

Ferdinand Kohler and Shrinidhi Kamalakar

Abbreviations

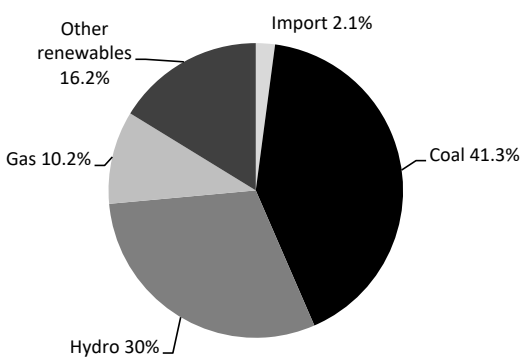
CBAM	Carbon Adjustment Mechanism
DPPA	Direct Power Purchase Agreement
EU	European Union
EVN	Vietnamese Energy Group
FDI	Foreign Direct Investment
FiT	Feed-In Tariff
GDP	Gross Domestic Product
GEFE	Green Economic Forum and Exhibition
JETP	Just Energy Transition Partnership
KWh	Kilowatt hour
MOIT	Ministry of Industry and Trade
MW	Megawatt
PDP 7 & 8	Power Development Plan 7 and 8
PDP 7 rev	Revised Power Development Plan 7
PPA	Power Purchase Agreement
PV	Photovoltaic
RE	Renewable Energy
USD	United States Dollar
VNEEP 1 & 2	Vietnamese Energy Efficiency Program
WTP	Willingness to Pay

1. Introduction

1.1 Overview of Vietnam's Energy Sector

Vietnam's energy sector is currently undergoing a rapid restructuring characterized by a shift from domestic fossil fuels towards a more complex, import-dependent model (Asian Development Bank, 2015). Vietnam is one of the fastest-growing economies with an annual GDP growth rate of 6-7%, approximately 11% per year (M. P. Nguyen et al., 2024, pp. 3-4). This high demand led to a strategic pivot in 2015, when Vietnam transitioned from being a net energy exporter to a net importer (Asian Development Bank, 2015). This change in strategy increased Vietnam's energy dependency on the fossil fuel sector. Currently, coal remains the largest source of energy in Vietnam, accounting for 46.17% of total energy generation. However, the country uses a varied mix of energy sources, including hydropower (28.3%), solar (9.16%), natural gas (9.38%), wind (4.05%), and other sources (M. P. Nguyen et al., 2024, p. 16). This distribution is shown below.

Figure 1: Share of Power Production and Purchase in Vietnam as of 2023

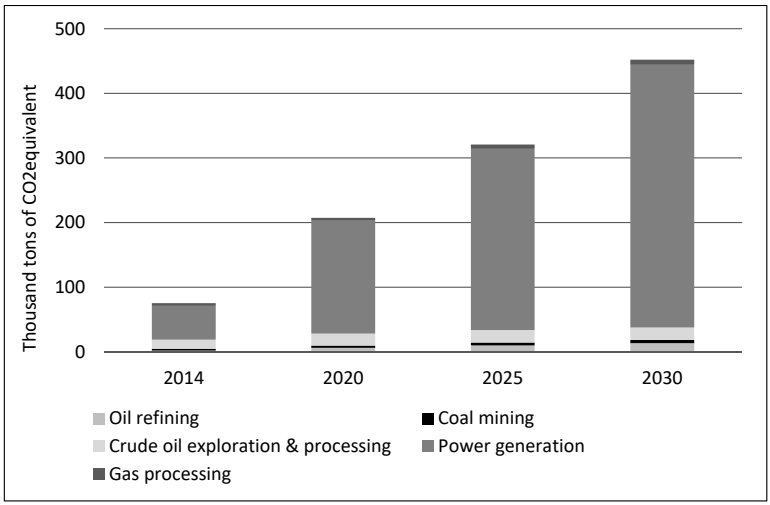


Source: Reprinted from Breakdown of power production and purchase Vietnam 2023, by type of resource., by L. Fernandez, 2025.

1.2 Vietnam's Commitment to Energy Transition

Vietnam has not remained idle in addressing climate change. As a member of the 2015 Paris Agreement, Vietnam has initiated plans to reduce its carbon footprint and expand its renewable energies. The country has even displayed promising initiatives to reach carbon zero by 2050, as outlined in an article by the Green Economy Forum & Exhibition (GEFE) in 2024 (Jaspaert, 2024, p. 6). Jaspaert (2024) also emphasizes the need for government policy reforms to attract foreign investment in the energy market, which they identify as an essential strategy to reach the projected goal of carbon neutrality. Vietnam possesses significant potential for renewable energy sources. Its proximity to the equator results in high levels of solar radiation, and extensive coastlines present opportunities for offshore wind parks due to high wind speeds (Do et al., 2021). During the period 2018-2023, Vietnam was able to scale up its wind and solar capacity from near zero to over 21,000 megawatts (MW). This success was supplemented by feed-in tariffs (FiTs) that captured billions in private investment (NewClimate Institute, 2025). However, several sources recognize that Vietnam is heavily affected by climate change. According to Urban et al., extreme weather events such as tsunamis or flooding are regular occurrences, which necessitates transition plans (Urban et al., 2018, p. 564). The actual deployment of renewable energies has run into several problems and has lagged behind expectations. The figure 2 illustrates Vietnam's commitment to growing its energy needs.

Figure 2: Projected Energy Procurement by Vietnam



Source: Reprinted from Vietnam NDC Sectoral Report Vietnam, by N. M. Bao and N. D. Cuong, 2021.

1.3 Barriers to Renewable Energy Development

Multiple interconnected reasons constrain Vietnam's renewable energy expansion. One main limiting factor of the Vietnamese renewable market development is incomplete and unspecific government policies (Bao & Cuong, 2021). Although Vietnam has laid the foundation for the development of renewable energy, the framework remains fractured and requires further development. These efforts are better understood as "green transformation", because they concern national stability, energy security, and public acceptance (Urban et al., 2018). However, over recent years, the energy market has exhibited volatility, and frameworks demonstrate inconsistencies such as the lack of comprehensive Direct Power-Purchase Agreement (DPPA) frameworks. Furthermore, the implementation and enforcement of environmental standards in Vietnamese companies have been incomplete and inadequate. Additional constraints include a dependence on foreign investment for project development and the lack of domestic investors and banks

with sufficient capital. Technical limitations such as insufficient grid capacity and technology production compound these challenges. Do et al. (2021) observe that the Vietnamese energy grid represented the biggest obstacle during the initial boom for solar deployment (Do et al., 2021). During this rapid expansion of economic activity and renewable energy adoption, disparities emerged between living standards of rural and urban areas (P. A. Nguyen et al., 2019). Due to the widening gap between the urban and rural regions, rural populations across the country initially lacked information about technological advancements and their consequences for land use.

While existing literature extensively covers Vietnam's technical limitations and policy inconsistencies, very few articles cover the way these factors translate into concrete socio-economic consequences for primary stakeholders like residents and investors. This study therefore addresses the following research question:

What are the socio-economic implications of renewable energy adoption for investors and residents in Vietnam?

The study tests two hypotheses. First, successful renewable energy utilization requires coordinated policy frameworks containing suitable financial incentives, adaptable development skill programs, modernized infrastructure, and inclusive transition mechanism to ensure sustainability and fair socioeconomic distribution. Second, Vietnam's poor framework and grid infrastructure are the main obstacles to implementation, and positive socio-economic outcomes are inhibited by these factors.

The following study will answer these questions through qualitative interviews with industry experts, investors, and academics. Further, a thorough literature review of policy documents and scientific articles will contribute to empirically grounded insights into how Vietnam's energy transition is creating outcomes for investors and residents.

2. Literature Review

2.1 Current State and Development

Vietnam's development of photovoltaic energy has been remarkable in pace and scale. It is part of a global development characterized by a rapid change of power systems. Diaconescu et al. (2024) note that the energy market in Vietnam is historically characterized by a mix of political and regulatory function under the dominance of the Vietnamese Energy Group (EVN). The boom was orchestrated through strong price signals and a decentralized approach where provincial government was able to attract foreign investment (Diaconescu et al., 2024). Moon et al. (2024) states that "under the country's economic boom, the Vietnamese government has actively driven the development of solar PV power to meet rapidly growing domestic power demands" (Moon et al., 2024, p. 2155). Starting from 2017, Vietnam reached its 2025 PV goal within 2 years. The article attributes this to feed-in tariffs issued by the government in 2017, which stipulated attractive pricing per kilowatt-hour for projects starting before April 30th, 2019. This government policy has attracted large quantities of foreign capital and investment. However, rapid development has caused several negative side effects such as grid overload in certain areas and difficulties with the integration of new power systems. The sector now faces a "curtailment risk" due to an underprepared transmission grid and aging infrastructure (Diaconescu et al., 2024). The Vietnam Electricity Group (EVN) is now under financial strain due to these tariffs. Despite increased generation costs, retail electricity prices have remained tightly regulated without corresponding increases. This oversight directly resulted in EVN losses of 1 billion USD in 2023. With rising purchase costs and escalating utility losses, the energy sector requires adjustments to existing policies to safeguard the system's long-term financial sustainability. While the conditions for a large-scale implementation of photovoltaic power are the most advantageous in the whole of South-East Asia, actual numbers have not reached that potential. Nguyen et al. observe that energy prices in Vietnam are not competitive in global markets. Thus, the government must implement additional policies to attract foreign capital (P. A. Nguyen et al., 2019, p. 59). Current efforts

are therefore shifting away from simple capacity expansion toward the refinement of the Electricity Law and the implementation of Direct Power-Purchase Agreements (DPPA) to ensure long-term market stability (Diaconescu et al., 2024).

Regarding land requirements, concerns about the destruction of agricultural land and forestry limit suitable deployment areas despite the 22,0000 square kilometers of technically suitable land identified earlier. Vietnam has also been heavily dependent on technology imports from China regarding solar power, even though this dependency has improved in recent years. Small scale solar energy plants with lower efficiency are more prevalent than large industrial-scale units, owing to administrative hurdles and sparse capital availability. Regulatory inflexibility from local and regional authorities presents another issue.

2.2 Power Development Plans 7 & 8

The Vietnamese government is trying to reduce dependency on fossil fuels and establish a sustainable long-term power strategy. This happened in collaboration with the Ministry of Industry and Trade (MOIT). It developed the revised National Power Development Plan VII (PDP7 rev) in 2016, and the plan extends to 2030 (Bundesministerium für Wirtschaft und Klimaschutz (BMWK), 2022). The previous version of the Power Development Plan 7 (also referred to as PDP7) focused on conventional power sources, especially on coal. The revised Power Development Plan 7 (PDP7 rev) displays a clear policy shift by prioritizing the development of renewable energies and the amount of electricity generated from renewable energy sources. The goal is to generate up to 7% in 2020 and above 10% in 2030 (Bundesministerium für Wirtschaft und Klimaschutz (BMWK), 2022). The table below shows the comparative analysis of power sources for PDP7 and PDP7 rev for the period 2016-2030.

Table 1: Projected Shares of Power Sources

Power Sources	2015[1]	2020		2025		2030	
	IE	PDP 7	PDP 7 rev	PDP 7	PDP 7 rev	PDP 7	PDP 7 rev
Renewable Energy	3.7%	4.5%	6.5%	…	6.9%	6%	10.7%
Coal	34.4%	46.8%	49.3%	…	55%	56.4%	53.2%
Gas Tirbine	30%	24%	16.6%	…	19.1%	14.4%	16.8%
Hydro	30.4%	19.6%	25.2%	…	17.4%	9.3%	12.4%
Import	1.5%	3.0%	2.4%	…	1.6%	3.8%	1.2%
Nuclear	…	2.1%	…	…	…	10.1%	5.7%

Source: Reprinted from Decision-428-QD-TTg PDP-7 Rev: Approval of Revised National Power Plan for the 2011-2020 Period with Vision for 2030, by Decision-428-QD-TTg, 2016.

According to the table, coal will remain the main source of energy, contributing about half of total electricity generation. Renewable energy demonstrates a positive upward trend over the 2016-2030 period.

The revised PDP7 focuses primarily on sub-targets and technologies within renewable energy production. The goal of the plan is to improve the proportion of electricity produced from renewable energies such as solar, wind, and bio energy. The strategy to achieve this is to increase the existing capacity and set out new targets in comparison to the old power development plan 7. The goal capacities of sub-targets under renewable energies are listed in table 2.

Subsequently, the Vietnamese government has approved the 8th National Power Development Plan (PDP 8) for the period from 2021 to 2030 with predictions going up to 2050. This plan outlines scenarios to increase power generation through renewable energies compared to previous plans. Other recent measures of the Vietnamese government include Vietnam Energy Efficiency Programs (VNEEP) 1 & 2, Power Planning draft (PDP 8), clearly indicating that low-carbon power is a long-term policy rather than short term program (OECD, 2021). To achieve carbon neutrality by 2050, Vietnam has partnered with the International Partners Group via the Just Energy Transition Partnership (JETP). The goal is to accelerate the transition toward low-emission systems (NewClimate Institute, 2025).

Table 2: Electricity Production Capacity of Sub-targets for Renewable Energy

		2020		2025		2030	
		Old	New	Old	New	Old	New
Wind	Total Capacity (MW)	1,000	800	…	2,000	6,200	6,000
	Electricity prod. (%)	0.7%	0.8%	…	1%	2.4%	2.1%
Hydro power	Total Capacity (MW)	17,400	21,600	…	24,600	…	27,800
	Electricity prod. (%)	…	29.5%	…	20.5%	…	15.5
Biomass	Electricity prod. (%)	0.6%	1%	…	1.2%	1.1%	2.1%
Solar	Total Capacity (MW)	…	850	…	4,000	…	12,000
	Electricity prod. (%)	…	0.5%	…	1.6%	…	3.3%

Source: Reprinted from Decision-428-QD-TTg PDP-7 Rev: Approval of Revised National Power Plan for the 2011-2020 Period with Vision for 2030, by Decision-428-QD-TTg, 2016.

2.3 Policy Gaps and Inconsistencies

Numerous studies demonstrate that effective and appropriate policy frameworks can enable an energy transition to generate a wide range of socio-economic benefits for Vietnam. These outcomes include increased energy security, and a reduction in reliance on energy imports. Furthermore, various employment opportunities are created as well as foreign investment and economic circulation (Bundesministerium für Wirtschaft und Klimaschutz (BMWK), 2022). However, Vietnam lacks a set of comprehensive laws, policies and frameworks to support emerging sectors like the renewable energy sector (Urban et al., 2018, p. 564).

Current regulations often function as vague directives rather than prescriptive rules, creating uncertainty for market participants, particularly in voluntary carbon markets and renewable deployment (Jaspaert, 2024, p. 9). Existing policies overlap, lack alignment and coordination, and pursue inconsistent targets for renewable development, hindering effective implementation (Urban et al., 2018, p. 587).

Meanwhile, innovative technologies such as carbon capture, utilization, and storage receive inadequate support, as policy enforcement and coordination remain deficient despite basic legal structures for

low-carbon transitions. The overall business framework lacks sophistication, which leads to an unstable business environment for investors and project developers. Businesses face significant administrative burdens in Vietnam, with rules and regulations varying strongly from district to district. Moon et al. recognizes that a higher level of maturity in the legal business framework must produce a more stable business environment. The weak enforcement of these policies has allowed businesses to bypass standards and leads to environmental degradation (Moon et al., 2024, p. 2162).

2.4 Grid Infrastructure and Energy Market

The existing grid infrastructure presents substantial challenges for renewable energy integration. Several researchers point out that the centralized existing centralized grid infrastructure is not well prepared for the decentralized energy production of renewable energy, especially solar energy. Additionally, relatively high transmission loss results in low efficiency of the energy grid, and the decentralized nature of renewable energy exacerbates this problem (Nong et al., 2020). Grid infrastructure development is particularly uneven, with remote northern regions exhibiting notable deficiencies. Meanwhile, 95% of solar deployment is concentrated in southern provinces, creating regional grid overload challenges, which limit further expansion. Industry reports that even major projects have faced wasting up to 12 % of generated energy due to the grid's inability to accommodate excess supply (Jaspaert, 2024).

That fact notwithstanding, Vietnam's energy market presents a compelling opportunity for international investors seeking to capitalize on the country's rapid economic expansion and ambitious energy transition goals. As one of the fastest-growing economies in Southeast Asia with an average annual growth rate of 6 to 7 percent, its energy demands are growing by 11 percent each year (Asian Development Bank, 2015). Foreign Direct Investment (FDI) not only brings substantial capital but also consolidates workforce development and domestic supply chains while bridging the gap for collaboration between domestic and international firms. Achieving high-quality FDI is a val-

uable approach to overcome internal deficiencies and move towards the goal of net zero emissions by 2050 (Jaspaert, 2024). Furthermore, renewable energies are increasingly cost-competitive with fossil fuels, aligning with global trends. Wind power presents the cheapest option at 0.05 USD per kWh, substantially cheaper than 0.096 USD per kWh with coal sourced energy (M. P. Nguyen et al., 2024, p. 30). While Vietnam's natural conditions and economic development are promising excellent returns on investment, there are several pitfalls that need to be avoided. Recent policy changes and inconsistency present major challenges to investors. Further, feed-in tariffs have proven to be unreliable due to short eligibility windows and frequent modifications that trigger unsustainable installation rushed rather than steady, long-term development (Do et al., 2021). Due to market instability and regulatory inconsistency, international investors increasingly hesitate to commit capital to large scale energy projects in Vietnam. Vietnamese energy projects are hampered through unpredictable legal development and characterized by long amortization periods. Consequently, international financing options have become limited.

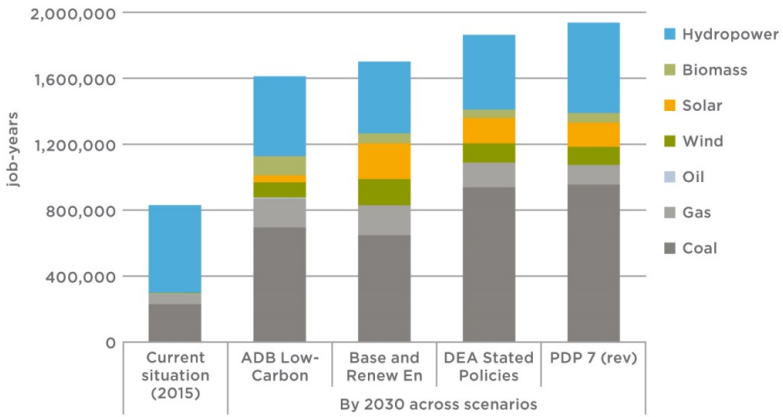
2.5 Employment and Workforce Implications

Substantial evidence demonstrates that energy transition not only creates a more sustainable environment but also promotes economic growth. Research by the International Renewable Energy Agency (IRENA, 2024) suggests that approximately 16.2 million jobs were created in renewable energy (RE) globally, with Southeast Asia contributing a large percentage of these jobs (International Renewable Energy Agency, 2024). The article predicts that this job boom could increase worldwide energy employment to more than 38 million jobs by 2030. Photovoltaic and wind power remain the most dominant producers within the RE sector, accounting for a large number of jobs (World Economic Forum, 2023). Considering Vietnam's aim of reducing emissions and moving towards renewable energy, the country will reach peak emissions by 2035 and attain net-zero emissions by 2050 (NewClimate Institute, 2025). Moreover, as the share of renewable energy in power generation continues to grow, employment will rise accordingly. The

sectors within renewable energies such as solar and wind are labor intensive and have generated a wide range of employment particularly within installation, maintenance, and manufacturing (Okedele et al., 2024). Numerous studies measure the employment impact by utilizing input-output and labor force projection models. In a joint study about the socio-economic benefits of a green transition, Okunlola et al. (2024) find that replacing coal power plants with solar or wind sources would double the number of jobs on average (Okunlola et.al, 2019). While these findings highlight a "jobs boom" potential in the renewables sector, this transition may lead to short-term unemployment within the fossil fuel sector. The authors caution that strategic policy frameworks are required to mitigate short-term unemployment risks in the fossil fuel industries and to bridge the gap in local expertise (Okunlola et.al, 2019). Nevertheless, insights from the interviews support the literature's conclusions that the transition generates employment in renewables and related services. Both literature and interview data acknowledge that job losses in coal and other fossil fuel sectors are likely to happen.

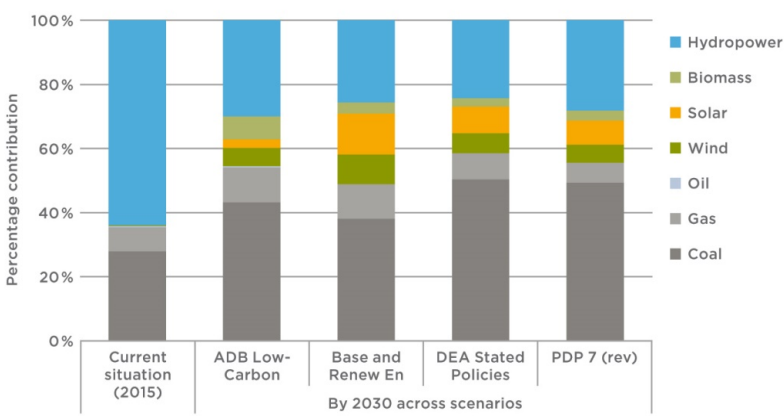
On the positive side, more jobs will be generated within construction, installation, and maintenance value chains (NewClimate Institute, 2025). When taking the input-output analysis conducted by CO-BENEFITS into consideration, the renewable energy sector, constituting solar PV, wind, and biomass energies, can produce up to 315,000 jobs every year by adhering to the PDP7 (rev) decisions until the year 2030. However, coal and hydropower are already established energy sectors in Vietnam: they are estimated to contribute approximately 60% of employment across the scenarios by 2030 (Okunlola et.al, 2019).

Figure 3:Job Generation by Different Technologies till 2030 under the PDP7 Scenario (I/O Analysis)



Source: Reprinted from COBENEFITS-Study-Vietnam-Employment, by A. Okunlola et al., 2019.

Figure 4:Percentage Contribution to Employment by Different Sectors till 2030 under PDP7 Scenario



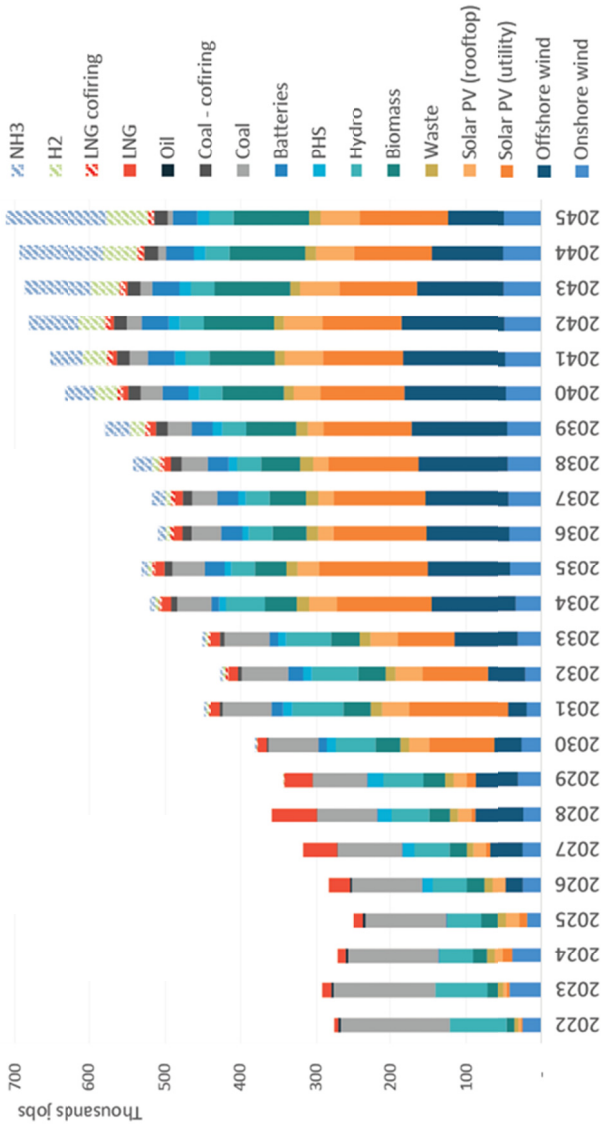
Source: Reprinted from COBENEFITS-Study-Vietnam-Employment, by A. Okunlola et al., 2019

Progressively, with increased electricity demand and a greater share of renewable energy under PDP8, power generation through renewable energies will increase compared to the previous plan for PDP7. Thus, the number of jobs generated in the energy sector will rise. To reach carbon neutrality by 2050, Vietnam has partnered with International Partners Group via Just Energy Transition Partnership (JETP) to boost the transition towards low-emission systems (NewClimate Institute, 2025). According to model estimates, direct employment would increase from around 300,000 FTEs currently to around 500,000 FTEs by 2035. Under the JETP scenario, the labor sector would experience an additional increase of 60,000 jobs, accounting for 560,000 jobs in total. Model predictions indicate that jobs generated in solar and wind would together constitute more than half of the employment in the energy sector in the 2040s. When considering the amount of indirect and induced employment, the authors predict the creation of 100 million jobs by 2030, which can be seen in figure 5 (Bundesministerium für Wirtschaft und Klimaschutz (BMWK), 2022).

2.6 Skill Requirements and Gaps

With the evolving landscape of renewable energy, there is an increase in skilled labor demand. In the power job sector, including construction, installation, and maintenance, there is a high concentration of employment in skilled labor groups. Comparing all energy sources in Vietnam, approximately 25% of employment calls for skilled and highly skilled laborers. Given the currently low installed capacities of solar and wind energy, demand for specialized skills remains low. To meet the current requirements, project managers are hiring local engineers who are not specifically trained in renewable technologies. This is resulting in a gap in the technical knowledge and skills mandatory for plant construction and grid connection (Okunlola et al., 2019). Gradually, the dependency on highly skilled foreign labor could lessen, particularly within the solar and wind sectors. For this, training and practical knowledge in universities must align with the expectations set by the renewable sector. However, compared to the percentage of workers in the apparel manufacturing, food processing factories, and

Figure 5:Employment Effect by Technology under the PDP8 Scenario



Source: Reprinted from Projection of labour force for Vietnam's energy transition, by NewClimate Institute, 2025.

electronic industries, the labor market within the renewable sector remains in its initial stages. This underlines the requirement for workforce development in that sector. Studies suggest that jobs such as renewable energy engineers and consultants demand average salaries of around 17.6 million VND and around 25 million VND per month (NewClimate Institute, 2025).

2.7 Public Awareness of Renewable Energy

One root cause of lacking implementation is insufficient understanding of circular economic principles like sustainability concepts among stakeholders, according to the authors. This knowledge gap comes with inadequate infrastructure and a lack of standardized approaches for implementation. In the paper of Yu et al. the authors shed light on the willingness to pay by Vietnamese citizens (Yu et al., 2022, pp. 2-3). They note that Vietnam's citizens are willing to pay up to $9 more for their electricity per month, higher than all other countries in Southeast Asia except Japan. On the other hand, the authors note that the awareness of renewable energy correlates with income levels. They are suggesting that Vietnam will have the potential for a higher willingness to pay as income rises.

> "For instance, one concern for respondents was air quality. As income grows, individuals are increasingly aware of the adverse effects of environmental quality issues on health benefits. (…) As one of the determinants of consumers' willingness, concerns about air quality contribute to the increase of renewable energy WTP in Vietnam" (Yu et al., 2022, p. 7).

Certain technologies like carbon trading or electric vehicle standards have not been recognized by policymakers, which limits the effectiveness of Vietnam's strategy towards reducing waste. This is part of a systemic problem. While there are basic regulations in place for sustainable development, lawmakers do not consider advanced methods like carbon trading and carbon capture (P. A. Nguyen et al., 2019, pp. 13-14).

3. Methodology

This study employs a qualitative research design aimed at exploring the socio-economic implications of the green transition in Vietnam, particularly among certain stakeholders. Given the multi-faceted nature of energy transition, this study uses data triangulation to enhance validity and reliability by integrating multiple data sources and perspectives. The study uses two complementary methods to address the research question.

3.1 Interviews

First, the research team used a semi-structured, in-depth interview method, in which interviews are conducted by researchers with experts and consultants to capture the life experiences of stakeholders and experts. Secondly, secondary literature analysis contextualizes primary findings within knowledge and policy frameworks. This mixed-method qualitative approach enables the examination of both micro-level experiences in interviews and macro-level dynamics in literature. The study's primary data was collected through semi-structured, in-depth interviews with experts and stakeholders involved in Vietnam's renewable energy transition. Interview participants included energy sector consultants, investors in renewable energy projects, manufacturing plant managers, and university professors with a focus on sustainable management and energy policy. The aim of the selection of a diverse sample was to capture several perspectives on how renewable energy adoption creates socio-economic consequences.

3.2 Sampling Methods and Analysis

To access potential participants, the research team initially relied on recommendations and introductions from supervising professors and other lecturers. Subsequently, the research team used the Snowball Sampling method to reach individuals with more in-depth knowledge through the initial participants' professional networks. The research team prepared an interview guideline to ensure consistency across

interviews while maintaining flexibility to alter the interview if themes emerged. The guideline contains open-ended questions about key topics. They include policy volatility and regulatory frameworks, grid infrastructure constraints and technical barriers, investment decision-making and financing access, employment and workforce factors, and community awareness about green transition. These interviews were face-to-face meetings or conducted online via Zoom/Google Meet depending on participant availability and geographic location. The table below illustrates the list of interview partners as well as the experience they brought to the research.

All interviews were audio-recorded with the explicit informed consent of the participants for transcript and analysis purposes. In total, the research team conducted five semi-structured interviews between July 2025 and November 2025. Two of them were face-to-face interviews, and three were online sessions. The mean duration of the interviews was between 30 and 40 minutes.

Table 3: Overview of Interviews Conducted

Region	Expert	Expertise
Vietnam	Interview 1: Investor in Renewable Energies	Investors in Renewable Energy Companies across the globe
Vietnam	Interview 2: Plant Manager (Manufacturing Industry)	Managing the production and manufacturing of products end-to-end
Vietnam	Interview 3: Investor in renewable energy	Investor in equity, infrastructure, and renewable energy
Germany	Interview 4: Professor of Sustainable Management	Experience in collaborating with companies, particularly in sustainable practices
Vietnam	Interview 5: Expert on energy grids	Experience in Thailand and Vietnam, advisory experience in Thailand and Vietnam; government consultation

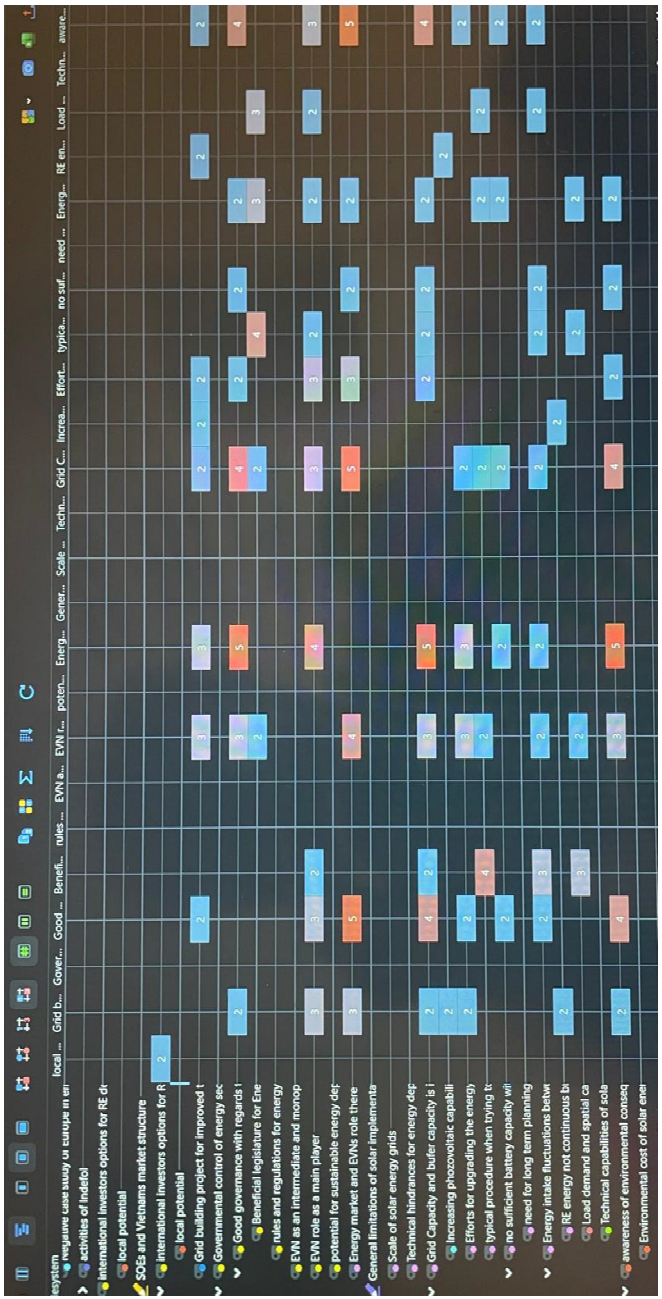
Source: Authors' Own.

3.3 Literature Analysis

The systematic analysis of secondary literature supplemented the primary data of the interviews. This literature review included multiple document types such as government and industry documents, reports from the General Statistics Office, EVN, and Ministry of Industry and Trade policy reports. Furthermore, the literature review relied on academic literature such as academic articles and book excerpts. Lastly, the team made use of market documents like reports from energy companies and industry associations. The integration of these diverse sources enables triangulation between policy intentions and actual outcomes and lived experiences. Following data collection, the researchers transcribed all audio-recorded interviews exactly. Then the team transferred the validated transcripts into MAXQDA software to facilitate systematic analysis. After completion of data collection, the team used Braun & Clarke's Thematic Analysis, which researchers commonly use in qualitative research. The steps of this procedure include familiarizing yourself with your data, creating initial codes that inform the content of the texts, and rereading the transcripts to decide what information to add. The next step is to combine codes with supporting data: group the same tagged parts, generate themes within the code system, evaluate, and revise. In the last step, a combination of the codes is used to write a narrative derived from the code system.

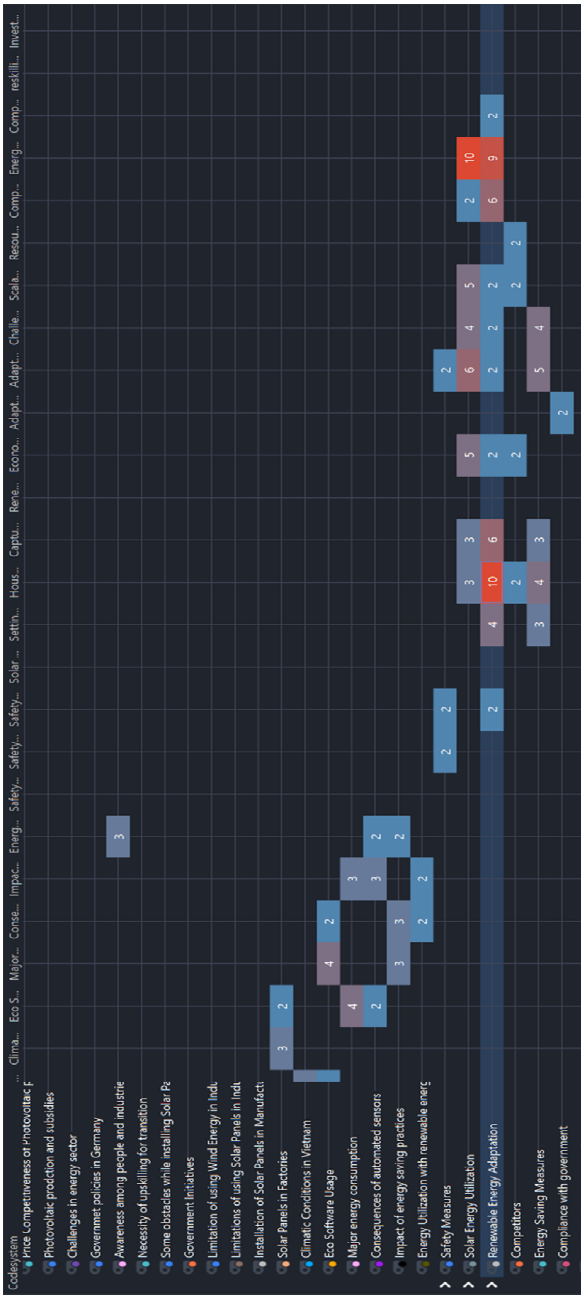
The team identified correlations between the codes through the code relations browser. Subsequently, they examined the codes after appearing in relevant correlations. The researchers deemed four or more statistically significant correlations and further investigated these correlations in the interview transcripts.

Figure 6: MAXQDA Code Relations about Energy Market Conditions



Source: Authors' own.

Figure 7: MAXQDA Code Relations Browser about Renewable Energy Adoption



Source: Authors' own.

3.4 Research Hypotheses

The research team proposed two hypotheses. First, successful renewable energy utilization requires coordinated policy frameworks containing suitable financial incentives, adaptable skill development programs, modernized infrastructure, and an inclusive transition mechanism ensuring both environmental sustainability and socio-economic justice. Second, Vietnam's inadequate regulatory framework and insufficient grid infrastructure are the main obstacles to implementation and positive socio-economic outcomes for investors and residents.

These hypotheses guided the analysis by providing testable statements about the relationship between institutional capacity and transition outcomes.

3.5 Ethical Considerations

The research adhered to ethical guidelines for qualitative research with human participants. This includes informed consent by all participants in the study's interviews. They received clear information about research purposes, procedures, and data use before conducting the interview. Personal information and organizational affiliations were anonymized in transcripts and reports. All the interviewees were informed of their right to withdraw at any time without consequence. The audio recordings and transcripts were stored securely with access limited to the research team.

4. Findings

4.1 Investors

4.1.1 Policy Volatility and Market Disruption

Policy instability represents the primary source of market disruption in Vietnam's renewable energy sector. The interviews indicate that regulatory frameworks vary strongly due to policy volatility, which has effects on both investors and residents.

Policy changes were so constant that *"(they were) valid at the beginning of the year, but (...) at the end of the year (...), those policies are not valid anymore*." (Interview 5, 2025). This unpredictability forces businesses to close and causes mass layoffs. It also leads to investors' loss of confidence while simultaneously eliminating employment opportunities for residents. The resulting market instability creates substantial financial losses and reinforces Vietnam's reputation as a "*high-risk country*" by international investors and developers (Interview 5, 2025).

Workforce skill gaps are a key dimension of investor risk assessment in Vietnam's renewable energy sector. The local workforce exhibits significant deficiencies upon labor market entry, as noted by one interview partner. They need extensive training from companies to meet labor market requirements. This human capital deficit influences investors' decisions and consolidates Vietnam's classification as a "*high-risk country.*" First, investors must evaluate whether available personnel can sustain day-to-day project operations. Given that renewable energy projects have runtimes of 20 to 35 years until amortization, this is one of the key factors for investment decisions (Interview 1, 2025).

Regarding the long-term perspective, Vietnam lacks the overarching strategic framework that countries like Thailand have implemented. Nor is Vietnam investing in renewable energy, artificial intelligence, and similar education. This creates a negative feedback cycle and prevents more foreign investment (Interview 5, 2025).

4.1.2 Grid Infrastructure Constraints and Revenue Losses

A large constraint that both investors and residents face is the grid infrastructure. EVN, Vietnam's largest energy provider, needs to balance greenhouse emission reduction targets with energy security for the population. Yet weak policy commitment brings these two goals into conflict (Interview 1, 2025). Inadequate grid capacity limits and energy intake fluctuations represent one of Vietnam's main technical limitations. The main hours for energy generation fall into break hours (12 am, 1 pm, and 12 pm) when factories take lunch breaks, reducing load demand. One of the most prominent companies that sells electric-

ity must sacrifice those important yield hours. Missing buffer capacity consolidates this problem (Interview 1, 2025).

Furthermore, the absence of a comprehensive roadmap for solar energy implementation prevents investors from making 20-30-year financial projections. Those projections are essential for investors. This uncertainty follows through the value chain since factories cannot guarantee a stable and renewable energy supply. International companies like Adidas, Nike, or Microsoft are thus less likely to invest in this country, because they cannot guarantee that they will meet their decarbonization goals (Interview 1, 2025).

The analysis revealed that the Power Purchase Agreement VII contains unfavorable conditions. The structure of Thailand's energy market is like Vietnam's, with The Electricity Generating Authority of Thailand being the sole energy buyer and distributor. In Thailand, the distributor is obliged to buy energy from power plants even if the energy is neither needed nor consumed. This creates secure revenue for producers.

Vietnam, meanwhile, operates on a consumption-based model. The energy producers thus face greater risks if the Vietnamese energy grid cannot absorb their product. Under Vietnam's structure, producers receive payment only when electricity is consumed actively or accepted by the grid. They simply lose their revenue if EVN decides they currently do not need their products (Interview 1, 2025).

EVN is the central power provider in Vietnam. Therefore, it manages Vietnam's energy transition. Their range of responsibilities is far larger than that of a conventional state-owned enterprise. The company must simultaneously upgrade grid infrastructure, regulate both supply and demand sides of the energy system, and ensure national economic development (Interview 1, 2025). Alongside traditional utility management, EVN must implement strategic policy implementation. As Interview 1 stated,

> "not only that they have to regulate themselves, but they have to issue in terms of policy, a lot of documents to see how they can… strategically plan their user to use their power". (Interview 1, 2025)

One of EVN's main tasks is to upgrade the country's antiquated energy grid. However, EVN's failure to modernize the antiquated grid infrastructure creates negative governance consequences. The organization

forces renewable energy developers to adapt the size of their projects based on the grid interconnection capacity and not the actual demand or available energy (Interview 1 & Interview 5, 2025). This represents one of the most significant ways that the transition has socio-economic consequences for Vietnam.

Our sources indicate that policy volatility creates market disruption. This has effects on both investors and residents. This forces businesses to close and causes mass layoffs. Investors lose confidence, businesses fail, and residents lose their jobs. The sudden policy changes create an unstable market and cause financial losses. Vietnam is perceived as a "high-risk country" by international investors and developers regarding its government framework.

4.1.3 Good Governance, EVN's Role and Buffer Capacity

EVN is the central power provider in Vietnam. Therefore, it manages Vietnam's energy transition. Their range of responsibilities is far larger than that of a conventional state-owned enterprise. The company must simultaneously upgrade grid infrastructure, regulate both supply and demand sides of the energy system, and ensure national economic development (Interview 1, 2025). Alongside traditional utility management, EVN must implement strategic policy implementation. They not only have to regulate themselves, but they also issue regulations for developers. One of its main tasks is to upgrade the country's antiquated energy grid. It also forces renewable energy developers to adapt the size of their projects based on the grid interconnection capacity and not the actual demand or available energy (Interview 1 & Interview 5, 2025). This represents one of the most significant ways that the transition has socioeconomic consequences for Vietnam. According to Interview 1,

> "from 2021 to 2024, we do not have the option to sell back to EVN because the grid is not stable enough and EVN still do not upgrade to their facility, to their infrastructure." (Interview 1, 2025)

The government canceled the program where house owners could sell back excess energy to the grid because of missing battery storage capacities during a critical expansion period (Interview 5, 2025).

Due to market instability and framework inconsistency, international investors hesitate to invest in large-scale projects in Vietnam. This is due to the poor predictability of legal development and the long amortization period for renewable energy. Investors are therefore heavily dependent on secure investment conditions and uninhibited energy production. Since the boundary conditions for FDI are not met by Vietnam's business environment right now, international banking options have become rare. Meanwhile, local banks like Vietcombank do offer financing packages for renewable energy projects (Interview 1, 2025). The clear socio-economic consequence becomes clear. While international financing support for large-scale projects remains limited, this presents opportunities for domestic banks to benefit from the transition in terms of market share and benefits. This can potentially strengthen Vietnam's domestic banking sector while constraining the size and technology of renewable energy deployment.

Government policy commitment functions as the foundational mechanism that decides the outcome of energy implementation in Vietnam. Evidently, weak policy commitment generates a negative feedback cycle. Inadequate grid capacity limits renewable energy absorption capacity. This forces investors to accept revenue cuts from limited generation. Reduced profitability in RE projects makes foreign investment less likely. These failures further undermine government credibility, which reinforces the reluctance of international investors to invest in long-term renewable energy projects (Interview 5, 2025).

4.2 Residents

EVN's governance failures create direct barriers to residents' participation in distributed energy generation. Between 2021 and 2024, EVN could not accept power from residential solar installations due to insufficient grid stability. Thus, the government canceled programs allowing homeowners to sell excess electricity back to the grid.

Due to it being prohibitively expensive, most owners also do not have access to battery storage, so they cannot use their own home-produced energy during the night. Current arrangements require more administrative duties from house owners, signifying a barrier to this

program. This shows an interesting truth. Residents could benefit from the opportunity to sell their electricity and become more independent from the energy grid. On the other hand, the energy grid is actively slowing down energy enrollment in the population and hindering further implementation. So, while there are clear economic benefits for the residents in the green transition, the realization of those benefits is still underway.

The green transition can also be a major job contributor to the Vietnamese economy, though with uneven distributional effects. One interview partner, an investor in RE projects across Vietnam, acknowledged that the demand for workers in the renewable sector will rise (Interview 3, 2025). None of the experts questioned expect a decrease in jobs when energy sources switch from fossils to green. However, the workforce transition will be difficult. A domestic investor recognizes that workers will only transition their skills when their contracts are terminated.

> "The employees in a fossil fuel source will only change to the renewable source when their plant is shut down. Otherwise, they just keep doing the same thing. Because in the end, the plant will operate for 30 years and they have a secure PPA with EVN, so nothing changes." (Interview 3, 2025)

Particularly, within the traditional energy sectors, altering the occupations of long-term employees can be rather unrealistic as this will cause the loss of their jobs. Although the prediction for the job market looks positive, there will be a significant loss of jobs in the fossil fuel industries soon.

Interview results indicate that there is a mismatch between the market's needs and the skills applicants possess. The skills that students acquire at university are often specialized, but companies need generalists. They need to be adept as project managers, business developers, and financial analysts. This means that companies need to invest in training their new employees (Interview 1, 2025). This effectively transfers the cost of education from educational institutions to private firms.

With the expansion of the grid system and more dependable, business-friendly legal frameworks, Vietnam could open itself up to international investment. This could bring Vietnamese residents higher wages and disposable income, which they in turn invest (Interview 3,

2025). It could also improve working conditions for the average worker, since energy producers want to make themselves even more attractive to foreign investment. Foreign investment, because of the green transition, can produce tangible improvements for Vietnamese workers, leaving them with more job opportunities and more disposable income. Furthermore, international investment and competition could also create spillover effects.

4.2.1 Awareness of Residents about Renewables

The awareness of Vietnamese residents about renewable energy has increased in recent years. Before 2019, there was not simply a lack of technical knowledge; residents in rural areas did not understand what renewable technologies were. They also did not know why investors wanted their land or what consequences it would have for their communities. Meanwhile, the state did not try to create community engagement. They would try to attract investment now and explain it to the residents later (Interview 5, 2025). The renewable energy boom from 2019 to 2021 functioned as an unintended educational process. This means that people expanded their awareness once renewable energy projects were underway. They learned about those technologies through direct observation rather than formal education or government programs. Residents also learned how RE projects could benefit them in the rural areas, providing new jobs, infrastructure, and economic growth (Interview 5, 2025). The way residents actively asserted their interests and negotiated compensation represents the most meaningful change since 2019. This does not mean that they have complete freedom in this negotiation, as an interviewee mentions, but that they could alter deals if they were affected by the changes.

The interviews suggest several ways in which residents acquired this ability to negotiate. When one community successfully negotiates compensation or favorable terms, neighboring communities copy these best practices. On the other hand, they also learned about the negative consequences that green energy facilities have on local environments. In this regard, an interviewee remarks, solar *"(was) not pure green" (*Interview 5, 2025*)*. Lastly, they learned about their bargaining power

when in negotiations. The high value of rural land that is suitable for RE plants gives them bargaining power and makes them an important stakeholder.

5. Discussion

The following chapter will discuss the findings in relation to the research question: "What are the socio-economic implications of renewable energy adoption in Vietnam's industries?" The discussion will cover empirical findings using the existing literature, and it will link them to theoretical frameworks.

5.1 Investor Risk and Policy Volatility

From the investment perspective, Vietnam's clean energy framework generates new opportunities for investments in manufacturing and renewable energy projects but simultaneously creates significant constraints. Despite implementing various measures to support clean and green energy, the limited competitiveness of local enterprises and the lack of technological infrastructure within the renewable energy sector reinforce the importance of prioritizing high-quality foreign investment. While the literature emphasizes FDI's theoretical benefits, interview evidence on workforce development and supply chains suggests that these benefits remain unrealized in Vietnam's renewable energy sector. Participants indicated that international financing options have "become very limited" due to regulatory inconsistency. While Vietnam was initially of great interest for foreign investment, policy instability has decreased foreign investment interest significantly. This leaves domestic banking institutions to accept the risk of investing in large-scale energy projects, which proves difficult because of insufficient capital being available.

The absence of power purchase agreement (PPA) frameworks or investment safeguard measures has challenged investors, forcing them to absorb full financial risk while reducing return on investment (Hang et.al, 2025). Moreover, insights from the interviews also suggest that policy fluctuations and inconsistent implementation practices are cru-

cial barriers to Vietnam's renewable energy transition, particularly from the lens of investors in large-scale projects. Recurrent changes to feed-in tariffs, modifications to eligibility criteria, and halting of rooftop solar buy-back schemes are considered "stop-and-go" policies by investors. These policies result in project terminations and intensify Vietnam's recognition as a high-risk destination for investments. The research findings complicate the BMWK's (2022) assertion that effective policy frameworks generate socio-economic benefits, including energy security and investment growth. While Vietnam has implemented numerous frameworks, interview participants did not describe said benefits because of failures in implementation. Business closures, mass layoffs, and investor withdrawal documented in this study suggest that the mere existence of formal policy is not sufficient. Consistent enforcement and stakeholder coordination are prerequisites for realizing benefits.

To fully capitalize on these advantages, it is quite necessary to align multiple policies and existing frameworks, such as energy labor policies, to the context of green transition.

Interview findings are paradoxical regarding Vietnam's policy landscape. While multiple frameworks like PDP8, VNEEP 1 and 2 signal long-term commitment, implementation is consistently described as lacking. The gap between policy intention and execution helps explain why Vietnam is characterized as "high risk" despite possessing formal green transformation strategies.

The study's findings provide essential context for understanding Vietnam's impressive 2018-2023 expansion from near zero to 21,000 MW capacity (P. Nguyen & Hauber, 2025). Interviewees directly connected this rapid growth to the feed-in tariff boom, while already characterizing growth as unsustainable and insecure. The subsequent policy reversals reveal that rapid quantitative expansion without institutional adaptation produces negative social and economic outcomes. This reframes the 2018-2023 period, not just as unlikely and misinformed success. It also illustrates the risk of deployment-focused strategies without adequate governance tools.

Interview participants connected EVN's financial strain-manifested 1 billion USD losses in 2023, which aligns with the socio-economic implications experienced by investors and residents. From the inves-

tor's perspective, EVN's inability to absorb surplus generation during midday hours translates to "sacrificed" revenue despite successful generation, as described by the Indefol Solar representative. From the resident perspective, EVN's financial constraints explain why lawmakers cancelled household solar buyback programs. This prevented a large part of the population from participating in energy trading and buyback schemes. The findings show that EVN first needs to revise its financial model to produce positive socio-economic outcomes.

From the interviewee's perspective, policy volatility does not just have a significant impact on investment volumes but also disrupts employment opportunities and income security for workers in affected projects.

5.2 Grid Infrastructure and Competitiveness

Although significant investment has been made following the fiscal crisis in 2022, gaps remain in power generation capacity and grid capacity. Production struggles to meet increasing energy consumption (OECD, 2021). Furthermore, one of the critical challenges for Vietnam's renewable energy projects in long-term planning is insufficient technical expertise and inadequate coordination in transmission infrastructure. Interview participants consistently identify grid inadequacy as a binding constraint. Investors noted that the size of a project is determined by "interconnection capability" rather than demand or resource availability.

Drawing on the example of China, that country has built a robust transmission network that effectively utilizes offshore wind power and thus maintains attractiveness for foreign investors. To effectively address this issue, the Vietnamese government should invest a substantial amount into the grid infrastructure, ensuring integration and efficiency. This is especially crucial as several renewable projects are coming online soon (Hang et.al, 2025).

According to IRENA, a focus on parallel investment in carbon capture and storage (CCS) technology will reduce emissions from industrial plants. Land-use planning must support the growth of renewable energy projects while maintaining a fair balance with other land uses,

such as agriculture (IRENA, 2024) (Viet et al., 2024). In addition, interviews consistently identify grid congestion, limited capacity, and rigid PPA structures as technological and economic barriers, which have negative socio-economic consequences. For investors providing green energy to industries, curtailed midday generation and insufficient ability to export excess power to the grid create negative consequences. These include revenue losses and reduced interest in supporting and financing long-term projects. International evidence also demonstrates that weak transmission infrastructure, combined with inconsistent Power Purchase Agreements (PPA), can lower the competitiveness of renewable energy. These negative effects even apply to regions that possess strong resource potential (Kim, 2025).

5.3 Employment Effects and Skill Requirements

Substantial evidence suggests that energy transition not only creates more sustainable environments but also promotes economic growth. Research by the International Renewable Energy Agency (2024) suggests that approximately 16.2 million jobs were created in renewable energy globally, with Southeast Asia contributing a large percentage of these jobs (IRENA, 2024). The article predicts that this jobs boom could increase worldwide energy employment to more than 38 million by 2030. Solar PV and wind power remain the most dominant producers within the RE sector, accounting for a large proportion of the jobs (World Economic Forum, 2023).

However, this transition may lead to short-term unemployment within the fossil fuel sector. Fossil fuels still have a significant amount of energy market share and are therefore responsible for many jobs. Insights from the interviews support the literature's conclusion that the transition generates employment in renewables and related services. Both literature and interview data acknowledge that a scarcity of jobs within the fossil fuel sectors is likely to come soon.

5.4 Awareness Among Residents

The findings illuminate how Vietnam's rural-urban development disparity shaped the social strategies of rural residents in unexpected ways. Interview five revealed that rural residents' initial lack of awareness about "what solar and wind technologies were" positioned them as passive participants in the green transition process. However, this knowledge gap transformed into a learning opportunity: The 2019-2021 renewable boom functioned as an unintended practical learning opportunity for residents. Here, they developed awareness through observation rather than organized government programs. The irony is that Vietnam's failures to implement proactive risk communication inadvertently empowered communities by forcing them to learn through engagement rather than plain information and education. This suggests that there are alternative pathways to community participation alongside structured consultation, although with increased social costs.

Advanced projects focusing on green energy transition have created awareness among residents, however. Interview evidence confirms that the renewable energy boom between 2019 and 2021 functioned as an educational period for residents as they expanded their knowledge and awareness about recent technologies through observing projects directly. Communities have also realized that renewable energy projects can bring positive results to rural areas by generating new employment opportunities, infrastructure development, and overall rural development.

6. Conclusion

This study shows that Vietnam's renewable energy transition has several complex socio-economic consequences for investors and residents. The most critical areas in Vietnam's RE development are policy commitment, modernization of the grid infrastructure, and workforce enhancement. These topics are crucial for a smooth and continuous process. However, the study finds that there are significant deficits in each of those areas. The consequences are reduced investment returns by domestic and international investors, limited household participation with rooftop solar systems, and insecure employment conditions

in the broader labor market. Regarding the two research hypotheses, the article confirms both. First, successful renewable energy utilization does require multiple conditions on multiple scales. This includes coordinated policy frameworks oriented towards long-term usage. Models like the power purchase agreement VII and the direct power purchase agreement introduced in 2024 ensure that large companies can purchase energy directly from the producer, bypassing EVN. On the other hand, Vietnam's power purchase agreement creates risk for energy producers because of its consumption-based model. Here, producers face the risk of not receiving revenue when the grid cannot absorb their energy. Rapid policy changes have caused business closures, mass layoffs, and the loss of international capital. This missing capital has major consequences on the energy market, given that energy plants require large initial investments and have runtimes of up to 30 years to become profitable investments. While the 2017 feed-in tariff successfully mobilized resources for rapid solar deployment, the lack of long-term planning and policy inconsistencies has stopped that boom and slowed down development significantly.

Another critical aspect is the insufficient grid infrastructure with missing battery storage capacities and large amounts of energy lost in transition. Private households could not participate in the energy grid as recently as 2024 due to the lack of grid modernization. The inadequate network is also the reason why renewable energy producers need to limit energy production and sacrifice revenue during peak productivity hours in the afternoon, since there is no buffer capacity built into the system, and demand is not high enough to use all the electricity. The limited absorption capability and absence of battery storage systems simultaneously prevent investors from gaining returns and restrict residents from participating in energy trading.

Additionally, Vietnam needs to invest in adaptable skill development programs for its workforce. Our research finds that there is a significant gap between university-provided skills and market requirements, which places the burden for this education on companies' shoulders. This limits companies' abilities to hire new employees and create new jobs fast. This notwithstanding, other literature has shown that models under the national Power Development Plan 7 predict that renewable energy sectors like solar and wind could generate up to

315,000 jobs by 2030. Vietnam's Power Development Plan 8 even predicts that by 2040, about half of the power sector jobs will be in the renewables sector. These positive projections warrant skepticism, though. Around 100,000 coal-dependent workers will lose their jobs, and transitional training as well as hiring chances for long-term employees remain an unrealistic option.

Despite institutional failures, the transition has created important bargaining power for rural residents as stakeholders in the energy transition. While small communities in the countryside had almost no awareness about renewable energy before 2019, their position changed rapidly with the later expansion of renewable alternative energy sources. This learning process happened independently of government programs. Residents observed the impact of energy plants in neighboring communities and recognized the benefits and risks of such a transformation. They also learned negotiation strategies by using successful agreements as guidelines. Residents are increasingly aware of land use and the natural damage that those projects can create and use their valuable land to exert pressure on developers. This is because investors require land and cooperation from them to make their projects profitable and possible at all.

6.1 Implications for Theory and Practice

These findings are an important contribution to research on green transition in the Southeast Asian region. They show that an organized transition not only needs policy ambition but also the institutions to implement the changes properly. Vietnam's experience illustrates how policy volatility and infrastructure underinvestment can disadvantage both investors and residents. For the Vietnamese policymakers, the research suggests certain steps. First, the government must establish a 10- to 20-year policy roadmap like Thailand's, which makes investor planning possible. The other necessary step is rapidly modernizing grid infrastructure, focusing on battery energy storage systems and grid capacity expansion. Furthermore, reforms of the power purchase agreement must reduce the pressure on energy producers and share risk between the state and producers. Lastly, the energy market must

cooperate with universities to redesign curricula to foster multidisciplinary competencies instead of just producing specialists.

6.2 Limitations and Future Research

Although this research provides valuable insights into the socio-economic implications of renewable energy adoption within Vietnam's industries, various methodological and substantive limitations must be acknowledged.

The research is based on a limited number of semi-structured interviews with different stakeholder groups. This includes investors, plant managers, and consultants, who supplemented the research with the analysis of residents' subjective experiences. Due to difficulties reaching out to experts, the number of interviews is very limited. Thus, the study could not achieve representativeness across all stakeholder groups. Although this qualitative approach is suitable for examining complex phenomena, the study cannot be representative of the broader population of Vietnam. Despite receiving key insights from certain stakeholders, a more comprehensive understanding could have been achieved through the inclusion of additional stakeholders such as community members, suppliers, and governing bodies. These steps would have enlarged the scope of the study. While investors' and residents' perspectives are well-represented within the data, EVN's internal decision-making processes are not represented in the interview data. This limits insights into the institutional mechanisms that created the documented outcomes.

The study focuses on Vietnam's turbulent renewable energy timeline from 2019 to 2025, which was characterized by rapid and volatile expansion. Whether current patterns will persist must be investigated by researchers and will require further longitudinal studies. Another limitation is that the research concentrates primarily on solar energy; other renewable energy forms were not included in the study. Therefore, findings are not transferable to other renewable technologies such as hydropower or wind power, which face different technical and environmental challenges.

The research faced challenges regarding the availability of practical data for accessing exact financial figures while analyzing economic implications within industries. The research team, therefore, faced difficulties in demonstrating the full economic impact of the green energy transition on aspects such as household energy costs and investment returns.

Further, confirmation of bias and language barriers presents risks to data interpretation. Additionally, the snowball sampling method could create echo chambers where the participants share remarkably similar information with their acquaintances. These methodological constraints make generalizing findings across Vietnam's diverse renewable energy sector difficult, given the unequal distribution of solar panels across the country. Despite these limitations, the findings expand the scope of discussion on Vietnam's energy transition while opening new avenues for future research. The qualitative depth achieved through expert interviews provides a nuanced understanding of how policy volatility, infrastructure deficits, and workforce gaps translate into live experiences for the population.

Longitudinal studies tracking fossil fuel workers' actual transition pathways over the next 10 to 20 years could prove or disprove predictions of net employment growth. Comparative studies across ASEAN countries could further identify best practices in government arrangements, potentially moving beyond even Thailand's model to examine Indonesia's geothermal development or Malaysia's decarbonization efforts. Small-scale ethnographic research on community-investor relations would display strategies through which rural residents bargain with investors and illustrate local differences across regions.

Use of Artificial Intelligence Tools

AI tools were used to provide drafting support and language editing during the preparation of the manuscript. All research design, analysis, interpretation, and conclusions were independently developed by the authors.

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Section II

Business, Supply Chains, and Corporate Sustainability

The Influence of National Culture on Corporate Social Responsibility: Insights from South Africa and Germany

Adivhaho Mudanalwo and Gian Luca Lunau

1. Introduction

The 20th century stands out in history not only for its remarkable technological advances and improvements in living standards but also for its unprecedented increase in the depletion of natural resources and a significant rise in global environmental sustainability challenges (Bergquist, 2017). Achieving sustainable futures has become the most defining challenge of our time. The concept of sustainability has evolved significantly over centuries, with its roots tracing back to ancient civilizations and forestry practices (von Carlowitz, 1713). The modern understanding of sustainability as we know it today began to take shape in the latter half of the 20th century (Frederick, 2006). A defining moment in the evolution of sustainability came in 1987 with the publication of the Brundtland Report, titled Our Common Future (UN Brundtland Commission, 1987). This report introduced the now-famous definition of sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." (p. 27). It expanded the concept of sustainability beyond just environmental concerns to include social and economic aspects.

Much like the concept of sustainability, the role of businesses in society and their contribution to sustainable development have evolved

significantly over time. As more and more countries joined the global industrial capitalist system, the role of business became increasingly influential at all levels of society, with multinational corporations often cited as key drivers behind the emergence of global sustainability challenges (Bergquist, 2017). In the early stages of industrialization, businesses primarily focused on economic growth and profit maximization, often at the expense of environmental and social considerations. Milton Friedman's (1970) influential New York Times article about the social responsibility of business, underscored this concept present since the 1920s, which was echoed by business thinkers throughout the mid-20th century: that a business's primary responsibility lays in serving its shareholders, while social responsibilities were seen as the domain of individuals or the government. However, since the mid-20th century, the role of business in society has shifted, placing greater emphasis on its responsibility to contribute positively to the broader community (Lee, 2008). Businesses were increasingly, and continue to be, expected to take on expanded responsibilities that align with societal and environmental well-being. Consequently, corporations have evolved into influential social and political actors (Matten, 2009; Scherer & Palazzo, 2009; Scherer & Palazzo, 2011; Rasche, 2015). In this context, the concept of Corporate Social Responsibility (CSR) emerged, emphasizing the obligations that companies have to align their activities with societal values and to act in the broader interests of society. The shift of CSR from being seen as an unimportant or questionable concept to a vital element in accomplishing organizational goals has been acknowledged. Today, CSR has evolved into a fundamental component of corporate strategy for businesses worldwide (Hamidu et al., 2015).

Numerous studies show that CSR takes diverse forms and is highly context-dependent (Moon, 2014; Örtenblad, 2016; Athanasopoulou & Selsky, 2015; Preuss, 2023; Leyuan, 2024). Context refers to a set of assumptions about a particular setting, its meaning and quality. In the realm of CSR, context generally refers to the complex and dynamic environment in which organizations operate, shaping how CSR is understood, conceptualized, and put into practice. This encompasses the institutional and regulatory frameworks, economic conditions, social and demographic factors. Above all, however, culture emerges as

a key factor in determining how CSR is understood and enacted (Ringov & Zollo, 2007; Crane et al., 2008; Kang et al., 2016; Tilt, 2016; Halkos & Skouloudis, 2017; Ling, 2019; Koprowski et al., 2021; Hsiao et al., 2024). The relationship between, and the influence of culture on, CSR makes an intriguing area of research. In this chapter, we therefore first explore the broader context of CSR and then narrow our focus to examine the cultural influences on CSR in the cases of South Africa, representing the Global South, and Germany, representing the Global North. The first section provides an overview of CSR and introduces theories and models of culture. The second section outlines the research design and methodology, explaining how the chosen methods provided insights into the intersection of culture and CSR. The final section presents the findings, discusses them, and reflects on their limitations.

2. Conceptual Background

To create a conceptual basis, in the following we first examine the development and historical background of CSR as well as the most important theories and models of culture. This aims to provide a framework for understanding their overlap in the specific contexts of South Africa and Germany.

2.1 The Evolution of Corporate Social Responsibility

CSR can be challenging to define, as it functions as a concept or a collection of societal expectations and as a set of business practices (Moon, 2014). The concept of CSR dates back centuries and is deeply intertwined with the evolution of economic systems, the historical progression of industrialization, globalization, corporate development, business practices, and shifting societal values over time (Carroll, 2008). Initially, CSR emerged in the business sector and gained prominence as a framework and a management concept, integrating varying levels of responsibility within liberalized economic markets particularly in the United States of America (USA). Some early examples of corporate responsibility in the late 19th century include initiatives

from industrialists like William Hesketh Lever, Andrew Carnegie and John D. Rockefeller who initiated philanthropic activities like providing housing and leisure facilities for workers (Knight, 2024). This highlights that responsible business practices were present long before Howard Bowen's formal conceptualization of CSR in 1953, which is widely regarded as the official inception of the concept. In his book *Social Responsibilities of the Businessman*, he defined CSR as "the obligations of businessmen to pursue those policies, to make those decisions, or to follow those lines of action which are desirable in terms of the objectives and values of our society" (p. 6).

CSR has undergone numerous twists and turns since Bowen's publication. In the 1960s and mid-1970s, it emerged as a response to the negative externalities of unchecked corporate practices, addressing both environmental and societal concerns and went along with the increase in government regulation. However, it wasn't until the 1970s that CSR truly gained momentum. In 1971, the US Committee for Economic Development introduced the concept of the *social contract* between businesses and society. The social contract proposed that companies exist and operate with public consent, and as such, they have an obligation to contribute to societal needs. It called for a broader, more humane view of businesses' role and function in society. In the 1970s, CSR shifted more and more from philanthropy to implementing concrete programs that addressed economic, social, and environmental concerns. During this decade, formal CSR codes were developed, and regulations focusing on corporate behavior increased (Frederick, 2006).

By the 1980s, the precepts of CSR had firmly established themselves and were here to stay. In that time, CSR was significantly enhanced by scholarly contributions that enriched its managerial implications and facilitated its institutionalization. The 1990s were the crucial decade of the development of CSR, with international agreements like Agenda 21 and the Kyoto Protocol promoting multinational corporations to broaden their CSR initiatives beyond local concerns. During this period, the enforcing process of globalization made companies face diverse regulatory environments and increased reputational risks. Many companies realized that applying CSR could help balance the challenges and opportunities of globalization, resulting in an even stronger institutionalization of CSR practices. The establishment of

the Business for Social Responsibility (BSR) association in 1992 by members of the Social Venture Network in 1992 to serve as the voice of progressive businesses in policy formation in Washington, is proof of this alteration, promoting positive social change among corporations. As the 2000s approached, CSR began to be considered a strategic necessity, with scholars advocating for the comprehensive integration of CSR into corporate strategies. The introduction of the United Nations Global Compact and the Millennium Development Goals have further positioned CSR as a key component of corporate governance, emphasizing broader social responsibility (Latapí Agudelo et al., 2019).

Archie B. Carroll's (1991) pyramid of responsibility provides a clear summary of CSR as it was understood at the time. This serves as the basis for our understanding today. Carroll identifies four levels of responsibility, each building on the previous one. The foundation is economic responsibility, ensuring a company's profitability and financial viability, which supports the other levels. The second level is legal responsibility, which requires compliance with relevant laws, followed by ethical responsibility, based on moral principles. At the top of the pyramid is philanthropic responsibility, the highest level of corporate engagement with society beyond a business's basic economic, legal, and ethical obligations. While Carroll's framework offers clearly defined and achievable responsibilities, it also leaves businesses considerable discretion, highlighting the importance of a more comprehensive approach to CSR.

In the narrower definition of CSR, social responsibility is considered fulfilled if the CSR initiative is, first, closely aligned with the company's core business, second, voluntary in nature, and third, typically aimed at promoting the sustainability of resources, often implicitly. The concept of the triple bottom line (Elkington, 1999) is commonly used to categorize CSR commitment, highlighting the three key pillars: economic, environmental, and social responsibility (Raupp et al., 2011).

Currently there is no universally accepted definition of CSR, but there is consensus in all the definitions, with the most frequently quoted definition of corporate social responsibility being the one suggested by the International Standard ISO 26000 – Guidance on Social Responsibility. According to this standard, CSR is the responsibility of an organization for the impact of its decisions and actions on society and

the environment through transparent and ethical behavior in key areas such as: organizational governance, human rights, labor practices, the environment, fair operating practices, consumer issues, social commitment and local community development (International Organization for Standardization, 2010).

2.2 The Interplay of Culture and CSR

Culture is a notoriously difficult term to define. It is a complex and multi-faceted concept and term that has been used, defined, and studied across various academic disciplines. Spencer-Oatey (2012) identified three ways in which the term is used. First, as illustrated in Matthew Arnold's *Culture and Anarchy* (1869), culture was understood as specific intellectual or artistic pursuits or creations. Arnold framed culture as the study of perfection, encompassing both intellectual rigor and aesthetic beauty, which together elevate individuals and society beyond self-interest and chaos.

Second, the classical definition of culture proposed by 19th-century anthropologist Edward Burnett Tylor (1871) characterizes it as a "complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society" (p. 1). He presents culture as a universal attribute inherent in all individuals across social groups, yet conceptualizing it within an evolutionary framework, suggesting that all human cultures progress through distinct stages of development. Culture is a shared human trait in all societies, acquired through social interaction rather than biology. It comprises interconnected elements like customs, laws, and norms, which influence and adapt to one another, shaping collective identity and evolving with societal changes. Tylor's (1871) theory proposed a unilineal evolutionary model, categorizing societies into three stages. "Savagery" referred to hunter-gatherer communities with basic tools, "Barbarism" to agricultural societies with early political systems, and "Civilization" to industrialized societies with advanced institutions, exemplified by Victorian Europe. His ideas reflect the intellectual tensions of the 19th century, blending progressive humanism with Eurocentric assumptions.

The third usage of culture developed in the twentieth-century work of Franz Boas (1911), drawing inspiration from the German concept of *Kultur*, which emphasizes local and personal behaviors and traditions. Boas argued that cultures do not follow a linear development trajectory; instead, they evolve in diverse directions shaped by unique historical events. He redefined culture as a dynamic, context-specific system shaped by unique historical trajectories rather than universal developmental stages. Boas emphasized that cultures are historically contingent, shaped by ecological conditions, migrations, environmental changes, and intercultural interactions. He viewed culture as holistic, integrating knowledge, beliefs, customs, and art into a unified system. Rejecting Eurocentric hierarchies, Boas laid the foundation for cultural relativism, arguing that cultural practices must be understood within their own context rather than judged by external standards.

A more contemporary definition of culture is offered by the United Nations Educational, Scientific and Cultural Organization (UNESCO), which describes it as the "set of distinctive spiritual, material, intellectual and emotional features of society or a social group, that encompasses, not only art and literature, but lifestyles, ways of living together, value systems, traditions, and beliefs" (UNESCO, 2001).

The relationship between culture and society and social practices is complex and bidirectional, with culture shaping and being shaped by society and its practices. Culture and society exist in a feedback loop: culture provides the "script" for social practices, while societal structures and interactions continually rewrite that script. This dynamic is explored within the interdisciplinary field of the sociology of culture, which examines how culture shapes, and is shaped by social structures and interactions (Daipha, 2001).

2.3 Hofstede's Dimensions of Culture

For this work, we find Geert Hofstede's interpretation and model of culture to be fitting, and we will introduce it accordingly. Geert Hofstede's theory of national culture emerged from his quest to systematically analyze how societal values shape human behavior in organizational and social contexts, as well as how societies address fundamen-

tal challenges in structuring social life. Hofstede (1980) succinctly defines culture as "the collective programming of the mind that distinguishes the members of one group or category of people from others." (p. 1). This programming develops through shared experiences and social learning, creating predictable patterns in how groups address universal human challenges. Hofstede focused on national-level cultural patterns, arguing that shared history, socialization, and institutions create distinct value systems and behaviors across countries. National culture encompasses the values, beliefs, and objectives that shape the attitudes and behaviors of a country's or society's members (Hofstede, 2001). Although culture is inherently collective, it can be associated with different groups. Within each group, individual differences exist and can be represented as a spectrum, often visualized as a bell curve. When transitioning from one society to another, the variation between cultures can be imagined as a shift in this curve. For instance, family structures differ significantly across cultures: extended families are more prevalent in collectivist societies, whereas nuclear families are common in individualist cultures. Similarly, education systems reflect cultural priorities, such as cooperative learning in Japan versus competitive achievement in the US. Cultural values also affect how stakeholders define the importance placed on long-term versus short-term outcomes, ethical priorities, or public opinion about business responsibility (Hofstede, 1980, 1991, 2001; Hofstede et al., 2002, 2010).

Following this argument, culture also shapes the role of businesses within society and, consequently, influences their approach to CSR. The connection between culture and CSR is rooted in how culture shapes shared social behaviors, social norms, institutions, beliefs, knowledge, and customs, and with it stakeholder expectations, regulatory environments, and consequently corporate priorities (Lowes, 2022). Culture shapes the accepted principles and perceptions of socially responsible activities, and businesses tailor their CSR strategies and approaches to align with local culture. CSR is not a static or universal concept but is deeply influenced by interactions between organizations and their stakeholders, operating environments, and broader societal norms (Kang et al., 2016).

Culture is recognized as a vital element influencing variations in the beliefs, values, customs, and traditions of organizations and individuals across diverse cultural contexts. Additionally, it plays a defining role in shaping societal mindsets, which subsequently affect business practices, including decision-making processes, strategic approaches, and the execution of CSR in different countries (Liu et al., 2015; Matondo, 2012; Akinyemi, 2016).

Hofstede's model of culture, with its six dimensions, which will be introduced below, not only highlights variations in cultural priorities but also offers a framework to investigate how national culture influences the ways organizations perceive and practice CSR. Hofstede's model of culture has evolved significantly since its inception, reflecting decades of research and refinement. It began with the publication of *Culture's Consequences* in 1980, which introduced cultural dimensions for comparative cross-cultural analysis. In this work, the model was derived from a massive IBM employee survey across 50+ countries in the 1960s-70s. Hofstede revisited this work in 2001, adding new research and the fifth dimension. Further developments appeared in *Cultures and Organizations: Software of the Mind* (2010), co-authored with Gert Jan Hofstede and Michael Minkov. This edition introduced the sixth dimension, Indulgence versus Restraint, based on Minkov's analysis of global data. Hofstede's model has become a robust framework for analyzing and understanding cultural diversity and its impacts.

The framework's six key dimensions are scored on a scale from 0 to 100. Higher scores generally indicate a more pronounced presence of that particular cultural characteristic. The cultural dimensions describe societal tendencies and act as guides for cross-cultural comparison. The dimensions include:

- *Power Distance Index (PDI):* This dimension examines how power is distributed within a society and how much less powerful individuals expect or accept unequal power distribution. Cultures with high PDI values tend to have more hierarchical structures, while those with low PDI values aim for more equal power distribution.
- *Individualism vs. Collectivism (IDV):* This dimension examines how individuals are integrated into groups. In individualistic societies,

personal goals and independence are emphasized, whereas group harmony and interdependence are prioritized in collectivist cultures.

- *Masculinity vs. Femininity (MAS):* This dimension refers to the distribution of emotional roles between genders and how much a society values traditionally masculine traits (e.g., assertiveness, competition) versus feminine traits (e.g., caring, quality of life).
- *Uncertainty Avoidance Index (UAI):* This dimension measures how comfortable a society is with uncertainty and ambiguity. Cultures with high UAI have strict rules and conventions to avoid uncertainty, while those with low UAI are more open to change and different ideas.
- *Long-Term vs. Short-Term Orientation (LTO):* Added later to the original model, this dimension focuses on a society's perspective on time. Long-term-oriented cultures value persistence and thrift, while short-term-oriented cultures focus more on immediate results and maintaining traditions.
- *Indulgence vs. Restraint (IVR):* The most recent addition to the model, this dimension looks at how societies regulate their desires and impulses. Indulgent cultures allow for relatively free gratification of basic human desires, while restrained cultures impose strict social norms to control gratification (Hofstede, 1980, 1991, 2001; Hofstede et al., 2002, 2010).

Numerous studies (Ringov & Zollo, 2007; Thanetsunthorn, 2015; Kang et al., 2016; Halkos & Skouloudis, 2017; Koprowski et al., 2021; Aleqedat et al., 2022; Lajnef & Ellouz, 2024; Leyuan, 2024; Hsiao et al., 2024) have explored how culture, as operationalized with the dimensions, influences CSR. The findings of these studies are presented below, linked to the corresponding dimensions, and serve as a foundation for the following comparative analysis.

- PDI has a complex relationship with CSR, with some studies suggesting a positive influence while others indicate a negative impact. The prevailing evidence suggests that in high-PDI cultures, organizations may experience less pressure to engage in CSR initiatives, as the emphasis is on compliance with existing norms rather than

challenging the status quo. Conversely, countries with low PDI encourage egalitarianism and empower individuals to question authority, fostering a greater expectation for companies to act responsibly towards society. Research indicates that high power distance can hinder CSR engagement, as organizations may prioritize economic performance over social responsibility.

- In the IDV dimension, the findings are more unequivocal. In individualistic societies, businesses may focus more on profit maximization rather than community welfare, resulting in lower levels of CSR engagement. In contrast, collectivist cultures emphasize group harmony and interdependence, leading to stronger societal expectations for companies to contribute positively to their communities. Studies show that firms in collectivist societies are more likely to engage in CSR activities as they align their operations with communal interests.
- In the MAS dimension, masculinity is defined as "a preference in society for achievement, heroism, assertiveness, and material rewards for success." This is why today it is sometimes named motivation towards Achievement and Success. These cultures value competitiveness, achievement, and material success, often at the expense of social considerations. This focus can lead companies in these societies to prioritize economic gains over CSR initiatives, as they may view social responsibility as secondary to financial performance. On the other hand, feminine cultures place higher value on quality of life and nurturing relationships, which encourages businesses to adopt CSR practices that enhance societal well-being. Research consistently finds a negative correlation between masculinity and CSR engagement, suggesting that more feminine cultures are likely to demonstrate higher levels of CSR.
- The relationship between UAI and CSR is complex and context-dependent, with mixed findings across studies. Some studies suggest that cultures with high UAI, characterized by a strong preference for rules and regulations to manage uncertainty and ambiguity, can stifle innovation and responsiveness to social issues. This can lead to lower levels of CSR engagement, as firms may be hesitant

to adopt new practices that fall outside established norms. In contrast, low UAI cultures are more open to change and experimentation, enabling organizations to effectively pursue innovative initiatives that address emerging social challenges. Consequently, companies in low UAI environments tend to engage more actively in CSR activities. Conversely, some studies suggest that high uncertainty avoidance drives organizations to adopt CSR to mitigate risks and align with formal or institutionalized expectations such as regulatory compliance or stakeholder pressure (additionally to the above: García-Sánchez et al., 2016).

– Long-term oriented cultures emphasize perseverance and future rewards over immediate results. This perspective fosters a mindset among businesses that encourages investment in sustainable practices and community welfare initiatives as part of their long-term strategies. Companies operating in such environments are more likely to engage in CSR because they understand the long-term benefits of building strong relationships with stakeholders. Conversely, short-term oriented cultures prioritize immediate gains, which can detract from meaningful investments in CSR.

– Indulgent cultures allow for the free gratification of basic human desires related to enjoying life and having fun. This openness can lead to higher expectations for businesses to contribute positively to societal well-being through CSR initiatives that enhance quality of life. In contrast, restrained cultures impose strict social norms that limit indulgence and prioritize duty over pleasure, potentially leading to lower levels of corporate engagement in socially responsible activities.

To provide a clearer overview, Table 1 summarizes the connection between Hofstede's cultural dimensions and CSR.

Table 1: Hofstede's Dimensions: Description and Connection to CSR

Dimension	Description	Connection to CSR
Power Distance Index (PDI)	Measures the degree of power inequality in a society. High PDI = hierarchical; low PDI = egalitarian.	High PDI cultures may have lower CSR engagement due to less pressure for accountability. Low PDI cultures encourage CSR through a more egalitarian mindset.
Individualism vs. Collectivism (IDV)	Focuses on whether individuals or groups are prioritized. Individualism = personal goals; Collectivism = group harmony.	Individualistic societies may focus on profit maximization, while collectivist cultures often demand CSR to promote community welfare.
Masculinity vs. Femininity (MAS)	Describes the distribution of emotional roles between genders; values masculinity (competition) vs. femininity (quality of life).	Masculine cultures prioritize economic gains, often neglecting CSR, while feminine cultures tend to place higher value on CSR for societal well-being.
Uncertainty Avoidance Index (UAI)	Measures a society's tolerance for uncertainty and ambiguity. High UAI = rigid rules; low UAI = open to change.	Depending on context, predominant finding that high UAI cultures are less likely to engage in CSR due to rigid norms, while low UAI cultures are more open to innovative CSR practices.
Long-Term vs. Short-Term Orientation (LTO)	Focuses on a society's perspective on time. Long-term = persistence; Short-term = immediate results.	Long-term oriented cultures are more likely to invest in CSR for sustainable, long-term rewards, while short-term cultures may focus on immediate gains.
Indulgence vs. Restraint (IVR)	Looks at how societies regulate desires. Indulgence = free gratification; Restraint = strict norms.	Indulgent cultures may expect higher CSR contributions to enhance quality of life, while restrained cultures may show lower CSR due to stricter norms.

Source: summarized results of multiple studies on the relationship between CSR and Hofstede's cultural dimensions (see above for details on the studies).

3. Research Design

To investigate the CSR approaches in two distinct national contexts, a comparative framework is used that contextualizes CSR within each country's specific circumstances. The study is primarily exploratory, aiming to uncover the similarities and differences in CSR practices in both countries, while considering the unique cultural, historical, and socio-economic backgrounds of each. Germany and South Africa have been selected due to their distinct cultural and economic characteristics, as well as the authors' cultural affiliations. These two countries offer a unique contrast in terms of social norms, cultural values, and their respective economic and historical development, making them ideal for comparative analysis.

The study employed a qualitative methodology, using systematic procedures to identify, collect, analyze, and interpret data. The primary data collection method was semi-structured expert interviews, chosen for their ability to provide flexibility in exploring the diverse and complex perspectives on CSR, while maintaining a structured framework for analysis. This approach was particularly valuable for capturing in-depth insights from experts in both Germany and South Africa. A purposive sampling strategy was employed to select participants based on their expertise and experience in CSR, academia and practices within their respective cultural contexts. A total of four semi-structured interviews (SSIs) were conducted – two with participants from Germany and two from South Africa. The interviews, which lasted approximately 45 minutes each, were conducted in English, with one exception in German, via video chat between September and November 2024. Participants were asked questions based on a SSI guide that explored their perceptions of sustainability and CSR in their respective countries. The questionnaire was divided into three distinct sections. Key themes explored during the interviews included the interconnections between sustainability, CSR, and entrepreneurial development, with a particular focus on how these concepts are understood and implemented in the respective cultural context. Questions were designed to probe cultural influences, drivers, and the impact of international and national institutions on CSR and entrepreneurial development in both countries. The collected data was analyzed using the-

matic analysis, with recurring patterns and themes manually coded. Ethical research standards were adhered to throughout the process, with informed consent obtained from all participants, and confidentiality and anonymity ensured by de-identifying participant data.

Table 2: Overview of Interview Partners

Expert (anonymized)	Date of Interview	Experience and background of Expert
E 1	25th Sept. 2024	A scholar and academic in CSR at the Albert Luthuli Leadership Institute (ALLI). Focus is on social and environmental justice within corporations.
E 2	27th Sept. 2024	Former CEO of Afrika Tikkun working in the development sector with 20 years experience. Expert in CSR and Entrepreneurial Supplier Development. Runs companies that benefit from CSR and ESD.
E 3	18th Oct. 2024	Practitioner of Business Ethics, transitioning from academia to practice. Background in Business Ethics (Peter Ulrich and Josef Wieland). Counselor on sustainability for German Mittelstand, Small, Medium, Enterprises (SMEs). Self-employed professional. Years of practical experience.
E 4	24th Oct. 2024	Participant in the development of ISO 26000. Rich background in philosophy, business, and ethics in Europe. Experienced in practice and academia. Contributor to corporate responsibility, integrity, and ethical management. Specialist in business ethics, value, and integrity management.

Source: Own table.

A literature review was also carried out, following reproducible methods and complementing the primary data. The literature review was conducted using a selection process based on specific inclusion and exclusion criteria. The inclusion criteria were studies examining cross-

country differences, the cultural influence on CSR, peer-reviewed journal articles, books, and reputable reports. Studies not related to CSR or culture, as well as those written in languages not accessible to the reviewers, were excluded. Databases such as Scopus, Web of Science, JSTOR, and Google Scholar were utilized for the search. Relevant search terms included "Culture and CSR," "Cultural influence on corporate social responsibility," and "Cross-cultural differences in CSR," with Boolean operators (and, or, not) employed to refine results. Synonyms and variations like "corporate sustainability" and "responsible business practices" were also incorporated (Cresswell & Plano Clark, 2011).

We also incorporated empirical data from the DATA Country Comparison Tool, developed by the Culture Factor Group, a globally recognized cultural analytics and strategy consultancy. This tool utilizes Hofstede's six-dimensional cultural framework to provide country scores, which were most recently updated on October 16, 2023. Updates are based on data published in scientific journals or, when such publications are unavailable, derived from supplementary studies or commercial projects. When working with this data, it is important to note that these scores do not represent homogeneity among individuals within a country or society. Instead, they reflect general trends informed by the law of large numbers, making them valuable for comparative analysis (Culture Factor Group, 2025).

4. Findings and Discussion

The following section presents the findings and combined discussion, starting with an exploration of the cultural implications of CSR in South Africa and Germany, based on the interviews with experts. This will set the context for a deeper analysis of Hofstede's cultural dimensions and their specific relationship to CSR within a more focused context.

4.1 Thematic Insights from Interviews and the CSR Landscape in South Africa

The following thematic analysis of the SSIs with two South African experts (E1, E2) offers an overview of CSR in South Africa, highlighting national influences and challenges in CSR implementation. The experts both emphasized that CSR is the broader responsibility of companies to promote sustainable economic, social, and environmental practices. They also mentioned that, in South Africa, Corporate Social Investment (CSI) is a crucial component of CSR, reflecting the country's unique socio-economic challenges and historical context. CSI focuses on direct investments made by companies to uplift communities and address pressing societal needs. It is connected to the legal framework in South Africa, as well as education, healthcare and skills development. Both experts highlighted how the history of apartheid in South Africa shaped the current views and especially the societal expectations for CSR. The apartheid regime (1948-1994) institutionalized racial segregation and economic inequality, leaving a legacy of poverty, unemployment, and social divisions that continue to influence the nation's socio-economic landscape. Under apartheid, wealth and resources were concentrated in the hands of a white minority, while the majority black population was systematically excluded from economic and educational opportunities. CSR and CSI initiatives are now often designed to bridge these gaps by promoting inclusivity and redressing inequalities through education, job creation, and community uplift. Post-apartheid, the South African government introduced policies to ensure equitable participation of historically disadvantaged groups in the economy. Companies are incentivized or mandated to contribute to social transformation through targeted investments in marginalized communities, making CSI a cornerstone of their compliance and ethical obligations. This resulted in CSR being perceived as a tool to redress the injustices of the past, wherein companies are expected to empower societies with the aim of equalizing the black majority and white minority. This is further evident in how expectations from societies are rooted towards the contribution that companies can make in building schools in rural communities, creating jobs, and providing bursaries for the less privileged. This seems to be a common

understanding within the country and both experts argued that most companies understand their obligations towards society in South Africa.

There was a common thread in their responses which revolved around the idea that CSR in South Africa is driven by both legal frameworks and societal expectations. Whereas the historical trajectory has founded societal expectations, both experts conclude that the strong collectivist culture within South Africa is a prominent influence for CSR implementation. This collectivist culture is influenced by the concept of Ubuntu, which requires humanity towards everyone around you. However, legal policies have also served as a huge contributor towards CSR implementation in South Africa. Evidently, the prominent Broad-Based Black Economic Empowerment (BBBEE) Act has been utilized to rate and score companies in their progress. Despite its shortfall in creating binding obligations, meaning that CSR laws have limited effect, this had great impact. Although both the cultural and legal influence have been crucial, both experts agreed on the lack of transformation, which has been a huge setback within CSR. CSR has proven to be a well-established concept in South Africa, but both experts shared the common idea that there remains a lack of true transformation. Therefore, there is a need for companies to be truly transformed and not merely comply with CSR simply to meet the minimum standards set out in policies.

The dynamics of businesses within society, as well as the conceptualization and implementation of CSR, remain profoundly shaped by South Africa's unique history of apartheid (Ramlall, 2012; Kabir et al., 2015). Thus, the context of corporate philanthropic responsibility, where companies have to give back to society, is still foundational to South Africa's CSR. Considering the growing awareness of CSR, in the 1970s, South African companies also recognized how apartheid's inequality was affecting its economic growth (Kabir et al., 2015), hence the current understanding and acceptance of CSR within companies. In the same light, CSR conversations, a foreseeable shift to democracy in 1993, resulted in the King Committee being established to drive ethical business practices. According to their King IV revision of the King Report, it states that CSR in South Africa is driven by the idea that "Organisations operate in a societal context which they affect and by which they are affected".

This definition of CSR aligns with the cultural concept of Ubuntu in African countries, which promotes interdependence and generosity. Further, when applied to corporate governance, Ubuntu has been perceived as the distribution of resources which emphasizes the contribution towards health care to the underprivileged and job creation among other socio-economic factors (Murithi et al., 2006). When assessed in South Africa's context, CSR can be perceived to mirror the concept of Ubuntu owing to how both concepts are about doing good within the communities we exist in. This parallel conception was concluded to also imply that Ubuntu is equivalent to the Western stakeholder theory (Louw & Venter, 2013).

Despite the cultural influence in South Africa, laws have been an equally powerful tool to ensure corporations are socially responsible. In 2003, the government promulgated the BBBEE Act 53, initially Black Economic Empowerment (BEE) which aims to ensure companies are socially responsible, by measuring compliance (Republic of South Africa, 2003). This Act has been a leading policy in driving CSR compliance through CSI programs. CSI is a philanthropic initiative in which corporations give back to the community, however, broader versions of CSR exist. Currently, in South Africa the emphasis is on CSI (the philanthropic activities), excluding the broader version of CSR. Evidently, the prominent BBBEE Act promotes black empowerment through employment and opportunities. In line with the purport of the BBBEE, there are five categories, each with its own score or rating which is used to measure a company's effort towards black empowerment (Republic of South Africa, 2015). These scorecards influence company behavior, because companies get rankings based on how many points they have in total (level 1 being the highest and level 8 close to non-compliance). Companies that attain high scores have a greater advantage in conducting business in South Africa, and they receive incentives (Juggernath et al., 2011). Further, there is also a market force penalty based on BBBEE, meaning lack of compliance has implications. To ensure companies comply, the Johannesburg Stock Exchange (JSE) obliges all its listed companies to report on their CSR contribution, which can be seen as an indirect obligatory measure to ensure compliance with CSR. In 2022, South Africa was the leading African country in terms of CSR compliance (Cheruiyot-

Koech & Reddy, 2022). Although laws have been critical in progressing the implementation of CSR in South Africa, some scholars have argued that redress remains slow paced (Esser & Dekker, 2008). The general impression one gets from the overview of South Africa's CSR is that most companies have pressure from all the factors discussed above. This means that the historical context, societal expectations, and legislation requirements all contribute to the landscape of CSR in South Africa.

4.2 Thematic Insights from Interviews and the CSR Landscape in Germany

The thematic analysis of the SSIs with the two German experts (E3, E4) revealed insights into the history, conceptual understanding, practical application, and challenges of sustainability and CSR in the German context. Both experts emphasized sustainability as the ideal, but not yet achieved, balance between social, ecological and economic dimensions. They highlighted sustainable development as the pathway to achieving sustainability and noted the debate over sustainability and corporate responsibility terminology, noting that these terms often converge on sustainable development. They defined CSR as the corporate responsibility to actively address and manage the impacts of business activities and cited the ISO 26000 definition as a guiding framework. As the key drivers for CSR in Germany, legal requirements at national, international, and/or European levels were mentioned. These include the German Commercial Code, which mandates corporate reporting on various matters, including environmental, social and governance (ESG) issues and specific environmental and labor regulations that encourage companies to adopt responsible practices by addressing environmental protection, employee rights, and workplace safety. Additionally, the Supply Chain Due Diligence Act obliges companies to assess and mitigate human rights and environmental risks within their supply chains. Furthermore, the EU Taxonomy Regulation requires businesses to report in accordance with Article 8. The Corporate Sustainability Reporting Directive (CSRD), applies to large corporations, capital market-oriented SMEs, and specific financial insti-

tutions. Under the CSRD, companies must submit non-financial reporting, adhering to the European Sustainability Reporting Standards (ESRS) for detailed disclosures on ESG issues (Federal Ministry of Labour and Social Affairs, 2025). Legislation and CSR regulation were criticized for being poorly designed and overwhelming, especially for SMEs (Mittelstand). One expert pointed out that, unlike today's compliance-driven and reporting-focused approaches, stakeholder-driven voluntary engagements in the past fostered more authentic sustainable development. In this context, CSR drivers such as employer attractiveness, customer demand, and investor pressure were mentioned. Cultural aspects, including the unique German mindset, Christian culture, and the tradition of the honorable merchant (*Ehrbarer Kaufmann)*, shape CSR approaches and practices, with sectoral leaders in textiles and chemicals contrasting with slower adopters like the automotive industry. Looking ahead, the experts mentioned that a holistic approach, integrated reporting, and supplier support in meeting standards are seen as critical for advancing sustainability.

In Germany, the development and context of CSR mirror the diversity of Europe's economic, political, and cultural landscape. Historically, European business practices were influenced by Christianity, medieval guilds, and the industrial paternalism of the 19th century, with many companies providing social benefits such as housing, pensions, and education. In Germany, several established companies had been implicitly engaging in early forms of CSR by investing in their communities since the 19th century. However, throughout much of the 20th century, CSR remained on the periphery, as the rise of the welfare state shifted the responsibility for societal well-being to governments. This shift was further reinforced by the involvement of workers' unions and social democratic parties, which helped to establish welfare systems that embedded business obligations within state-led frameworks. In this system, collective bargaining takes place at the sectoral or national level, with companies' responsibilities largely defined by regulation and public policy, rather than by voluntary corporate initiatives. The European Commission's involvement with CSR gained momentum at the turn of the 21st century, particularly after the Lisbon European Council in 2000, where EU leaders called on businesses to contribute to sustainable economic growth and social cohesion. This led

to the publication of the 2001 Green Paper, advocating for a European framework for CSR (Visser & Tolhurst, 2010; O'Riodan & Hampden-Turner, 2021). By the early 21st century, CSR had become a central element of business-society relations across Europe, driven by declining government intervention, increased public scrutiny, and the rise of multi-actor governance models. This period saw German companies adopting explicit CSR policies, influenced by international standards such as those from the UN and ISO, reflecting a transition from implicit to explicit corporate responsibility (Hiss, 2009).

Germany's cultural emphasis on industriousness, resilience in the face of historical crises, and the value placed on durable products has shaped its corporate ethos. The country's strong green movement and commitment to ecological responsibility has positioned it as a global leader in balancing economic success with environmental stewardship. Unlike in other countries, where CSR is sometimes seen as a superficial public relations tool, CSR in Germany has long been viewed as an integral part of industrial policy, reflecting the country's stakeholder-oriented approach to business. This stakeholder capitalism, which extends beyond shareholders to include all parties with a stake in a company's success or failure, is deeply embedded in the German corporate culture (O'Riodan & Hampden-Turner, 2021). Corporate governance in Germany, traditionally more mixed than in other regions, has often been less influenced by the pressures for explicit social responsibility that have been seen in countries like the USA. In particular, lower levels of public shareholding and higher levels of bank, family, and cooperative finance meant that the need for large corporations to adopt explicit CSR policies was not as urgent. Furthermore, Germany's neo-corporatist model, especially evident in its social market economy, exemplifies a blend of free-market capitalism with strong social policies, aiming to balance competition with welfare state principles. This model was championed by former Chancellor Ludwig Erhard and was a key driver of Germany's post-war economic recovery, known as the *Wirtschaftswunder* or "Miracle on the Rhine" i.e. Economic Miracle. By focusing on fairness, social stability, and regulatory oversight, this framework helped Germany become a leading industrial power. In this context, CSR in Germany is closely tied to stakeholder capitalism, with companies traditionally orienting themselves to

their stakeholders rather than to absentee shareholders. This is reflected in the Mittelstand, Germany's network of small and medium-sized enterprises (SMEs), which are characterized by close ties to their communities and a strong ethical foundation. These companies emphasize long-term value creation and sustainable solutions, contributing to both economic growth and social well-being. In this environment, CSR is not viewed as an isolated moral initiative but as a natural extension of a company's commitment to its broader community (O'Riodan & Hampden-Turner, 2021). Also relevant and mentioned by both German experts is the concept of the *Ehrbarer Kaufmann* (honorable merchant), a European ideal that stresses the importance of ethical conduct and long-term responsibility toward business, society, and the environment. An *Ehrbarer Kaufmann* is guided by values that seek to achieve economic success while aligning with societal interests, prioritizing sustainability, and ensuring that business practices benefit both the company and the wider community. This approach embodies the commitment to ethical and responsible business operations that balance profitability with broader social and environmental goals, serving as a foundational principle for CSR in Germany.

4.3 Comparative Analysis via Hofstede's Cultural Dimensions

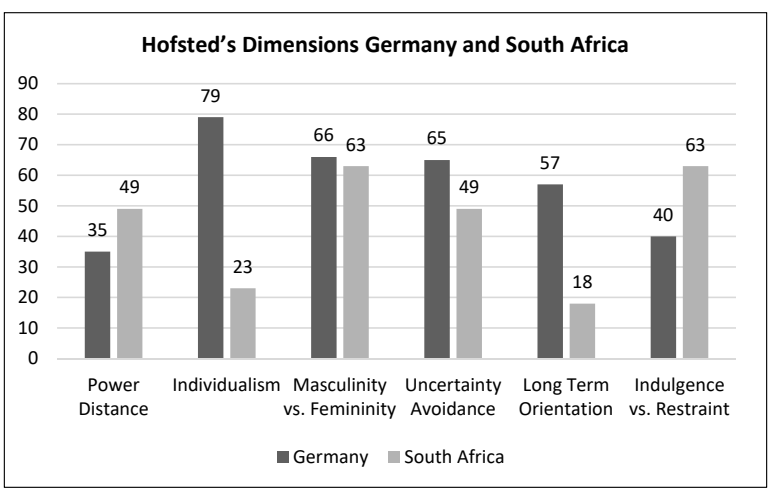
Now that the context and landscape of CSR in both countries have been established, we will now focus on Hofstede's cultural dimensions to make a more detailed comparison between the two countries.

4.3.1 Power Distance Index (PDI)

South Africa's moderate score of 49 on the PDI indicates a society with moderate acceptance of hierarchical order and power inequalities. In organizations, there is a mix of top-down and bottom-up approaches. While there is respect for authority, South Africans are increasingly calling for companies to engage directly with communities and stakeholders. This balance fosters inclusive CSR strategies, where management may initiate programs, but input from various levels of

the workforce is encouraged. Companies often create CSR initiatives that reflect both corporate values and the needs of the community, promoting a sense of shared responsibility and collaboration (Schutte, 2009). Germany's PDI score is relatively low, at 35. The low PDI suggests a society that favors decentralized power structures and equal rights, which translates into a work environment where open dialogue about social and environmental issues is encouraged. Employees feel empowered to voice their concerns and ideas, as superiors are accessible and promote transparency. Participative communication allows for employee involvement in CSR programs, leading to more inclusive and collaborative efforts. Furthermore, management in German companies tends to facilitate and empower employees, fostering bottom-up CSR initiatives. This decentralized approach to power and decision-making contributes to a higher likelihood of CSR adoption, as employees at all levels feel responsible for driving socially responsible practices within the organization (Ringov & Zollo, 2007).

Figure 1: Country Comparison of Hofstede's six Dimensions based on Data from the Country Comparison Tool of the Culture Factor Group (2025)



Source: Own illustration.

4.3.2 Individualism vs. Collectivism (IDV)

In South Africa, a variety of cultures are contained within a single political border, which vary in terms of Individualism and Collectivism (Vogt & Laher, 2009). Allik and McCrae (2004) highlight that the influence of social groups often surpasses that of geographical settings, as evidenced by the contrasting personality profiles of black and white South Africans who have co-existed in the same country for generations. The Factor Culture Group scores South Africa with a low score of 23 in the IDV dimension, which shows that South Africa leans toward collectivism. Also, Hofstede (1980) describes South Africa as being more collectivist rather than individualist. This is informed and founded by cultural values, the strongest one being *Ubuntu*, a Southern African philosophy that emphasizes human interconnectedness, compassion, and the importance of community. However, when applied to corporate governance, *Ubuntu* has been perceived as the distribution of resources (Murithi et al., 2006). This notion of *Ubuntu* has resulted in the emphasis being on CSR contributing towards health, education, and job creation (Institute of Directors in Southern Africa, 2009). Other findings, however, suggest that the white population in South Africa, especially, tends to have a higher IDV score, which could correlate with a lower emphasis on CSR. This shows that the relationship between IDV and CSR is difficult to quantify owing to the country's immense cultural diversity. South Africa, as a multicultural society, consists of numerous communities and micro contexts, each with unique cultural dynamics that influence CSR practices and priorities. Consequently, CSR cannot be generalized across the nation but must be understood and implemented in a way that reflects the specific social and cultural nuances of each context. At 79, Germany's IDV score is high, indicating a society that places significant value on individual autonomy and self-actualization. This individualism can have both positive and negative effects on CSR. On the one hand, the strong emphasis on personal responsibility drives commitment to social causes, as individuals see corporate responsibility as an extension of their personal values. Furthermore, employer-employee relationships in Germany are often based on mutual advantage, which can align well with CSR goals. However, the individualistic nature of the society may also lead to a focus on

personal achievements over collective welfare, which can sometimes hinder efforts to address larger societal issues through CSR. German companies often mitigate this by framing CSR initiatives as opportunities for individual growth and contribution to society, allowing employees to see their participation in CSR efforts as a way to achieve personal goals while also benefiting the broader community (Ringov & Zollo, 2007). Additionally, Gallén & Peraita (2017) show that in countries with a high gross domestic product (GDP) per capita, the CSR disclosure is negatively related to individualism. This therefore reinforces the assumption that individualism has a negative impact on CSR in Germany.

4.3.3 Masculinity vs. Femininity (MAS)

South Africa scores 63 on the MAS dimension, indicating a predominantly masculine society that places a strong emphasis on achievement, competition, and success, where managers are expected to be assertive and decisive. This masculine orientation can present challenges for CSR, as the focus on high performance often prioritizes financial metrics over social impact. It can also lead to companies viewing CSR as an opportunity to differentiate themselves and enhance their brand. Organizations tend to prioritize results-oriented CSR initiatives, focusing on measurable impacts that align with business objectives. This emphasis on tangible outcomes often leads companies to implement programs that demonstrate their success in addressing social issues. However, the focus on achievement can sometimes overshadow the softer aspects of CSR, such as employee well-being and community engagement. In response, many South African companies are increasingly integrating ethical considerations and social responsibility into their core business strategies (Motilewa & Worlu, 2015), ensuring that competitive advantages do not come at the expense of social values. Germany's MAS score of 66 reflects a society that places high value on achievement, performance, and success. According to Gallén & Peraita (2017), in countries with a high GDP per capita, like Germany, CSR disclosure tends to be negatively related to masculinity, suggesting that Germany may have lower levels

of CSR engagement. The "live to work" mentality traditionally prevalent in Germany may overshadow initiatives aimed at promoting work-life balance or employee well-being. Additionally, the display of status through material possessions can sometimes conflict with sustainability goals, as the desire for status may lead to overconsumption. However, despite these challenges, many German companies integrate CSR into their performance metrics, aligning social responsibility with the cultural emphasis on achievement. By doing so, they ensure that CSR is seen not only as a moral obligation but also as a measurable and rewarding business practice that contributes to the company's success.

4.3.4 Uncertainty Avoidance Index (UAI)

The moderate score of 49 on the UAI suggests that South Africans are comfortable with some level of ambiguity and change. This flexibility is reflected in CSR strategies, as organizations are open to experimenting with new approaches and adapting their programs to meet evolving social needs. The moderate level of uncertainty avoidance encourages creativity in developing CSR solutions, allowing companies to innovate without being overly constrained by rigid rules. At the same time, companies maintain a degree of structure in their CSR reporting and accountability, ensuring that their initiatives are transparent and measurable. This balance enables South African companies to develop dynamic CSR programs that evolve in response to feedback and shifting societal expectations (Halkos & Skouloudis, 2017). Germany's UAI score of 65 suggests that the country has a moderate preference for avoiding uncertainty, which significantly shapes its approach to CSR. The maintenance of rigid codes and clear structures in German society translates into thorough and well-structured CSR policies within companies. There is a strong emphasis on precision, reliability, and accountability, which means that CSR initiatives are often meticulously planned and executed. The careful analysis before decision-making ensures that CSR strategies are well thought out, leading to long-term sustainability programs that align with Germany's cultural need for stability and predictability. This preference for order and structure often results in comprehensive and effective CSR pro-

grams that aim for lasting positive impacts on society and the environment. Additionally, Gallén & Peraita (2017) show that in countries with a high gross domestic product (GDP) per capita, the CSR disclosure is positively related to uncertainty avoidance.

4.3.5 Long-Term vs. Short-Term Orientation (LTO)

In terms of LTO, South Africa's score of 18 suggests a tendency toward short-term orientation. This is evident in the country's focus on immediate results and the respect for traditions that often guide CSR efforts. Companies are more likely to prioritize CSR initiatives that deliver quick, visible benefits to communities, rather than committing to long-term, sustainable projects. While the short-term orientation can lead to an emphasis on short-term gains, there is a growing awareness of the importance of sustainability. South African businesses are increasingly incorporating long-term sustainability goals into their CSR strategies, recognizing that lasting social impact requires long-term investment. To balance the short-term focus, many companies frame their CSR initiatives as quick wins, while gradually integrating long-term sustainability objectives into their strategies. Germany's LTO score is medium at 57, indicating a focus on achieving quick results but also a respect for traditions. This orientation presents both challenges and opportunities for CSR. On one hand, the emphasis on quick results may discourage long-term investments in CSR, as companies may prefer to see immediate returns rather than committing to long-term sustainability goals. On the other hand, the respect for traditions and cultural values can support CSR initiatives that are rooted in the principles of quality, reliability, and social responsibility. German companies often address the short-term focus by framing CSR initiatives in terms of immediate benefits, ensuring that they align with the company's core values and cultural emphasis on delivering high-quality results in the present (Rosecká et al., 2023)

4.4 Indulgence vs. Restraint (IVR)

South Africa's high score of 63 on the IVR dimension suggests a cultural tendency toward indulgence. This dimension impacts CSR by encouraging companies to implement employee-centric programs that promote well-being, happiness, and work-life balance. There is a stronger desire for people to enjoy life and fulfill their personal needs, which translates into CSR initiatives that engage employees in meaningful volunteer work and community projects. These initiatives often align with employees' desires for personal fulfillment and social contribution. The relatively high indulgence score also implies that South African companies may encourage enjoyment in their CSR efforts, finding ways to make community involvement enjoyable for employees and stakeholders alike. The higher degree of indulgence enables organizations to design CSR initiatives that foster positive employee experiences while benefiting the communities they serve.

Finally, Germany's IVR score of 40 places it in the moderate range, indicating a balance between indulgence and restraint. This cultural characteristic affects CSR in several ways. The moderate willingness to indulge in life's pleasures can support work-life balance initiatives and employee well-being programs, while the balanced optimism ensures that CSR goals are realistic yet positive. Furthermore, the moderate importance placed on leisure time can be leveraged for employee volunteering programs, as individuals may be more inclined to dedicate their time to social causes when it aligns with their personal values. This balance enables German companies to implement CSR programs that address both immediate employee needs and long-term societal goals, contributing to a sustainable and fulfilling work environment (Halkos & Skouloudis, 2017). Gallén & Peraita (2017) additionally show that in countries with a high gross domestic product (GDP) per capita, the CSR disclosure is positively related to indulgence.

5. *Conclusion*

The need for a sustainable future continues to grow, placing companies at the forefront of the transformation towards sustainability. In this context, CSR has emerged as a critical component of corporate strategy. CSR is not a static concept, but a dynamic practice shaped by national culture. Culture significantly shapes perceptions of companies' roles in this transformation, influencing how they are viewed by stakeholders and, consequently, how they approach and implement CSR.

This chapter has analyzed the influence of national cultures on CSR by comparing South Africa and Germany. Our results show that cultural dimensions, as described by Hofstede, play a key role in the conceptualization and implementation of CSR. In South Africa, CSR is characterized by collective values such as Ubuntu, while in Germany the combination of traditions such as the honorable merchant and strongly structured legislation promotes CSR. While South Africa has a stronger social focus, characterized by historical inequality and the legacy of apartheid, Germany emphasizes a systematic integration of CSR into corporate governance with a focus on environmental responsibility, which stems from Germany's long political environmental tradition.

Both approaches show how national framework conditions and cultural values shape CSR strategies and how crucial the context is for their success. Our results illustrate the need for a differentiated understanding of cultural and institutional framework conditions to organize CSR effectively and sustainably. Further research should deepen the intersection of national culture and globalized CSR standards to support companies in developing culturally appropriate and globally effective CSR practices.

6. *Limitations*

This research has several limitations that should be acknowledged. One significant constraint was the limited number of interviews conducted. While the exploratory nature of the interviews aimed to uncover broader cultural insights, the small sample size restricts the generalizability of the findings. Moreover, the theoretical framework of

Hofstede's cultural dimensions was not initially incorporated into the interview design but was instead identified during the analysis phase. This reactive application of the theory limited the opportunity to directly question experts about Hofstede's categories. Consequently, the primary data provided broader contextual and background insights rather than specific applications of Hofstede's dimensions.

To address this gap, supplementary data on Hofstede's dimensions was sourced from secondary literature and databases. However, this reliance on aggregated national averages has its own challenges, including the oversimplification of cultural diversity within countries. Hofstede's model itself also has inherent limitations. It has been critiqued for oversimplifying cultural dynamics within nations, which can obscure regional, ethnic, and organizational subcultures (Spencer-Oatey, 2012). Additionally, the model risks reinforcing stereotypes by attributing fixed characteristics to national cultures. Its reliance on data collected from a single multinational company in the mid-20th century further limits its relevance, as it may not fully reflect contemporary cultural realities shaped by globalization and generational change. Moreover, the model fails to account for cross-cultural and transcultural interactions, which have become increasingly significant in an interconnected and globalized world. For example, in countries with high cultural diversity, such as South Africa, a single national score does not capture the distinct cultural differences between various ethnic and racial groups. Similarly, the historical division between East and West Germany highlights the model's challenges in addressing cultural complexity within politically unified nations.

Matthew Corritore, Sameer B. Srivastava and Amir Goldberg (2019) state that individuals in complex modern societies acquire a capacity for polyculturalism due to their chronic exposure to multiple and incongruent institutional orders. The research's focus on national cultures may underemphasize the influence of global cultural convergence, which blends national characteristics and challenges the traditional boundaries of Hofstede's framework.

7. Outlook

This study has examined how national cultures shape CSR practices by comparing South Africa and Germany through the lens of Hofstede's cultural dimensions. While this intercultural approach has yielded valuable insights into the contextual nature of CSR, it is important to position this research within the broader evolution of cultural theory and to consider more advanced frameworks for future investigations.

Intercultural approaches retain a fundamental constraint: they continue to treat cultures as separate islands or spheres. As Welsch (1999) argues, this island-premise itself creates the very problems interculturality seeks to solve, rendering such efforts cosmetic rather than transformative. Contemporary cultural reality and complexity demands a more sophisticated framework: transculturality should be taken into account. Transculturality recognizes that cultures today are no longer – if they ever truly were – homogeneous, bounded entities that must bridge gaps between themselves. Instead, cultures are characterized by the following key features: On the macro-level, cultures exhibit internal differentiation, external networking, and hybridization. Professional lifestyles are no longer distinctly national but global in character. Consequently, CSR practices evolve across once considered fundamentally different cultures. On the micro-level, individuals are increasingly "cultural hybrids" shaped by "multiple cultural connections" rather than a single homeland (Welsch, 1999). Identity formation involves integrating components of differing cultural origins, making transcultural competence essential. While diversity in the form of clearly delineated single cultures diminishes, a new type emerges: "the diversity of different cultures and life-forms, each arising from transcultural permeations" (Welsch, 1999).

Building on this transcultural framework, several promising research directions emerge for advancing our understanding of CSR and culture in a globally interconnected world. Future research could investigate how CSR practices both require and develop transcultural competences among stakeholders. This involves examining which specific competences enable effective CSR management across cultural contexts and how these capabilities differ from traditional inter-

cultural skills (Wieland & Baumann-Montecinos, 2018). Of particular interest is understanding how CSR professionals navigate the tension between global standards and local implementation, developing what might be termed "transcultural sensitivity" rather than merely intercultural awareness. Further reserach could also explore how CSR practices themselves produce transcultural exchange and generate new hybrid forms of corporate responsibility. Corporate commitments to universal human rights or environmental protection represent instances where shared values – the "commonalities" (Grünfelder & Baumann-Montecinos, 2024) that transcultural thinking seeks – are actively constructed and institutionalized across cultural contexts. CSR initiatives create networks where diverse cultural perspectives intersect, negotiate, and generate new practices that transcend their original cultural moorings.

Consistent with the relational turn's emphasis on developing commonalities rather than merely managing differences (Grünfelder & Baumann-Montecinos, 2024), future studies could examine how CSR creates shared practices that emerge from transcultural collaboration. This shifts the focus from how different cultures approach CSR differently to how CSR becomes a vehicle for creating new, shared approaches that draw on multiple cultural resources without being reducible to any single cultural origin. These research directions would move beyond the comparative logic of intercultural studies toward an understanding of CSR as inherently transcultural.

Use of Artificial Intelligence Tools

Generative AI tools (including ChatGPT and Claude) were used to assist with identifying relevant literature and improving the language, clarity, and readability of the manuscript. All AI-generated suggestions were critically reviewed, verified, and adapted by the authors. The research design, analysis, interpretation, and conclusions remain entirely the responsibility of the authors.

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The Influence of Transcultural Knowledge Management in Sustainable Global Supply Chains: The Case of Food and Agricultural Corporations

Omolemo Job and David Seeger

1. Introduction

Globalisation and multilateralism became prominent at the end of the Cold War, with most states intensifying investments in international trade and cross-border relations, as evidenced by the founding of various multi-state organizations such as the World Trade Organisation (WTO) (Scholvin & Wigell, 2018, p. 80). This has fundamentally transformed the organisation of economic activity: Cross-border flows of 1) goods, 2) capital, 3) information, and 4) knowledge were strongly intensified on a worldwide scale (Alkharafi & Alsabah, 2025; Foreman-Peck & Zhou, 2025). To illustrate, production processes that were once nationally embedded are now often dispersed across multiple countries and regions. Today, this has created dense networks of interdependence among firms, their workers, a variety of institutions, and different geographical, vegetational, and cultural territories (Gereffi et al., 2005). While this process of globalisation has enabled significant efficiency gains through specialisation and scale, it has also increased structural complexity and vulnerability, as economic outcomes in one location are increasingly shaped by decisions and conditions elsewhere (Dicken, 2015). As a result, coordination, governance, and learning across spatial, cultural, and institutional boundaries have become cen-

tral challenges for contemporary economic organisation (Gereffi, 2018; Ponte et al., 2019).

Within this globalised context, supply chains have emerged as key organisational forms through which value is created and distributed, and which are also overall governed. Therefore, modern supply chains are no longer understood merely as logistical arrangements for moving goods from production to consumption, or, within the food sector, from the field to the plate. Rather, they constitute complex socio-economic systems that integrate multiple actors across different stages of value creation (Barrientos et al., 2011). This includes producers, processors, traders, retailers, regulators, and civil society organisations. These systems rely not only on physical flows of products but also on the continuous transfer of knowledge, standards, and expectations. Consequently, supply chain performance increasingly depends on firms' abilities to coordinate across institutional heterogeneity and manage relational dependencies (Gereffi, 2018).

In recent decades, global supply chains have also become central arenas for sustainability governance (Seuring & Müller, 2008). To illustrate, pressures arising from ecological conditions such as climate change or resource scarcity, as well as social responsibilities such as labour conditions and ethical consumption, have prompted firms to adopt certain sustainability standards, to certify them, and to develop reporting frameworks that extend beyond their organisational boundaries.

At the same time, recent research points to a gradual slowdown in cross-border integration. Even before the COVID-19 pandemic and renewed geopolitical tensions, scholars had observed signs of "slow globalisation" or partial "deglobalisation", reflecting efforts by firms and governments to reassess global dependencies and manage systemic risks more carefully (Antràs, 2020). Therefore, supply chains are increasingly being restructured to balance efficiency with resilience and strategic control (Baldwin & Freeman, 2022).

These developments have shifted attention toward knowledge management as a critical capability: firms must collect, interpret, and translate diverse forms of information not only across diverse professional roles within supply chains, which implicate different professional knowledge, but also across geographically and culturally dispersed networks. The paper, therefore, focuses on the central challenge of

integrating heterogeneous forms of tacit, experiential, and locally embedded knowledge within global supply chains.

2. *Literature Review*

This section provides an overview of the existing literature on knowledge management across multinational companies and its relationship with supply chain management. The first section provides an overview of the definition of knowledge management, followed by a second section that evaluates the relationship between transcultural knowledge management and global supply chains in the current literature.

2.1 Transcultural Knowledge and General Definition of Knowledge Management

Knowledge management (KM) can be defined in various ways across various fields of study; the generally accepted definition offered by Koenig (2018) is that KM is "the process of capturing, distributing, and effectively using knowledge". Although broad, this definition remains flexible and applicable across various industries and scholarship. KM has been studied across the literature; however, according to Schwengber (2025, p. 155), it regained prominence through recent debates in the knowledge economy. Furthermore, Schwengber (2025, p. 155) notes that various authors such as Simon (1991), March (1991), and Gorman (2002) all distinguish between the 'know what', 'know how', 'know when', and 'know why', due to the very flexible nature of knowledge when affected by diverse cultures. These are all components that are taken into consideration when defining knowledge and applying it in practice. KM is further defined primarily through its function as a set of dynamic processes and organisational frameworks essential for managing transcultural complexity and fostering cooperation in global networks. Knowledge soon becomes a resource that must be managed to maximise its availability and potential for innovation, often conceptualised as a "common" (Montecinos, 2022).

Transculturality seeks to establish and strengthen commonalities through learning processes, in contrast to conventional intercultural notions that frequently place the emphasis on managing cultural differences (Biggiero & Magnuszewski, 2022). In this regard, various actors can have or can establish common understandings, meanings, or behaviours as we refer to commonalities while preserving their distinctive characteristics (Grünfelder et al., 2024). In the context of transculturality, KM can be defined as the intentional organisational process of cultivating environments for shared experiences and dialogue to enable the continuous co-creation of meaning (new commonalities) among diverse actors. Thus, knowledge is treated as a common resource that ensures the continuity of cooperation in global value networks (Grünfelder, 2025).

As such, transcultural knowledge can be understood as knowledge that arises from and is continuously enhanced by shared experiences and reciprocal learning across various cultural contexts (Biggiero & Magnuszewski, 2022). The approach goes beyond static, essentializing, or comparative perspectives of culture to highlight how cultures are dynamic, interconnected, and permeable (Biggiero & Magnuszewski, 2022). Emerge directly from structured cooperative efforts and learning processes, shared experience and co-creation of meanings become a central part in transcultural knowledge.

On the one hand, transcultural competence, at the heart of sharing experience, is the ability and willingness to consciously create new commonalities under circumstances of cultural complexity while allowing cultural differences to thrive (Grünfelder, 2025). By actively concentrating on establishing and enhancing similarities through reciprocal learning processes rather than just managing cultural differences, this idea marks a paradigm shift from conventional intercultural conceptions (Grünfelder, 2025). This construction is achieved by shared experience and mutual learning as both a means and a result of being in relation (Grünfelder & Baumann Montecinos, 2024). Transcultural competence is therefore a relational process that evolves as people engage with each other and develop commonalities (Grünfelder, 2025).

On the other hand, co-creation of meaning as a foundational concept within the relational view of economics and transcultural management represents the active process by which diverse actors bridge cul-

tural complexity and develop the shared foundations necessary for sustained cooperation. The mechanism for cocreating meaning is primarily the Transcultural Learning Model, which also emphasises learning through practical engagement. Specifically, the 3-step Transcultural Learning Model formalises the link between transcultural management and co-creation of meaning: how recognising cultural complexity (Step 1) leads to dialogue and common experiences (Step 2: Identification of existing commonalities), which, through co-creation, results in the development of new commonalities (Step 3) (Grünfelder & Baumann Montecinos, 2024). These newly developed commonalities are the tangible form of transcultural knowledge. They may manifest as shared perspectives, habits, customs, practices, routines, or, more generally, shared attributions of meaning (Grünfelder, 2025).

2.2 Transcultural Knowledge and Global Supply Chains

Knowledge management becomes highly relevant for multinational enterprises (MNEs) because differing local cultures and languages can impede the efficiency of global supply chains. Although global supply chains offer a competitive advantage, these cross-cultural issues have hindered the degree to which they yield capital results. When knowledge sharing and exchange are appropriately integrated into an MNE's policies and strategies, they can directly enhance the success of these global supply chains. Cummings et al. (2019) assert that for any corporation to be fully integrated into the global economy and achieve its goals, it must develop strategies that capture the role of knowledge (p. 782). Furthermore, effective KM can break down corporate silos, allowing the MNE to address each specific issue with appropriate tactics and strategies. Corporations must understand local knowledge and integrate it into their supply chain strategies and policies. This integration not only ensures a smooth global supply chain but also helps to break down perceptions that international corporations are attempting to impose their own cultural norms or ignore local customs. Ultimately, sharing knowledge is fundamental for achieving sustainability because it helps individuals innovate new ideas and share good practices (Nonaka & Takeuchi, 1995). However, a gap in the research exists, as not much

is known about how sharing knowledge across different cultures specifically affects this sustainability.

In this paper, sustainability is understood as an institutional and relational capacity to maintain ecological integrity, economic development, and socially viable production conditions over time (WCED, 1987; Scoones, 2016: 297). Supply chain sustainability is accordingly conceptualised as the governance of interdependent production networks through which environmental, economic, and social objectives are coordinated, negotiated, and enacted across organisational, cultural, and territorial boundaries (Seuring & Müller, 2008).

In general, transcultural knowledge links with supply chains by providing the necessary relational framework and competence to manage complexity, foster cooperation, and ensure the continuity of transactions among diverse global partners.

3. Empirical Research

Against such a backdrop, this paper aims to understand how transcultural knowledge impacts the global supply chain in the agrifood sector and to further understand what global supply chain design models can be put in place to mitigate the impact of cultural and language differences and transactionality in the business process to ensure long term stability. While it is important to respect different cultures in business, not much is known about how sharing knowledge across cultures helps supply chains become more sustainable. Most studies address knowledge sharing in general or only look at one culture. It is not understood, firstly, how sharing knowledge across cultures leads to sustainability, secondly, what unique opportunities and challenges are offered by cultural differences, and finally, how knowledge can be shared in a culturally smart way to become more sustainable. This research wants to close this gap by investigating and examining how sharing knowledge across cultures and sustainability are linked in supply chains.

3.1 Research Question

> "How can transcultural knowledge exchange shape the development of global supply chains in the food and agricultural sector?"

With the development of globalisation, knowledge has become a valuable intangible asset in the global economic and financial landscape. This study investigates whether transcultural knowledge acts as a driver for global supply chain performance and whether this relationship fosters long-term sustainability.

3.2 Case Study Design and Rationale

To examine how transcultural knowledge transfer and coordination operate in practice, this study focuses on multinational food corporations as the empirical setting. These organisations occupy a central position in global food supply chains and increasingly function as global knowledge hubs that design, mediate, and disseminate sustainability standards across multiple tiers of production and distribution. In these organisations, transcultural learning takes place internally (across departments and regional branches) and externally (across partnerships with suppliers, NGOs, and governments). This makes them representative of a broader trend in the global economy: the shift from transactional, efficiency-based supply chains toward knowledge-driven, relational, and sustainability-oriented value networks (Nonaka & Takeuchi, 1995; Grant, 1996).

Within this context, the case study analyses transcultural knowledge transfer, exchange, and management along food supply chains within multinational food and agricultural corporations. The food sector offers a strategically significant and theoretically rich setting for investigating organisational structures and knowledge management practices that contribute to sustainability along global supply chains. Unlike purely industrial sectors, food value chains are deeply embedded in cultural practices, ecological conditions, and territorial specificities. Agricultural production relies heavily on locally embedded knowledge of soils, climates, biodiversity, and farming traditions, while down-

stream stages are shaped by culturally specific consumption patterns and regulatory environments. This combination of global integration and local embeddedness intensifies the importance of transcultural competence and adaptive knowledge management in coordinating supply chain activities across diverse contexts (Ponte, 2019; Gereffi et al., 2005).

Furthermore, multinational food corporations are increasingly subject to global expectations to balance economic performance with environmental responsibility and social accountability. Sustainability in these supply chains, therefore, encompasses not only resource efficiency but also traceability, fair labour standards, biodiversity protection, and carbon accountability (Carter & Rogers, 2008; Seuring & Müller, 2008). To operationalise these objectives across geographically dispersed production networks, firms rely on knowledge management systems that facilitate learning, coordination, and the translation of sustainability standards into organisational practices. However, the effectiveness of such systems depends on the ability of organisations to adapt standardised frameworks to diverse cultural and institutional contexts (Grünfelder, 2025; Montecinos, 2022). This is precisely where transcultural knowledge becomes critical for aligning global strategies with locally embedded practices. By investigating knowledge management within multinational food cooperatives, this case study captures not only the sector's practical importance but also its representativeness for understanding how transcultural knowledge fosters sustainability in global supply chains.

3.3 Methodology

Building on this context, the study adopts a qualitative methodology that seeks to perform an in-depth analysis of the relationship between transcultural knowledge and global supply chains in small and large agricultural corporations. Global supply chain in this context refers to the chain of all the different segments of value creation "from the field to the plate". Qualitative approaches are particularly suitable for exploring complex organisational and social processes, such as knowledge transfer and intercultural interaction, that require contextual and inter-

pretive understanding (Flick, 2009). By adopting a case study approach, this chapter provides empirical insights through interviews with agri-food and supply chain experts to examine how transcultural competencies and knowledge management practices are applied in organisational contexts. Case study research, therefore, is appropriate for investigating contemporary phenomena within their real-world settings and for analysing how organisational practices and institutional conditions shape complex processes (Yin, 2018). In this study, the qualitative case study approach enables the identification of best practices for knowledge transfer in sustainable farming cooperatives and facilitates a deeper understanding of how knowledge management contributes to bridging cultural and segmental differences within global food supply chains (Eisenhardt, 1989).

3.4 Data Collection

Therefore, primary data sources, including, on the one hand, semi-structured interviews with farmers, agronomists, cooperative leaders, and sustainability managers, should provide insights into how cultural intelligence is applied in practice and how different actors interact in knowledge transfer settings. Semi-structured interviewing allows researchers to explore participants' experiences and interpretations while maintaining flexibility to pursue emergent topics during the conversation (Kvale & Brinkmann, 2009). The interview protocol, therefore, consisted of a set of guiding questions that structured the discussion but did not limit the scope of responses. Depending on the expertise and professional role of the interviewees, follow-up questions were asked to clarify organisational practices, experiences with transcultural knowledge exchange, and examples of knowledge integration in supply chain management. Table 1 presents the main guiding questions used during the interviews.

Table 1: Main Interview Questions

1	What does transculturality and knowledge management mean in the context of your organisation?
2	How does your organisation manage transcultural communication within its global supply chains? What strategies are in place?
3	Why is knowledge management important for the sustainability of global supply chains in your organisation?
4	In your experience, how important is cultural understanding when managing international supply chain operations?
5	What challenges arise from transcultural knowledge in global supply chains?
6	What cultural or linguistic barriers most commonly affect knowledge sharing in your supply chains?
7	How do power dynamics between global headquarters and local partners influence the flow and implementation of knowledge within supply chains?
8	What strategies does your organisation use to integrate local knowledge into supply chain decision-making?
9	How are sustainability goals communicated and interpreted across different cultural contexts within the supply chain?
10	How do digital tools or platforms support – or potentially hinder – transcultural knowledge sharing in supply chain operations?
11	Can you provide examples of solutions that emerged from cross-cultural collaboration?

Note: The questions served as guiding prompts within semi-structured interviews and were complemented by follow-up questions depending on the interview context and expertise of the participants.

Source: Own elaboration.

On the other hand, to understand formal knowledge-sharing frameworks and provide context for the qualitative findings, document analysis will involve reviewing sustainability reports, policy documents, and training materials from selected organisations.

A cross-case comparison was performed to analyse variations in knowledge transfer success across different organisations and regions. Cross-case analysis is a common strategy in qualitative case study research as it enables the identification of recurring patterns and mechanisms across cases (Yin, 2018). This helped to identify best practices for overcoming cultural barriers and enhancing collaboration in sustainable farming initiatives. Analytical tools consist of content analysis and thematic categorisation, which enable the organisation of findings into conceptual frameworks and patterns of argumentation. Critical analysis will further be applied to evaluate convergences, divergences, and gaps in the literature. This design not only facilitates the synthesis of knowledge but also provides the analytical depth required to answer the research question and sub-questions.

3.5 Sampling Strategy and Data Analysis

In terms of sampling, a purposive sampling technique is employed to ensure that all participants and interviewees have direct and long-term experience in the field of transcultural knowledge management, specifically within agricultural corporations. This includes knowledge managers, training managers, and recruitment policy advisors in these selected corporations. The data analysis includes interviews and focus group transcripts, which are analysed using thematic analysis. Tables 2 and 3 summarise the empirical basis of the study by reporting interview lengths, the organisational types and operational scope of participating institutions, and the roles and geographical locations of the interviewees. Data has been and will continue to be anonymised and stored securely in compliance with the local and international standards of data protection regulations.

Table 2: Interview Sample & Characteristics

Inter-viewee	*Role*	*Type of organization*	*Countries of Operation*	*Location*
1	Knowledge Manager	Agrifood company	> 50	Vietnam
2	Supply Chain Manager	Agrifood company	> 100	Vietnam
3	Operations Manager	Infrastructure & agriculture company	> 100	Dubai
4	Chief Executive Officer	Plant solutions provider (agricultural practice)	< 50	Switzerland
5	Consultant	Int. Development Organization	> 100	Peru
6	Professor and Scientific Board	Academic & global farmers' advocacy organization	> 50	Switzerland / South Africa

Note: Organizational affiliations were anonymized where necessary to protect interviewee confidentiality.

Source: Own elaboration.

Table 3: Interview Lengths

Interviewee	*Time*
1	51:46
2	43:31
3	58:45
4	28:43
5	26:38
6	61:03

Note: Interview lengths are reported in minutes and seconds.

Source: Own elaboration.

3.6 Limitations

Several limitations should be acknowledged. The study is based on a small number of expert interviews and focuses primarily on perspectives from multinational organisations and intermediaries, which limits the direct representation of producer-level experiences. In addition, the qualitative and exploratory nature of the analysis does not allow for causal inference or broad generalisation across sectors.

Future research could address these limitations by incorporating longitudinal designs, comparative sectoral analyses, and more systematic inclusion of producer perspectives. Further work could also examine how specific institutional arrangements, such as cooperative models, hybrid governance structures, or digital extension systems, shape bidirectional knowledge flows over time.

4. Findings

Following thorough interviews with experts in knowledge management and transcultural communication in supply chains, this study provides an empirical and inductive thematic analysis of the findings, which are linked to the above literature review. Using a case study approach and purposive sampling technique, this research has identified the importance of cultural respect, trust, and rapport-building within multinational corporations (MNCs) in navigating transcultural communication, sustainability in supply chains, and knowledge management. It is further noted that while corporations may maintain these techniques across local communities, there are challenges that are often overlooked, such as power dynamics, resistance to knowledge sharing, and language barriers. As such, knowledge management and transcultural competence have become increasingly essential for sustainable and inclusive supply chain practices.

In conducting a thematic analysis, this research found that, in terms of transcultural communication and knowledge, the first step, which precedes technical discussions, is rapport building, not just globally for the MNCs but also locally with domestic policies and regulations. Thereafter, in ensuring effective knowledge transfer across borders in

various local communities, it is the responsibility of the knowledge manager to ensure that farmers feel and are heard during policy drafting and decision-making. This increases the chances of acceptance of policy and knowledge-sharing strategies in local communities. Thirdly, in all policy adoption and knowledge management, local customs, language, and respect for traditions are of outstanding importance. Finally, it must be noted that communication goes beyond mere information sharing; it also includes mutual trust and collaboration.

As stated above, there is a responsibility of transcultural competence, which is described in this paper as the ability to create new shared knowledge and meanings while respecting the differences. This thus requires active listening and the ability to adapt communication methods depending on the context. Various MNCs adopt a standardised framework and digital tools for their knowledge management, which enables it to remain consistent and aligned across global operations. However, this, too, is met with challenges and limitations, as some employees often resist knowledge sharing, and in most cases, cultural logics can derail alignment and supply chains.

Providing a theoretical and conceptual connection, it becomes apparent that transcultural knowledge aligns with Grünfelder's (2025) idea of the creation of new shared realities through relational spaces such as farm visits, local dialogue, and collaborative projects. Furthermore, Grünfelder and Baumann Montecinos' (2024) transcultural competence is evidenced in this research, whereby it is noted that MNCs align themselves with the shift from managing differences to fostering similarities through collaboration (Schwengber, 2025). This case study exemplifies Nonaka's Socialisation, Externalisation, Combination and Internalisation (SECI) model, which is explained below, wherein tacit farmer knowledge is made explicit and shared across the local community and adopted as part of policy strategy making (Simon, 1991; Nonaka, 1995).

Conclusively, this study embodies the outlined literature and further applies models and frameworks for a clearly structured thematic analysis of the findings.

The diversity of consumers globally has contributed largely to the flexibility of global supply chains, and this is narrowly attributed to the diverse knowledge and cultural landscape across regions globally.

Literature has given us the foundation for understanding knowledge management in global supply chains. With the volatile global context, there is a constant need to align literature to contemporary opportunities and limitations.

4.1 Empirical Triangulation of Key Analytical Themes

In order to synthesise findings and enhance analytical robustness, Table 4 presents a triangulation matrix where analytical themes were mapped against the perspective of the interviewees. This illustrates that key findings described in 4.2-4.10 are supported across multiple organisational levels and perspectives.

Table 4: Triangulation of Interview-Based Findings

Analytical Theme	Agribusiness Executives	Supply Chain / Operations Managers	Development Organisation Practitioner	Scientific Expert
Communication, rapport, and transcultural competence	Emphasis on rapport, humility, and local communication	Continuous coordination, informal communication	Observed failures of top-down communication	Conceptual framing of culture
Localisation vs centralisation of decision-making	Local solution development, decentralised centres	Role-based adaptation across origins	Critique of HQ-designed policies	Structural interpretation
Legal and regulatory complexity	Compliance tools, cross-jurisdictional risk	Operational delays due to a legal mismatch	Policy volatility and misalignment	Macro-level critique
Supply chain vulnerabilities & post-harvest losses	Infrastructure focus	Coordination failures across stages	Empirical evidence on storage losses	System-level diagnosis
Intermediaries and power asymmetries	Strategic acknowledgement	Market structure awareness	Detailed empirical accounts of intermediaries	Theoretical framing of power

Analytical Theme	Agribusiness Executives	Supply Chain / Operations Managers	Development Organisation Practitioner	Scientific Expert
Structural heterogeneity of food supply chains	Segmentation across chain stages	Practical implications across nodes	Observed effects in development work	Strong conceptual articulation
Experimental infrastructures (learning-by-doing)	Application centres, trials, sensory testing	On-site learning and rotations	Demonstration plots ("parcelas demostrativas")	Epistemic validation
Digital knowledge infrastructures & codification limits	Documentation vs. imitation tension	Operational use of shared data	Limited digital uptake in extension	Knowledge-theoretical reflection
Directionality of knowledge flows	Acknowledged implicitly	Partial feedback loops	Strong evidence of one-way transfer	Epistemic critique
Human capital, retention, and boundary spanners	Knowledge tied to people	Role of experienced coordinators	Skills gaps among farmers	Boundary-spanning individuals

Note. The matrix synthesises analytical themes and empirical claims derived from thematic analysis.

Source: Own elaboration.

4.2 Communication, Competence and Localisation: The Trajectory of Supply Chain Management

It is worth noting that there is no '*seven steps to knowledge management in global supply chains'* or a 'one size fits all approach'; however, practice has revealed that some common limitations and strategies exist across global supply chains in the farming industry, as alluded to in the current literature. As a key step, communication becomes instrumental in building a rapport, especially in Asia and Africa, where there are more cultural and language differences than in all other regions globally. When poorly managed, communication becomes the

exacerbator of ineffective knowledge transfer; however, when done properly, communication allows for farmers across regions to feel heard and integrated into the system. As a primary tool for localisation, communication ensures that local customs and languages are taken into account for policy formulation and implementation and ensures that correct marketing strategies are in place for the correct target market.

> "Without rapport, the conversation is just transactional – it won't result in lasting impact." Interviewee 1

As an identifying factor of a highly globalised and interdependent world, collaboration is important for any business wanting to enter a new market in a different country, as such communication is not just a matter of passing information, but rather it is an imperative tool for building mutual trust and collaboration.

Transcultural competence can only be sharpened through active listening and adapting communication styles to fit the context, thus ensuring humility and acknowledgement of local knowledge. However, this is not always a linear process, as there may be challenges with some local employees resisting the sharing of local knowledge – "Knowledge hoarding". Secondly, different cultural ideologies may complicate alignment with the overall vision and mission of the corporation. In response to this gap, firms seek to employ workers who can navigate religious, cultural, and generational differences. Consequently, as partly highlighted by existing academics, the diaspora of professionals and individuals educated in global institutions are valued for their ability to bridge cultural and organisational worlds.

> "You don't go into a community to impose knowledge; you go to exchange knowledge." Interviewee 1

Some key patterns or limitations in terms of localisation as a strategic manoeuvre are firstly that continents like Africa with more than 50 countries, different regulatory systems, and differing cultural contexts make modern-day remote operating systems complex and sometimes delay the supply chains. It was noted during our interview with an Operations Manager who is based in Dubai but works closely with South

African markets, that companies rely heavily on local partners who have a better understanding of local regulations, customer expectations, and government processes. Therefore, the strategy of localisation in optimising global supply chains enables firms to navigate complex environments through embedded knowledge, cultural fluency, and relational networks. This also reflects a shift from the traditional expatriate-driven methods towards hybrid, locally anchored organisational structures. Conclusively, cultural competence rests heavily on transparent communication between the firm and the consumers. To internalise such cultural differences, the firm must frame localisation as essential, not as optional.

> "The biggest barrier isn't technology; it's people being reluctant to share what they know." Interviewee 1

4.3 Legal Complexities and Organisational Flexibility in Multinational Operations

As mentioned above, multinational corporations exist within a complex global setting; therefore, regulatory implications must be considered when setting up systems, policies, and strategies. It has become a common theme, not just in Africa but in much of Asia, that firms must incorporate strategies to navigate international compliance requirements while still dealing with clients who may lack formal literacy or familiarity with global contracting norms. This means that there must be literacy on intercultural negotiation within the clientele context, diplomatic behaviour within a legislative context, and global leadership within the context of international norms. It is further stressed that, although regulatory environments are volatile and can shift abruptly due to regime change and other political factors, legal compliance is still non-negotiable. This is exemplified in the case of Nigeria, where import bans were announced without warning. Moreover, for an agri-business, instruments such as letters of credit, cash-against-documents, and multi-judicial verification can assist in reducing risks in such events. This is therefore a call to firms in global supply chains to ensure that they simultaneously uphold international standards

while adapting to unpredictable regulatory landscapes, and this involves both procedural rigour and operational flexibility, which leads to the next point on organisational flexibility within multicontinental operations.

> "They announced import authorisation one day, and the next day it was forbidden. Nobody warned you." Interviewee 3

Flexibility within a firm that is based in multicultural environments remains a determining factor of how susceptible its global supply chains are to events such as regime change, transcultural composition in various regions, and minor cultural issues such as working days and times. With documentation having to pass through multiple jurisdictions, each with different holidays, workdays, and bureaucratic rhythms, a single transaction that may include firms in Dubai, suppliers in Italy, banks in the United States of America, and customers in Algeria can be delayed in the case of cultural ignorance or discrepancy. Such mistakes warrant flexibility and adaptation because a small error may cause week-long delays. This thus highlights the importance of organisational resilience, transcultural coordination, and the ability to manage asynchronous systems.

> "As an international company, you can't understand all the regulations and specificities of a country alone. You need strong local partners." Interviewee 5

4.4 Supply Chain Vulnerabilities in African Agricultural Systems

An identifying factor of information gaps and coordination failure in much of Africa from a knowledge-management perspective is the 30-50% of food lost due to inadequate storage infrastructure. This point strongly highlights that, while production capacity has improved, supply chains have weakened, particularly because of inadequate storage facilities, cold chains, and transportation. As such, this undermines the efficiency and sustainability of agricultural systems, which constantly underscores post-harvest losses as a major constraint on African food security. Such an impediment highlights that sustainable supply chains

require not only infrastructure but also systemic knowledge integration across production, storage, and distribution.

The interviews indicate that these losses cannot be attributed to infrastructural deficits alone but are embedded in structural coordination asymmetries along agricultural supply chains. Production remains highly decentralised, while downstream stages such as aggregation, processing, and market access are comparatively concentrated. This mismatch challenges temporal and informational coordination, which implies limitations for producers' ability to align their harvesting, storage, and distribution decisions with downstream requirements. As a result, even where technical solutions exist, their effectiveness is constrained by fragmented governance and weak knowledge interfaces between supply chain stages.

Vulnerability is further reinforced by the intermediated organisation of market access. While intermediaries facilitate aggregation and logistics, their position often allows them to capture value through information advantages and unequal bargaining power. These arrangements secure short-term market participation but weaken incentives for producers to invest, for example, in storage capacity or sustainable practices, thereby perpetuating structural fragility.

In addition, the interviews highlight another source of vulnerability. Experiential, locally embedded knowledge relevant to production management is often insufficiently integrated into formal planning, while technical knowledge is often transferred in a one-directional manner and poorly adapted to local conditions. As a result, adoption remains limited, and interventions fall short of their intended impact.

> "They know it works, even if they don't know the chemistry behind it." Interviewee 5

4.5 Structural Heterogeneity of Food Chains

A major emergent theme is that transcultural dynamics vary not only across national contexts but also across distinct segments of the food supply chain. Within the sector, several structurally differentiated segments can be identified. This includes decentralised agricultural production with many small producers; consolidated global trading

activities dominated by a few global actors; decentralised processing stages such as milling with predominantly regional firms, and highly consolidated multinational food corporations. Each of these segments is associated with specific organisational cultures, time horizons, dominant forms of knowledge, and decision-making logics. As a result, knowledge management practices that are effective in consolidated segments – where coordination can be supported by shared organisational norms and routines – are usually inefficient in decentralised segments that rely on locally embedded practices and relational trust.

This segmentation has important implications for the design of transcultural knowledge management. Rather than treating transculturality primarily as an inter-country challenge, the findings indicate that it should also be conceptualised as an inter-segment coordination problem with modular management approaches. Where consolidation is high, cultural integration tends to be achieved rather through corporate routines and a shared organisational identity, whereas in decentralised segments, integration rather depends on ongoing local sensemaking and relationship-based infrastructures.

> "The closer you get to the consumer, the more culturally specific food becomes. [...] Where the chain is consolidated, you have one culture. Where it's decentralised, local culture dominates." Interviewee 4

4.6 Experimental Infrastructures

The case insights consistently highlight experimentation and demonstration as central mechanisms of knowledge transfer in agricultural and food supply chains. Rather than relying primarily on abstract instruction or formal documentation, knowledge is conveyed through practical settings in which actors can directly observe, test, and then evaluate outcomes. With the help of, for example, demonstration plots, pilot production lines, and application centres, participants can assess the effects of new practices or technologies under real conditions. This reduces uncertainty and the need for a formal scientific explanation. This approach is particularly important in food systems, where many relevant qualities, such as taste, texture, and processing

behaviour, are (culturally-) context-dependent and cannot be fully captured through standardised metrics alone.

> "You can't measure taste or texture – you have to test it." Interviewee 4

This finding implies that effective knowledge transfer in food supply chains depends less on the codification of information and more on practice-based validation. Where knowledge is tacit, experiential, and culturally shaped, learning occurs primarily through doing and comparison rather than through written or digital transmission. Experimental infrastructures, therefore, serve a dual function: they facilitate the translation of technical knowledge into locally applicable practices and provide settings in which experiential knowledge can be articulated and shared.

4.7 Digital Infrastructures

Digital knowledge infrastructures, such as internal knowledge management platforms and shared databases, play an increasingly central role in coordinating activities across global food supply chains. These systems support knowledge transfer between actors with different cultural backgrounds and between different chain segments by allowing organisations to document trial results and best practice cases, compare processes across locations, and support learning in geographically dispersed operations. The interviews indicate, however, that the use of such platforms introduces a tension between the benefits of documentation and the need to protect knowledge from imitation. While broader access facilitates coordination and consistency, greater transparency also increases the risk that valuable process knowledge can be replicated outside the organisation.

This tension shapes both knowledge-sharing practices and organisational strategies for retaining expertise. Some forms of knowledge – particularly those acquired through long-term practical experience – remain difficult to codify and are therefore closely tied to individuals. The findings suggest that safeguarding such knowledge depends less

on the possibilities of digital systems than on organisational continuity. When experienced staff leave, accumulated knowledge is lost; when teams remain stable, knowledge can be transferred through everyday interaction and mentoring. From this perspective, effective knowledge management in sustainability-oriented supply chains relies not only on digital infrastructure but also on organisational arrangements that support long-term learning and staff retention, which could be observed in the analysed cases.

> "Experience leaves with people. When teams stay stable, knowledge transfers naturally." Interviewee 1

4.8 Directionality of Knowledge Flows

Knowledge transfer practises between different supply chain actors are usually organised as one-way processes in which knowledge is transferred from public institutions, non-governmental organisations, or firms to producers, with little systematic incorporation of producers' own knowledge into policy or programme design. As a result, locally developed practices that are effective under specific conditions – to illustrate an example, low-input pest control methods or timing strategies – are often overlooked. This leads to the loss of forms of practical knowledge that are particularly relevant for cost-effective and context-sensitive sustainability.

The findings, therefore, suggest that effective knowledge transfer requires arrangements that allow information to move in both directions, enabling producers to contribute actively to the development and adjustment of practices rather than being treated solely as recipients of externally defined solutions. The analysed cases demonstrated best practice examples.

> "You don't go into a community to impose knowledge; you go to exchange knowledge." Interviewee 5

4.9 Knowledge Management: Homogeneity and Heterogeneity in Agriculture

Despite global diversity, global standards for farming are considered to be similar in nature, as evidenced by similar orientation, similar perception, and exhibiting a shared transcultural identity which is not conditioned by deliberate management but by universal external pressures. However, cultural heterogeneity becomes apparent towards the end of the supply chain, as it gets closer to the consumer. Some limitations surrounding this factor are that retail chains are country-specific; thus, what began as a universal heterogeneous supply chain begins to morph into a complex customer-specific line of production. This thus results in difficulties for retailers expanding beyond borders due to the drastic difference in preferences across cultures. A prime example provided by our interviewee is the difficulties encountered by Target, which is a major household store in the US; however, it has been battling to expand beyond the States to regions such as Europe and Africa. The opposite is true for global companies that operate in upstream production, such as seed production, fertilisers, and tractors, which have been noted to operate more easily across borders. This further exemplifies a global upstream actor versus local downstream actor impediment that exists in global supply chains. Evidently, transculturality is not uniform across the supply chain; it is stable upstream and fragmented downstream.

Food production generally carries a universal moral responsibility, and thus the sector employs various natural and societal resources, creating shared stewardship. This results in long-term cycles of agricultural change, which cultivate a similar temporal orientation. Therefore, transculturality in agriculture is developing, not engineered, because it arises from shared existential conditions, not from organisational interventions.

> "You don't go into a community to impose knowledge; you go to exchange knowledge." Interviewee 5

4.10 Governance, Policy and Power Dynamics in Shaping Knowledge, Sustainability and Cultural Outcomes

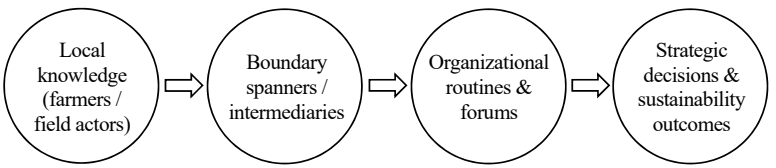
Current literature has pointed towards this aspect yet it remains mostly marginal. Although management is encouraged across both practice and literature, there has been a trend of government micromanagement, which has resulted in harmful practices. This highlights the need for macro-objectives rather than micro-rules from domestic governments. The over-regulation of local governments has resulted in power relations between farmers, governments, corporations, and scientists. Moreover, the global moral obligation to comply with sustainability frameworks such as the UNSDGs (United Nations Sustainable Development Goals) has offered the necessary supply; it is asserted that it remains insufficient due to large corporations influencing regulations and scientific agendas. Not only does this result in complexities within global supply chains, but it also results in the politicisation of transcultural knowledge management and thereby shifts towards knowledge that is shaped by regulatory incentives rather than cultural interaction.

> "The problem started when governments tried to micromanage farming instead of setting objectives." Interviewee 6

Such government involvement has further widened the gap between scientific knowledge and practical farming due to ongoing differences in incentives and worldviews. Scientists have often expressed that their knowledge is undervalued and underutilised in industry development. Yet similarly, practitioners have stated that science does not address the impediments that really exist in the industry. This not only highlights a gap in the literature but also the constant disconnects between practitioners and academics. It is further noted that only individuals who operate as both practitioners and scientists can bridge the divide and provide insight which can be implemented in policy making, governance structures, and knowledge management. This argument suggests that knowledge management in agribusinesses is relational and not purely based on structure. Therefore, transculturality emerges through boundary-spanning individuals who translate between epistemological cultures, as illustrated in Figure 1.

> "Only people who operate as both practitioners and scientists can bridge this divide. [...] Knowledge management is not a system problem – it's a people problem." Interviewee 6

Figure 1: Knowledge Integration Mechanisms across the Global Food Supply Chain Segments



Note: Conceptual illustration of key mechanisms enabling transcultural knowledge integration across global food supply chains.

Source: Own elaboration based on qualitative interview analysis.

5. Conclusion

This paper examined how transcultural knowledge transfer, exchange, and management are organised within multinational food supply chains and how these processes shape sustainability outcomes. Drawing on qualitative interviews with experts across different organisational positions and supply chain segments, the study shows that effective knowledge integration depends less on formal systems alone than on relational, organisational, and practice-based arrangements. Knowledge transfer is most effective where communication is embedded in trust-ased relationships, where experiential learning infrastructures enable validation through practice, and where local and technical knowledge are integrated across structurally heterogeneous segments of the supply chain.

The findings further demonstrate that vulnerabilities in food supply chains cannot be explained by infrastructural deficits alone. Instead, they are closely linked to coordination asymmetries, one-directional knowledge flows, and institutional arrangements that marginalise locally embedded knowledge. Transcultural knowledge management thus

emerges as a governance challenge that spans organisational design, labour stability, and the configuration of interfaces between decentralised production and consolidated downstream actors. By highlighting these dynamics, the paper contributes to research on global supply chain governance by foregrounding the social and institutional conditions under which sustainability-related knowledge is produced, translated, and applied.

Finally, the research invites policy and managerial engagement: future work should explore how international frameworks from both the private and public sectors, such as the UN Sustainable Development Goals, OECD Guidelines for Multinational Enterprises, or MNC internal policy, can more explicitly integrate transcultural competence as a criterion for sustainable supply chain management. This would not only enhance organisational learning but also strengthen the alignment between corporate sustainability and global cooperation.

Use of Artificial Intelligence Tools

AI tools (e.g., ChatGPT) were used during the writing process to provide language support, assist with the transcription of interview recordings, and support the verification of research materials. All research design, analysis, interpretation, and conclusions remain the intellectual work and responsibility of the authors.

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Appendix

Ethical Considerations

The researchers ensure that all sources are properly cited to avoid plagiarism and that arguments are presented fairly, without misrepresentation or selective use of evidence. It is also important to engage critically with diverse perspectives in the literature, including those that may challenge the researchers' assumptions, to maintain balance and scholarly rigour.

Furthermore, ethical responsibility will extend to ensuring transparency in the research process by accurately reporting findings, acknowledging limitations, and avoiding intellectual bias. This upholds the standards of academic honesty and contributes to the credibility and trustworthiness of the research paper.

Because this is an interview-based research with primary information and sources, ethical approval has been obtained from the relevant institutional review board. Moreover, informed consent has and will continue to be secured for all our participants through rigorous confidentiality throughout the research process. Data has and will continue to be anonymised and stored securely in compliance with the local and international standards of data protection regulations.

The Role of Transcultural Competence in Facilitating Knowledge Exchange in Global Supply Chains

Phú Nguyễn Hồ, Roxana Moshfeghnia and Patience Sonto Skosana

1. Introduction

As supply chains become increasingly global, the diversity of actors across cultures, languages, and institutional frameworks has expanded significantly (Holloway, 2024; Baumann Montecinos & Grünfelder, 2022). While this diversity offers opportunities for innovation and learning, it also introduces considerable complexity in communication and coordination (Jurkova, 2021; Kinoti, 2025). In such contexts, transcultural competence (or its related field of research: cultural competence) – the ability to bridge, integrate, and co-create understanding across cultural divides – has emerged as a key capability for international managers and supply chain professionals (Holloway, 2024; Baumann Montecinos & Grünfelder, 2022).

This review synthesizes academic work on knowledge transfer, cultural and transcultural competence, and organizational and technological enablers of communication in particular, in the field of supply chain management (SCM). The goal is to contextualize the role of transcultural competence in shaping effective knowledge exchange in SCM and to define the specific gap this study addresses.

2. Transcultural Competence

2.1 Culture

In order to understand how transcultural competence works and integrate it in the context of knowledge transfer in SCM, we have to grasp the definition and characteristics of culture itself, similarly to how we have just discussed knowledge transfer.

2.1.1 Definition of Culture

Culture is a complex, fuzzy and wide-ranging concept, with intensive endeavors from researchers to define it clearly (Fischer & Wieland, 2018; Leung et al., 2002, p. 286; Spencer-Oatey, 2012; Taras et al., 2009). Some attempts to define culture as well as literature reviews on the topic are as follows.

Definition of culture in a qualitative perspective: According to Fischer & Wieland (2018), the terminology "culture" takes its root in the Latin word "*colere"* meaning "*to till, to tend, to care for* or *to cultivate*". Tylor's (1889) perception of culture as a "complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by a man as a member of society" was one of the earliest and most well-known definitions in the field (Fischer & Wieland, 2018; Geertz, 1973, p. 4). Geertz (1973, pp. 4-5) sought to expand on Tylor's theory by using semiotic, thick description; according to him, culture must be put into context ("webs of significance") and explored with an interpretative mind, not an experimental science, since when a "contracting" of "the eyelids" are out of context, no-one shall know whether it is an instinctive "twitch" or a conspiratorial "wink" (Geertz, 1973, p. 6). Fischer and Wieland (2018) also mentioned some other definitions of cultures, mainly in terms of sociology and Systems Theory: a subsystem differentiated by "art, education, science and intellectual activities" or "an 'assemblage' of meanings and imagining."

Furthermore, Spencer-Oatey (2012, pp. 3-16) discussed the characteristics of cultures. Of the twelve characteristics explored, some notable ones are as follows. For instance, culture is different from that of

"*human nature*" and "*personality*," it's both a nurtured practice and has the scope between individual and humanity (Spencer-Oatley, 2012, pp. 6-7). Then, culture is learned and would change over time (Spencer-Oatley, 2012, pp. 12-14).

Definition of culture in a quantitative perspective: As we can see, the aforementioned definitions focused more on the "qualitative" aspects of culture, in which cultures were recorded as qualitative descriptions of societies (Taras et al., 2009, p. 359). In practice, one would like to apply culture knowledge into their practical fields, such as management, sociology and social science or psychology (Taras et al., 2009); this might mean that, to use the theory of culture in SCM, a more quantitative approach would be beneficial. Indeed, Geertz (1973, p. 24) argued that culture could be as "formulable" as a field of natural science; the only hindrance is the almost "nonexistent" terminology to explain the formulations.

To compensate for this, we are going to look into the measures supported by intensive empirical research. Taras et al. (2009) mentioned the possibility of doing so through shifting "the focus" to the "cultural values and attitudes" that dictate human behavior. Some quantitative approaches to culture listed by Taras et al. (2009) are: the "Culture's Consequences" (Hofstede, 2001); "low and high-context groups" (Hall, 1977); the "tightness-looseness" value-free model of Gelfand et al. (2006); the social axiom theory with empirical data of Bond et al. (2004) and Leung et al. (2002); etc.

To begin with, the Culture's Consequences model was developed by Hofstede (2001). In his book, Hofstede (2001, p. 9) defined culture as "*the collective programming of the mind that distinguishes the members of one group or category of people from another."* To be more specific, each culture has their own "values" and "practices"; the latter include unique perceptions of "symbols", "heroes" and "rituals" (Hofstede, 2001, p. 10). The six dimensions proposed include the five dimensions *power distance, uncertainty avoidance, individualism versus collectivism, masculinity versus femininity* and *long-term versus short-term orientation* (Hofstede, 2001, p. 29) and an additional dimension of *Indulgent versus Restraint* (Hofstede, 2011). The theory was backed by statistically significant empirical data and rigorous validation methods, e.g., ensuring conceptual and statistical independence

between the dimensions (Hofstede, 2001, pp. 41-78). Some survey questions are mentioned by Hofstede (2011) and could be used as a source of reference in the interview process.

Aside from the prevalent perspective of "value" dimensions, there have been attempts to look at culture in terms of value-free models (Taras et al., 2009, p. 359). One such attempt is the aforementioned "low and high context groups" model of Hall in 1977 (Taras et al., 2009, p. 369). Likewise, Leung et al. (2002) went further and explored culture in terms of *social axioms* – "basic assumptions" about a society's elements and how it functions (Leung et al., 2002, p. 289; Taras et al., 2009, p. 359). According to the theory, social axioms are "generalized beliefs," in which *a belief* refers to "a perceived relationship between two objects or concepts" (Leung et al., 2002, p. 289), e.g., "*good things* will happen to *good people*." The dimensions (factors) of social axioms are *cynicism, social complexity, reward for application, spirituality* and *fate control* (Leung et al., 2002, p. 292). More in-depth discussion on these dimensions, as well as some survey items were also included by Leung et al. (2002, pp. 292-295).

From these literature reviews and surveys of culture experts, Taras et al. (2009, p. 360) compiled two tables of measures and dimensions of culture, giving an assessable perspective to culture. For the first one, the main five dimensions in the research of Hofstede (2001) are included (excluding Indulgent-Restraint which was included later on by Hofstede, 2011), showcasing his influence in the field (Taras et al., 2009). Each dimension of the cultural instrument has from 2 to 11 measures (e.g., "Teamwork and cooperation" in "Individualism-collectivism"). For the result of "expert opinion survey" by Taras et al. (2009), the four highest scoring dimensions (criteria: "Relevance to workplace") are power distance, assertiveness, inclination to teamwork, and risk-avoidance. The dimensions would be a great reference for the making and analysis of interviews.

To establish a focused theoretical framework for this study, we proceed primarily with Hofstede's (2001, p. 9) definition of culture as "the collective programming of the mind that distinguishes the members of one group or category of people from another." Because our subsequent findings heavily explore both formal hierarchical structures and relationship-driven communication within supply chains, we

rely on a synthesized approach. We utilize Hofstede's (2001) quantitative dimensions – specifically power distance and uncertainty avoidance – alongside Hall's (1977) high- and low-context communication models to effectively analyze the transcultural dynamics between the South African and Vietnamese contexts.

2.1.2 From Cultural to Transcultural Competence

There are many ways to gauge one's capabilities to navigate and work together with people from "various cultural backgrounds", like the ones differentiated by Fischer and Wieland (2018): intercultural, multicultural and transcultural competences. Going through related theories in "cultural differences" (Fischer & Wieland, 2018) could help us understand more about the term "transcultural competence" itself.

Initially, cultural competence refers to an individual's capacity to function effectively ("achieving the valued goals and outcomes") in intercultural settings and includes traits such as openness, empathy, and adaptability (Alizadeh & Chavan, 2016, ~~p.~~ e120; Ang et al., 2015; Leung et al., 2014). However, cultural competence is often reactive and too focused on adapting to predefined cultural norms (Salhi et al., 2019) or on a static assumption based on ethnicity (Kleinman & Benson, 2006; Salhi et al., 2019); this could potentially lead to prejudices about individuals based on their culture or ethnicity, a practice looked down upon by Tylor (1889, p. 11). This perspective would align well with how national and cultural characteristics affect SCM (Gupta & Gupta, 2019; Kinoti, 2025). Still, its limitations led to the proposal of structural competency (Salhi et al., 2019), and intercultural competence. Of the two, the former is in the clinical field and not really related to SCM, while the latter experienced intensive research and efforts to conceptualize (Deardorff, 2009, pp. 44-45; Jurkova, 2021). Despite this, interculturality also has its limitations: it may not be sufficient in the complex multicultural setting, as communication in particular not only consists of interactions "in-between" cultures (as suggested by the prefix "inter"), but rather ones that "transcend boundaries" (Baker, 2022).

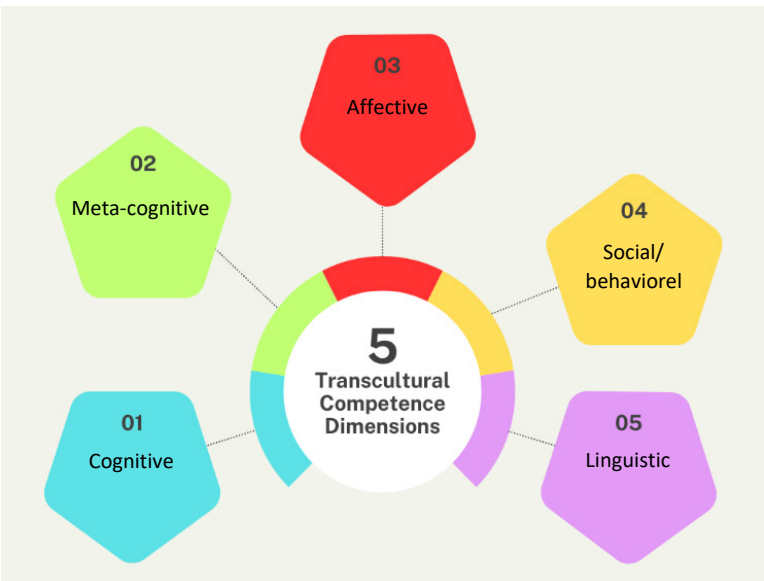
Transcultural competence, unlike the aforementioned theories, emphasizes proactive co-creation of shared meanings, practices, and trust across cultural boundaries (Jurkova, 2021). Jurkova (2021) frames transcultural competence as a continuous learning process involving global awareness, critical reflection, and relational dialog. Jurkova (2021, p. 115) saw transcultural competence as the combination of three dimensions: cognitive, affective and social. Slimbach (as cited in Jurkova, 2021), underscores the importance of ethnographic skills and language proficiency in transcultural growth. Trenches-Parera & Pastena (2021) perceived transcultural competence as having four dimensions: linguistic, attitudinal (inclination and perspectives of other cultures, their people and international affairs), affective (e.g., transcultural sensitivity, open-mindedness, confidence, comfort) and identitary. Kayes et al. (2005) identify seven essential competencies, including managing ambiguity and building intercultural relationships, as critical for collaborative performance in culturally complex environments.

On a side note, aside from the transcultural competence framework, Ang et al. (2015) proposed Cultural Intelligence (CQ) – a notable framework that is both measurable and malleable. CQ is defined as an individual's capability to operate effectively in diverse cultural contexts (Ang et al., 2015). It includes four components: metacognitive (awareness of cultural assumptions), cognitive (factual knowledge), motivational (drive to engage), and behavioral (interactional adaptability). CQ is both a *predictor* and an *enabler* of performance in multicultural settings, especially where collaborative decision-making and learning are involved (Ang et al., 2015). It is malleable, influenced by training, organizational climate, and individual background. Tools such as the Cultural Intelligence Scale (CQS) or intercultural situational judgment tests (iSJT) provide frameworks to assess and develop CQ. While CQ focuses on individual competence, its practical value lies in how it supports shared meaning-making in cross-border environments – particularly when paired with inclusive organizational systems.

In conclusion, all these perspectives contributing to cultural study make it a diverse field of research. We chose transcultural competence as our framework as it implies a transcendental boundary in a multicultural setting. To use a metaphor: while cultural competence implies

the ability to live inside another's barn, and intercultural competence facilitates interaction from opposite sides of a fence, transcultural competence moves beyond mere "tolerance." It involves the active co-creation of a "new tent" that belongs to, and works for, both parties. Drawing from Cultural Intelligence (CQ) (Ang et al., 2015) and the dimensions of transculturality (Jurkova, 2021; Trenches-Parera & Pastena, 2021), we propose a multidimensional framework for this study. We categorize transcultural competence into six key dimensions (Figure 1 shows five of them): cognitive, meta-cognitive, motivational, affective, social/behavioral and linguistic. These main dimensions and some secondary transcultural characteristics above serve as the foundational and deductive subtopics for our thematic analysis, capturing the holistic effort required to build that shared space.

Figure 1: Transcultural Competence Dimensions ("motivational" excluded due to its rare occurrence during the interviews)



Source: Own representation.

2.1.3 Evaluation of Transcultural Competence

In conclusion, the quantitative instruments to measure culture that we could use as references for the interview are the IBM study of Hofstede (2001), the social axioms model of Leung et al. (2002, pp. 293-294) and the GLOBE project of House et al. (2004). All of these instruments have reliable and statistical significant data: 100,000 samples for the IBM study and 17,370 samples for the GLOBE study (Tares et al., 2009, p. 364); multiple methods of interviewing, surveying, content analysis of Leung et al. (2002, pp. 290-291). Moreover, the study of Hofstede (2001) bore statistically independent results and was one of the foundational culture survey methods (Hofstede, 2001, p. xx), while the GLOBE project was perceived as more consistent in "correspondence between item wording and the intended level of measurement" compared with other related studies (Tares et al., 2009, p. 367). However, it would be of utmost importance that we keep in mind the warning of the "cognitivist fallacy" pitfall (Geertz, 1973, p. 12), and the conclusion that quantitative approaches might not successfully "capture the unique variance" or the "descriptive" nature of cultures (Spencer-Oatley, 2012, p. 15; Tares et al., 2009, p. 370).

From this, considering culture as an important element of transcultural competence, we take into account the aforementioned studies as secondary reference resources. The iSJT test included in the paper of Rockstuhl et al. (2015, p. 467) could also be a great reference, but the specific materials seem to be private, so we only consider their methodology and some of the sample verbal questions. On the other hand, the CQS proposed by Ang et al. (2015) is available and is straightforward enough as a sub-part of our larger interview protocol (Ang et al., 2015, pp. 311-312).

3. The Context of Knowledge Transfer in Global Supply Chains

This section discusses the context of knowledge transfer in the global supply chain, in which transcultural competence is an integral part.

3.1 Knowledge Transfer

Knowledge is not simply information, but a socially and contextually constructed resource. Tsoukas & Vladimirou (2001, p. 976) define knowledge as the ability to draw distinctions in practice, influenced by "context or theory, or both." On the organizational scale, knowledge is further put into these perspectives: the task-oriented domain of action, organizational context and generalizations based on "historically evolved collective understandings and experiences." Organizational knowledge, is hence the one important way to be ahead in competitions (van Wijk et al., 2008). Van Wijk et al. (2008) identify key factors that shape inter- and intra-organizational knowledge transfer – such as absorptive capacity, shared systems, cultural distance, and knowledge ambiguity.

Knowledge exchange in the supply chain context is increasingly understood as a multi-level capability that underpins learning, innovation, performance and resilience across inter-organizational networks. Within supply chain relationships, the effectiveness of knowledge exchange depends not only on structural connections and trust but, critically, on cognitive social capital, meaning that shared understanding, common language and aligned interpretations are necessary to transform interactions into meaningful knowledge transfer (Handoko et al., 2023). At the cognitive level, supply chains require a balance between shared cognition and diversity; alignment supports coordination and communication, but excessive congruence can create rigidity and suppress process innovation, meaning cognitive conditions must be deliberately managed to sustain effective knowledge exchange (Żywiołek et al., 2025). Moreover, knowledge exchange in the form of staff training and "continuous workforce development" is also connected to enhanced supply chain performance (Kinoti, 2025). Finally, knowledge exchange plays a central role in coping with supply chain complexity. It enhances the flexibility and resilience, especially under conditions of uncertainty (Blome et al., 2014; Hernández-Espallardo et al., 2010),

as knowledge exchange (through digitalization, collaboration, leadership development and learning structures) helps firms address product, process, customer and decision-making complexity while strengthening integration and performance (Ahmed et al., 2022).

However, global supply chains also face barriers including language differences, unclear communication expectations, and fear of opportunism (Myers & Cheung, 2008). These issues point to the need for human and relational capabilities – particularly those grounded in cultural understanding.

Collectively, these studies establish knowledge exchange as a strategic, relational and cognitive process that is foundational to the functioning, adaptability and competitiveness of modern supply chains.

3.2 Supply Chain in the Context of Vietnam

SCM is a crucial field for Vietnam. To elaborate, since its economic reforms in the late 20th century, Vietnam has been an open and export-driven economy (Hollweg et al., 2017, pp. 4-5). During recent decades, the country has also experienced an upward trend in trade volume – export-import turnover increased 4.34 times from 2010 to 2023, and increasing physical volume of goods – the total volume of freight tripled in 2023 compared with 2010 (General Statistics Office, 2024). In addition, other countries in the global value chain also posed an incentive for improving transport and logistics, as suggested by Hollweg et al. (2017, p. 11). From this, we could see the importance of SCM to Vietnam.

The research on SCM in Vietnam has been mainly on the following topics (T. T. B. Nguyen et al., 2024): uncertainty, digitalization, value creation, structural changes (structure, culture, leadership), and organizational barriers. According to T. T. B.-Nguyen et al. (2024), these are towards the goal of sustainable supply chain in Vietnam.

Regarding the theme of uncertainty, risk and uncertainty are both considered as an integral part in the theoretical research landscape and as crucial factors facilitating supply chain performance (N. H. Duong & Ha, 2021; T. T. B. Nguyen et al., 2024). To elaborate, Dao et al. (2023) classified the risks into transportation disruption, natural disas-

ters, port congestion, and cybersecurity breaches, while emphasizing the need for proactive measures, diversification and technology adoption to enhance supply chain resilience and productivity. N. H. Duong & Ha (2021) expanded the perspective by acknowledging the contribution of risk management to supply chain integration, as well as how knowledge sharing reduced uncertainty and risk.

Furthermore, antecedents and consequences of SCM risk management were surveyed from the perspective of industries such as pharmaceutical and construction (A. T. B. Duong et al., 2023; T. M. A. Nguyen et al., 2024). Regarding the theme of digitalization, one important antecedent of SCM, Le & Dang (2023) and T. D. Nguyen et al. (2025) discussed the factors influencing digital transformation in the supply chain; T. V. Nguyen et al. (2024) approached the problem using a case-study of small and medium-sized enterprises (SMEs), while generalizing and considering knowledge management as "the key" to digital transformation. Alternatively, H. Nguyen et al. (2021) discussed how manufacturers and "supply chain members" interact with each other. According to them, there are the dimensions of "cultural compatibility" (CC) and "information exchange" (IE), dividing interaction between firms into three main groups: reactive (low CC, low IE), initiative (low CC, high IE), and proactive (high CC, high IE). This quantitative research is the closest to our approach.

Some other research explored the relationship between internal collaboration (i.e., between departments in the company) and group culture in garment companies (D. T. M. Tran et al., 2025); the effect of CQ on corporate social responsibility, and especially *knowledge-based* and identity-based trust (Luu, 2016); the capabilities and skills (general "competencies", not only cultural competence) affecting the performance of logistics managers (D. M. Tran et al., 2025).

To our knowledge, although there has been literature on SCM, transcultural and knowledge exchange, the research landscape lacks a comprehensive link connecting them together, especially in the context of Vietnam. Firstly, for the pair of SCM and cultural / transcultural competence, the research of Luu (2016) investigated the influence of CQ in the Vietnamese SCM context. Secondly, the review of SCM and knowledge exchange showed that, in the context of SCM, knowledge exchange is mentioned either in the form of supply chain integration

or knowledge flow and management. According to N. H. Duong & Ha (2021), supply chain integration (i.e., sharing information and collaboration) with another supplier or within the internal organization needs to be focussed on by managers, as they are related to sustainability and risk management of the supply chain. T. V. Nguyen et al. (2024), on the other hand, looked at the aspect of digitalization, and perceived knowledge management as the center and a great tool to optimize knowledge flow and digitalization. On a side note, the study of H. Nguyen et al. (2021) is the closest to what we are looking for. However, it is quantitative research, and focused more on the relationship between supply chain companies' "cultural compatibility" as a whole, not individual social and transcultural interaction.

In conclusion, the research gap is perceived to be the lack of connection between the three very important fields of SCM, transculturality, and knowledge exchange. Rigorous and in-depth research has been done on each field separately, but a cross-domain connection is yet to be seen. This is especially contradictory, considering the international nature of SCM, as well as emerging and integrating economies like that of Vietnam.

3.3 Supply Chain in the Context of South Africa

The study of SCM in South Africa focuses mainly on the topics of green SCM, innovation, the fast-moving consumer goods industry (FMCG), the public sector, and the antecedents of SCM. Compared with Vietnam, the themes are more heavily centered on overcoming systemic public sector inefficiencies, navigating socio-economic constraints, and transitioning toward digitalized supply chains. However, as is the case with Vietnam, there is a distinct lack of connection between transcultural competence, SCM, and knowledge exchange within the South African research landscape.

An older research study by Mvubu and Naude (2016) looked at green and sustainable practices of SCM in the FMCG sector. From the perspective of one FMCG company, the authors looked for the "constraints" faced when practicing green SCM, as well as the "remedies" to overcome them. During a similar period, Ambe and Badenhorst-

Weiss (2012) identified how SCM was practiced in the public sector. Even though policies and legislations had been established, SCM in the South African public sector still suffered from numerous problems, critically including a "lack of skills, capacity and knowledge of the workforce." According to the authors, despite workshops and training since the inception of the "New Public Management" model in 2003, "fully skilled and professional SCM personnel" remained crucial for implementation, and their absence was leading to "bad governance." To resolve this, they suggested improving training curricula, recruiting skilled personnel, and utilizing information and communication systems. Fast forward more than a decade, the study by Maramura and Ruwanika (2023) further delved into the public sector and its persistent challenges. Focusing on the Mangaung Metropolitan Municipality, they found that SCM performance was still negatively affected by a "lack of human capacity" and a "lack of skills." Consequently, Maramura and Ruwanika (2023) suggested digitalization (moving "from a paper-based system to an electronic system") and the hiring of competent SCM professionals to facilitate quicker procurement. These studies highlight the dominance of the public sector in South African SCM research, as well as the chronic, systemic deficit in knowledge and skills.

Beyond the public sector, researchers have investigated various antecedents and technological facilitators of SCM. Mofokeng and Chinomona (2019) discussed how SCM performance is positively affected by supply chain partnerships, collaboration, and integration, based on a sample of 271 SMEs. From a technological perspective, recent studies highlight how innovation facilitates SCM resilience. Hirsch et al. (2024) researched the use of artificial intelligence and information systems to improve supply chain resilience specifically within the FMCG industry. Similarly, Mahache and Mafini (2025) surveyed the "mediating role" of innovation within the landscape of municipal supply chains and service delivery.

Despite the breadth of research covering public sector challenges, green SCM, and technological integration, there remains a noticeable void regarding the human and cultural elements that drive these processes. While studies emphasize collaboration (Mofokeng & Chinomona, 2019) and highlight severe skills deficits (Maramura & Ruwanika, 2023), the literature rarely examines how knowledge is actively

exchanged across organizational or cultural boundaries to build these necessary competencies. Unlike the Vietnamese context, where knowledge exchange is increasingly linked to supply chain integration, South African literature focuses predominantly on structural and technological remedies. Therefore, establishing a cross-domain connection linking transculturality, knowledge exchange, and SCM remains an underexplored but critical necessity in the South African context.

4. Research Gap and Aim of This Study

The literature strongly supports the role of cultural and transcultural capabilities in shaping knowledge transfer. However, while many studies explore general intercultural competence or the structure of knowledge systems, few examine how transcultural competence specifically enables or hinders knowledge exchange in the context of global supply chains.

Moreover, geographically, the literature regarding cultural factors in SCM contains a bias toward a few countries. Indeed, there have been more studies on the USA, China and western countries' SCM and cultural practices since these nations are more dominant in the global supply chain (Dhaigude et al., 2025, p. 6; Kinoti, 2025, p. 48). Conversely, as elaborated in part III, there have been emerging but still "underexplored" markets and supply chain nodes like Vietnam, Africa, Australia, Brazil, etc. (Dhaigude et al., 2025, p. 6; Kinoti, 2025). On the basis of this, discussion on SCM in these two countries would bring better coverage and inclusivity to the international SCM field (Dhaigude et al., 2025, p. 6).

This topic matters because, as supply chains grow in complexity, cultural diversity, and digital integration, the ability to create shared understanding across boundaries becomes central to performance, innovation, and resilience (Blome et al., 2014; Cummings, 2004; Jurkova, 2021). By investigating this relationship, the study aims to clarify how human competencies and organizational conditions combine to support or hinder the smooth flow of knowledge across global supply networks.

5. Research Design

5.1 Research Aim

As global markets continue to integrate, businesses increasingly rely on multicultural teams across their supply chains. These collaborations call for more than basic language proficiency – they necessitate transcultural competence: the ability to communicate, collaborate, and share knowledge effectively across cultures. Although knowledge transfer is essential to supply chain performance, cultural misalignment still poses a significant barrier (Muthusamy & White, 2005). This study seeks to explore the influence of transcultural competence on knowledge transfer within international supply chains. The research focuses on companies operating in South Africa and Vietnam. By studying these countries, we could understand how to develop transcultural skills, and hence, identify the primary opportunities and obstacles in fostering global SCM knowledge exchange.

As mentioned in section 3, previous research has overlooked transcultural competence as a critical factor in SCM knowledge exchange. This study addresses this overlooked dimension by exploring the main research question:

How does transcultural competence influence knowledge exchange in supply chain management within the specific multicultural contexts of South Africa and Vietnam?

And to answer it, we would seek the answers to these two sub-questions:

- How is transcultural competence practically understood?
- What are the main enablers, obstacles and respective strategies to its application by professionals in these regions?

5.2 Methodology

5.2.1 Qualitative, Semi-Structured Interviews

The primary method employs qualitative, semi-structured interviews with five interviewees and one pilot interviewee, from the pool of supply chain professionals and academics.

For the qualitative aspect, this study adopts a qualitative and exploratory research design to investigate the role of transcultural competence in knowledge transfer within international supply chains. A qualitative approach is ideal for exploring complex, human-centered phenomena, particularly where social dynamics and individual interpretations are central (Creswell & Poth, 2018, p. 40; Merriam & Tisdell, 2016; Trenches-Parera & Pastena, 2021, pp. 4-5). The exploratory nature of this design allows for flexibility and responsiveness to emerging patterns, making it especially suitable for studying a relatively underresearched topic such as transcultural competence in Vietnam and South Africa (Stebbins, 2001; Dhaigude et al., 2025, p. 6).

The choice of qualitative semi-structured interviews offers flexibility and allows for deeper understanding of cultural nuances (Holloway, 2024, pp. 10-11) while ensuring that core topics are consistently covered. Participants are encouraged to reflect on their experiences with knowledge transfer in multicultural teams, cultural misunderstandings, and strategies for effective communication. The interviews will be conducted in English and Vietnamese. Before each interview, participants will be asked for their preferred language from these two languages. Each interview will be recorded and then transcribed for analysis (Adams, 2015). Moreover, this research follows an interpretivist paradigm, assuming that meaning is constructed through human interaction and is therefore best understood through participants' lived experiences (Lincoln & Guba, 1985; Marshall & Rossman, 2016). Accordingly, the focus is on how supply chain professionals interpret and apply transcultural competence in their knowledge-sharing practices.

By collecting data from interviewees in international companies located in South Africa and Vietnam, who were exposed to supply chain management settings, the study uses a multi-case qualitative design to identify both shared themes and cultural particularities. This allows for

comparative and duplicated insights into how transcultural knowledge transfer manifests across different organizations through the supply chain. Such a framework is particularly useful given prior research showing that knowledge transfer is significantly influenced by cultural, contextual, and interpersonal factors.

5.2.2 Participant Selection and Sampling Strategy

Participants will be selected using purposive sampling techniques. These techniques are well-suited for qualitative studies where participants must have specific knowledge or experience relevant to the research questions (Palinkas et al., 2015). We aim to include supervisors or team leaders with at least three years of experience, who have managed transcultural or cross-functional teams, and are involved in physical or knowledge-based supply chains. The reason is to ensure that participants are familiar with team dynamics and knowledge flow, and the application of transcultural competencies, which makes our results more valid. Our first participants are chosen from universities and the professional platform Linkedin. This selection follows a structured approach with prepared criteria to make sure we select the relevant and right participants for our interviews. Inclusion criteria include: a minimum of three years of professional or academic experience in international or intercultural SCM environments. This criterion ensures that all participants can offer informed insights into knowledge transfer and transcultural competence. Professionals from various sectors (e.g., logistics, procurement, operations) and academics in related disciplines will be included to ensure diversity (Patton, 2015).

During our search, we found six interviewees: three in Vietnam, and three in South Africa. Of the three interviewees in Vietnam, there is one experienced expat (whose nationality is set as European to avoid them being identified) and one pilot interviewee (who contributed valuable advice on methodology and interview questions). We refer to them by their aliases (Table 1).

Table 1: Interviewee's Aliases and Position

Alias	Nationality	Language interviewing in	Position
VN-1	European	English	Global supply manager, national manager
VN-2	Vietnamese	Vietnamese	Regional sales executive, transport coordinator
VN-Pilot	Vietnamese	English	Operation associate
SA-1	South African	English	Category management specialist
SA-2	South African	English	Supply chain administrator
SA-3	South African	English	Production coordinator

Source: Own representation.

5.3 Interview Protocol and Data Processing

The interviews will follow a semi-structured "general interview guide" format to balance consistency and flexibility (Adams, 2015; Patton, 2001). This format is ideal for encouraging in-depth discussions and exploration of ideas and themes (Creswell & Poth, 2018) while ensuring comparability across interviews. Interview questions will draw from several categories, including experience, beliefs, knowledge, and demographics (Patton, 2001, pp. 348-351), tailored to evaluate transcultural awareness (Leung et al., 2014).

Open-ended and singular questions are important for qualitative interviews. With open-ended questions, we could receive an interviewee's in-depth experience in their own words (Johns Hopkins Bloomberg School of Public Health, 2014; Patton, 2001, p. 353). To achieve this, we have some methods: asking "how" and "what" questions more often, and being aware that "why" questions may have the presupposition of the subject and could be ambiguous (Creswell & Poth, 2018; Patton, 2001, pp. 363-364). We should also avoid implied yes-no questions (also called dichotomy by Patton, 2001, p. 354) to not limit the interviewees to just two choices. For singular questions, it is deemed as a

basic rule of interviewing by Patton (2001, pp. 358-360). This is simply because the interviewees may become confused if too many questions are asked.

Another important part of the interview is how to interact with the interviewee, especially with follow-up questions. For instance, these kinds of questions could help us deepen the interviewee's response and explore it from different perspectives (Patton, 2001, p. 372). There are many ways to ask probing questions. On the one hand, we could practice detail-oriented probes (direct), utilizing "who," "where," "what," and "how" questions to get more information on an answer (Patton, 2001, p. 373). These probes could further be divided by their purpose: for clarification (including *contrast probe*) and for going into more depth (Johns Hopkins Bloomberg School of Public Health, 2014; Patton, 2001, pp. 372-374). And on the other hand, we have elaboration probes (indirect) (Patton, 2001, p. 37 which comprise of non-verbal cues such as nodding, smiling or verbal ones like the mirroring technique, showing empathy (e.g., "I understand that") and using fillers (e.g., "uh huh," "interesting"). Moreover, as suggested by one of our interviewees, after an answer, the interviewer should briefly share their experience on the subject matter to better connect both sides.

We also need to avoid some rabbit holes of interviewing. For instance, it is crucial to avoid leading questions, as they could negatively affect our neutrality in an implicit manner (Patton, 2001, p. 369). We prevent this by using open-ended questions and avoiding presuppositions that assume certain things about the questions being asked. Furthermore, there are also some behaviors that should be avoided, e.g., overly dramatic nodding and verbal fillers (which could interrupt the speaker; or could imply a cue to stop talking on the interviewee's part, suggested by Patton, 2001, p. 373).

5.4 Data Analysis Approach

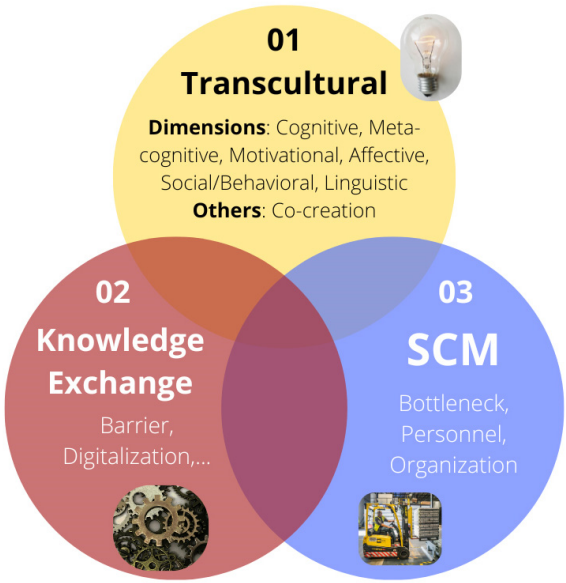
After the interviews, the recordings were transcribed using a secured software run on a local machine. The tool uses the Whisper model of OpenAI (Radford et al., 2023). The transcription will be followed by manual review to ensure accuracy. The translation, if required, will then

be done by the speaker of the original language in the research group. Note-taking will be minimized to maintain interviewer focus and rapport (Patton, 2001). This method will help to deal with one important problem of qualitative research: the sheer amount of time required to transcribe the interview, which could span up to 10,000 pages in extreme cases (Patton, 2001). During that process, we need to keep in mind that the first and foremost thing of qualitative research is the collection of raw, unprocessed data in the form of a transcript (Patton, 2001). Immersing ourselves in the raw data may gain us insights that otherwise cannot be attained through a perfect and altered script (Patton, 2001).

In qualitative research, we have two popular approaches: content and thematic analysis. Firstly, content analysis requires us to find out the common trend in the text script through both qualitative and quantitative approaches (Özden, 2024; Vaismoradi & Snelgrove, 2019). Secondly, the thematic analysis consists of classifying the data into clusters of themes, sub-themes and subtopics, making it purely qualitative (Özden, 2024; Vaismoradi & Snelgrove, 2019). Of the two, thematic analysis is considered to be exhaustive as well as more intensive and richer in meaning than content analysis (Özden, 2024), whereas content analysis may miss important nuances in the data (Vaismoradi & Snelgrove, 2019), as it, for example, analyses the frequency of word usage without taking into account the interaction between words with each other.

Hence, we will apply thematic analysis for our research. The data was analyzed using a thematic approach, where specific main topics were categorized into subtopics – dimensions of transcultural competence, knowledge exchange barriers, SCM, and other aspects (Figure 2). Based on this, we could identify patterns and co-occurrences across both the Vietnamese and South African contexts without relying on purely anecdotal interpretations.

Figure 2: Analytic Framework for the Interview Results



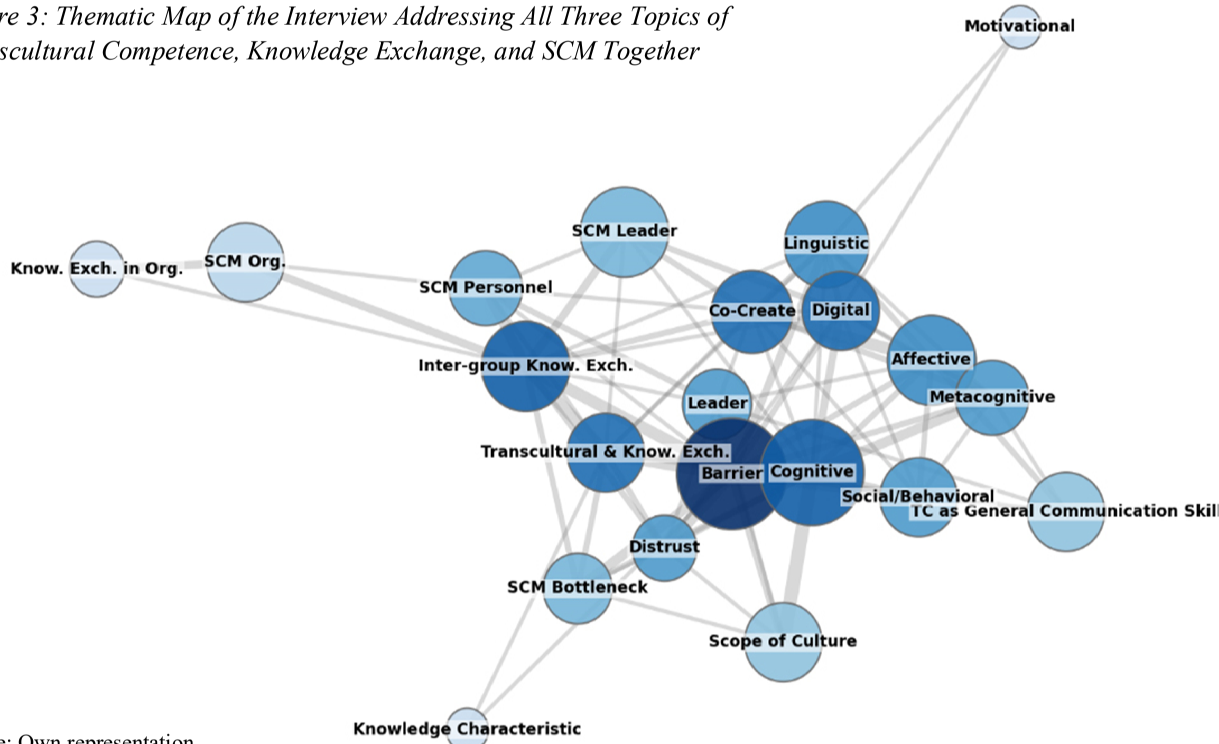
Source: Own representation with CC0 Pexels images (Pixabay and ELEVATE).

6. Findings

6.1 Visualizing the Thematic Network of Transcultural Competence

To move beyond simple frequency counts or pure qualitative interview analysis, we mapped the co-occurrence of our qualitative subtopics (Figure 2) using a network graph (Figure 3): the more often a subtopic is mentioned, the bigger its node (the circle) is; and the more two nodes co-occur with each other, the thicker their edge (the line connecting them). This visualization reveals a highly centralized thematic structure, indicating that transcultural competence and knowledge exchange are deeply intertwined in practice as a big theme rather than existing as isolated phenomena.

Figure 3: Thematic Map of the Interview Addressing All Three Topics of Transcultural Competence, Knowledge Exchange, and SCM Together



Source: Own representation.

At the heart of this network, nodes representing cognitive competence and knowledge exchange barriers display the highest frequency and strongest degree centrality. Their proximity visually confirms that cognitive cultural awareness serves as the primary mechanism that practitioners rely on when confronting structural or communicative barriers. Alongside this dominant core, inter-group knowledge exchange acts as a distinct sub-center, emphasizing that overcoming these barriers is most critical when information crosses distinct cultural or departmental boundaries. Moreover, the inductive nodes of distrust/discrimination being centered between SCM bottle neck and knowledge exchange barrier implies distrust is one of the main causes of knowledge exchange difficulties in SCM.

Furthermore, the layout validates our deductive framework: core dimensions – specifically the cognitive, meta-cognitive, social, and linguistic subtopics – cluster tightly near the center. Crucially, co-creation, which distinguishes transcultural from intercultural competence, is moderately large and centrally positioned, highlighting its role as a bridging mechanism between foundational skills and active knowledge transfer. Conversely, motivational competence appears as a peripheral outlier, connecting almost exclusively to linguistic and digital themes. This suggests that for these SCM veterans, the motivation to engage is not a general attitude, but is specifically triggered by the need to overcome distinct language or technological gaps.

Finally, nodes related to knowledge exchange in organizations, SCM organizational structures, and knowledge characteristics sit at the distal edges of the network. This indicates that while participants recognize the broader structural SCM context, their day-to-day focus remains overwhelmingly on the immediate, interpersonal friction of transcultural interactions.

Overall, our interviews resulted in a highly structured theme, with the main center knowledge exchange barrier and cognitive competence as the main challenge – solution pair. The main cluster also has inter-group knowledge exchange as an emerging node. This connects all of the fields of transcultural competence, knowledge exchange and SCM.

6.2 How Do Experts Perceive Transcultural Competence?

We did not explicitly ask for a definition of transcultural competence from the interviewees. We explored their perception through how they define the skills and characteristics a person would need to navigate, connect and co-create values in a multicultural environment. Overall, we perceived two main important themes: structured transcultural dimensions – when interviewees perceive transcultural interactions according to our framework (Figure 1: Cognitive, Meta-cognitive, Linguistic, Affective, Social/Behavioral, Motivational); and when they occasionally see transcultural competence as innate communication abilities (TC as general communication skill).

For the former, the interviewees showed and expressed interest not only in intercultural skills and CQ, but also in the specific dimensions of transcultural competence such as the co-creation of meaning, and less importantly, identitary as well as the consideration for continuous learning.

6.2.1 The Dominance of Cultural Awareness – The Role of Knowledge and Language

Firstly, as illustrated from the thematic map above (Figure 3), cognitive competence emerged as the most significant requirement for SCM professionals. The ability to learn (meta-cognitive), connecting to "continuous learning" in transcultural competence (Jurkova, 2021), is also a frequent subtopic, with high co-occurrence to cognitive competence itself. Semantically, linguistic affinity and skills are also closely related to cognitive competence. We would group this theme as "cultural awareness." Across both geographic contexts, "cultural awareness" was viewed as a strategic tool to reduce friction.

In Vietnam, this was often described as a tactical necessity; for example, VN-2 noted that working with Japanese and Korean partners required a deep dive into their "personality and work culture" specifically to "communicate without misunderstandings." VN-1 went further and mentioned how the local people were more familiar with the law and implicit (or even shady) norms in the industry, since it is written with their culture in mind. This sentiment was mirrored in South Africa,

where SA-2 and SA-3 advocated for formal "training programs" to institutionalize this awareness, suggesting that transcultural success is not accidental but a learned organizational capability. According to SA-1 and SA-3, a known consensus before "making decisions" would also be prioritised to avoid misunderstandings, delays, etc.

On the other hand, informally, VN-1, being an expat, repeatedly underlined that knowing others' culture and language (Cognitive and Linguistic) is a great way to bridge the gap between people. They said, "Correct yeah. Like hey, they recognize me as a foreigner and know my language, they know my culture." To them, knowing people's culture and acting accordingly is the right thing to do – and that thing could not be done through technology like Machine Translation or Artificial Intelligence, which they dismissed using the story of Hitchhiker's Guide to the Galaxy (featuring a human travelling in the universe with a translator fish – but they still experienced difficulties due to the lack of cultural understanding). Unlike VN-2 who is working in their native country, VN-1 works as a veteran expat and global SCM employee and thus places more emphasis on language skill. Contrary to the more nuanced and informal dynamic of transcultural cognitive and linguistic in Vietnam, South African responders showed a more professional, formal and barrier-focused perspective (the barriers are listed by SA-1, SA-2 as: language barrier, different ways of communicating, making decisions and cultural rules about feedback, misinterpreted complex technical terms, etc.).

6.2.2 Affective and Social Dynamics

While technical knowledge was the baseline, the "softer" dimensions of the framework were framed as the lubricant for knowledge flow. These aspects were moderately emphasized but carried high emotional weight.

With affective sensitivity, a mutual "carefulness" was observed in the Vietnamese context. VN-2 highlighted bilateral sensitivity, noting that both Japanese and Vietnamese team members were "careful about [each other's] culture." For VN-1, affectiveness is also related to another important aspect of transculturality, as previously mentioned: co-creation of meaning. They mentioned the fascinating cases of a

Singaporean being able to count in Bangladeshi language, people greeting others in their mother-tongue, and respecting each other. Indeed, co-creation of meaning has the most co-occurrences with affective sensitivity. VN-1 also mentioned how affectiveness and co-creation helps with SCM flows and knowledge exchange ("because I communicated with them they gave me the things that I needed in less time than it took from Germany to ship here; shipping from Vietnam to Singapore is much faster than from Germany to Singapore"), but overall, the affective themes in Vietnam are more about implicit and social interaction. In South Africa, the interviewees discussed affectiveness in a more professional way; e.g., SA-1 mentioned affectiveness in the form of an open, welcoming and transparent leader.

Next, for social/behavior skills, both countries recalled how interactions are expected in a multicultural setting. In Vietnam, it is more about paying attention to the personality and showing goodwill to people. For VN-1, their team paid attention in their interaction with both the expats and the people from the other regions of Vietnam (which we will discuss later on), while VN-2 asserted that we ought to make an effort to learn the culture and language, acting in accordance with the counterparts' culture and acknowledging that there are different attitudes, "rituals" and "ways to communicate." In South Africa on the other hand, SA-3 suggested that "active listening" is the key.

6.2.3 Transcultural Competence Perceived as General Communication Skill

An emergent inductive subtopic throughout the interviews was the strong overlap between transcultural competence and general communication skills (TC as General Communication Skill). Several participants perceived foundational communication practices as the primary mechanism for navigating transcultural environments. It is important to note that this perception may be influenced by the sample's characteristics; because the interviewees possess extensive experience in multicultural supply chains, they may have internalized transcultural nuances to the point of "unconscious competence," viewing these specialized adaptations simply as standard professional communication.

In the South African context, this overlap manifests through a reliance on formalized communication frameworks. SA-2 highlighted routine corporate practices – such as emails, physical and online meetings, and technical reports – as their primary methods for maintaining alignment. Building on this need for structure, SA-3 emphasized how these standard tools are specifically adapted to bridge global gaps: "We rely on templates that will ensure that in terms of our languages, we are aligned... to ensure a smoother and a slower clarification in terms of our communication."

Conversely, the Vietnamese participants framed this overlap around interpersonal relationship-building and trust. VN-1 explicitly linked foundational communication skills to mutual respect and risk mitigation across the supply network: "You must be good with each of the parts of the chain. And you need to... have a communication skill. We like you, you would not cheat on us, right?" Similarly, VN-2 equated transcultural navigation to general sales acumen and empathy, noting that paying attention to customer personalities creates goodwill to the extent that "you don't really feel like there are significant barriers between Vietnamese and foreign communication." VN-2 further elaborated that this skill relies heavily on behavioral observation: "Anticipating things like their history... their personality... I can predict what they're likely to do next, so I base my reactions on those predictions to have the suitable reaction."

6.3 Influence of Transcultural Competence on Knowledge Transfer

To discover the influence of transcultural competence on knowledge transfer, we looked for how the barrier subtopics interact with transcultural competence subtopics (with co-occurence and semantic analysis).

In Vietnam, initially, active cultural adaptation creates a perception of seamless integration. As VN-2 stated: "We pay attention to the personalities of our customers so that we can create goodwill; it's not... fundamentally, in your company, you don't really feel like there are significant barriers between Vietnamese and foreign communication." This could be due to the perception of transcultural competence as a general communication skill as we discussed earlier. However, this

seemingly imperceptible barrier occasionally emerges, because VN-2 also noted that distrust between foreign bosses and employees could lead to inefficient micro-management. Not only trust, operational efficiency also drops when cultural and linguistic understanding is not achieved. VN-1 emphasizes again the importance of linguistic skills as a baseline. They stated that the lack of linguistic proficiency could lead to people not communicating their ideas and intentions correctly – "That is not the efficient way to be able to work together," said VN-1. Crucially, however, VN-1 argues that not only language, but also culture could be a hindrance. Highlighting the limits of purely linguistic translation, they offered a striking analogy:

> "Do you know The Hitchhiker's Guide to the Galaxy? It is a book by a British author from the 1980s, […] They develop a little fish. A fish you put in your ear and this fish can tell you, immediately can translate everything and this fish will take control over your lips. […] But still, if you don't know, this guy is traveling around the universe, he doesn't know anything about the other aliens' culture, and that's why he's still stuck and has problems everywhere. Just the words, it's not just the words, and IT is working just on the words. It's about the culture."

Indeed, to VN-1, culture also makes up an important aspect of intercultural communication: attention to small cultural details (Japanese cultural norms, counting to 100 in Bangladeshi, etc.) is important in the people's interaction with each other. Ultimately, failing to navigate this cultural layer might fuel the language and silos (discussed in 6.3 below) that trap knowledge within isolated departments.

In the South African context, the stakes of transcultural knowledge exchange are more formally defined. As SA-2 noted, supply chain is not only about physical and material flows, but also the "intellectual property," e.g., the technical specifications and project standards. SA-2 recognised the importance of a leader's open communication, as well as "clear, direct and simple language to minimize misunderstanding;" else, the supply chains risked having its members being hesitant to contribute and communicate, especially with "complex technical specifications." Likewise, SA-1 saw communication disruptions as severe bottlenecks. The primary obstacles identified by SA-1 include the

"language barrier, different ways of communicating, different ways of making decisions." These barriers become tangible operational risks when interacting with differing cultural norms. For instance, transcultural friction occurs when an "overseas supplier operates within a culture that prioritises consensus and indirect communication prior to making decisions. Responses were delayed and communications were perceived as unclear due to a lack of comprehension of the cultural distinction" (SA-2). Furthermore, this indirectness directly threatens supply chain planning; as SA-3 explained, "In some cultures people avoid saying 'No!', which can make it difficult to assess whether production plans are truly feasible."

6.4 Enablers and Obstacles to Effective Transcultural Knowledge Exchange

Regarding enablers, in Vietnam, most information is shared through casual and informal interactions; while in South Africa, VN-2 mentioned the beer culture of Vietnam ("văn hóa nhậu") as a great opportunity to welcome and interact with foreigners. VN-1 would say that casual drinking, dinners are where the information flows ("You feel comfortable to talk to someone, you talk to people also outside of work. Maybe the Vietnamese in my company would say we go together and cook something in the evening and while doing that maybe you share information that cuts across departments."). Furthermore, this knowledge exchange can be accelerated by people spreading in different diaspora, citing how they got exclusive information from their group of culture ("Yeah I think you tend to get information in your own diaspora you know what that is like from your own people quicker and you get them informal also... So sometimes I got the information on the evening we went out for a beer and I got the information about what happened in Japan, what happened in Myanmar, what happened in Australia, informally and very quickly.").

However, these same factors often act as obstacles. According to VN-1, sharing information through social interactions has its downside: the isolation and stagnated flow of knowledge due to the clique's lack of interaction with the others ("… this department is their silo.

Do you know what a silo is? S-I-L-O. It's like their own castle. They are walled. They have a wall around and they only work inside their department."). Additionally, the knowledge exchange barrier often comes from being excluded from this diaspora with culture as a distinction between groups ("...internally in their Singapore... among their Singapore people. While me as a foreigner I was outside... The Filipinos themselves, I guess they also shared certain information among each other."). This is exacerbated by the language barrier, when VN-1 missed the organization's bus coming back home due to the chat group speaking only in Vietnamese ("Also our chat group is in Vietnamese. I don't read it. And I think you share a lot of information among each other quickly, also by chat or whatever, but I'm outside. I don't get this information.").

Another major obstacle is the discrimination and distrust theme, which is also a prevalent subtopic in the context of Vietnam, in contrast to the highly standard and conventional description of South African interviewees. VN-1 perceived the distrust of a few Japanese bosses with their employees, shown through their micro-management (VN-1 had a disclaimer that this is just a few, some bosses are very "relaxing and just like us Vietnamese"). This also partly shows Hofstede's power distance is sometimes high in the Vietnamese responders' environment. In addition, VN-2 mentioned how prejudices and perceptions of a culture's characteristics could affect their assignment to departments. And unfamiliarity could extend to stranger distrust ("If you don't like someone... you try to scam these people...").

Finally, an internal obstacle involves redefining the scope of culture: not only should we care about nationality- or ethnicity-based culture, but also about the region-based subculture in Vietnam (VN-2), or the professional culture of departments (VN-1). According to VN-1, "first of all, before talking about the culture between Vietnamese and foreigners," we should stop and think about the diverse and distinct cultures of the nation; from a Southerner's perspective, the Northerners are the high-context group, and could be more traditional in terms of belief and superstition. VN-2 mentioned that, to them, the Northern culture "is completely different", and "you have to predict and be prepared" as they don't necessarily talk in a straightforward way. This requires extreme care in interpersonal communication ("You need to

pay attention when communicating with them, especially on holidays or full moon days" …), as some Northern customs even affect the professional performance and company income. Even some companies nowadays could not manage inter-regional relationships well. From another perspective, VN-1 perceived the division in university majors ("… the computer science guys, they really stick together to computer science almost only"), or departments. In short, culture does indeed have its scope between individual and humanity (Spencer-Oatley, 2012, pp. 6-7), which indicates that future cultural studies ought to take this perspective into consideration.

6.5 Solutions to Improve Transcultural Knowledge Exchange

The solution for SCM transcultural knowledge, according to Vietnamese interviewees, is more about the soft and cultural aspects. VN-2 highlighted the importance of "continuous training" to ensure employees do not forget the transcultural nuances, as well as a clear company's value and culture. To them, this is especially important, since if "the company's values aren't truly believed in or followed", there's a lack of connection – they would not have a distinct identity during sales and interaction with another group of people (e.g., customers). This part is in line with the identitary factor of transcultural competence (Trenches-Parera and Pastena, 2021), which is not shown significantly like other transcultural competence dimensions. To overcome the silo effect, VN-1 suggested that there would be a connector between "cliques" of people who share information through casual and informal interactions ("That is because in the Vietnamese diaspora, in the Vietnamese community, it's easy to transmit the information. Same in Singapore, the German community I got the information faster than from the Singapore community. Sometimes you need people who are linking this."). Therefore, VN-1 suggested that goodwill is shown and there are people linking culture communities together. When discussing digital solutions, VN-1 was cynical and asserted that Artificial Intelligence tools do not fit yet in transcultural interactions, using the story of Hitchhiker's Guide to the Galaxy's Babel fish (elaborated more in subsection 6.2.1).

South African interviewees, on the other hand, also suggested cultural awareness training uniformly; significantly, all 3 of the interviewees included it as a solution when asked. Aside from that, and contrary to the Vietnamese expat VN-1 participant, SA-1 proposed an ERP system and Microsoft Teams as a solution to overcome cultural barriers. This shows that our South African interviewees tend to offer solutions from a more administrative and digital perspective.

6.6 Discussion

The thematic analysis reveals that transcultural competence, knowledge exchange, and supply chain management are not merely parallel fields but are deeply integrated through social and cognitive mechanisms. We came to the conclusion of four main themes: (1) transcultural competence dimensions, (2) scope of culture, (3) distrust as a main SCM knowledge exchange barrier, and (4) the two aspects of transcultural competence in practice.

First, the dimensions of transcultural competence in SCM are primarily driven by the five cores – cognitive, meta-cognitive, affective, social, linguistic. The CQ model of Ang et al. (2015) emphasized motivational drivers, but our findings suggest that, in the context of Vietnamese and South African SCM, the "will" to engage is secondary to the cognitive, affective and behavioral ability to acknowledge other cultures, while co-creating value across boundaries, whether professionally or casually.

Second, the study identifies a critical shift in the scope of culture, moving away from traditional "national" definitions toward a more granular, multi-layered perspective. The data suggests that aside from the traditional Hofstede scores for the nation-level (Hofstede, 2011), regional sub-cultures (e.g., Northern vs. Southern Vietnam) and professional "silos" (e.g., IT vs. management) often create significant friction. This suggests that transcultural competence must be applied to navigate any group-based identity or "clique" that hinders the flow of information, regardless of whether a border has been crossed.

Third, the research highlights distrust and group isolation as the most pervasive barriers to effective SCM knowledge exchange. Rather than simple linguistic miscommunication, the primary "bottleneck" is

identified as the psychological and social distance between functional groups. The co-occurrence of distrust and discrimination with SCM bottlenecks implies that the lack of interaction between groups and the power-distance (Hofstede, 2001) might hinder the SCM and knowledge exchange processes. This positions transcultural competence not just as a communication bridge, but as a crucial tool for "de-siloing" departments and building the foundational trust required for technical SCM systems to function.

Finally, the findings reveal the two aspects of transcultural competence in practice, oscillating between formal and informal mechanisms. To the South African interviewees, transcultural competence is often operationalized through formal structures, such as standardized protocols, and explicit documentation to ensure clarity. Their suggested solutions are more about training curricula, and digitalization, which are in line with the suggestions from South African literature (Ambe & Badenhorst-Weiss, 2012; Maramura & Ruwanika, 2023). Conversely, the Vietnamese context emphasizes informal enhancers, such as social bonding and "relationship-first" interactions, to bypass the rigidity in the office environment. This difference is close to the high- and low-context culture classification of Hall (Hall, 1976). Together, these different strategies demonstrate that there is no "one-size-fits-all" approach to transcultural SCM; instead, success depends on the practitioner's ability to strategically alternate between formal systems and informal social capital to facilitate knowledge flow.

7. Conclusion

In this work, we looked into the interactions between the fields of transcultural competence, knowledge exchange, and SCM in the context of Vietnam and South Africa – emerging SCM hubs. This is an important yet underexplored intersection of the research landscape.

On the one hand, through semi-structured qualitative interviews and thematic analysis, we saw the connection between the three aforementioned fields, and came to four main conclusions. Firstly, our findings further validate classic transcultural dimensions (core dimensions: cognitive, meta-cognitive, affective, social/behavioral, and lin-

guistics; with certain aspects of transcultural competence mentioned like co-creation of meaning, and identitary). Secondly, the scope of culture could be as small as a region (as in Vietnam), university major, or department; this supports and elaborates the idea that the scope of culture is between "individual" and "humanity." Thirdly, one crucial barrier to transcultural knowledge exchange is the distrust and isolation between groups such as departments and cliques. And finally, we discovered that transcultural competence in practice could have two aspects – formal (through technical, and managerial methods) and informal (communication, connection); our South African participants tended to focus more on the former, while the Vietnamese leaned more to the latter.

On the other hand, while this research offers valuable insight into transcultural competence in supply chain contexts, it is not without limitations. Focusing only on South Africa and Vietnam with a limited pool of interviewees (5 interviewees) may limit the generalizability of findings and lead to homogeneity of responses. With the same concern, the reliance on self-reported data through interviews may also introduce social desirability bias and reduce the authenticity. From the data analysis perspective, thematic analysis carries a risk of subjective interpretation.

Despite all that, we hope our work will make the research landscape of transcultural competence, knowledge exchange and SCM more diverse, while offering a look at how transcultural interaction in the industry actually works.

Use of Artificial Intelligence Tools

AI tools (e.g., ChatGPT and Gemini) were used to support language editing and provide drafting assistance for explaining complex concepts. All research design, analysis, interpretation, and conclusions were developed independently by the authors.

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Section III

Indigenous, Transcultural, and Relational Knowledge

The Role of Indigenous and Local Knowledge in Shaping Sustainable Futures

Arushi Chakravarty

1. Introduction

Climate change and biodiversity loss have intensified interest in forms of environmental knowledge that long predate the contemporary language of resilience, adaptation, and ecosystem services. International assessments now acknowledge that Indigenous and local knowledge holders contribute in substantial ways to ecological stewardship and to the maintenance of socio-ecological systems under pressure (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services [IPBES], 2019). Yet recognition in global and national policy discourse does not automatically confer authority. One may name Indigenous knowledge as relevant and still leave intact the institutional habits that treat it as supplementary, local, or culturally valuable but not decisive. In the South African case, that tension is especially pronounced.

This report is organised around a single claim. Indigenous and local knowledge in South Africa matters for sustainable futures not chiefly because it offers a set of isolated low-tech practices, useful though some of those practices may be, but because it embodies governance logics of restraint, custodianship, and relational accountability that contemporary policy frameworks still struggle to recognise on their own terms. The problem, then, is not simply one of "inclusion." It is also a question of what institutions are prepared to hear as evidence, whom they are willing to recognise as authoritative, and whether sustainability can be imagined as more than technical management.

South Africa offers an unusually revealing setting in which to approach these questions. The country combines high ecological diversity with a long history of dispossession, racialised exclusion, and unequal access to land and decision-making. Post-apartheid climate and biodiversity frameworks have opened some discursive room for Indigenous and local knowledge, particularly through the language of participation, community-based adaptation, and sustainable use. Even so, existing scholarship suggests that implementation remains uneven and is often still shaped by technocratic assumptions and the primacy of Western scientific expertise (Chanza & de Wit, 2016; Leal Filho et al., 2023). For that reason, this report treats South Africa not simply as a national case, but as a site where a broader contradiction becomes visible: Indigenous knowledge is acknowledged in principle, while the institutional terms of environmental governance continue to be set elsewhere.

The analysis draws together three kinds of material. The first is a representative Khoisan protest case at the Union Buildings in Pretoria, read as a politically charged environmental vignette rather than only as a recognition struggle. The second consists of three in-depth interviews: with Makhosi, a traditional healer and founder of the Masibuyele initiative; with Neo, an animal scientist whose professional training sits alongside household and community-based Indigenous practices; and with Heidi, a leadership and sustainability scholar attentive to institutional culture, identity, and epistemic hierarchy. The third is a small policy corpus, including South Africa's National Climate Change Adaptation Strategy, the National Biodiversity Strategy and Action Plan, the South African Indigenous Knowledge Systems policy, and the wider international framing supplied by the IPBES Global Assessment and the Sendai Framework (Department of Environment, Forestry and Fisheries, 2019; Department of Science and Technology, 2004; IPBES, 2019; Republic of South Africa, Department of Environmental Affairs, 2015; United Nations Office for Disaster Risk Reduction [UNDRR], 2015). Taken together, these materials do not yield a comprehensive empirical account of Indigenous environmental governance in South Africa. They do, however, make it possible to trace recurring tensions around recognition, authority, and scale with some precision.

2. *Reading Indigenous Knowledge through Two-Eyed Seeing and Ubuntu*

A guiding question runs through the discussion: how do Indigenous knowledge practices in South Africa, illustrated through a representative Khoisan case, support the sustainable management of land, water, and biodiversity, and under what conditions might they enter into a less unequal conversation with contemporary scientific and policy frameworks? The answer developed here is deliberately cautious. Indigenous knowledge appears in this material as living, adaptive, and often internally contested. It should neither be romanticised nor reduced to heritage. But it does show that sustainable environmental practice is often sustained by moral and social disciplines that formal governance documents register only faintly, if at all.

To hold these materials together, the report works with Two-Eyed seeing. Bartlett et al. (2012, p. 335) describe it as learning to see from one eye with the strengths of Indigenous knowledges and from the other with the strengths of Western knowledges, using both together for the benefit of all. In this South African context, the heuristic is helpful because it resists two familiar temptations at once: the first is to render Indigenous knowledge picturesque and pre-modern; the second is to cast scientific and policy expertise as neutral, complete, and universally portable. Two-Eyed Seeing instead encourages a more difficult question. What becomes visible when each way of knowing is allowed to illuminate the other without being absorbed into it?

There are, of course, limits to that translation. The framework emerges from Mi'kmaq thought and cannot simply be relocated into southern Africa as though its genealogy were irrelevant. That caution matters all the more because the material also invites comparison with Ubuntu. There is an unmistakable resonance between the two, particularly in their emphasis on relation, obligation, and forms of knowledge that exceed individualist reason. Yet resonance is not equivalence. Ubuntu is rooted in distinct African philosophical and historical traditions, and its ethical vocabulary is not interchangeable with Mi'kmaq formulations of co-learning or epistemic plurality. In what follows, Ubuntu is therefore used sparingly and only where the comparison clarifies a relational politics of sustainability in the South African set-

ting. The point is not to collapse these traditions into one generalised language of harmony. It is to notice that both unsettle the assumption that environmental governance can be reduced to technical optimisation, while still preserving the differences in origin, emphasis, and political history that matter to each.

That caution is also important because the literature on knowledge integration has long warned that "bridging" frameworks can conceal unequal power relations rather than transform them. Bohensky and Maru (2011), reviewing a decade of work on Indigenous knowledge and science, showed that integration is often celebrated rhetorically while institutional hierarchies remain largely undisturbed. Nalau et al. (2018) make a similar point in the ecosystem-based adaptation literature, where Indigenous and traditional knowledge is frequently welcomed for its practical insights but rarely permitted to alter the deeper architecture of decision-making. Read in that light, Two-Eyed Seeing is not a solution. It is better treated as an analytical discipline, one that keeps both value and asymmetry in view.

3. Indigenous Knowledge in Practice

The significance of this becomes clearer when one turns to the South African material. The report does not begin in a policy document. It begins, rather, with a broader unease that runs through current environmental debates. Climate crisis language is often universal in tone. Biodiversity loss is routinely narrated through global indicators, species decline, and protected-area targets, especially in international assessment frameworks such as the (IPBES, 2019). Those framings are important, and in many respects indispensable. Yet they can flatten the historical terrains in which environmental harm is actually lived. In South Africa, land degradation, water stress, and ecological vulnerability do not unfold on neutral ground. They settle into landscapes already shaped by removal, enclosure, racial ordering, and contested authority over land. This is part of what makes the representative Khoisan case so instructive.

At the Union Buildings in Pretoria, the long-running Khoisan protest camp led by King Khoisan SA appears, at first glance, to belong

primarily to the terrain of recognition politics. The demands for First Peoples status, land restitution, and language rights might easily be read as constitutional or symbolic claims. That reading is not wrong, but it is incomplete. The camp also stages an argument about environmental governance. Its simple shelters, ritual forms, and continued physical presence in a highly formal state space do not merely represent a community. They enact a different relation to land in the heart of administrative power. During the visit that informs this report, what stood out was not only the language of historical grievance, but the way land loss, endangered languages, and disappearing species were narrated as connected injuries. In that conversation, environmental harm did not appear as a separate sectoral issue. It was braided into cultural erasure and political exclusion.

Burnett et al. (2023), writing on Khoisan resurgence and environmental justice in the Sarah Baartman district, note how memory, reminding, and resurgence are tied to struggles over land, ecology, and political voice. That wider scholarship helps to place the Pretoria encampment in context. Khoisan claims are not merely about recovering a lost identity. They often concern the right to sustain particular relationships with territory, wildlife, language, and sacred sites. When King Khoisan SA spoke of traditional hunting and land management as knowledge that prioritises ecological balance, the statement did not sound like a decorative addition to a political campaign. It sounded like an insistence that stewardship itself has been misrecognised as culture rather than governance.

The Khoisan case also complicates a familiar institutional separation. Climate adaptation is typically handled in one set of offices, biodiversity conservation in another, heritage in a third, and questions of justice or redistribution elsewhere. The protest camp did not map neatly onto those compartments. It brought them into the same frame. That may be one reason why such claims are so difficult for institutions to absorb. They do not arrive in the idiom through which public administration is accustomed to sorting problems.

A comparable refusal of compartmentalisation appears in Makhosi's interview, though in a different register. Makhosi described Indigenous knowledge not as a concept to be added to sustainability debates, but as an ethical and practical discipline rooted in everyday encounters

with forests, rivers, mountains, plants, and animals (Makhosi, Interview, 2025). One moment in particular deserves close attention. Before entering a forest, river, or mountain, she explained, one asks permission from the spirits that inhabit that place. The act may involve fasting, purification, and offerings to what she called the spirit owners of the land. Read hurriedly, this might be taken as symbolic language surrounding otherwise practical work. Yet the force of the moment lies precisely in the fact that it is not separate from practice. Asking permission delays entry, interrupts extraction, and places use under conditions of accountability. One does not simply go in and take.

A second moment follows from the first. Makhosi described the Festival of First Fruits as requiring the earliest harvest to be offered to spiritual custodians before anyone may consume it (Makhosi, Interview, 2025). The sequence matters. The first yield is not privately appropriated and then ritually blessed after the fact. It is held back. Gratitude precedes use. Here again, the environmental significance lies less in a single observable outcome than in the form of discipline being enacted. It is a discipline of timing, restraint, and relation. If a policy document were to translate this into technocratic language, it might describe a norm that discourages premature extraction or overuse. But such a translation would also thin out what makes the practice durable. The force of restraint does not come only from the rule. It comes from the moral world in which the rule makes sense.

That moral world is not untouched by politics. Makhosi linked contemporary ecological practice to a history in which traditional healing was stigmatised, criminalised, and pushed to the margins under colonial and apartheid rule (Makhosi, Interview, 2025). She spoke of fines, illegality, and the lingering shame attached to Indigenous practice. This is significant for more than historical background. It means that the problem of environmental governance cannot be separated from the problem of whose ways of knowing were systematically recoded as backward. When a healer speaks of rivers, medicinal plants, and spiritual custodianship, she is not only describing ecological care. She is also speaking from within a history in which the legitimacy of that care has repeatedly been denied.

The literature on sacred sites and biodiversity among South African communities makes this point in a different form. Mutshinyalo and

Siebert (2010), for example, show how myth can function as a biodiversity conservation strategy among the Vhavenda, an indigenous Bantu ethnic group, not because myth is an ornamental cultural layer placed atop conservation, but because moral worlds regulate use in concrete ways. Dikgang and Muchapondwa (2012), in their work on the Khomani San, likewise highlight that biodiversity conservation may be valued through forms of relation that do not fit easily within standard economic or technocratic frameworks. Makhosi's account belongs to that broader pattern, though it also carries the particular weight of contemporary healing practice and social recovery.

Neo's interview shifts the scene considerably. He does not speak from the position of a healer or ritual custodian. He is trained in animal science, thinks in terms of productivity and livestock management, and is familiar with the practical demands of feeding large populations. Yet his account is no less revealing for that reason. If Makhosi's testimony shows how ecological restraint is embedded in ritual discipline, Neo's shows what happens when such practices encounter the temporalities of commercial agriculture and regulatory standardisation (Neo, Interview, 2025).

One of his strongest examples concerns medicinal plant harvesting. In discussing how plants are gathered, he remarked that younger plants are left untouched and only older ones, near the end of their life cycle, are used (Neo, Interview, 2025). The phrase is deceptively simple. It condenses a principle of regeneration into an everyday rule. The claim is not that Indigenous people never make mistakes or that harvesting is always ecologically benign. Neo was too careful a thinker for that sort of idealisation. The point, rather, is that the practice carries within it a working sense of ecological time. Use is structured by succession. Extraction is calibrated against regrowth.

Another example from his interview concerns Indigenous microorganisms produced through fermentation with rice and brown sugar, then used to reduce odour in pig housing (pens) and to convert manure into fertiliser (Neo, Interview, 2025). This is not the sort of example that easily fits romantic narratives about untouched tradition. It is practical, adaptive, and experimental. It also sits between categories. One might call it traditional knowledge, low-tech innovation, household science, or simply a resourceful agricultural method. That ambi-

guity is instructive. It shows that Indigenous and local knowledge cannot always be captured by a binary opposition between traditional and modern. Sometimes it already inhabits a zone of translation.

Neo was also unusually clear about the limits of that translation. He repeatedly stressed that modern veterinary medicine and nutritional systems may be more reliable when scale, commercial timelines, and consistent yields are at stake (Neo, Interview, 2025). Traditional methods, in his account, can work well in low-input settings, but they do not always travel easily into the standards required by large-scale production. This is where his interview becomes especially valuable. It resists both celebratory integrationism and dismissive scepticism. He is not simply choosing science over tradition, nor the reverse. He is describing a conflict of scales, risk cultures, and temporal demands. The ambivalence feels earned because it arises from practice rather than from abstract theorising.

That ambivalence also reveals something about evidence. Neo noted, for instance, that regulations concerning manure or wildlife use often do not distinguish adequately between commercial exploitation and small-scale or subsistence-oriented practices (Neo, Interview, 2025). What counts as safe, efficient, or permissible is defined at a level of abstraction that may leave little room for local judgement. The tension here is not merely epistemic in the narrow sense. It is administrative and economic as well. Knowledge is judged through regulatory templates that are themselves shaped by assumptions about scale, market integration, and acceptable forms of proof.

Heidi's interview takes that problem one step further by asking who gets to define those templates in the first place. Her reflections were less about individual environmental techniques than about the institutional and intellectual conditions under which some forms of knowledge become conceivableas serious (Heidi, Interview, 2025). She spoke from experience of growing up in a rural coloured community during apartheid and later moving through leadership and academic settings in which Western frameworks remained dominant. One moment in her interview is particularly striking. She observed that leadership literature continues to be predominantly Western-based, with African perspectives entering only marginally or as supplemental additions. The

remark matters because it shifts attention from whether Indigenous knowledge is useful to how epistemic authority is organised.

Heidi also turned to Ubuntu in a way that requires careful handling. When she invoked the phrase "I am because we are," the move was not toward a vague communitarianism. Nor was she suggesting that Ubuntu provides a ready-made environmental policy blueprint. The point was more precise. Leadership, sustainability, and responsibility look different when personhood is understood relationally rather than as a self-contained unit of choice. Read in that way, Ubuntu does not merge with Two-Eyed Seeing, but it does illuminate why the politics of sustainability cannot be reduced to behavioural incentives or technical compliance. It raises questions about positionality, obligation, and the social repair required in settings marked by historical trauma.

At the same time, Heidi was explicit that rhetorical celebration of African concepts is not enough. Indigenous knowledge, she argued, is often treated as outdated until reframed as innovation or technology in a vocabulary that institutions already respect (Heidi, Interview, 2025). That observation is double-edged. On the one hand, reframing may help certain practices travel into policy and educational settings. On the other, it risks stripping them of their relational force. Heidi was alert to that danger. Superficial inclusion, in her account, can become another polite form of extraction.

4. Policy Frameworks and the Limits of Recognition

Taken together, these interviews do not tell a single story, and it would be counterproductive to force them into one. Makhosi speaks of ritual custodianship, Neo of practical negotiation across knowledge systems, and Heidi of the institutional politics of authority and leadership. Yet some motifs recur with notable consistency. One is restraint. Another is relation. A third is the sense that the marginalisation of Indigenous knowledge is not an accidental oversight but a sedimented effect of longer histories and current institutional arrangements. What varies is not whether these pressures exist, but where each speaker encounters them.

The broader literature supports this reading. Chanza and de Wit (2016) argue that Indigenous knowledge can enhance climate governance in South Africa, but they also show that such enhancement is neither automatic nor politically neutral. Leal Filho et al. (2023), reviewing evidence from African regions, similarly find that Indigenous knowledge serves adaptation in important ways, while also noting the unevenness of institutional uptake. The issue, then, is not whether such knowledge exists or whether it is occasionally effective. The harder question is what kinds of governance structures would allow it to shape public environmental futures without either romanticising it or draining it of context.

That question becomes sharper when the interview material is placed alongside policy frameworks. South Africa's National Climate Change Adaptation Strategy presents itself as the country's National Adaptation Plan and repeatedly grounds decision-making in the "best available science," while also noting that adaptation should draw on traditional knowledge and local experience (Department of Environment, Forestry and Fisheries, 2019). The National Biodiversity Strategy and Action Plan likewise recognises the relevance of Indigenous and local communities' knowledge, innovations, and practices for conservation and sustainable use (Republic of South Africa, Department of Environmental Affairs, 2015). At the international level, the IPBES Global Assessment (IPBES, 2019) and the Sendai Framework (UNDRR, 2015) have further legitimised the inclusion of Indigenous and local knowledge in biodiversity governance and disaster risk reduction.

These documents matter. They mark a significant departure from earlier policy styles that either ignored Indigenous actors or treated them chiefly as obstacles to expert management. Yet their mode of recognition remains limited. Indigenous knowledge tends to appear in enabling sections concerned with awareness, participation, or community resilience, rather than in the technical passages where indicators, evidentiary standards, modelling assumptions, and decision rules are defined. The pattern is subtle but important. Knowledge is welcomed as input, rarely as institution.

This is where the report's central claim comes into focus. The difficulty is not only that Indigenous knowledge is under-represented in policy. It is that the form in which it is recognised often detaches usable

content from the governance logics that sustain it. “Traditional knowledge, innovations, and practices” is a phrase broad enough to include almost anything, but too abstract to convey what is at stake in asking permission before entering a forest, holding back the first harvest, leaving younger plants untouched, or treating certain places as morally non-negotiable. Policy can register the existence of such practices while leaving their underlying disciplines unintelligible.

A second limitation concerns authority. Policy texts speak fluently of communities, stakeholders, and participation. Yet participation is not the same as shared decision-making. Indigenous actors may be consulted as providers of local knowledge while remaining peripheral to the institutions that decide what counts as evidence, which risks matter most, and how trade-offs are to be managed. Makhosi’s concern that conservation spaces remain dominated by non-African voices, and Heidi’s account of Western leadership literature setting the terms of credibility, both point toward this problem. The issue is not simply that Indigenous knowledge is missing. It is that authority remains unevenly distributed.

A third limitation lies in the relation between evidence and scale. Policy frameworks privilege codified proof, expert assessment, and forms of data that travel across contexts. Indigenous and local knowledge, by contrast, may be validated through long-term observation, ritual confirmation, apprenticeship, and ecological balance experienced over time. Neo’s interview captures this tension especially well. He is sympathetic to low-input methods and context-sensitive experimentation, yet he also worries about what happens when such practices are judged against the demands of commercial consistency. The friction cannot be reduced to a science-versus-culture binary. It concerns the infrastructures through which credibility is made.

Two-Eyed Seeing is useful here precisely because it does not require these tensions to vanish. It allows one to notice, for example, that Makhosi’s ritual language and Neo’s technical vocabulary sometimes point toward similar ecological concerns. One speaks of spirit owners, purification, and the right order of harvesting. The other speaks of plant life cycles, livestock health, and nutrient management. The idioms differ sharply, as do the ontologies they presuppose. Yet both are concerned with how to use without exhausting. If these are meeting points, they are partial and fragile ones. Still, they matter.

Ubuntu helps illuminate this only at a certain level. Its relevance lies in foregrounding an ethics of relation that complicates more individualised models of governance and responsibility. But the comparison must stop there unless one is willing to commit more conceptual violence than the material can bear. Two-Eyed Seeing is not an African framework in disguise, and Ubuntu is not merely a regional synonym for epistemic pluralism. The value of reading them side by side is modest but real. Each helps to unsettle the assumption that sustainability can be fully captured by managerial reason. Beyond that, their differences should remain visible.

5. An Unfinished Answer

What, then, does the South African material suggest about sustainable futures? First, that Indigenous and local knowledge supports sustainability in ways that are both practical and normative. Clay-pot cooling, the use of cow dung to regenerate soils, selective harvesting, mobile grazing, herbal treatments, and fermentation-based livestock care are not trivial examples. They show that low-energy, context-sensitive practices remain part of everyday environmental life. But their significance is deeper than their immediate utility. They are carried by habits of sufficiency, patience, and accountability that many formal sustainability discourses only partially register.

Second, the material suggests that policy inclusion without institutional redistribution is likely to remain thin. One can cite Indigenous knowledge in strategy documents, or even build participatory processes around it, without altering the authority structures that determine whose reasoning is decisive. This is why the report has insisted on the difference between recognition and governance. The issue is not whether Indigenous knowledge may be included as a data source. It is whether custodianship, ritual obligation, and relational forms of accountability can shape public decisions in their own right.

Third, the report suggests that future work on sustainability in South Africa would benefit from moving beyond the search for extractable "best practices." That language is often administratively attractive, but it can encourage institutions to borrow techniques while ignoring the

moral worlds that make those techniques durable. A clay pot or a fermentation method can be described easily enough. The harder question is what happens when institutions are asked to engage forms of stewardship that do not separate use from relation, evidence from memory, or care from history.

This report remains exploratory. It is based on a representative Khoisan case, a small number of interviews, and a limited policy corpus. It does not speak for the full range of Indigenous communities in South Africa, nor does it replace participatory research led by Indigenous custodians and knowledge keepers themselves. That limit should be stated plainly. There is always a risk, in work of this kind, of either romanticising Indigenous practice or translating it too quickly into a technocratic idiom that empties it of force. The analysis has tried to avoid both temptations, though not always perfectly.

Even with those limits, a clearer intervention emerges. The strongest contribution of Indigenous and local knowledge to sustainable futures in South Africa may lie less in supplying additional information to existing systems than in exposing the narrowness of those systems' own assumptions. It asks whether ecological responsibility can be organised through custodianship rather than control, through restraint rather than maximisation, and through relation rather than detached management. Present institutions do not seem wholly deaf to these possibilities. Their policy language increasingly gestures toward them. But gesture is not transformation.

Where this leaves the question of integration is uncertain. The most plausible path does not seem to be the wholesale replacement of scientific and policy frameworks, nor a simplistic fusion in which all differences dissolve. More promising, perhaps, are institutional arrangements in which Indigenous practitioners, scientists, and public officials jointly deliberate over evidence, safety, and sustainability while remaining accountable for the asymmetries that structure those conversations. Such arrangements would not eliminate disagreement. They would, however, shift the terms on which disagreement takes place.

In that respect, the South African case speaks to a wider debate. Sustainability is often discussed as if it were mainly a technical or behavioural challenge. The material gathered here suggests otherwise. It may also be a struggle over whose histories are allowed to organise

public futures, whose practices are heard as serious, and what kinds of restraint are recognised as rational before they have been translated into a scientific vocabulary. The answer, for now, remains unfinished. But the unfinished quality is not a weakness of the material. It is part of what the material reveals.

Use of Artificial Intelligence Tools

AI tools were used to support language editing, improve the structure, clarity, and academic style of the manuscript, and assist in identifying and organizing relevant literature. All intellectual contributions, including the research design, analysis, interpretation, and conclusions, remain the work of the authors.

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An Indigenous Contribution to Sustainable Development

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1. Introduction: The Importance of Indigenous Knowledge in Today's World

Sustainable development has no one-size-fits-all answer. Its complex nature requires an interdisciplinary approach, particularly in developing nations. In terms of development in Africa, du Plessis (2001) proposes that development must align with the African cultural context by incorporating the values and worldviews of traditional Africa into the definition and principles of sustainability. Sustainable development interventions may need to be context-specific and incorporate the indigenous knowledge of that particular region (Khosla et al., 2021). In this context, Agrawal (1995) discussed how indigenous knowledge has a solid foundation in local contexts and is a result of evolved and lived experiences over generations. It needs to be acknowledged that there is diversity within regions as well, and consulting this knowledge may be beneficial for the prosperity of each region. Local knowledge systems vary due to changes in geography, climate, history, and cultural practices, requiring specific development approaches (Scoones, 1998).

Indigenous people are known to be the experts of their environment. Their rich reservoir of knowledge, traditional practices, and cultural norms serve as resilient threads, enabling their survival in a world that has often sought to erase their existence (Lastra-Bravo, 2021). Even with their wealth of knowledge about the environment,

health, and social structures, very often, indigenous groups tend to be forgotten in conversations about development. Indigenous communities constitute approximately 6% of the world's population (World Bank, 2025)[1]. Despite being some of the oldest tribes on Earth, they continue to face marginalization due to a complex interplay of factors. Historical and structural inequalities, discrimination, and social exclusion contribute to their vulnerability. Presently, indigenous people grapple with extreme poverty and socio-economic challenges, including limited access to healthcare (Cianconi, 2019; Kirmayer, 2014).

The implementation of Western development models often led to the application of intricate solutions, overlooking the potential effectiveness of approaches based on indigenous knowledge about nature and people. These models frequently fail to account for contextual factors, resulting in unsuccessful conclusions (Easterly, 2006). Furthermore, in many cases, the Western models failed to account for local skill levels, economic conditions, and the (un)reliability of critical infrastructure services, such as electricity (Scott, 1998). The endorsement of a development model rooted in Western values and consumerism has led to rising inequality, cultural estrangement, diminished cultural wisdom, and environmental deterioration (du Plessis, 2001).

At the same time, indigenous knowledge can be used to conserve natural resources and possibly provide new solutions to the issue of climate change (*Indigenous Peoples in the African Region*, 2013)[2]. A variety of case studies from different countries around the world provide a comprehensive understanding of social-ecological systems in different cultural and environmental contexts (Berkes & Folke, 1998). Berkes and Folke (1998) argue that traditional methods enhance community resilience because they are firmly grounded in knowledge of the local environment and are specifically tailored to its particular circumstances. The emphasis is that combining scientific and traditional knowledge improves the capacity to understand and manage

[1] Indigenous Peoples Overview. (n.d.). World Bank. Retrieved February 15, 2025, from https://www.worldbank.org/en/topic/indigenouspeoples

[2] Indigenous Peoples in the African region. (2013). Wikipedia. Retrieved May 31, 2024, from https://www.un.org/esa/socdev/unpfii/documents/2013/Media/Fact%20Sheet_Africa_%20UNPFII-12.pdf

socio-ecological systems. It is possible to create more responsive and adaptable management procedures by combining the benefits of both modern and indigenous knowledge systems.

In this study, we hope to learn from indigenous people's lived experiences of how indigenous cultural knowledge can inform development intervention in the global south. The concept of "sustainable development" has been widely debated and proven to be a complex issue (Fu et al., 2019; Sakalasooriya, 2021). Against this backdrop, cultural sustainability has traditionally been considered separately from development, but it should align with ecological, social, and economic sustainability (Soini & Dessein, 2016). Culture ought to be recognized as a valuable asset for development, serving as a framework to conceptualize, influence, and guide the process of development (Soini & Dessein, 2016). Accordingly, local cultural knowledge serves as a vital resource and influential factor in the realms of nature conservation, local livelihoods, and social well-being (Soini & Dessein, 2016).

After conducting interviews with indigenous leaders in South Africa and Brazil, the findings of the authors coincide with the insights from literature that indigenous people have rich knowledge that could be used in sustainable development in the global south. However, they also face socio-economic tensions and struggles that need to be addressed to preserve indigenous knowledge and practices. The literature on indigenous knowledge is abundant, but there is very limited literature on their lived experiences. This research is intended to make a contribution to filling this gap.

Although we compare two different countries, namely Brazil and South Africa, the issues faced by indigenous groups in both countries are rather similar. The two interviews that form the basis of this study underscore the two major themes that have contributed to sustainability in indigenous groups: the need for community and a reverence for the environment, which could form a foundation on which development interventions are built.

The chapter begins with the research reasoning, followed by the methodology of the study. Thereafter, the authors outline the academic background of the study exploring the relationship between indigenous knowledge practices and sustainable development, with a particular focus on previous studies in South Africa and Brazil. After detailed

empirical analysis, the limitations of the study are discussed, and the chapter closes with the lessons that can be learned from the study.

2. Literature Review: An Overview of Research on Indigenous Knowledge and Sustainable Development

For this research, the term "indigenous" is defined as "native to a particular place" and "inhabiting a land before the arrival of colonialists"[3] (Oxford University Press, n.d.). In recent years, the indigenous people have transitioned from being a social category on the verge of extinction and mere victims of the inevitable impact of development to becoming important potential partners in "sustainable development". Indigenous peoples are fundamental for environmental preservation due to their deep traditional knowledge of fauna and flora (Stevenson, 1996). They inhabit ecologically important regions, such as the Amazon Rainforest, and have a detailed understanding of ecosystems, acquired over thousands of years. Kopenawa (2013) sees the destruction of the forest as a danger to humanity. Taking the example of the Amazon, indigenous people treat nature as a living being and maintain sustainable practices that preserve biodiversity as well as ecosystems, and mitigate climate change, contributing significantly to the preservation of Brazilian ecosystems and the fight against environmental degradation.

At the same time, when it comes to a global crisis, indigenous groups are often left behind. Indigenous communities have encountered adverse effects from COVID-19 due to structural inequalities, discrimination, and social exclusion (Power, 2020; Lastra-Bravo, 2021). Despite these challenges, their wealth of knowledge, traditional practices, cultural heritage, and connection to natural resources have bolstered their resilience during uncertain times. These groups, while facing a higher risk of infection, implemented strategies such as self-isolation (Lastra-Bravo, 2021; Lane, 2020). For instance, the Igorot indigenous communities in the Philippines practiced "Ubaya," a period of community isolation. Similarly, the Amazigh communities in Algeria

[3] Oxford University Press. (n.d). *[Word]*. In *Oxford English Dictionary* (3rd ed.). Retrieved November 28, 2024, from https://www.oed.com

restricted social contact by closing their territories to foreigners. Their strong sense of community played a crucial role in managing the emotional distress caused by the pandemic. Indigenous autonomy was evident through their control measures to limit the spread of the virus, irrespective of government actions (Lastra-Bravo, 2021). While severely marginalised, it can be seen that indigenous groups were able to develop measures that mitigated the spread of the virus while still maintaining their unity, something for which indigenous groups are popularly known.

Sustainability is not a new concept to indigenous people. According to a study by Fernando (2007), the "sustainable world" from the indigenous peoples' perspective existed before colonization, an event which altered nature and resulted in threatening issues such as global warming. Fernando points out that over 10.6 million hectares along the Rio Negro (Brazil) were officially recognized as Indigenous lands for 22 peoples, and these communities have developed sustainability projects under the Programa Regional de Desenvolvimento Indígena Sustentável do Rio Negro (Regional Program for the Sustainable Indigenous Development of the Negro River). The recognition of these lands ensures the preservation of traditional knowledge and the continuity of indigenous cultures. Projects and partnerships with organizations strengthen this protection. Indigenous participation in debates and the creation of intellectual property networks are fundamental for the protection and sharing of benefits of traditional knowledge which could form an integral part of sustainable development (Fernando, 2007).

Moreover, in the context of implementing development policies, securing local support becomes crucial. Mercer et al. (2020) conducted a comprehensive study in southeast Labrador, Canada, focusing on community members' perceptions and endorsement of sustainable energy initiatives. Their research employed a combination of hybrid interviews, surveys, and key informant interviews to delve into indigenous perspectives. The study identified five central themes that significantly influence indigenous support for sustainable energies: community familiarity and understanding, connections to previous projects, relationships with culture and sustenance, the inherent nature of resources, and the impact on energy security (Mercer et al., 2020). The current study highlights the importance of indigenous practices

that consider sustainability, that could potentially inform development policies in different industries and sectors of the economy, which can only take place through the collaboration between indigenous peoples and policymakers.

In an article exploring the importance of connecting different knowledge systems, particularly indigenous and Western ones, Grünfelder et al. emphasize the complexities involved in such communication and advocate for the creation of ethical spaces, shared understanding, and patience in building genuine partnerships (Grünfelder et al., 2024). Furthermore, communication across knowledge systems is never neutral. When indigenous knowledge is translated into Western scientific categories, meaning is often lost or distorted (Kimmerer, 2013). Indigenous knowledge is not limited to data; it is sacred and relational (Yunkaporta, 2020). Moreover, Kimmerer (2013) underscores the importance of gratitude and responsibility as foundations of indigenous epistemologies. This suggests that responsibilities rather than rights often govern indigenous knowledge systems.

3. Research Question

The realization of development is a dichotomy consisting of the Western idea of advanced technology, economic growth, and material wealth, whereas the African context emphasises shared wealth and community (du Plessis, 2001). In an article about sustainable construction in Africa, du Plessis (2001) emphasizes that understanding development priorities and cultural context is important for sustainable development. To support this statement, in a research study conducted within the traditional villages of Guangxi, China, an analysis was carried out to explore the distinctions between conserving the natural, historically-rich living environment and accommodating modern development requirements. Lu and Ahmad (2023) discovered that tailored protection and development approaches should be implemented based on the unique environmental conditions of these traditional villages. This suggestion underscores the importance of community consultation prior to development projects being implemented. Furthermore, Eyong (2007) argues that indigenous knowledge systems could significantly contribute to

sustainability through a wealth of inter-tribal networks and that the decline of these systems presents a challenge for sustainable development. Mazzocchi (2020) adds to this debate by stating that people of different cultures and knowledge frameworks should be included in conversations about sustainability thanks to their unity and close relationship with nature, which would challenge the Western idea of sustainability.

Building on this perspective, our research investigates how indigenous knowledge, resources, and community practices could contribute to sustainable development approaches for specific regions. This research project adds to this topic of the role of indigenous knowledge in sustainable development by providing insights from some indigenous people's lived experiences.

4. Research Framework: Indigenous Knowledge in South Africa and Brazil

The inclusion of indigenous knowledge can be of great benefit in addressing sustainable development issues (Gorjestani, 2004). Scholars have emphasized that indigenous knowledge provides unique insights into sustainable resource management, biodiversity conservation, and climate adaptation (Berkes, 2012; Tengö et al., 2014). It would be expected to offer an approach that not only incorporates modern practices and indigenous knowledge but that also takes into account the context and environment in which sustainable development issues are being addressed (Agrawal, 1995; Whyte, 2013).

This research project explores the role of indigenous knowledge in sustainable development, with a focus on the Khoisan communities in South Africa and the Pataxó tribe in Brazil. The two contexts offer diverse and divergent perspectives on the relationship between indigenous practices and sustainability. South Africa and Brazil, with their unique cultural landscapes, historical trajectories, and environmental difficulties offer valuable insights for understanding indigenous knowledge. The Khoisan peoples, who have lived in southern Africa for thousands of years, developed sophisticated ecological knowledge systems that allow them to thrive in arid and semi-arid areas. Their extensive knowledge of local flora and fauna is demonstrated by their

capacity to identify hundreds of plant species, recognize seasonal fluctuations, and use the plants for food and medicine (Barnard, 2007). According to Barnard (2007), some San communities display ecological competence similar to that of professional Western scientists, demonstrating a high level of environmental adaptation and sustainability.

Similarly, the Pataxó people have been acknowledged for their sustainable ecological practices, particularly in agroforestry and fire management, which help to preserve biodiversity and environmental sustainability. Indigenous communities' use of traditional ecological knowledge (TEK) has helped to reduce deforestation and promote ecosystem resilience. Mistry, Bilbao, and Berardi (2016) emphasize the importance of indigenous fire management strategies in minimizing the frequency of large-scale wildfires and maintaining carbon stocks. Their findings show that lands managed by indigenous communities have much lower rates of deforestation and habitat conversion, indicating the environmental benefits of traditional fire management practices. Indigenous groups use controlled burning practices to generate patch-mosaic landscapes that not only minimize wildfire risks but also increase biodiversity by preserving habitat heterogeneity (Mistry et al., 2016).

Nobre et al. (2016) address the broader dangers of land-use change and climate instability in the Amazon, focusing on how deforestation and industrial expansion endanger the region's ecological equilibrium. The study emphasizes the need for sustainable development models that incorporate indigenous knowledge, acknowledging that agroforestry techniques used by tribes like the Pataxó contribute to soil fertility, carbon sequestration, and long-term ecological stability. Their findings support the argument that indigenous techniques provide viable alternatives for balancing environmental conservation and cultural preservation (Nobre et al. 2016).

Despite their environmental benefits, indigenous fire management and agroforestry practices have typically received little attention in policymaking spheres. Many national policies prioritize fire suppression above adopting indigenous practices that have been shown to sustain ecosystems for centuries. Addressing these gaps necessitates a policy shift that recognizes and incorporates indigenous land management into environmental governance frameworks (Mistry et al., 2016).

By examining these two environments, this study intends to discover how indigenous knowledge systems contribute to sustainable development in separate but complementary ways. The choice of South Africa and Brazil is not arbitrary but reflects their global importance as biodiversity hotspots and their shared pasts of indigenous resilience and adaptability.

Given the context explained above, the study uses an inductive reasoning approach. This involves making broad inferences from particular observations. By researching the Khoisan indigenous group in South Africa and the Pataxó tribe in Brazil, this study tries to identify themes and practices of indigenous communities and examine how they could contribute to sustainable development.

5. Methodology

5.1 Sampling

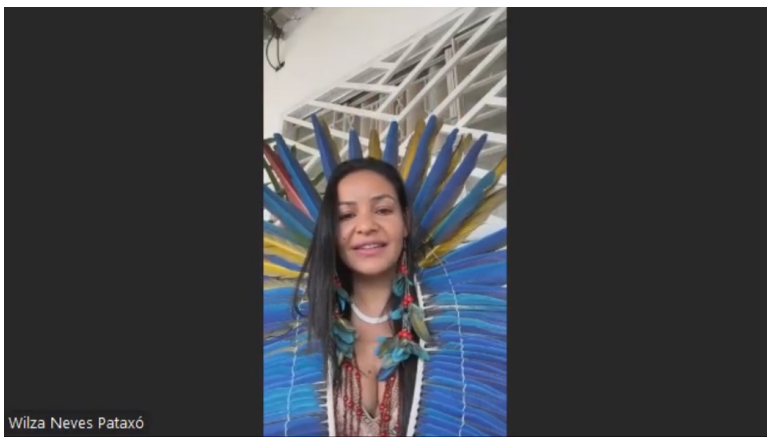
This research project is intended to study how indigenous groups embed sustainable practices in their daily lives, which could provide valuable lessons to inform sustainable solutions to complex development problems. Therefore, two sample groups were included to provide a broader perspective and a detailed comparison between the indigenous groups in different regions of the global south.

5.1.1 Wilza Pataxó – An Indigenous Leader from Brazil:

Wilza Neves Silva from the Pataxó tribe is an indigenous leader from Cumuruxatiba in the south of Bahia, where she was born. She spent part of her childhood among the Kayapó people in Pará before returning to Bahia. In search of educational opportunities, she moved to Rio de Janeiro, where she completed high school and began studying Law, overcoming financial challenges to balance work and studies. As she deepened her knowledge of indigenous issues, Wilza took an extension course in Indigenous Law and Policy at PUC-Rio, reinforcing her commitment to fighting for improvements for her community and promoting cultural preservation and sustainable development. Wilza's

account offers valuable insights into the challenges and practices that sustain indigenous identity, highlighting the importance of developing public policies that acknowledge and integrate the cultural heritage of indigenous communities to promote a more equitable and sustainable future.

Figure 1: A Picture of Wilza Pataxó



Source: Own creation.

5.1.2 King Khoisan SA – King of the Khoisan Tribe from South Africa

The KhoiKhoi (or 'Khoekhoe') and the San (or 'San bushmen'), considered the oldest human inhabitants of southern Africa, were the first people encountered by Europeans in their initial journey around the continent (Marks, 1972; Hofmeyer, 2023). The KhoiKhoi were herders and the San were hunter-gatherers during the pre-colonial period. The word 'Khoisan' was first coined by Schultze in 1928 to collectively describe the Khoi and the San as it was believed that the two groups were not that different from one another in appearance that and their languages shared a similar clicking sound (Smith, 2022).

For the purpose of this study, the contribution of a Khoisan tribe member is particularly valuable, as it can inform about the practices

and knowledge passed down from generation to generation, ensuring their survival even in times of oppression and lack of resources. In addition, this will enable us to understand these cultural practices and the impact of modernization and external influences on their way of life, ultimately helping us understand policies that can be better aligned with the local context.

Figure 2: A Picture of the Authors with King Khoisan SA



Source: Own creation.

5.2 Data Collection Methods

To comprehensively understand the research objective, the authors used two data collection methods: semi-structured interviews (questions shown in figure 3 below) – an in-person interview with King Khoisan SA and an online interview with Wilza Pataxò – as well as observations. In addition to the interviews, field notes from direct observation were used to better understand the context of daily life and cultural practices of the Khoisan and Pataxò tribes. This approach cap-

tured the subtleties that may not be expressed during interviews. This approach was also used by Mercer et al. (2020) who used interviews to gain indigenous perspectives.

Figure 3: Interview Questions

1. Could you briefly introduce yourself and what you do in your tribe?
2. For someone who does not know about Khoisan/Pataxó people, how would you describe your tribe, and what makes you distinctive?
3. It is common for tribes to pass on knowledge or teachings orally or through traditional songs; many African tribes have such traditions. Do Khoisan/Pataxó people also have such practices?
4. In your tribe, then, to illustrate this,could you give any examples of traditional practices that have been passed down from generation to generation?
5. If these practices are still being used, to what extent do the tribe members still benefit from these practices?
6. In terms of the way you manage and survive, for example, how does your tribe traditionally manage natural resources at their disposal?
7. In terms of the modern challenges is your tribe facing difficulties in maintaining these sustainable practices?
8. Still in the modern context, can you give examples of successful adaptations of traditional practices to modern contexts?
9. Reflecting on the challenges you have encountered in maintaining these practices, could you provide recommendations for overcoming them to ensure that these practices are more beneficial in today's context?
10. From your perspective, can your tribe adapt to modern circumstances over time, even if it means leaving behind certain traditional practices? Are those practices crucial for your tribe to live sustainably?

Source: Own creation.

Lastly, while the nature of this study is comparative across different tribes in two different countries, the authors are aware of the limits of a direct comparison between these tribes. However, this analysis aims to learn from the two tribes' lived experiences to form inferences and look for some transcultural commonalities for sustainability in the global south.

And even though the inductive approach, an approach that allows one to move from specific observations to broader generalizations, was used to analyze the data, the results of this study are not intended to be applicable to all other indigenous communities, given the limited number of subjects of the study and because this would require additional research.

6. Empirical Analysis

6.1 Observations by the Researchers

6.1.1 Interview 1: King Khoisan SA

Upon arrival at the King's residence, we were met by his nephew, who outlined the etiquette for meeting the king. The nephew wore a distinctive triangular headband crafted from wool and animal skin, accompanied by a simple covering over his groin and a hand-made crossbody bag across his chest, both fashioned from animal hides.

Behind him, a kraal – a traditional enclosure made of thorn-bush branches – housed chickens: hens, roosters, even baby chicks. Nearby, a vegetable garden thrived, and a few huts provided shelter for members of the king's immediate family. A little farther off, the king's silver car, a gift from a visitor, stood parked while a goat ambled nearby. The sound of laughter and chatter emerged from within the kraal, the clucking of chickens, a baby's occasional cry, and a warm call-and-response echoing from family members. This courtyard stood out as a space teeming with nature and fostering a sense of community.

The nephew greeted us in the Khoisan language characterized by its distinct clicking sounds. He then translated his greeting and demonstrated how to greet the king, crossing his arms over his chest and uttering a word in his native tongue. This interaction established a

tone of respect and hospitality, subtly shifting us from visitors to welcomed guests.

In preparation for the meeting, we had arranged an appointment with the king, which we communicated to the nephew. He entered one of the huts to inform the king, leaving us to wait on two wooden benches positioned opposite the king's chair. Shortly after, the king entered the area, his demeanour combining a welcoming warmth with an air of natural authority.

The meeting offered insight into the cultural significance of the Khoisan tribe. The king's traditional attire reflected his connection to his heritage, in contrast to the modern clothing we were accustomed to. Walking barefoot, he embodied a close relationship with the natural world.

As the discussion unfolded, chickens meandered freely among the group enhancing the organic atmosphere of the setting. The visit extended beyond a formal interaction, offering a glimpse into a way of life deeply aligned with the rhythms of nature. While the king's presence conveyed respect and authority, his knowledge and cultural insight left a lasting impression. His demeanour was marked by humility and kindness, treating each guest with equal respect.

The interaction highlighted the cultural values of the king and his people, emphasising a philosophy that transcends material wealth and challenges conventional notions of prosperity and fulfilment.

6.1.2 Interview 2: Wilza Pataxó

During the interview with Wilza Pataxó, her connection to the cultural and spiritual roots of her people was not only evident in her words but also in her attire and demeanour. Wearing a striking headdress made of vibrant blue, yellow, and green feathers, she visually embodied the richness of Pataxó heritage. Her earrings, adorned with red seeds and green leaves, added a touch of natural symbolism that reflected her deep respect for the environment and for her people's traditions.

Wilza's calm yet assertive presence carried an air of wisdom, and her thoughtful pauses while speaking emphasized the importance of every word she chose. Her headdress, a powerful cultural emblem,

seemed to symbolize her role as both a guardian of tradition and an advocate for her community's future.

She shared her vision for revitalizing indigenous languages, describing how her mobile app aims to include storytelling features, traditional songs, and cultural teachings. Her excitement grew as she spoke about how this initiative could inspire the younger generation to reconnect with their roots while embracing modern tools.

Wilza also highlighted some of the practical challenges faced by indigenous communities, such as limited access to technology and reliable infrastructure. She described how these barriers affect education and economic development, making her advocacy for indigenous-led solutions even more pressing. Her focus on autonomy and empowerment was evident as she discussed projects like sustainable agriculture workshops and cooperative networks for indigenous artisans.

By the end of the interview, her broader philosophy became clear: a belief in the co-existence of cultural heritage and innovation to build a sustainable and inclusive future. Her words, combined with the vibrant symbolism of her attire, painted a picture of a leader rooted in tradition yet forward-thinking in her approach to community resilience and development.

7. Findings

7.1 King Khoisan SA Interview

Khoisan tribe: contact and problems

The main themes that emerged from the interview with King Khoisan SA were the importance of cultural identity, language, and a suitable environment around oneself. It is important to note that indigenous peoples are very attached to their identity and try not only to preserve it but also to pass it on to future generations. Beyond this, there is also a desire to share and inform to change the narrative and misinformation about indigenous peoples.

> "We are trying to explain the people; they have direct communication, and then they can ask questions and get clarification from that." – King Khoisan SA, 2024.

The King highlighted how, in South Africa, few people know about the indigenous people and how they live in modern times. He stated:

> "In South Africa, there are not a lot of people that know about the First Nation people." – King Khoisan SA, 2024.

For the indigenous population, it is true that, because of their practices or appearances, their perception by other people has always been a subject of discussion and interpretation.

> "In the system, when they see me, it's like you don't fit in." – King Khoisan SA, 2024.

However, it is precisely these practices that characterize their identity.

> "For people that do not know us, imagine if you saw me coming out with jeans or maybe even a suit; your perception of me would be different." – King Khoisan SA, 2024.

The king and his immediate family travelled about 1500 kilometers (932 miles) in their traditional attire and walked in dire weather conditions to Pretoria, South Africa, the administrative capital of the country. They settled outside the Union Buildings, a monumental tourist attraction site, to campaign for the Khoisan language to be included as an official South African language, for the return of their ancestral land, for the Khoisan to be recognized as the first nation of South Africa, and finally, for the removal of the word "colored" as a means to describe a race of people in the country. The king and his people went on a 17-day hunger strike when their pleas were not heard by the government.

> "People would come and get angry that we are messing up the space, and some assume we are fighting for houses. They never have the time to come and ask why we are here." – King Khoisan SA, 2024

Khoisan tribe: practices and knowledge

To survive in their environment, indigenous peoples have developed traditional healing practices and techniques that are passed down from generation to generation. King Khoisan SA further went on to explain the benefits of walking barefoot. They believe that the whole body is

beneath the feet, and walking barefoot allows them to connect to the earth, which has great health benefits.

Furthermore, King Khoisan shared insights into the wisdom of his ancestors, particularly their hunting practices, which were done with sustainability in mind. He explained how hunters would only venture out when food from crops was scarce. The king also mentioned how they utilized a unique method: digging a hole in the ground to place an ostrich eggshell filled with water alongside a plant, signalling to the next hunter that water was nearby.

He also addressed the limits of modern medicine: how modern medicines often only provide temporary cures, and that some have side effects. Preserving these practices is very important to them. He said,

> "It's not just important for us, but it's important for the nation; we need to heal the nation." – King Khoisan SA, 2024.

Khoisan tribe: Sustainability

The King spoke of the fact that people's responsibility is not only to protect their environment but also to look after the people that come after. He stated:

> "The First Nation preserves, the one that came destroyed, and he believes that his way is the right way." – King Khoisan SA, 2024.

Khoisan tribe: New Technology

The King spoke about the importance of human communication. He spoke about the development of social networks and new technologies, which break many codes and bring new problems that were not the intention of their creation. It is important to feel people's hearts.

> "In social media, there is no heart; it is just an illusion that was created for us to feel happy that we are talking to each other." – King Khoisan SA, 2024.

He explained how he uses social media as a tool and not as a substitute for human communication:

> "We are using it more as making an announcement, not just a daily chat." – King Khoisan SA, 2024.

Khoisan tribe: How to move forward

The King emphasized that we can either change the system or create a new one for sustainable development. To create a new system, we need to formulate a program based on an analysis of everyone's plans. He gave an example of education, which should offer more shortcuts so as to avoid a surplus of knowledge that will not be useful.

He went on to talk about the problems of poverty and the unequal distribution of wealth. He urged young academics to think about how to create added value.

The king shared a valuable lesson he had learned from the Lakota people. During an exchange, some colonizers confronted a Lakota chief about the power and importance of money. In response, the chief took a handful of sand and asked the colonizers to throw their money into the fire. When they did, the money burned away. The chief then threw the sand into the fire, which began to burn hotter and hotter but did not disappear. The chief's message was clear; he said,

> "You think so much about money, but here your money disappears. The sand will always be there; it will never disappear; your money will disappear." – King Khoisan SA, 2024.

Reflecting on this, the King emphasized that the lesson that one can learn from the Lakota chief's message is that the true path to the future is to reconnect with nature. Therein lie all the answers we seek.

> "The way forward is the natural way, is to move back to nature; all the answers are in nature." – King Khoisan SA, 2024.

He calls for knowledge to be shared between peoples, creating a balance in which the solutions that are applied in one place can also be applied in another and solve the problems of many.

7.2 Wilza Pataxó Interview

Cultural Background and Upbringing

Wilza Pataxó was born in the Indigenous community of Cumuruxatiba in Bahia but spent part of her childhood among the Kayapó people in Pará. This experience in different indigenous cultures not only ex-

panded her knowledge of diverse traditions but also strengthened her identity and commitment to cultural preservation. From an early age, Wilza understood the importance of keeping indigenous knowledge alive and passing it on to new generations, a principle that would guide her future actions.

> "Each ethnicity is a universe. So I would like to make all this knowledge available so that other people, not only indigenous, could access and learn more. This way, they could learn to respect and deal better with us because there is still a lot of conflict." – Wilza Pataxó, 2024.

Educational Journey and Overcoming Challenges

The desire for education led Wilza to move to Rio de Janeiro, where she completed high school and entered law school. During this time, she faced financial difficulties but remained firm in her goal of empowering her community and defending indigenous rights. In Rio de Janeiro, she found learning opportunities that expanded her view of social justice and policies for indigenous peoples, which later encouraged her to establish initiatives focused on training indigenous leaders.

> "I arrived in the city as a girl from the countryside, facing everything with courage. I studied law, got married, had two children, and continued my studies. During the law course, I missed learning more about indigenous peoples." – Wilza Pataxó, 2024.

Foundation of the Indigenous Biomes Fund Institute (Instituto Fundo Biomas Indígenas, IFBI)

Wilza founded the IFBI (Indigenous Biomes Fund Institute) to train members of indigenous communities in project management and entrepreneurship. The IFBI addresses the lack of resources in villages, such as internet access and tools. Through this institute, Wilza promotes community autonomy, encouraging practices in community-based tourism and cultural projects that respect the environment. She believes empowering indigenous communities is essential for sustainable development, and her institute seeks to offer practical means for this.

> "My idea with this institute is to train the indigenous people themselves to manage and do management inside their territories, through projects and community-based tourism, training all of them. There is a very big difficulty for them to do this; things that seem simple to us sometimes result in lost opportunities for them." – Wilza Pataxó, 2024.

Revitalization of Indigenous Languages

In her effort to preserve cultural heritage, Wilza is developing an app focused on teaching and translating more than 300 native languages. The loss of fluency in indigenous languages is a central concern for Wilza, who sees language as a core element of cultural identity. The app aims to serve both indigenous and non-indigenous users, offering a way to learn and preserve these languages, promoting a connection with roots that she considers essential for future generations.

> "My idea is that, in the future, we can type an indigenous word, and Google will provide the translation. In my ethnicity, for example, we lost a lot of fluency in the language. We know the language, but we don't use it in our daily life. We don't speak Pataxó fluently because most of the people in our community also don't. This is something I would like to fix and expand." – Wilza Pataxó, 2024.

Importance of Cultural and Spiritual Symbols

For Wilza, the headdress and body painting with urucum represent more than adornments; they are symbols of spiritual protection and connection with ancestors. The headdress is particularly sacred for the Pataxó people, representing a link with the "Encantados" – ancestral spirits who, according to their beliefs, offer protection and guidance. This spiritual symbolism is fundamental for Wilza, as it reinforces indigenous ties to cultural identity, even in a world that often pressures them to abandon their traditions.

> "We need to understand and respect the culture of the other, which is different. I believe that socio-economic development is possible while being connected with environmental issues. We see this in other countries, and it can be replicated in Brazil." – Wilza Pataxó, 2024.

Leadership and Solidarity with Other Communities

Wilza acts as a bridge between different indigenous tribes, promoting unity and mutual support. She organizes aid networks, seeking resources for emergencies and facilitating contacts with institutions such as FUNAI (National Foundation for Indigenous Peoples). Her ability to articulate partnerships and offer support to other communities reinforces her role as a leader. Wilza believes that solidarity between tribes is essential to face contemporary challenges and preserve cultural diversity among Indigenous peoples.

> "Every space where we have the opportunity to speak and defend our causes is highly valued. That's why I'm very grateful for this space." – Wilza Pataxó, 2024.

Sustainability and Vision of the Future

Wilza believes that traditional indigenous practices are valuable for sustainable development and sees indigenous peoples as fundamental allies in environmental preservation. For her, indigenous practices must be incorporated into public policies, as they offer knowledge that contributes to the well-being of the planet and promotes a more harmonious co-existence. Wilza sees the future as an opportunity to unite traditional knowledge and modern practices in favor of sustainable development that respects cultural diversity.

> "We are allies, we are not here to destroy. The areas we claim are aligned with the culture of each people. Scientific studies show that the most environmentally protected areas are those within indigenous territories. We do not deforest or destroy the environment; we are allies in fighting climate change." – Wilza Pataxó, 2024.

Table 1: Key Insights from Interviews with King Khoisan SA and Wilza Pataxó

Theme	King Khoisan SA (South Africa)	Wilza Pataxó (Brazil)
Cultural Identity & Recognition	• Campaigns for Khoisan language recognition • Protests for first nation recognition • Rejects imposed racial labels	• Wilza stresses the importance of cultural symbols as identity anchors • She is developing a mobile app to revitalize 300+ Indigenous languages
Traditional Knowledge & Practices	• Traditional medicine • Healing through barefoot walking • Sustainable hunting and water conservation	• Promotes Indigenous-led tourism, entrepreneurship, and training through IFBI (Indigenous Biomes Fund Institute) to ensure autonomy
Sustainability & Responsibility	• Frames sustainability as obligation to future generations • Critiques extractive systems that destroy land	• Argues Indigenous people are allies in climate protection • Cites evidence that Indigenous territories are best preserved
Technology & Consumption	• Warns against social media illusions • Uses it only for announcements, not relationships	• Uses digital platforms for leadership, training, and language preservation
Pathways Forward	• Advocates for new systems rooted in nature • Stresses inter-community knowledge sharing • Critiques money-driven systems	• Promotes solidarity among Indigenous tribes • Emphasizes education, leadership, and policy-making participation

Source: Own table.

The insights summarized in the table above demonstrate how questions of identity, knowledge, and responsibility influence the contribution of indigenous people to sustainable development. King Khoisan SA pointed to practices such as walking barefoot, traditional healing,

and sustainable hunting, while also stressing the importance of recognition and land rights. In a different context, Wilza Pataxó emphasized language revitalization, community-based tourism, and indigenous-led entrepreneurship as ways of strengthening autonomy. Together, these examples reflect previous literature that underscores the depth of indigenous ecological knowledge and its crucial role in biodiversity preservation (Stevenson, 1996; Fernando, 2007, Kopenawa, 2013). At the same time, it extends existing scholarship by showing how cultural practices can be maintained alongside innovative uses of technology, as in Wilza's development of a digital language app (Kimmerer, 2013; Yunkaporta, 2020; Grünfelder et al., 2024). Finally, the strong emphasis King Khoisan SA and Wilza Pataxó (Brazil) placed on intergenerational responsibility and systemic change speaks to the wider potential of indigenous perspectives to inform sustainable development policies. This resonates with calls in the literature for greater Indigenous participation in decision-making (Mercer et al., 2020).

8. Discussion

8.1 Indigenous Knowledge and Community

King Khoisan shared insights into the traditional practices and knowledge of the Khoisan tribe, which exemplifies a deeply rooted sense of community and selflessness, contrasting sharply with today's prevalent hyper-individualism. This perspective resonates with Simpson's (2017) conception of indigenous life as a "network of intimate relations" built through reciprocity. Modern society often grapples with isolation, anxiety, and depression, issues that have intensified since the COVID-19 pandemic. A global survey conducted in 2021 revealed that one in every three people experienced some degree of loneliness (Loneliness Among Adults Worldwide by Country 2021, 2024), highlighting the urgent need for community bonds in our rapidly modernising and digital world [4].

[4] Loneliness among adults worldwide by country 2021. (2024, August 9). Statista. Retrieved November 6, 2024, from https://www.statista.com/statistics/1222815/loneliness-among-adults-by-country/

Indigenous groups, such as the various tribes in Brazil, embrace the principle of diversity. As Wilza points out, each tribe possesses a unique style of handicrafts, which strengthens inter-tribal ties. Bartering remains a common practice in these communities, fostering unity and presenting a paradox to prevailing literature that suggests homogeneity and economic growth are inherently linked. Some research has shown that ethnic heterogeneity can hinder economic performance due to conflicting perspectives, and this notion is often cited as a barrier to development, particularly in developing nations (Cardenas, 2019; Montalvo & Reynal-Querol, 2005). Contrasting literature suggests that diversity can have favourable results (Gomez & Bernet, 2019). Ironically, as a country prospers, it tends to become more ethnically homogeneous, allowing for easier implementation of development policies. However, this growth often comes at the expense of cultural and ethnic diversity.

Leaders like Wilza and King Khoisan are actively combating this issue (Cardenas, 2019). King Khoisan SA advocates for the inclusion of the Khoisan language in South Africa's official languages. Similarly, Wilza is currently developing an app designed to teach indigenous languages from over 300 tribes and 270 native languages. She emphasises that revitalising these languages is crucial for maintaining cultural identity for future generations, especially for the Pataxó tribe, which has seen a decline in fluency. For Wilza, language serves as a vital tool for cultural preservation and connection to ancestral roots. Through her IFBI (Indigenous Biomes Fund Institute), Wilza is trying to help indigenous peoples manage projects and enterprises within their native territories. On both sides, there is a strong bond and a desire to maintain, transmit, and promote cultural and traditional practices in a fast-changing modern world.

Wilza's story serves as a blueprint, pointing towards a solution for indigenous peoples worldwide. A solution that would enable them to develop on their territory while allowing exchange and interaction with the modern world, therefore building bridges to the modern world. This ensures that future generations can navigate between these spheres and draw wisdom from both.

8.2 Indigenous Knowledge and the Environment

Indigenous people have a profound relationship with their environment, characterised by practical knowledge that can significantly benefit development interventions (Dove, 2006). King Khoisan elaborated on how his tribe's sustainable practices were ingrained in their daily lives. For instance, during hunts, the Khoisan would carefully observe whether an animal was pregnant, opting not to kill it to ensure the ongoing population of wildlife. Additionally, he wore a necklace made of ostrich egg and tortoise shells, carrying roots of plants believed to possess healing properties. These practices demonstrate the indigenous understanding of their surroundings, which is invaluable for initiatives aimed at food security and healthy living. Preserving female mammals, for example, could inform sustainable agricultural practices.

While the concept of utilising indigenous knowledge for development is not new; some researchers contend that there is limited evidence supporting conservation efforts within indigenous communities and that intellectual property rights regarding unique plant knowledge raise concerns, particularly in the pharmaceutical industry (Ellen, 2005; Dove, 2006). Nonetheless, a collaborative approach between scientists and indigenous leaders could yield beneficial results. By merging indigenous practical knowledge with scientific expertise, we can create sustainable conservation interventions that ensure environmental protection for future generations. This collaborative venture underscores the necessity for tailored development approaches that cater to the unique environmental conditions experienced by indigenous communities (Lu & Ahmad, 2023). In conclusion, the integration of local and scientific knowledge offers a promising path towards sustainability, enhancing our understanding of socio-ecological systems. By weaving together traditional wisdom with contemporary approaches, we can effectively address environmental challenges while strengthening the bonds that hold communities together.

While staying true to their culture and traditional practices, indigenous tribes have had to adapt to the modern world. King Khoisan SA mentioned that he consults with other indigenous tribes around the world on his mobile phone by use of social media. The app designed

by Wilza to translate indigenous languages in Brazil is an innovative way to preserve these languages for future generations.

9. Transcultural Analysis

The analysis of different cultures in different geographical locations brings a transcultural theme to the study. The two indigenous groups share commonalities despite their distinct differences. The two interviewees are of indigenous descent and have journeyed from their homelands to urban areas to educate others about their tribes, advocate against the marginalization of indigenous groups, and preserve the identities of their peoples, despite facing various socio-economic challenges. Despite living on different continents, this demonstrates how indigenous groups have similar beliefs and convictions about sustainable development, environmental protection, and cultural preservation.

9.1 Implications for Sustainable Development

These transcultural commonalities suggest implications for sustainable development:

- Both leaders' selective use of technology highlights the significance of fusing traditional knowledge systems with contemporary tools and resources.
- The necessity for development initiatives to consider cultural preservation and economic progress as a pair.
- The possibility of establishing global networks for the exchange of Indigenous knowledge.
- The significance of indigenous perspectives in addressing global environmental challenges.

9.2 From Local Traditions to Global Lessons: A Transcultural Perspective

This transcultural analysis reveals that, despite having different cultural contexts, indigenous tribes share similar fundamental perspectives on sustainability and cultural preservation. These common experiences and methods raise the prospect of creating more effective and inclusive sustainable development strategies that respect contemporary realities while incorporating indigenous knowledge.

In line with the Transcultural Learning Model (GIZ's Knowledge Management and Learning Team, 2021), it is possible to see the cases of King Khoisan SA in South Africa and Wilza Pataxó in Brazil not only as parallel experiences, but as representative of transcultural processes in action. The model emphasizes that transculturality not only means recognizing differences among cultures, but rather means the generation of new spaces of mutual comprehension and action. Both leaders embody this dynamic in the sense that they are caught between indigenous protocols and global modernity in constant motion – through digital tools, political advocacy, and the reclaiming of their languages. Such practices exemplify what the model refers to as "hybridization spaces," where indigenous knowledge interfaces with modern systems and generates novel solutions to sustainability challenges.

From a transcultural perspective, the study is enriched by the observation that indigenous knowledge, although originating in particular cultural milieus, can, when entering into dialogue across borders, also produce insights of global significance. The Khoisan and Pataxó cases reveal how transcultural encounters challenge development paradigms not as static templates, but as malleable frameworks shaped by plural epistemologies.

10. Limitations

The research offers valuable insights into indigenous perspectives on sustainable development and highlights how the two interviewees share several commonalities as discussed above. However, it contains various limitations that should be acknowledged to understand the findings in context and guide future research efforts.

One of the study's primary limitations lies in the small sample size of interviews conducted with indigenous people. While these interviews provide insightful, in-depth information, they only scratch the surface of the enormous variety of indigenous perspectives globally. Lijphart (1971) points out that a common limitation in comparative studies is the tendency to generalize based on a small number of cases.

A second limitation arises from the research's dependence on personal experiences. These first-hand accounts provide genuine and insightful perspectives; however, they are subjective by nature and influenced by the unique situations and surroundings of the leaders. Although valuable, King Khoisan SA and Wilza Pataxó's experiences and opinions cannot be assumed to represent the entirety of their respective communities' perspectives, much less those of other indigenous people. The interpretations and uses of traditional knowledge discussed in these interviews are based on individual understanding and experience.

Third, although the comparative study shows significant similarities between these two indigenous groups, the conclusions do not offer general answers to problems in sustainable development. Instead of providing conclusive solutions, this study should be seen as a contribution to the larger discussion on integrating indigenous knowledge into development approaches.

Furthermore, by focusing on just two regions, South Africa and Brazil, the study represents only a small portion of the global indigenous experience. Additional perspectives would likely lead to distinct or complementary conclusions because of the great diversity of indigenous peoples around the world, each with its unique cultural contexts and challenges.

Nevertheless, these limitations provide prospects for further study:

- Increase the sample size to incorporate more voices from various indigenous communities;
- examine the perspectives of several generations in indigenous communities regarding sustainable development;
- use quantitative methods to enhance qualitative understanding; and
- examine the feasibility and practicality of including indigenous knowledge in existing development frameworks.

The recommendations discussed above do not offer a comprehensive solution to all questions surrounding sustainable development in the Global South. Policy design is complex, and development interventions are challenging to implement. Our contribution lies in presenting the lived experiences of these indigenous leaders. We suggest that valuable lessons may emerge from how indigenous groups interact with one another, their environments, and the broader world – lessons that could inspire research on the relevance of these practices in today's society.

11. Conclusion

Based on the preliminary analysis of the cultural practices and traditional knowledge of indigenous groups in Brazil and South Africa, this project indicates the importance of integrating indigenous knowledge into sustainable development policies. The interviews with indigenous leaders aim to provide a comprehensive insight into how these communities use their traditional knowledge to maintain resilience and sustainability in their environments. Moreover, these two interviews emphasize the significance of language as a fundamental component of culture (Fishman, 1991).

So far, the cultural practices of the Khoisan in South Africa and indigenous groups in Brazil have been observed as fundamental to preserving natural resources and maintaining biodiversity. These practices not only contribute to environmental conservation but also promote social cohesion and community well-being. The Western approach to development often overlooks these cultural aspects, resulting in policies that are not suitable for the local context and can exacerbate existing inequalities.

Therefore, one of the main conclusions of this study is the need for a development model that respects and incorporates indigenous knowledge and cultural practices. Combining modern scientific knowledge with traditional knowledge can create more adaptable and effective approaches to managing socio-ecological systems. Development policies should be formulated in an interdisciplinary manner, considering the values and worldviews of indigenous communities.

Our contribution to the topic is the inferences derived from the lived experiences of both King Khoisan SA and Wilza Pataxó. It seems that indigenous knowledge is rooted in communal living and in being at one with the immediate environment. The interviewees displayed how traditional practices can still be practiced in modern society and how technology can be adopted without completely eradicating the culture and heritage of indigenous groups.

In the light of the research question about the role of indigenous knowledge in sustainable development, this study concludes that sustainability has no single solution, and this chapter does not aim to resolve every challenge. However, much can be learned from the lived experiences of these two indigenous leaders. While different regions may require different approaches, indigenous knowledge can play a crucial role in shaping policies that ultimately affect communities. Although the two interviews differ significantly in background, heritage, culture, and worldview, there are striking similarities between them. Indigenous groups are marginalized both socially and economically across different parts of the world, yet they share a deep sense of community as the foundation of their daily lives. Despite leading modest lifestyles, these groups often embody a profound joy and possess rich wisdom about nature and human connection.

Moreover, this research highlights the importance of recognizing and valuing indigenous knowledge not only as a tool for environmental sustainability but also as a crucial component for global sustainable development. The incorporation of this knowledge can lead to more equitable and sustainable solutions, respecting cultural diversity and promoting social and environmental justice. Through this research, the authors hope to have contributed to a more holistic and inclusive understanding of sustainable development.

In summary, placing these findings in a truly international context renders them all the more pertinent. Groups such as the United Nations, IPBES, IPCC and UNESCO's LINKS program have been trying to bridge the gap between Western and indigenous voices at the core of sustainability programs. One example is the *Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) Global Assessment Report on Biodiversity and Ecosystem Services (2019)*, which acknowledges, as a cross-cutting issue, the importance of

recognizing, respecting and integrating indigenous peoples' and local communities' knowledge, value systems and world views for promoting good quality and long-term sustainability of nature and the benefits that people derive from it and in stemming biodiversity loss *(Section B6, p. 8)*. When local ways are consistent with these global efforts, it is evident that indigenous knowledge is more than culture, it is a scientific resource that can help us solve global environmental problems. This combination of indigenous knowledge and international efforts can form the basis of inclusive and flexible solutions for a sustainable world.

Use of Artificial Intelligence Tools

AI tools were used solely to assist with the translation and refinement of highly technical language. All research design, analysis, interpretation, and conclusions were developed independently by the authors.

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Beyond Representation: Transcultural Dialogue as an Affective-Relational Process in a Vietnamese Women's Museum

Svenja Hoffmann, Jeanie Laubscher and Võ Ngọc Nhân Nguyễn

1. Introduction

Gender-themed and feminist museums have increasingly been recognised as important cultural institutions that challenge dominant historical narratives and foreground marginalised voices, particularly those of women (Message, 2014; Sandell, 2007) Beyond their role in preservation and representation, such museums function as learning environments where visitors encounter stories of gender, power, resistance, and identity through objects, narratives, and spatial experiences (Hooper-Greenhill, 2000). In a globalised world marked by intensified mobility and cultural interconnection, these museums are no longer visited solely by local audiences, but increasingly by international and cross-cultural visitor groups. This shift raises critical questions about how feminist meanings are communicated, negotiated, and reinterpreted across cultural boundaries within museum spaces.

At the intersection of museum studies, feminist pedagogy, and transcultural research, scholars have emphasised the transformative potential of feminist exhibitions to stimulate reflection, dialogue, and collective meaning-making among visitors (Ahmed, 2012; Sandell, 2007). Feminist museums are often conceptualised as spaces of participation, storytelling, and embodied knowledge, where learning occurs

not only through textual information but also through emotional engagement and interpersonal interaction (Hooper-Greenhill, 2000). However, much of the existing research has focused on curatorial intentions, exhibition design, or visitor responses within Western contexts (Message, 2014). Less attention has been paid to how gender-themed museums in Southeast Asia operate as sites of transcultural encounter, particularly from the perspective of lived visitor experience.

This chapter argues that transcultural dialogue in gender-themed museums emerges primarily through affective and relational processes rather than through representational content alone. It addresses this gap by examining a museum dedicated to women's history in Vietnam. Rather than treating the museum as a static repository of feminist knowledge, this study approaches it as a dynamic social and spatial environment where meanings are actively produced through interaction, movement, and conversation. In doing so, the chapter positions the museum not only as a cultural institution but also as a relational space that shapes how transcultural dialogue unfolds.

1.1 Gender-Themed Museums as Spaces of Transcultural Learning

Gender-themed museums are often grounded in feminist educational principles that emphasise participation, reflexivity, and the validation of lived experience (Ahmed, 2012). Within feminist pedagogy, learning is understood as a relational process that emerges through dialogue, storytelling, and shared reflection rather than the passive transmission of knowledge. Museums aligned with these principles seek to create environments where visitors are invited to question dominant narratives and connect personal experience to broader social structures (Sandell, 2007).

When such museums are visited by international audiences, they become sites of transcultural learning. Transcultural dialogue, in this context, refers to processes through which individuals from different cultural backgrounds interact, negotiate meaning, and build shared understandings that move beyond static or essentialist notions of culture (Grünfelder & Baumann Montecinos, 2024). Rather than positioning culture as a fixed attribute, transcultural approaches emphasise rela-

tionality, hybridity, and the co-creation of meaning in specific situations (Bhabha, 1994).

At the same time, transcultural dialogue can be understood as a communicative process in which participants move across and through fluid cultural boundaries, drawing on diverse linguistic, cultural, and semiotic resources as meaning emerges in interaction. Cultural meanings are therefore not provided in advance but are constructed situationally, often combining elements that cannot be clearly attributed to a single culture or located "in-between" cultures (Baker, 2022). In this sense, transcultural dialogue involves the relational and situated co-construction of meaning, which can both sustain and transform existing cultural frameworks (Keifer-Boyd, 2018). Furthermore, such processes encourage participants to question assumptions and reflect on their own position, thereby enabling more nuanced and dynamic forms of understanding across cultural differences.

However, the capacity of a museum to foster transcultural dialogue cannot be assumed. Gendered narratives that are deeply embedded in national histories may resonate differently with visitors depending on their cultural background, prior knowledge, and expectations. What is intended as empowering or commemorative within a local context may appear fragmented, opaque, or emotionally distant to international visitors. Understanding these dynamics requires close attention to how visitors experience exhibitions in situ, including how they move through spaces, engage with objects, and converse with one another.

1.2 The Museum as a Spatial and Relational Environment

This study approaches the museum not merely as a container for exhibitions, but as a spatial practice that actively shapes visitor interaction and meaning making (Lefebvre, 1991). Architectural and spatial configurations influence how visitors circulate, where they pause, and how they encounter exhibits and each other. Elements such as spatial sequencing, enclosure and openness, and sensory conditions can either encourage or constrain dialogue and reflection (Hooper-Greenhill, 2000).

From this perspective, space is not neutral. It mediates power relations, structures visibility, and frames the conditions under which nar-

ratives are accessed and discussed (Lefebvre, 1991). In gender-themed museums, spatial design can reinforce feminist values such as inclusivity and collectivity or, conversely, reproduce hierarchies through rigid layouts or overwhelming information density. These spatial factors become particularly significant in transcultural settings, where visitors rely not only on textual explanations but also on embodied and sensory cues to interpret unfamiliar narratives.

By foregrounding the spatial dimension of the museum experience, this chapter aligns with relational understandings of learning and culture (Baumann Montecinos et al., 2023). Meaning making is seen as emerging through the interaction of visitors, narratives, and space, rather than residing solely in curatorial texts or individual cognition.

1.3 Research Context and Empirical Focus

The empirical focus of this chapter is a qualitative, exploratory case study conducted during a visit to an anonymised women-focused museum in Southern Vietnam by a multinational group of international students. The museum is described in terms of its thematic orientation and institutional positioning but remains unnamed in accordance with ethical agreements.

The study forms part of a broader research design combining non-participant observation, questionnaires, and focus group discussions. This multi-method approach captures how visitors collectively engage with exhibitions and how meaning unfolds over time. The researchers' position as members of the visiting group is acknowledged, allowing for reflexive insight into shared interpretive processes.

Rather than evaluating the institution against predefined standards, the study adopts an inductive and interpretive approach. Patterns of facilitation and hindrance emerge from visitor accounts and observational data, making visible the relational and embodied dimensions of transcultural dialogue. The research is guided by the central question:

How do gender-themed museums in Vietnam facilitate or hinder transcultural dialogue and knowledge exchange among international or cross-cultural visitor groups?

1.4 Contribution and Relevance of the Chapter

This chapter makes three central contributions. Empirically, it provides insight into visitor experiences within a Southeast Asian gender-themed museum, addressing a geographical gap in feminist museum research. Conceptually, it integrates feminist museum pedagogy with transcultural theory, shifting the analytical focus from cultural difference toward relational meaning-making. Methodologically, it demonstrates the value of experience-based qualitative approaches for examining informal and embodied processes of dialogue in museum settings.

Importantly, the chapter challenges the assumption that representational inclusion alone generates transcultural understanding. Instead, it demonstrates that dialogue emerges through the interplay of thematic plurality, interpersonal interaction, and spatial accessibility. By foregrounding environmental and embodied conditions alongside narrative content, the study highlights how feminist knowledge is shaped not only by what is displayed but by how visitors move, feel, and interact within museum space.

In doing so, the chapter positions gender-themed museums as potentially powerful, yet structurally contingent, sites of transcultural encounter. The following sections develop the theoretical framework, methodological approach, and empirical findings that support this argument.

2. Literature Review

2.1 Transcultural Dialogue and Shared Meaning

Contemporary discussions of cultural interaction increasingly move beyond static or nation-bound understandings of culture toward more relational and process-oriented perspectives (Grünfelder & Baumann Montecinos, 2022). Within this shift, the concept of transculturality has emerged as a critical framework for understanding how individuals from diverse cultural backgrounds engage in dialogue, construct shared meanings, and negotiate difference in dynamic social contexts. Unlike traditional intercultural models, which often emphasise comparison between bounded cultural groups, transcultural approaches

foreground interaction, hybridity, and the co-creation of meaning across cultural boundaries (Grünfelder & Baumann Montecinos, 2022).

Early intercultural frameworks, most notably Hofstede's (2001) cultural dimensions model, conceptualised culture as a relatively stable system of values associated with national contexts. While such models have been influential, they have also been widely criticised for reifying culture and underestimating individual agency and situational complexity (Welsch, 1999). Scholars argue that these approaches risk reinforcing stereotypes and oversimplifying cultural encounters, particularly in increasingly globalised and mobile contexts (Hall, 1997). In response, transcultural perspectives emphasise fluidity, multiplicity, and relational engagement, positioning culture as dynamic and continually negotiated rather than fixed and homogeneous.

Grünfelder & Baumann Montecinos (2022) define transcultural competence not as the ability to manage cultural differences, but as the capacity to build commonalities through interaction. From this perspective, shared meaning does not pre-date cultural encounters; rather, it emerges through dialogic processes in which participants negotiate understanding, values, and perspectives. This relational focus is further developed by Grünfelder & Baumann Montecinos (2024), who propose a transcultural framework centred on co-creation, mutual recognition, and the development of shared practices in culturally complex environments. Transcultural dialogue is thus understood not merely as communicative exchange, but as a social process through which new, hybrid meanings are produced.

Hepp (2015) similarly conceptualises transcultural communication as an ongoing and emergent process shaped by context, power relations, and interactional dynamics. Rather than treating culture as a background variable, transcultural approaches view it as something actively performed and renegotiated in everyday encounters. This understanding is particularly relevant to informal learning environments, where participation is voluntary, and meaning-making is less structured than in formal educational settings.

Extending this relational perspective, Sackmann (2023) emphasises the importance of inclusive environments in enabling meaningful interaction across cultural boundaries. In culturally complex settings, shared meaning is facilitated when spaces encourage dialogue, reflexiv-

ity, and the recognition of multiple identities. Although Sackmann's work focuses primarily on organisational and leadership contexts, her emphasis on relationality and interaction provides a useful lens for analysing public cultural institutions such as museums, which similarly function as spaces where diverse individuals encounter one another and engage with shared narratives.

Taken together, these perspectives suggest that transcultural dialogue is most effectively facilitated in environments that support interaction, reflection, and commonality-building rather than merely presenting cultural difference. Museums, as informal learning spaces that bring together visitors from varied cultural and linguistic backgrounds, offer a particularly relevant context for examining these processes. By situating transcultural dialogue within a relational framework, the present study approaches the museum not simply as a site of cultural representation but as a space where shared meanings can emerge through embodied experience, conversation, and emotional engagement. This conceptualisation provides the foundation for analysing how transcultural dialogue unfolds among international visitors at the research site.

2.2 Feminist Museum Pedagogy

Feminist museum pedagogy positions museums not merely as sites of cultural preservation, but as active spaces of learning, critique, and social transformation. Rooted in feminist educational theory, this approach emphasises participation, reflexivity, emotional engagement, and the questioning of dominant historical narratives. Feminist museums and gender-themed exhibitions are therefore understood as pedagogical environments in which visitors are invited to engage critically with issues of power, representation, and lived experience rather than passively consume authoritative knowledge.

A substantial body of research highlights the educational potential of feminist exhibitions to foster dialogue and perspective transformation. Clover (2018) conceptualises feminist exhibitions as forms of community adult education, arguing that they create opportunities for visitors to engage with contested histories and marginalised voices

through affective and participatory encounters. Building on this work, Clover (2021) demonstrates how feminist museum spaces can function as dialogic learning environments in which visitors collectively reinterpret gendered histories, drawing connections between past struggles and contemporary social realities. These studies emphasise that learning in feminist museums extends beyond cognitive knowledge acquisition to include emotional resonance and social interaction.

Participatory and dialogic practices are central to feminist museum pedagogy. Clover et al.'s (2018) development of the Feminist Museum Hack illustrates how guided collective engagement can encourage visitors to identify patriarchal assumptions embedded in exhibitions and actively challenge dominant narratives. Similarly, Franger (2024) shows how feminist arts-based practices and craftivism in museum settings open up spaces for dialogue, mutual recognition, and respect. In these contexts, visitors are positioned as co-creators of meaning rather than passive recipients of curatorial authority, aligning closely with relational approaches to learning.

Research on feminist-inspired gallery visits further underscores the importance of emotional engagement and embodied experience. Spring et al. (2018) demonstrate that feminist-guided museum visits can facilitate transformative learning by fostering empathy, self-reflection, and emotional connection to exhibited narratives. Their findings highlight those affective responses, such as identification with personal stories or emotional discomfort, play a critical role in challenging existing assumptions and enabling new understandings to emerge. This emphasis on emotional accessibility is particularly relevant for examining how feminist museums may facilitate connection across cultural boundaries.

While existing literature affirms the pedagogical potential of feminist museums, it also reveals significant contextual limitations. Studies by Grácio et al. (2020) and Zanetti (2020) illustrate how feminist and queer interventions within museums often operate as acts of resistance against institutional norms, particularly in European contexts. However, these studies tend to focus on curatorial strategies and activist practices rather than systematically examining visitor interactions, especially among culturally diverse or international audiences. This gap is even more pronounced outside Western contexts. Mandel Katz's (2024) analysis of decolonial feminist pedagogies in the Women's

Museum in Costa Rica provides important insight into how feminist museums can challenge colonial narratives and foreground marginalised voices. However, the study prioritises curatorial intention and educational philosophy over empirical analysis of visitor meaning making. Similarly, Largo's (2022) queer feminist Asian diasporic approach to museum education offers a critical perspective on representation and identity but does not explicitly examine live transcultural dialogue among museum visitors. Consequently, the processes through which feminist exhibitions facilitate dialogue across cultural differences remain underexplored.

Although feminist and decolonial museum practices have received growing scholarly attention beyond Western contexts, empirical research examining live transcultural dialogue and visitor meaning making remains limited. Addressing this gap, the present study brings together feminist museum pedagogy and transcultural perspectives to examine how shared meanings are constructed through interaction, emotion, and dialogue in a gender-focused museum context. Focusing on visitor experiences at an anonymised research site, the study explores how feminist narratives and exhibition practices facilitate or constrain transcultural dialogue among an international audience.

2.3 Museums as Relational Learning Environments

Museums are increasingly understood as relational learning environments in which knowledge is constructed through interaction between visitors, exhibitions, and the physical and social context of the space. Rather than functioning as neutral repositories of information, museums shape learning experiences through spatial design, narrative structure, sensory conditions, and opportunities for social engagement. This relational understanding of museum learning is particularly relevant for examining how transcultural dialogue and shared meaning emerge among diverse visitor groups.

Falk & Dierking's (2013) Contextual Model of Learning provides a foundational framework for understanding museum experiences as the dynamic interplay of personal, sociocultural, and physical contexts. According to this model, learning in museums is not linear or uniform,

but situated, embodied, and shaped by prior knowledge, social interaction, and environmental conditions. Importantly, physical factors such as temperature, layout, lighting, and spatial flow can significantly influence visitors' attention, emotional engagement, and capacity for reflection. These insights highlight that relational learning depends not only on exhibition content but also on the conditions that enable visitors to remain present, attentive, and open to dialogue.

Narrative structure plays a central role in mediating meaning-making within museum spaces. Exhibition narratives guide visitors through historical timelines, thematic connections, and interpretive frames that shape how knowledge is understood and remembered. When narratives are fragmented or insufficiently contextualised, visitors, particularly those unfamiliar with the cultural or historical background, may struggle to construct coherent interpretations (Hooper-Greenhill, 2000). In transcultural settings, where visitors bring diverse frames of reference, the clarity and accessibility of exhibition narratives become especially important for facilitating shared understanding and dialogue.

Beyond curatorial design, museums also function as social spaces where learning frequently occurs through informal interaction. Research suggests that visitor-to-visitor conversations, shared observations, and spontaneous discussions often play a more significant role in meaning-making than engagement with interpretive texts alone (Hein, 1998). These dialogic moments allow visitors to test interpretations, express emotional responses, and negotiate understanding collectively, aligning closely with relational and transcultural theories that emphasise co-creation and interaction as central to learning.

Sensory and affective dimensions further shape relational learning in museums. Embodied experiences, such as movement through space, sensory comfort or discomfort, and emotional reactions to objects, are integral to how visitors engage with exhibitions (Pink, 2015). Emotional responses can either deepen engagement or inhibit reflection, depending on how the environment supports or constrains visitor presence. In this sense, sensory conditions are not peripheral, but constitutive of learning and dialogue.

Taken together, these perspectives position museums as complex relational environments in which learning emerges from the interaction of space, narrative, sensory experience, and social exchange. For trans-

cultural visitor groups, these factors are particularly salient, as shared meaning must be negotiated across different cultural, linguistic, and experiential backgrounds. Understanding museums as relational learning environments, therefore, provides a critical lens for analysing how structural and environmental features can either facilitate or hinder transcultural dialogue. This framework informs the present study's examination of the anonymised research site, enabling an analysis of how spatial conditions, exhibition narratives, and informal interactions shape opportunities for emotional connection and shared meaning among international visitors.

To conclude, these three strands of scholarship: transcultural dialogue, feminist museum pedagogy, and relational understandings of museum learning, form the conceptual framework guiding the present study. Rather than treating these perspectives as separate theoretical domains, this chapter integrates them to analyse how shared meaning emerges through the interaction of narrative scope, emotional engagement, spatial conditions, and visitor-to-visitor dialogue. These concepts structure the empirical analysis presented in the Findings chapter.

3. Methodology

3.1 Research Design and Methodological Approach

This study adopts a qualitative, exploratory case study design grounded in interpretive cultural research. The aim is to explore situated processes of transcultural knowledge exchange as they emerge during a museum visit by a culturally mixed group. Rather than testing predefined hypotheses or measuring learning outcomes, the study seeks to understand how meaning is produced, negotiated, and shared through social interaction in a specific cultural setting.

Qualitative research is particularly suited to this aim because it prioritises meaning, context, and process over variable-based explanation (Creswell, 2007). As Maxwell argues, qualitative research is especially appropriate for addressing questions about how people interpret events and how physical and social contexts shape action, as these questions are inherently situation-specific and processual (Maxwell,

2008). Transcultural knowledge exchange unfolds through interaction, interpretation, and negotiation, and therefore cannot be adequately captured through standardised instruments or outcome-oriented measures.

The study follows an interpretive epistemological orientation, which understands social reality as being constructed through interaction and meaning-making. Interpretive research assumes that actions are embedded in symbolic and cultural systems that must be reconstructed analytically rather than taken at face value (Rosenthal, 2018). This perspective aligns with Geertz's conceptualisation of culture as a 'web of meanings' that requires thick description, that is, an interpretive account that situates observed behaviour within its social and cultural context (Geertz, 1973).

The research is designed as a single-case study, allowing for in-depth analysis of a bounded social situation. Exploratory case studies, while open-ended, still require a clear purpose and rationale to guide data collection and analysis (Yin, 2017). In this study, the case is bounded temporally (one museum visit), spatially (a single museum), and socially (one visitor group). This boundedness enables focused observation of interactional processes without attempting to capture the entirety of museum practice.

Crucially, the museum visit is conceptualised not as an educational intervention or experimental setting but as a minimally structured social situation. While participants were invited to visit the museum as a group, they were not assigned specific tasks, guiding questions, or pre-defined learning objectives. Beyond being informed that their visit would be observed, no further instructions were provided. This design created a context that was initiated by the researchers but largely unfolded according to participants' own interests, interactions, and movement through the space. Such an approach enables the study to examine informal and emergent forms of knowledge exchange as they occur through engagement with exhibits, interaction among group members, and encounters with the museum environment. Qualitative research is particularly suited to such contexts, as it focuses on understanding processes as they develop during social interaction, rather than on measuring outcomes against pre-defined criteria (Maxwell, 2008).

3.2 Case Selection and Research Setting (Methodological Perspective)

The empirical case examined in this study is a women-focused museum in Vietnam, conceptualised as an institutionalised site of cultural knowledge production. From a methodological perspective, museums constitute particularly relevant research settings, as they bring together curated narratives, material artefacts, and spatial arrangements that structure interpretation and invite informal discussion. As such, they function as environments in which processes of meaning-making and knowledge exchange can be observed *in situ*, rather than elicited through predefined tasks or instructional frameworks.

The museum is situated in a major urban context characterised by layered historical trajectories and routine encounters between local and international perspectives. Within this setting, the selected institution presents culturally and historically embedded narratives through both material and discursive means, rendering it a productive site for examining transcultural interaction as it unfolds in everyday museum practice. To ensure institutional anonymity and to comply with ethical agreements, the museum is referred to in anonymised form throughout this chapter and the subsequent analysis. As Yin notes, while case identification is often desirable in qualitative research, anonymity may be warranted when disclosure could affect the institution or the individuals involved (Yin, 2017). Detailed historical, institutional, and curatorial information is therefore addressed in a separate Case Context chapter, allowing the Methods chapter to remain focused on methodological considerations.

3.3 Participant Group and Sampling Strategy

The study involved a culturally mixed group of participants who visited the museum together. Participants had known each other for several days before the visit, a condition that shaped the interaction dynamics observed during the study. There was no formal hierarchy within the group, and no participant assumed an officially designated expert role. The group size was small, enabling close observation of interaction

while still allowing diverse perspectives to emerge. Basic demographic characteristics, such as international background, were considered only insofar as they were relevant to understanding transcultural interaction; no exhaustive demographic profiling was undertaken. Participants were selected through purposive sampling, as the study intentionally focused on a group composed of individuals from different cultural backgrounds. Depending on the circumstances of group formation, elements of convenience sampling may also apply. Such combinations are common in qualitative exploratory research and are consistent with achieving analytical depth rather than statistical representativeness (Maxwell, 2008). Importantly, the participants' pre-existing familiarity is treated as a methodological strength rather than a limitation. Familiarity facilitated spontaneous interaction, supported more comfortable, collegial interaction, and enabled more natural exchanges of explanation, comparison, and interpretation: key phenomena for the study of transcultural knowledge exchange (Denzin & Lincoln, 2017).

3.4 Data Collection Methods

The study employed a multi-method qualitative design, combining participant observation during the museum visit with a group interview conducted afterwards. The use of multiple qualitative methods allows for the examination of both situated interaction and participants' reflective interpretations, strengthening interpretive analysis through triangulation (Denzin & Lincoln, 2017).

3.4.1 Participant Observation in the Museum

Data collection began with non-intrusive participant observation during the museum visit. The observation took place in a naturalistic setting, with no scripted tasks or instructions provided. Researchers adopted an observational role and refrained from guiding or intervening in participants' interactions.

The observation focused on:

- verbal exchanges between participants
- non-verbal interaction (e.g., gestures, pointing, spatial orientation)
- movement through the museum space
- moments of explanation, translation, comparison, or disagreement

Field notes were taken during and immediately after the visit to preserve the chronological sequence of events. Following Rosenthal's guidelines, observation memos concentrated on selected interaction scenes described in detail and recorded in their temporal order, while distinguishing description from interpretation as far as possible (Rosenthal, 2018).

This approach corresponds to focused ethnographic observation, emphasising situational depth rather than exhaustive coverage. Rosenthal argues that such detailed, sequentially ordered memos provide a strong basis for reconstructive analysis, even in the absence of audio or video recordings (Rosenthal, 2018).

3.4.2 Group Interview in a Café Setting

Following the museum visit, an informal group interview was conducted in a café setting. The interview took place immediately after the visit in a relaxed environment, encouraging open discussion and reflection. The group interview format was chosen to facilitate collective meaning-making (Krueger & Casey, 2000). Participants articulated their impressions of the visit, responded to one another's interpretations, and negotiated shared or divergent understandings. In this way, the group dynamic itself became an integral part of the data. While guiding questions were used to structure the discussion, the interview remained open and conversational. Yin notes that group interviews (or focus groups) can be particularly valuable in case study research for capturing participants' perspectives and for corroborating or complicating observational findings (Yin, 2017).

3.5 Role of the Researchers and Reflexivity

The researchers were present throughout the data collection process but adopted a non-directive role. They did not instruct participants on how to engage with the museum or with one another. Reflexivity was an integral part of the research process. Researchers remained aware of their own cultural positioning, language proficiency, and interpretive frameworks, and documented reflections through analytic memos. Rosenthal emphasises reflexive memo-writing as a key tool for maintaining analytical transparency and for distinguishing observation from interpretation (Rosenthal, 2018).

3.6 Ethical Considerations

Ethical principles guided all stages of the study. Participation was voluntary, and informed consent was obtained from all participants before data collection. Participants were informed about the purpose of the study and the use of observational and interview data. Anonymisation was applied consistently to protect both participants and the institution involved. No deceptive practices were used, and care was taken to respect participants' cultural backgrounds and personal boundaries throughout the research process.

3.7 Data Analysis

Data analysis followed an interpretive, reconstructive strategy. Observational field notes were analysed sequentially, focusing on key interaction scenes and reconstructing their meaning in relation to the broader situation (Rosenthal, 2018). The group interview data was analysed to examine how participants retrospectively interpreted and negotiated these interactions. By relating observational and interview data to one another, the analysis follows a triangulated logic, allowing for a nuanced interpretation of transcultural knowledge exchange as a situated and interactional process (Denzin & Lincoln, 2017).

4. Case Context

This chapter provides the institutional, historical, and situational context of the empirical case examined in this study. Its purpose is to situate the analysed museum as a research setting and to enable readers unfamiliar with the site to understand the narrative environment, exhibition logic, and visitor conditions under which the observed museum visit took place. In line with ethical considerations and institutional agreements, the museum is treated as an anonymised case. It is therefore described only in terms of its thematic focus, institutional positioning, and spatial characteristics, without reference to its name, exact location, or founding history. Rather than offering an evaluative interpretation, the chapter reconstructs the contextual conditions that shaped the museum visit as a social situation. These conditions form the background against which transcultural encounters and processes of meaning-making unfolded and are essential for understanding the subsequent analysis.

4.1 Institutional Positioning and Narrative Orientation

The museum examined in this study is a publicly administered cultural institution dedicated to the history and representation of women in Southern Vietnam. As a state-affiliated museum, it operates within an official framework of cultural heritage preservation and national remembrance. Its institutional mandate emphasises education, commemoration, and the transmission of historically significant narratives concerning women's contributions to society. The museum's narrative orientation is closely aligned with dominant national memory frameworks. Women are presented as historically significant actors primarily through their participation in collective struggles, especially in contexts of war, resistance, and national defence. This framing situates women's lives within a broader story of social sacrifice and moral exemplarity, emphasising dedication to collective goals rather than individual trajectories. Although the museum is clearly identifiable as a women-focused institution, it does not position itself explicitly within feminist discourse. Concepts such as gender equality, women's rights,

or feminist movements are not foregrounded in institutional framing or exhibition texts. Instead, the museum's focus remains on documenting and honouring women's historical roles within nationally significant events. This institutional positioning shapes the thematic scope of representation and establishes the interpretive boundaries within which women's histories are narrated.

4.2 Exhibition Structure and Thematic Organisation

The permanent exhibition is distributed across multiple floors and thematic sections. The overall structure combines thematic and historical elements rather than following a strictly linear chronological path. Visitors are not guided through the space by explicit directional signage or interpretive framing, and the narrative progression must be constructed by visitors as they move through the exhibitions.

The visit typically begins on the first floor with an exhibition dedicated to women's clothing, centring on the historical development and cultural significance of the *Áo Dài*. This section traces the evolution of the garment across different periods, emphasising its role as a symbol of Vietnamese femininity, tradition, and national identity. Adjacent to this main exhibition, a smaller section presents women's clothing from various ethnic minority groups in Southern Vietnam. These garments are displayed primarily as material and visual artefacts, highlighting differences in style, fabric, and ornamentation. Across both sections, clothing is displayed using different modes of presentation. Garments associated with dominant or nationally recognisable forms of dress, such as the *Áo Dài*, are exhibited in glass cases, visually separating them from visitors and emphasising their status as preserved heritage objects. In contrast, clothing associated with ethnic minority groups is displayed more openly, typically positioned behind a low rope barrier rather than enclosed in glass display cases. While both forms of display foreground aesthetic diversity and craftsmanship, the garments are largely presented as self-contained cultural objects. In most cases, textual explanations remain brief and focus on descriptive information, offering limited contextualization of the social, political, or historical conditions under which these forms of dress were worn.

The second floor is devoted predominantly to women's roles in times of war and resistance. This exhibition constitutes the core narrative focus of the museum. It documents women's participation in armed struggle, logistical support, communication networks, and political organisation across different historical periods, with a particularly strong emphasis on twentieth-century conflicts. Personal artefacts such as tools, weapons, items of clothing, and everyday objects form the primary material basis of these displays. Photographs, portraits, statues, and commemorative artworks accompany these objects, collectively constructing a narrative in which women appear as resilient, courageous, and morally exemplary figures. Exhibition texts emphasise perseverance, sacrifice, and commitment to collective struggle. The tone throughout these sections is descriptive and commemorative, presenting a coherent and affirmative account of women's historical participation. Alternative perspectives, internal conflicts, or divergent experiences are not explored in depth.

Other dimensions of women's lives, such as peacetime social roles, post-war developments, or contemporary gender issues, are less visible within the permanent exhibition. As a result, the museum's thematic scope is strongly oriented toward historical moments of crisis and collective mobilisation.

4.3 Spatial and Sensory Environment

The physical and sensory conditions of the museum form an important part of the case context. During the observed visit, the museum was relatively quiet, allowing visitors to move freely through the space without crowding. The absence of a guided tour or organised groups contributed to an atmosphere of individual exploration. Interior design varies across floors. Lower levels feature lighter colours, stone flooring, and neutral display cases, while upper levels use darker tones, wooden flooring, and more subdued colour palettes. Lighting is functional and sufficient for reading exhibition texts but does not create theatrical effects. Overall, the atmosphere is solemn and reflective rather than interactive.

During the visit, the museum environment was characterised by high indoor temperatures and limited air circulation in several exhibition areas. Seating within the exhibition spaces was scarce. These environmental and spatial conditions formed part of the situational setting in which the museum visit took place and are therefore noted as contextual background to the empirical material.

5. Findings

The observed museum visit unfolded as a loosely structured and highly individualised experience, shaped by the visitors' selective engagement with the exhibition content, their spatial movement, and intermittent social interaction. Rather than progressing through the museum as a cohesive group, participants navigated the exhibition in shifting constellations, alternating between solitary exploration and brief encounters with one another. Initial engagement strategies varied, with some visitors orienting themselves primarily through visual exhibits such as clothing displays and photographs, while others began by reading introductory texts.

Across the visit, engagement remained episodic. Attention was distributed unevenly, time spent at individual exhibits was limited, and sustained collective discussion was rare. Notably, explicit emotional articulation and critical reflection emerged more clearly in post-visit focus group discussions than during the visit itself. This temporal unfolding underscores that meaning making did not occur solely within the exhibition space but developed relationally over time.

The findings indicate that transcultural dialogue was neither automatic nor uniformly enabled. Instead, it emerged under specific structural and relational conditions. The chapter, therefore, first outlines barriers that constrained transcultural engagement, before analysing the facilitators that enabled moments of shared meaning and emotional connection.

5.1 Barriers to Transcultural Dialogue and Emotional Engagement

5.1.1 Thematic Narrowness and Restricted Interpretive Bridges

Participants consistently identified the museum's dominant focus on women's wartime participation as a central structural feature shaping their experience. While this emphasis produced a coherent and emotionally powerful narrative of sacrifice, resistance, and national contribution, it also limited the thematic scope through which women's lives were represented.

Visitors noted the relative absence of:

- Women's peacetime roles
- Social, intellectual, and political contributions beyond war
- Post-war developments
- Contemporary gender equality debates

The predominance of wartime narratives restricted the range of interpretive entry points available to international audiences. Several participants expressed a desire for clearer links between historical representation and present-day gender issues. One participant summarised this limitation by noting that the museum focused on "past roles without linking to current gender equality or feminist movements."

Importantly, this critique did not reject the wartime narrative itself. Rather, it pointed to the absence of thematic continuity across time. Without broader temporal framing, visitors struggled to situate the exhibition within global gender discourses, thereby limiting transcultural commonality-building.

5.1.2 Narrative Fragmentation and Limited Contextualisation

Beyond thematic scope, visitors frequently described difficulties related to narrative coherence and interpretive mediation.

The transition between the first floor (clothing displays) and the upper-floor (war exhibitions) was experienced as abrupt and insufficiently contextualised. Participants referred to a "disconnect" between floors and a lack of clear guidance regarding how the sections related

to one another. The exhibition structure required visitors to construct interpretive links independently.

International visitors emphasised that exhibition texts often assumed prior knowledge of Vietnamese history. Labels were described as factual but minimal, frequently listing names and dates without explaining broader significance. As a result, visitors reported being able to see objects but not fully understanding their historical or social implications.

Clothing displays illustrate this challenge clearly. While garments were visually engaging, participants noted a limited explanation of how women's attire evolved in relation to political shifts, social reforms, or cultural transformation. One participant remarked: "They had clothing from different times, but I didn't see much evolution in the dressing of women." Without narrative integration and contextual framing, visually compelling artefacts remained analytically static, reducing their potential as anchors for shared meaning-making.

5.1.3 Environmental and Embodied Constraints

Environmental and sensory conditions emerged as a significant embodied barrier shaping visitors' engagement.

Participants repeatedly referred to:

- High temperatures
- Limited air circulation
- Noticeable musty odours
- Minimal seating opportunities

Physical discomfort affected concentration, emotional receptivity, and so-called dwell time. Several participants described shortening their visit due to heat-induced fatigue. One noted that it became "hard to stay focused on the stories being told."

These embodied constraints influenced not only individual interpretation but also relational interaction. Physical strain reduced visitors' willingness to linger, reflect, or initiate conversation. The capacity for sustained dialogue was therefore materially conditioned by environmental comfort.

Participants did not frame these limitations as fundamental institutional failures but as infrastructural constraints that could be improved. Nonetheless, they functioned as structural barriers shaping the conditions under which transcultural engagement became possible.

5.2 Facilitators of Transcultural Dialogue and Emotional Connection

Despite these constraints, participants described multiple conditions under which transcultural dialogue and emotional connection did occur.

5.2.1 Emotional Resonance as a Catalyst for Dialogue

Emotional engagement emerged as the most significant facilitator of transcultural dialogue. Participants reported strong affective responses, particularly sadness, anger, and empathy, in relation to wartime narratives and representations of women's suffering and resilience.

Artefacts accompanied by identifiable personal histories were described as especially powerful. Named weapons, personal belongings, and symbolic objects humanised historical narratives, making them memorable and worthy of discussion. Emotional specificity appeared to transform abstract historical information into a relatable human experience.

These affective responses frequently prompted conversation. Rather than remaining private reactions, emotions became shared reference points through which visitors articulated interpretations, asked questions, and compared perspectives.

In this sense, emotional resonance functioned as a bridge across cultural differences. Visitors did not require shared cultural background knowledge to connect; shared emotional responses created common ground for dialogue.

5.2.2 Informal Social Interaction and Relational Meaning-Making

The findings further indicate that transcultural dialogue most often emerged through informal and spontaneous interactions rather than through structured educational interventions. Participants described moments of shared observation, brief conversations, and dialogue with companions or local individuals as central to their experience.

These interactions frequently occurred in response to emotionally charged exhibits or moments of uncertainty, where visitors sought clarification or shared interpretations. Dialogue developed organically through shared attention and situational engagement rather than through predefined interpretive frameworks. Participants identified conversations with local individuals as particularly meaningful, suggesting that transcultural understanding was facilitated through relational exchange rather than curatorial explanation alone.

5.2.3 Relatability, Accessibility, and Conditions for Engagement

Participants' reflections highlight the importance of accessibility and narrative clarity in shaping opportunities for emotional connection and dialogue. When exhibition narratives were perceived as fragmented or insufficiently contextualised, visitors reported difficulty engaging meaningfully with the content.

Confusion regarding thematic organisation and narrative flow limited visitors' ability to situate individual exhibits within a broader historical framework, thereby constraining emotional engagement and relational exchange. While emotional resonance and informal interaction enabled moments of connection, these processes were more effective when supported by clear narrative framing and accessible interpretive cues.

5.2.4 Environmental and Sensory Barriers as Constraints on Engagement

Environmental and sensory conditions emerged as a significant factor shaping visitors' capacity for sustained attention, emotional openness, and interaction. Participants repeatedly referred to high temperatures,

limited air circulation, and unpleasant odours as negatively affecting their experience. Physical discomfort was described as reducing concentration, increasing fatigue, and shortening engagement with exhibits.

These embodied constraints influenced not only individual experience but also social dynamics. Participants reported moving more quickly through exhibition spaces or skipping sections altogether, limiting opportunities for shared observation and dialogue. In addition, confusion regarding spatial orientation – particularly the relationship between the clothing exhibition and wartime narratives – further compounded interpretive difficulties, especially for international visitors unfamiliar with local historical contexts.

Participants did not frame these conditions as institutional failure, but rather as modifiable factors that significantly shaped their engagement. Environmental comfort and spatial orientation thus emerged as foundational conditions influencing whether emotional engagement and transcultural dialogue could be sustained.

5.3 Transcultural Dialogue as an Affective–Relational Process

Taken together, the findings demonstrate that transcultural dialogue within the museum was shaped by the interaction of thematic scope, relational meaning-making, and embodied environmental conditions. While emotional resonance and informal social interaction enabled moments of shared meaning across cultural differences, these processes unfolded unevenly and were often constrained by narrow thematic focus, fragmented narratives, and embodied discomfort.

The museum functioned as an affective–relational space whose transcultural potential was partially realised through visitor interaction rather than consistently supported by curatorial structure. Emotional engagement and dialogue emerged alongside, and sometimes despite, exhibition design rather than through it. This integrated understanding provides the foundation for the following Discussion chapter, where these findings are situated within broader debates on transcultural competence, feminist museum pedagogy, and relational learning in museum contexts.

6. Discussion

This chapter discusses the study's findings in relation to existing literature on transcultural dialogue, museum learning, and feminist heritage representation. Rather than reiterating the empirical results, the discussion interprets how and why transcultural dialogue and emotional connection emerged, or failed to emerge, within the museum context examined. The chapter argues that, in this case, transcultural dialogue was not primarily produced through curatorial narratives or institutional design, but through affective engagement and relational interaction among visitors. At the same time, the findings reveal how structural, thematic, and environmental conditions constrained the museum's transcultural potential. Taken together, the discussion positions transcultural dialogue as an affective–relational process that is enabled, limited, and shaped by the interaction of narrative scope, embodied experience, and social exchange.

6.1 Transcultural Relevance Beyond Representation

A central finding of this study is that transcultural relevance did not emerge automatically from the representation of women's histories, despite the museum's explicit focus on women. This challenges assumptions within heritage and museum discourse that visibility alone ensures inclusivity or cross-cultural relevance. Instead, the findings support relational theories of transculturality, which conceptualise relevance as something that emerges through connection, resonance, and shared meaning rather than through representation in isolation (Grünfelder & Baumann Montecinos, 2022).

The museum's dominant focus on women's wartime participation generated a powerful national narrative that participants recognised as historically significant and emotionally compelling. However, the narrow thematic scope limited visitors' ability to situate these histories within broader transnational or contemporary frames of reference. This supports existing scholarship arguing that transcultural engagement requires narrative plurality and continuity, enabling visitors to relate specific histories to wider social, political, and gendered concerns (Hooper-Greenhill, 2000; Macdonald, 2006).

Importantly, the findings suggest that the issue was not the national specificity of the narrative, but the absence of interpretive bridges beyond it. This aligns with critiques of commemorative museums that privilege coherent national memory over dialogic engagement, often at the expense of alternative perspectives and relational meaning-making (MacDonald, 2006). In this sense, the museum's transcultural limitations reflect broader tensions between commemoration and dialogue within state-affiliated heritage institutions.

6.2 Feminist Visibility, Agency, and the Limits of Implicit Narratives

The study further highlights a distinction between women's visibility and feminist articulation. While women's experiences were central to the museum's narrative, feminist meanings remained implicit and unevenly accessible to visitors. Participants differed in whether they interpreted the exhibition as feminist, reflecting the absence of explicit engagement with gendered power relations, rights-based struggles, or contemporary feminist debates.

This finding resonates with feminist museum scholarship, which argues that representing women does not in itself constitute feminist practice (Clover, 2018; Clover, 2021). Feminist relevance emerges through critical framing by linking historical experiences to questions of inequality, agency, and social transformation. In the absence of such framing, visitors are left to interpret feminist significance individually, drawing on their own cultural and political backgrounds.

For transcultural audiences, this ambiguity poses challenges. Feminism is not a universal or homogeneous framework, but one shaped by local histories and ideological traditions. Without interpretive cues connecting women's historical roles to broader feminist questions, opportunities for shared feminist meaning-making across cultural differences are limited. The findings thus suggest that feminist heritage initiatives seeking transcultural engagement must move beyond visibility toward explicit articulation of gendered structures and struggles.

6.3 Emotional Resonance as a Foundation for Transcultural Dialogue

One of the most significant contributions of this study lies in demonstrating the central role of emotional resonance in facilitating transcultural dialogue. Emotional engagement emerged as a primary mechanism through which visitors connected across cultural differences, often in the absence of detailed historical or contextual knowledge. This supports affect-oriented theories of learning, which emphasise that emotion is foundational to meaning-making rather than secondary to cognition (Illeris, 2018).

Participants' emotional responses, particularly to personal narratives and symbolic artefacts, enabled recognition, empathy, and reflection. These affective connections functioned as shared reference points, allowing dialogue to unfold without requiring shared cultural scripts or interpretive frameworks. This finding aligns with relational models of transcultural competence, which prioritise relational engagement and shared meaning over comparison between fixed cultural identities (Grünfelder & Baumann Montecinos, 2022).

At the same time, the findings complicate assumptions that emotional engagement alone is sufficient for sustained transcultural dialogue. While emotion enabled initial connection, its dialogic potential depended on the availability of social interaction and supportive structural conditions. Emotional resonance thus appears as a necessary but not sufficient condition for transcultural engagement in museum contexts.

6.4 Informal Interaction and the Social Production of Meaning

The study reinforces the importance of informal social interaction as a site of learning and meaning-making in museums. Transcultural dialogue most often emerged through spontaneous conversations among visitors rather than through curatorial guidance or educational programming. This supports relational and constructivist theories of museum learning, which conceptualise knowledge as co-produced through social interaction rather than transmitted from institution to visitor (Hein, 1998; Falk & Dierking, 2013).

Notably, some of the most meaningful exchanges occurred between international visitors and local individuals, highlighting the role of interpersonal encounters in transcultural understanding. These interactions enabled visitors to ask questions, compare perspectives, and contextualise what they were seeing in ways not supported by exhibition texts alone.

This finding aligns with Hepp's (2015) understanding of transcultural communication as an emergent, interactional process rather than a scripted exchange. Dialogue developed organically through shared attention, emotional response, and situational engagement. The museum functioned less as a didactic space and more as a social setting in which transcultural meaning was negotiated through relationships.

6.5 Embodied Experience and Environmental Constraints

A key contribution of this study is its attention to embodied and environmental conditions as structural factors shaping transcultural engagement. High temperatures, limited air circulation, and spatial disorientation significantly affected visitors' capacity for sustained attention, emotional openness, and social interaction. These findings support research emphasising that museum learning is fundamentally embodied and sensory, shaped by how visitors physically experience space (Pink, 2015; Falk & Dierking, 2013).

Environmental discomfort reduced dwell time, increased fatigue, and limited opportunities for dialogue. In this sense, physical conditions did not merely coexist with interpretive processes but actively structured what kinds of engagement were possible. This underscores that accessibility must be understood not only in cognitive or linguistic terms, but also as an embodied condition.

From a feminist pedagogical perspective, these findings are particularly salient. Feminist pedagogy emphasises inclusive learning environments that recognise diverse bodily, emotional, and relational needs (Clover, 2021). When environmental conditions undermine visitors' capacity to remain present and engaged, the potential for inclusive and dialogic learning is diminished. The study thus highlights environmental comfort and spatial orientation as foundational preconditions for transcultural dialogue rather than peripheral concerns.

6.6 Museums as Uneven Affective–Relational Spaces

Taken together, the findings position the museum as an affective-relational space whose transcultural potential was unevenly realised. Emotional resonance and informal interaction enabled moments of shared meaning across cultural differences, but these moments often emerged despite rather than through curatorial structure. Narrow thematic scope, fragmented narrative design, and environmental constraints limited the extent to which the museum consistently supported transcultural dialogue.

This challenges instrumental models of museum education that assume dialogue can be engineered through representation alone. Instead, the study supports a relational understanding of museums as social and embodied environments in which transcultural dialogue emerges through the interaction of narrative, emotion, space, and social exchange. Transcultural engagement is thus contingent, situational, and relational rather than guaranteed.

6.7 Implications for Transcultural and Feminist Museum Practice

The findings of this study suggest several implications for museums seeking to foster transcultural dialogue and emotional connection. First, thematic plurality and narrative continuity are essential for enabling visitors from diverse backgrounds to relate specific histories to broader social and gendered concerns. Second, emotional resonance should be understood as a powerful entry point for dialogue, but one that requires supportive interpretive and environmental conditions to be sustained. Third, informal social interaction should be recognised and facilitated as a central mechanism of learning rather than treated as incidental.

Finally, the study highlights the importance of considering embodied experience as a core dimension of transcultural engagement. Environmental comfort, spatial orientation, and accessibility are not secondary concerns but foundational to visitors' capacity for reflection, dialogue, and relational connection.

7. Limitations and Reflexive Considerations

This chapter treats limitations not as methodological "flaws" but as conditions of knowledge production that shape what can be seen, said, and interpreted in the data. In a study focused on transcultural knowledge exchange, it is especially important to remain explicit about the boundaries of the empirical situation, the partiality of perspectives, and how interactional and material contexts co-produce meaning.

7.1 Scope and Generalizability

The study is designed as a qualitative, exploratory case study of a single museum visit and a subsequent group discussion. As such, it prioritises interpretive depth over representativeness. This choice supports process-oriented questions – how meaning is negotiated and how transcultural reference points emerge in interaction – rather than prevalence claims about "typical" museum visitors or stable cross-cultural patterns (Maxwell, 2008). At the same time, the case-based design limits the degree to which findings can be generalised beyond the specific constellation of site, exhibition design, visitor composition, and situational conditions. The analytic contribution, therefore, lies in *conceptual transferability*: the findings can inform how similar settings might be studied, and which mechanisms (e.g., narrative fragmentation, uneven contextualisation, shifting interpretive frames) may be relevant to transcultural dialogue in museums, but they do not license statistical inference. This aligns with qualitative reasoning that treats "generalisability" as analytically bounded and argument-driven rather than sample-driven (Maxwell, 2008). A further scope limitation concerns the empirical emphasis on visitor talk and visitor navigation. The study does not include systematic perspectives from museum staff, curators, or institutional documents. This narrows what can be concluded about curatorial intentions, organisational constraints, or interpretive decisions behind the exhibition narrative. In other words, the analysis primarily captures the *reception* side of cultural knowledge production rather than the full institutional chain that produces it.

7.2 Researcher Positionality

The research team's positioning is analytically relevant because transcultural knowledge exchange in this project was not simply observed, but interpreted through specific educational backgrounds, cultural repertoires, and disciplinary orientations. The team consisted of three female students: an architecture student from Vietnam, a social work student from South Africa, and a culture and communications student from Germany. This constellation enabled multiple analytic sensitivities, while also introducing asymmetries in what appeared salient, intelligible, or in need of explanation. Interdisciplinary collaboration shaped the analytic process itself. Differences in disciplinary attention influenced which aspects of the museum experience were foregrounded, how observations were discussed, and what counted as a meaningful interpretive cue. While this plurality functioned as a corrective against single-perspective readings, it also required ongoing negotiation of shared priorities and vocabulary. These negotiations form part of the project's reflexive conditions rather than an external methodological variable. Positionality in the field was situational and interactional. In the museum setting, the team's international and interdisciplinary composition likely influenced both participants' communicative behaviour and the researchers' interpretive focus, particularly when discussions touched on war history, gender roles, or national narratives. Even when researchers remained unobtrusive, the presence of observers may have shaped interactional dynamics toward explanation, justification, or restraint. Methodological guidance on qualitative fieldwork in Vietnam remains relevant insofar as it highlights the importance of linguistic and contextual mediation for accessing meaning in institutional settings (Huynh & Bartel-Radic, 2021). In this study, limited access to local linguistic nuance and historically embedded references primarily affected how exhibits were read and contextualised, rather than how participants interacted with one another. At the same time, differences in linguistic fluency within the group influenced who elaborated interpretations, who asked follow-up questions, and how uncertainties were articulated. This uneven distribution of linguistic and contextual resources may therefore have shaped what appeared as

confusion, fragmentation, or lack of context, not only as a function of exhibition design, but also as an effect of mediated access to meaning.

7.3 Temporal and Situational Constraints

The study captures a specific moment: one visit, under environmental conditions, with a particular group composition and a particular level of museum crowding and physical comfort. This raises three situational constraints.

First, the museum visit is "minimally structured" rather than fully spontaneous. Participants were invited to visit as a group, and they were aware that observation was taking place. While no tasks or learning objectives were assigned, this invitation still creates an interactional frame that differs from everyday, purely self-motivated museum-going. The situation is thus better understood as a *naturally unfolding social encounter under research attendance*, rather than as either an experiment or a fully unprompted leisure visit. This matters because reflexive awareness of being observed can increase explanatory talk, reduce disagreement, or shape how participants display cultural competence.

Second, temporal compression limits what can be accessed. Museum meaning-making often unfolds across repeated looking, return visits to exhibits, or post-visit reflection over longer periods. A single visit privileges immediate impressions and conversational negotiation in real time, while under-representing slower interpretive processes such as delayed association, later reading, or retrospective re-framing.

Third, bodily and spatial conditions affect interpretive capacity. Research on qualitative fieldwork stresses that the "field" is not only symbolic but also material, and fatigue, comfort, and pacing shape what is noticed and how long attention can be sustained. The fieldwork literature on interviewing in Vietnam similarly notes how timing and tiredness can limit depth and focus, emphasising the need to recognise when participants drift away from the topic due to exhaustion (Huynh & Bartel-Radic, 2021). Transposed to the museum, high heat, limited air circulation, and restricted opportunities to pause can plausibly shorten engagement with text-heavy exhibits and bias attention toward visually salient objects rather than dense interpretive panels. In

consequence, some observed "fragmentation" may be co-produced by physical endurance limits, not solely by narrative design.

7.4 Implications for Future Research Designs

The limitations identified in this study point toward several directions for future research on transcultural knowledge exchange in museum contexts. These implications are not intended as corrective measures, but as extensions that could broaden analytical scope and deepen empirical insight in subsequent studies.

First, future research may benefit from combining visitor-focused analysis with additional institutional perspectives. Incorporating curatorial, educational, or archival materials could enable a more comprehensive understanding of how exhibition narratives are produced and how interpretive intentions align – or diverge – from visitor meaning-making processes.

Second, extending the temporal horizon of data collection may allow researchers to capture interpretive processes that unfold beyond the immediate visit. Designs that include delayed follow-up conversations or reflective components could provide insight into how initial impressions are reworked, stabilised, or challenged over time, particularly in transcultural settings where connections often emerge retrospectively.

Third, future studies in linguistically and culturally diverse environments could more explicitly address the role of linguistic mediation in museum encounters. Approaches such as bilingual materials, contextual scaffolding, or comparative readings of exhibition texts may help disentangle whether perceived interpretive gaps stem from narrative design, translation practices, or uneven historical familiarity (Huynh & Bartel-Radic, 2021).

Overall, the study's limitations define its analytical contribution: it offers a situated account of how transcultural meaning is negotiated in a museum visit shaped by specific narrative structures, embodied conditions, and participant compositions. Precisely because the findings are bounded, they can be used to sharpen future research designs that test how robust these interactional mechanisms are across different museums, visitor groups, and interpretive infrastructures.

8. Conclusion

This chapter examined how transcultural dialogue and shared meaning emerge within a women-focused museum by approaching the institution as an effective relational space rather than a neutral site of representation. Drawing on transcultural theory, feminist museum pedagogy, and relational models of museum learning, the study demonstrated that meaning-making unfolded through the interplay of narrative scope, emotional engagement, social interaction, and spatial-environmental conditions.

The findings show that the museum's transcultural potential was unevenly realised. Although the exhibition offered a coherent and emotionally powerful national narrative centred on women's wartime contributions, its narrow thematic scope limited opportunities for broader identification among culturally diverse visitors. Crucially, this limitation was not inherent to the national specificity of the content, but to the absence of interpretive and spatial bridges linking historical narratives across floors, themes, and temporal frames. As a result, visitors were often required to construct coherence themselves as they moved through the space.

At the same time, emotional resonance emerged as a key entry point for transcultural engagement. Personal artefacts, symbolic objects, and representations of women's lived experiences generated affective responses that enabled visitors to connect across cultural differences. These emotional moments frequently became anchors for informal dialogue, indicating that shared meaning was often produced relationally and situationally rather than through curatorial narration alone.

Importantly, the chapter highlights that such relational processes were deeply shaped by the spatial and sensory conditions of the museum. Environmental factors such as heat, ventilation, seating, and spatial orientation directly influenced visitors' capacity to remain present, attentive, and open to dialogue. Spatial transitions – particularly between the clothing exhibitions and the wartime narratives – lacked narrative guidance, reinforcing experiences of fragmentation and limiting sustained engagement. These findings underscore that transcultural dialogue is not only discursive or emotional, but fundamentally embodied and spatially situated.

Taken together, the analysis positions the museum as an affective-relational space whose transcultural potential depends on how thematic narratives, social interaction, emotional resonance, and spatial design intersect. The chapter thus contributes to debates on feminist and transcultural museum practice by demonstrating that inclusive meaning-making requires more than representational visibility. It demands spatially coherent, emotionally accessible, and environmentally supportive conditions that allow visitors from diverse backgrounds to linger, interact, and co-construct shared understanding.

Use of Artificial Intelligence Tools

AI tools were used solely for editorial and linguistic support, including academic language refinement, improving structural clarity, and facilitating translation among authors with different native languages. AI was not used for data collection, data analysis, interpretation of findings, or the generation of original academic content. All theoretical development, empirical research, analytical decisions, and conclusions were independently developed by the authors, who accept full responsibility for the chapter.

The authors affirm that the research was conducted in accordance with ethical and professional academic standards. Responsibility for the integrity, originality, and accuracy of the chapter rests fully with the authors.

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How are Mandatory School-Based Internships Organized in German Comprehensive Secondary Schools and How Applicable are These Practices to Vietnam and South Africa?

Quy Pham Trong, Sara Hakob and Viola Rochelle Sass

1. Introduction

For several decades, the younger generation has been told that the higher one climbs the academic ladder, the better the employment opportunities will be later in life. In practice, however, this assumption does not always hold true. The transition from school to the world of work constitutes a central structural challenge worldwide and is associated with increased risks of unemployment, underemployment and social exclusion (OECD, 2017). Currently, around 75 million young people are unemployed after completing their education, many of whom have never worked at all. These prolonged transition phases and the lack of initial work experience can, in the long run, lead to what is referred to as the "scarring effect". This phenomenon contributes to persistently high youth unemployment as well as long-term productivity losses for societies as a whole (The Youth Employment Crisis, 2012).

Such problematic outcomes are frequently attributed to education systems, which are often criticized for failing to provide the compe-

tencies and practical experience required for a successful entry into the labor market. Qualifications acquired during academic education do not always correspond to labour market demands (The Youth Employment Crisis, 2012). As a result, increasing external pressure is placed on education systems to actively shape the transition into employment and to promote labor-market-relevant skills. The overarching expectation is to make this transition "smoother." (O'Higgins, 1997).

To address these challenges, education systems require concrete mechanisms to actively support the transition from school to work. Research increasingly highlights practical work experience as a key instrument in facilitating smoother labor market entry (OECD, 2017). According to the International Labour Organization (ILO), early exposure to real work environments strengthens labour market proximity and contributes to more successful transition outcomes, while simultaneously reducing the risk of the long-term negative effects associated with prolonged school-to-work transitions (International Labour Organization (ILO) & Organisation for Economic Co-operation and Development (OECD), 2025).

Internships, in particular, provide structured settings in which theoretical knowledge can be applied in practice, thereby linking formal education with workplace requirements. Through such experiences, students acquire job-relevant competencies and gain insights into professional environments prior to joining the labour market. This function is especially relevant in light of persistent skills mismatches between formal education and labour market demands, as identified in the literature (Baron-Puda, 2017). Importantly, the effectiveness of internships depends on their institutional embedding and systematic organization. Rather than isolated or voluntary measures, structured and school-based internship programs are more likely to contribute to sustainable transition outcomes (OECD, 2017).

Germany provides a particularly relevant case for examining the role of school-based internships in facilitating school-to-work transitions. Since the 1970s, student internships (Schülerbetriebspraktika) have become an established component of career orientation within German secondary education and are now implemented in most federal states as part of the school curriculum (Bergzog, 2008). These internships are typically mandatory and are embedded within broader career

guidance programmes that include preparation, workplace experience and post-internship reflection. Their primary purpose is to familiarize students with real work environments, support informed career decision-making and strengthen the connection between school learning and labour market requirements (Wengert-Richter, 2007). Research suggests that such structured workplace experiences can contribute to the development of occupational aspirations, enhance career maturity and improve students' understanding of vocational pathways. Furthermore, Germany's comparatively successful transition system, supported by strong cooperation between schools, employers and vocational institutions, has frequently been highlighted as an example of effective school-to-work integration. For these reasons, German school-based internships serve as a useful benchmark for exploring how similar approaches might be adapted to different educational and labour market contexts (Ostendorf et al., 2018).

Against this background, this study examines how mandatory school-based internships are organised within German comprehensive secondary schools and explores the extent to which such practices may apply to other national contexts. By adopting a comparative perspective, the analysis considers Vietnam and South Africa as contrasting cases with differing educational structures and labour market conditions. The study focuses on the institutional design and perceived functions of mandatory internships in secondary education rather than on individual employment outcomes. Through this approach, the paper aims to contribute to the discussion on context-sensitive strategies for improving school-to-work transitions and career orientation within diverse education systems.

2. Research Problem

Despite the fact that the challenges surrounding the transition from school to work have long been recognized in academic research, they remain largely unresolved in practice. While various policy approaches and proposals for reform exist, young people continue to face considerable difficulties when entering the labor market after completing their education (O'Higgins, 1997). This indicates that existing measures have not been sufficient to ensure a smooth and equitable transition

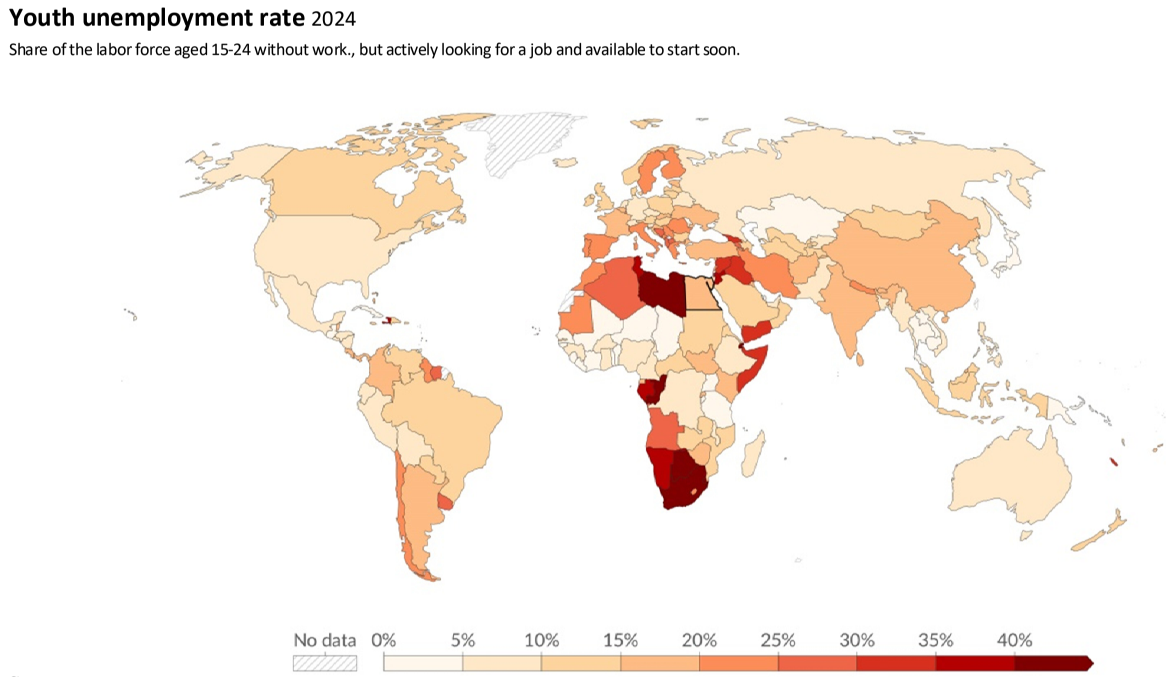
from academic life to employment: “The slow and insecure transition from school to work generates further difficulties for integration in the labour market as a result of lack of experience.” (The Youth Employment Crisis, 2012)

Importantly, the school-to-work transition does not occur in a uniform or symmetrical manner. Rather, it is characterized by significant uncertainty and uneven outcomes across different contexts. These differences are not only evident between continents, but also between countries and across various career pathways (ILO & OECD, 2025). Although certain career trajectories are often perceived as offering better employment prospects, they do not guarantee a successful transition into work. As a result, the transition process remains highly differentiated and structurally unequal on a global scale (Europäische Kommission, 2017).

This unequal distribution becomes particularly visible when examining global patterns of youth unemployment. The figure 1 illustrates youth unemployment rates worldwide in 2024 and highlights pronounced regional disparities. From the perspective of school-to-work transitions, this uneven distribution suggests that young people do not enter the labor market under comparable conditions. Despite increased public attention and repeated reform efforts, the persistence of high youth unemployment in many regions indicates that the underlying structural challenges have not been adequately addressed(Our World in Data, 2026).

One key factor contributing to these persistent difficulties is the limited availability of early career orientation and practical work experience within secondary education (Bergzog, 2008) & (Watts et al., 2013). Career guidance is often introduced at a relatively late stage and is not consistently integrated into school curricula (Bergzog, 2008). Instead, opportunities for early labor market exposure frequently depend on external initiatives or voluntary participation (Watts et al., 2013). As a result, such measures lack institutional anchoring and tend to be unevenly distributed (Šćepanović & Martín Artiles, 2020). Although existing research suggests that early work exposure can support smoother transitions, this instrument is not systematically implemented within public school systems across different national contexts (Baron-Puda, 2017).

Figure 1: Importance of Mandatory School-Based Internships



Source:
Retrieved from Our World in Data (2026) https://ourworldindata.org/grapher/unemployment-rate-for-young-people?mapSelect=~EGY

3. Research Question

Against this background, this study is guided by the following research question:

How are mandatory school-based internships organized in German comprehensive secondary schools, and how applicable are these practices to Vietnam and South Africa?

The research examines how mandatory school-based internships are organized within German comprehensive secondary schools, which operate in a context of relatively low youth unemployment. Using a comparative perspective, the study then considers how these practices relate to the institutional structures of secondary education systems in Vietnam and South Africa. Rather than focusing on employment outcomes, the analysis explores differences in school-based career orientation and practical work experience, as well as their potential relevance across different national contexts.

4. Literature Review

4.1 Education Systems in Germany, Vietnam, and South Africa

4.1.1 Structure of Secondary Education in Germany

The German secondary education system is characterised by a differentiated structure and does not follow a uniform pathway for all students (Bertram, 2016). After completing primary education, students can attend different types of secondary school, most commonly Hauptschule, Realschule, Gymnasium, and Gesamtschule (Bertram, 2016). This differentiation reflects varying educational trajectories within the system and contributes to unequal transition pathways from school to work even within the same national context EU (European Commission, 2017).

School-based internships are primarily embedded within lower secondary education (Sekundarstufe I) and vary in timing and duration depending on the school type and federal state (Senate Administration for Education, Youth and Research, 2012). This study focuses on

comprehensive secondary schools (Gesamtschulen), as they combine multiple educational tracks within a single institution and therefore play a central role in career orientation (Bertram, 2016). Gesamtschulen allow students to pursue different school-leaving qualifications without early academic selection and are particularly relevant for analyzing school-based transition mechanisms (Bertram, 2016).

Within this context, student internships are commonly implemented as a mandatory component of career orientation, typically during lower secondary education (Senate Administration for Education, Youth and Research, 2012). While the organizational details of these internships differ across schools, comprehensive schools are institutionally responsible for integrating practical work experience into the educational process. Given Germany's federal education system, responsibility for educational policy lies with the federal states, resulting in variation in how internships are organized and implemented at the school level (Bertram, 2016).

4.1.2 Role of Career Orientation within School Systems

Within the German education system, career orientation is generally considered an integral part of secondary education rather than treated as an additional or optional component (Bergzog, 2008) & (Hoffmann & Urban, 2016). Its primary aim is to prepare students for the transition from school to working life (International Labour Organization, 2019; ILO & OECD, 2025). Although the organization of career orientation varies across federal states, schools are generally assigned responsibility for supporting students during this transition phase (Šćepanović & Martín Artiles, 2020). Practical work experience, particularly in the form of mandatory school-based internships, constitutes a central element of career orientation within lower secondary education (Watts et al., 2013).

Schools play a key institutional role in coordinating career orientation measures (Senate Administration for Education, Youth and Research, 2012). This includes responsibility for the preparation, organization, and follow-up of internships, as well as pedagogical guidance throughout the process (Ostendorf et al., 2018b). In addition, schools

act as intermediaries between students, parents, and external agencies such as companies or training providers. Through this coordinating function, career orientation is institutionally anchored within the school system and contributes to structured pathways from education to work (International Labour Organization, 2019; ILO & OECD, 2025).

4.1.3 Institutional Differences Relevant to School-to-Work Transitions

In Germany, the transition from school to work is not left to individual students alone but is organized within an institutional framework (International Labour Organization, 2019; ILO & OECD, 2025). Schools are supported by other actors, including state institutions and external partners such as companies and employment agencies. Together, these actors contribute to career orientation and create opportunities for practical work experience, for example, by helping students find internship placements or by offering places within firms (Driesel-Lange & Klein, 2025).

At the same time, education in Germany is governed at the federal state level (Bertram, 2016). This means that rules and responsibilities related to school-to-work transitions differ across regions (Šćepanović & Martín Artiles, 2020). As a result, mandatory school-based internships are not organized in the same way everywhere (Bertram, 2016; Watts et al., 2013). Their timing, structure, and implementation vary depending on regional regulations and school contexts, even within the same national education system (Driesel-Lange & Klein, 2025).

Taken together, the structure of the German secondary education system, the institutional role of career orientation, and the governance of school-to-work transitions provide the framework within which mandatory school-based internships are implemented (ILO and OECD, 2025; Schneider, 2008). Building on this context, the following section focuses on mandatory school-based internships as a specific policy instrument within German secondary education (Senate Administration for Education, Youth and Research, 2012).

4.1.4 Education System in South Africa

The education system of a country plays a critical role in shaping its economic development, as it directly influences the quality and preparedness of the workforce. Where gaps exist within the education system, particularly in relation to practical and experiential learning, workforce readiness is often compromised. Practical work experience therefore serves as a key mechanism for enhancing learners' career readiness, employability, and adaptability to labour market demands. However, countries adopt different approaches and models to integrate work experience into their education systems.

This section examines the South African education system with a specific focus on school-based work experience and the role of internships. Unlike countries such as Germany, where mandatory school-based internships are embedded within the secondary school curriculum, South Africa does not formally require learners to participate in structured work-based learning during secondary schooling. This section therefore explores the current context of the South African education system, identifies gaps in experiential learning at secondary school level, and argues for the introduction of mandatory school-based internships as a strategy to improve career readiness and long-term employability.

4.1.4.1 Structure of the South African Education System

Former South African President Nelson Mandela famously stated that "education is the most powerful weapon which you can use to change the world" (Ramrathan, 2015). In South Africa, the education system operates primarily under the Curriculum and Assessment Policy Statement (CAPS), alongside Technical and Vocational Education and Training (TVET) initiatives. The CAPS curriculum governs basic education from Grade R to Grade 12 and was introduced in 2012 by the Department of Basic Education (DBE) to replace the Outcomes-Based Education (OBE) system (Ojo & Mathabathe, 2021).

The transition from OBE to CAPS was motivated by the need to provide clearer guidance on curriculum content, teaching methodolo-

gies, and assessment practices. CAPS places stronger emphasis on structured content delivery, pedagogical consistency, and clearly defined learning outcomes (Gina, 2017, cited in Ojo & Mathabathe, 2021). According to Wilmot and Irwin (2015, cited in Ojo & Mathabathe, 2021), CAPS assists teachers by outlining what should be taught and assessed at each grade level, thereby promoting curriculum uniformity across schools.

Despite these intentions, Ojo and Mathabathe (2021) argue that the adoption of CAPS did not adequately consider its broader implications for learners, teachers, and under-resourced schools. While CAPS has contributed to improved pass rates, the minimum pass requirement of 30% for key subjects remains a concern, as it does not adequately prepare learners for entry into higher education institutions. This misalignment highlights a broader structural issue within the schooling system, where academic progression is prioritized over meaningful skills development and preparedness for post-school pathways.

In addition to basic education, South Africa's post-school education system includes Technical and Vocational Education and Training (TVET) colleges. UNESCO (2013) defines TVET as education that combines the study of technologies and related sciences with the development of practical skills and knowledge relevant to economic and social employment opportunities. Gaffoor and Van der Bijl (2018) emphasize that TVET colleges aim to broaden access to post-school education while equipping students with labor market–relevant skills, knowledge, and attitudes.

Maringe and Osman (2016) argue that TVET institutions play a crucial role in producing graduates who are ready for the world of work. However, James (2014, cited in Sebola, 2022) highlights that many TVET students are school dropouts or individuals who struggled within the traditional schooling system. This has raised concerns regarding the capacity of the TVET sector to drive economic development if it primarily serves academically marginalized learners. In contrast, McGrath et al. (2020) contend that TVET education should not be viewed as a deficit pathway, but rather as a strategic mechanism to address South Africa's local economic and skills development needs.

4.1.4.2 Career Guidance in Schools

Career guidance and counselling at secondary school level are essential, as learners begin to make critical decisions regarding their future education and career trajectories. In South Africa, subject selection occurs at the end of Grade 9, when learners choose subjects for Grade 10 that are expected to align with their intended career paths. The Department of Basic Education (DBE) recognizes approximately 28 subjects at secondary school level, from which learners must select seven subjects annually. These include three compulsory subjects – two languages, Mathematics or Mathematical Literacy, and Life Orientation – along with four elective subjects chosen primarily based on career aspirations (DBE, 2020).

Albien (2018) argues that effective career guidance enables learners to identify their interests, abilities, and long-term goals, thereby supporting informed decision-making. Given the rapidly changing nature of the labor market, career guidance has become increasingly important in assisting learners to navigate emerging career opportunities. Naidoo et al. (2019) warn that inadequate career guidance prior to subject selection often results in learners choosing inappropriate subjects, which may limit their access to post-school education and employment opportunities.

Supporting this view, Dlamini (2019) and Streicher (2020) contend that incorrect subject choices at secondary school level contribute to limited study options after matriculation and exacerbate youth unemployment. Furthermore, Albein and Naidoo (2017) and Pillay (2020) highlight that many parents lack sufficient understanding of the curriculum, which constrains their ability to guide learners effectively. As a result, learners from disadvantaged backgrounds are particularly vulnerable to making uninformed subject choices. Mseleku (2022) and Statistics South Africa (Stats SA, 2023) report that graduate unemployment remains alarmingly high, with inadequate career guidance identified as a key contributing factor.

4.1.4.3 Current School-Based Work Experience

At present, school-based work experience in South Africa is limited and largely confined to vocational and technical secondary schools. Practical learning opportunities are primarily offered through subjects such as Civil Technology, Electrical Technology, Mechanical Technology, Consumer Studies, Hospitality Studies, Tourism, Agricultural Sciences or Agricultural Technology, and Dramatic and Visual Arts. While these subjects incorporate elements of practical learning, they do not constitute structured or mandatory work-based experience within real workplace environments.

Within the TVET sector, five vocational programs are offered: National Accredited Technical Education Diploma (NATED), National Certificate (Vocational) [NC(V)], National Senior Certificate (NSC), Occupational Programs, and Higher Certificates (Department of Higher Education and Training [DHET], 2021). Mabunda and Mayombe (2025) note that the NC(V) qualification is comparable to secondary schooling, as it aligns with the National Qualifications Framework (NQF). Rintala and Nokelainen (2020) argue that effective vocational education requires the integration of both school-based and work-based learning. This balance between theoretical instruction and practical exposure is essential for meaningful skills development and labor market relevance (Mabunda & Mayombe, 2025).

4.1.5 General Education in Vietnam Today

4.1.5.1 Current Institutional Statistics of the General Education System in Vietnam

Based on data from the General Statistics Office of Vietnam (General Statistics Office of Vietnam, 2025), the total number of schools of general education is 23,086, with 12,147 in primary (52.62%), 8,566 in lower secondary (37.10%), and 2,373 in upper secondary (10.28%). Notably, these statistics exclude multi-level (combined) schools, which are accounted for separately.

4.1.5.2 The Historical Evolution of Secondary Education in Vietnam: A Three-Period Analysis

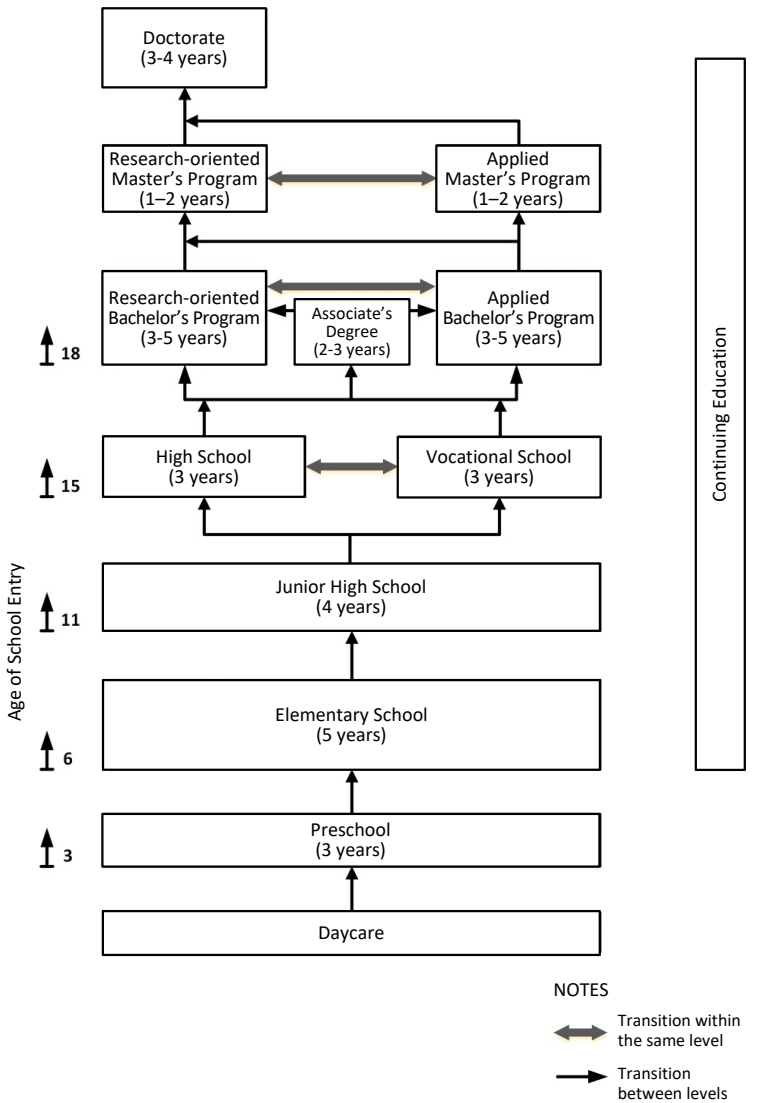
From a historical perspective, as documented by Nguyen et al. (2020), secondary education during the French colonial period (1884-1945) was divided into two distinct levels. The first was the 'Primary College', a four-year program equivalent to contemporary junior high school. This was followed by the 'French Vietnamese Lycée system', a three-year course of study corresponding to modern-day high school. This system, however, was exclusively accessible to the elite and designed primarily to staff the colonial administrative apparatus across all of Indochina (including Vietnam, Laos, Cambodia) (Nguyen et al., 2020). Structurally, the post-August 1945 period marked the transition from a fragmented, colonial-based model to a unified national education system. As highlighted by Nguyen et al. (2020), the new government restructured the curriculum to eliminate the divide between French and French-Vietnamese institutions. By 1976, the system had undergone a significant structural transformation, extending the compulsory duration from 9 to 12 years. This contemporary framework consists of Primary education (Grades 1-5, ages 6-10), Lower secondary education (Grades 6-9, ages 11-14), and Upper secondary education (Grades 10-12, ages 15-17) (Nguyen et al., 2020). To date, this 12-year structural framework remains in place.

4.1.5.3 Current Framework and Curriculum of Secondary Education in Vietnam

A visual representation of the Secondary Education framework is depicted in Figure 2.

As delineated in the provided framework, Lower Secondary Education is a four-year cycle commencing at the age of 11, bridging the gap between Primary Education (5 years) and the subsequent bifurcated pathways of the upper-level system. Upon completion, students transition into either Upper Secondary Education or Intermediate Vocational Training, both of which typically span a three-year duration. Parallel to the formal school system, Continuing Secondary Education serves a

Figure 2: The Structural Distribution of General Education Schools in Vietnam (2025)



Source: Wiki Cơ cấu hệ thống giáo dục quốc dân Việt Nam (2025).

specialized strategic function. While implementing the standard national curriculum to grant equivalent degrees, this sub-system is specifically designed to facilitate educational access for social policy beneficiaries, individuals with disabilities, and the labor force seeking professional upskilling. Beyond its degree-granting role, Continuing Education is instrumental in addressing local pedagogical demands, fostering literacy initiatives, and enhancing socio-vocational competencies.

4.1.5.4 Formal Secondary Education vs. Continuing Secondary Education

There are significant differences between Formal Lower Secondary Education and the Continuing Education system:

Table 1: Comparative Analysis of Formal and Continuing Secondary Education

Feature	Formal Lower Secondary Education	Continuing Secondary Education
Organizational Structure	Rigid framework with fixed courses and mandatory full-time daily attendance.	Flexible models including work-study, distance learning, and self-study.
Target Demographic	Standard age group (typically 11-15 years old).	Adults, laborers, and individuals with disabilities.
Operational Flexibility	Standardized schedules and centralized locations.	Adaptive scheduling with adjustable times and varied locations.
Curriculum Scope	Comprehensive: 13-14 compulsory subjects (e.g., Mathematics, Sciences, Languages).	Streamlined: 5 mandatory subjects supplemented by elective courses.
Primary Objective	Holistic development and academic preparation for transition examinations.	Practical application, degree attainment, and vocational skill enhancement.

Source: Wiki

4.1.5.5 Curriculum of Secondary Education Schools

A pivotal milestone is the 2018 General Education Program (promulgated under Circular 32/2018 and effective as of February 15, 2019), which serves as Vietnam's new national curriculum framework. Under the 2018 General Education Program, the curriculum is structured around a competency-based model, integrating mandatory core disciplines

Figure 3: Table Summary for Secondary Education Program

Curriculum Content	**Class Periods / School Year**			
	Grade 6	**Grade 7**	**Grade 8**	**Grade 9**
Compulsory Subjects				
Literature	140	140	140	140
Mathematics	140	140	140	140
Foreign Language 1	105	105	105	105
Civic Education	35	35	35	35
History and Geography	105	105	105	105
Natural Sciences	140	140	140	140
Technology	35	35	52	52
Informatics	35	35	35	35
Physical Education	70	70	70	70
Arts (Music, Visual Arts)	70	70	70	70
Compulsory Educational Activities				
Experiential & Career Guidance Activities	105	105	105	105
Local Educational Content	35	35	35	35
Elective Courses				
Ethnic Minority Language	105	105	105	105
Foreign Language 2	105	105	105	105
Total periods / school year (excluding elective subjects)	**1015**	**1015**	**1032**	**1032**
Average periods / week (excluding elective subjects)	**29**	**29**	**29.5**	**29.5**

Source: 2018 General Education Program Vietnam.

– such as Literature, Mathematics, Civic Education, and integrated Natural and Social Sciences – with a diverse range of elective modules including Foreign Languages, Informatics, and Technology. This program represents a fundamental pedagogical shift from a knowledge-transmission model to a competency-based approach, specifically designed to cultivate student qualities and capacities. It explicitly defines five core qualities and ten essential capacities as the primary objectives for student development.

4.1.5.6 Role of Career Orientation within School Systems

Education from the lower secondary level downward is a unified system without classification; all students follow the same framework. Only upon completion of this level are students categorized – based on examination results and personal orientation – to pursue either Upper Secondary Education or Intermediate Vocational Education. Consequently, within the school system structure, Lower Secondary Education plays a pivotal role in career orientation, as it serves as the definitive point where students are streamed into different educational pathways for their future.

4.2 Mandatory School-Based Internships (MSBI) in Germany, Vietnam, and South Africa

4.2.1 MSBI as an Established Practice in Germany

Internships have become a widespread and increasingly important component of education and are considered a key mechanism for facilitating the transition from education to the labor market (Margaryan et al., 2019). They are considered a major and influential element of career orientation (Hübner et al., 2025). This is particularly relevant because career orientation itself is established as a nationwide component of secondary education (Driesel-Lange & Klein, 2025). As noted in the literature, student internships are widely regarded as a central instrument within school-based career orientation. For many students, the

pathway into working life after graduation is initially unclear (European Commission, 2017; ILO and OECD, 2025). One of the core responsibilities of schools is therefore to prepare students for life after school (Neuenschwander et al., 2018). Within this context, internships are often regarded as the central or culminating element of career orientation measures, as they allow students to gain first-hand experience of the world of work (Baron-Puda, 2017; Watts et al., 2013).

In order to function effectively, internships must be institutionally embedded and organized as part of a continuous process (Ostendorf et al., 2018; Wengert-Richter, 2007). Schools are not solely responsible for this task but cooperate closely with external factors such as employment agencies and companies (Driesel-Lange & Klein, 2025). Employment agencies may support students in finding suitable placements, while companies provide internship opportunities and supervise students during their practical experience (Hübner et al., 2025; Senate Administration for Education, Youth and Research, 2012). Through this cooperation, students receive institutional support during both the search process and the internship itself, which facilitates their first contact with working life (Watts et al., 2013).

Although student internships are widely implemented across Germany, their organization is not uniform. Due to the federal structure of the education system, responsibility for education policy lies with the federal states, resulting in differences in how internships are organized and implemented. As the literature highlights, “although widely implemented, the organization of internships varies across schools and regions.” (…) In particular, the quality of preparation, supervision, and follow-up differs across schools and regions. This demonstrates that while school-based internships are firmly established within the German education system, they are not standardized nationwide (Hübner et al., 2025).

4.2.2 Policy Approaches to Practical Work Experience

In Germany, policy approaches to practical work experience in secondary education are shaped by the federal organization of the education system (Bertram, 2016; Erk, 2003; Hübner et al., 2025). Respon-

sibility for education policy lies primarily with the federal states (Bundesländer), which means that there is no single nationwide framework regulating mandatory school-based internships. Instead, education policy is governed at federal state level, reflecting the federal structure of the German education system (Erk, 2003).

Within this framework, the federal states play a central role in defining curricular guidelines and formal requirements related to career orientation (Driesel-Lange & Klein, 2025; Hübner et al., 2025). These include the obligation for schools to provide opportunities for practical work experience as part of secondary education. While the specific design of internships is not prescribed in detail, federal state-level regulations establish the general framework within which schools are required to integrate practical elements into their educational programs (Erk, 2003).

At the policy level, practical work experience is widely recognized as an important instrument for supporting school-to-work transitions (Margaryan et al., 2019; Neuenschwander et al., 2018). Political objectives associated with internships focus on familiarizing students with the world of work, supporting informed career choices, and reducing uncertainty during the transition from school to employment. As such, internships are framed as a key component of career orientation rather than as an optional or supplementary activity (Driesel-Lange & Klein, 2025; Erk, 2003).

At the same time, policy approaches reflect a balance between political steering and institutional autonomy. While the federal states set overarching objectives and formal requirements, schools retain considerable flexibility in how they organize internships in practice. Decisions regarding timing, duration, and pedagogical integration are largely made at the school level, allowing institutions to adapt internships to their specific contexts and student populations. This balance between state-level regulation and school-level autonomy results in variation in the organization of mandatory school-based internships across Germany (Driesel-Lange & Klein, 2025; Erk, 2003; Hübner et al., 2025).

4.3 Mandatory School-Based Internships in South Africa

4.3.1 Absence of Mandatory Internships

Despite the recognized importance of experiential learning, South African secondary schools do not typically offer mandatory school-based internships. Instead, structured work-based learning is largely confined to the TVET sector, where programs focus on fields such as engineering, manufacturing, retail, technology, and hospitality (Ngozwana, 2018). The TVET curriculum is intentionally designed to prepare students for employment by equipping them with practical and industry-relevant skills (Gaffoor & Van der Bijl, 2018; Taylor & Van der Bijl, 2018; Zulu & Mutereko, 2020).

TVET colleges were established by the South African government to address skills shortages and promote economic development. Their objectives include equipping students with practical skills, enhancing workforce quality, aligning skills development with labor market needs, and promoting entrepreneurship and job creation (Atari & McKague, 2015; DHET, 2021; Olabiyi & Chinedu, 2018; Oproiu & Litoi, 2019; Plooy & Du Preez, 2022). However, the concentration of work-based learning within the post-school sector highlights a critical gap at the secondary school level, where learners are expected to make career-defining decisions without meaningful exposure to the world of work.

4.4 Importance of Mandatory School-Based Internships

4.4.1 MSBI and Career Orientation

Young people often lack a concrete understanding of the world of work, as their experiences prior to leaving school are largely theoretical (Neuenschwander et al., 2018). Mandatory school-based internships provide students with the opportunity to explore different occupations and to gain first practical experiences, not only within specific professions but also within the broader working environment (Hübner et al., 2025; Neuenschwander et al., 2018). Through internships, students become familiar with different workplace cultures and working

conditions, ranging from manual and technical settings to office-based environments (Hübner et al., 2025).

In addition, internships allow students to reflect on their own expectations and interests (Neuenschwander et al., 2018). They support decision-making processes related to educational pathways, such as whether to leave school after grade nine, ten, or to continue towards an academic qualification (Hübner et al., 2025; Neuenschwander et al., 2018). By experiencing work environments directly, students are better able to assess whether an early entry into working life or further academic education aligns with their individual preferences (Neuenschwander et al., 2018). This experiential dimension helps to prevent misinformed career choices that might otherwise be based solely on information gathering or abstract expectations (Ntholeng, 2024).

Compared to short-term information events or career counselling sessions shortly before graduation, internships provide a more sustained and realistic form of career orientation. The literature emphasizes that career orientation is not an automatic process but requires structured and continuous support (Driesel-Lange & Klein, 2025). In this context, mandatory school-based internships serve as a systematic instrument that embeds career orientation within the school curriculum rather than leaving it to chance or individual initiative (Driesel-Lange & Klein, 2025).

4.4.2 MSBI and Skills and Competency Development

A central function of mandatory school-based internships is the development of social and work-related competencies. During internships, students are exposed for the first time to expectations and behavioral norms of the working world. This includes learning how to interact with colleagues, adhere to workplace rules, and manage responsibilities within a professional environment. For many students, internships represent their first experience with fixed working hours, task-oriented work processes, and employer expectations (Hübner et al., 2025; Neuenschwander et al., 2018).

Internships also promote organizational and self-management skills. Students are required to organize application materials, maintain in-

ternship portfolios, and plan their daily work routines. Through these activities, they gain initial insights into how working life is structured and how tasks are coordinated beyond the school context. At the same time, internships contribute to the development of basic occupational routines, which differ significantly from classroom-based learning (Hübner et al., 2025; Neuenschwander et al., 2018).

From a pedagogical perspective, learning within internships is largely situational and experience-based (Kolb & Kolb, 2009). The literature highlights that such competences do not emerge automatically within formal schooling but require practical contexts (Kolb & Kolb, 2009). Importantly, the quality of competence development depends on structured guidance and reflection (Ostendorf et al., 2018). Preparation, supervision, and follow-up by schools play a crucial role in transforming practical experiences into meaningful learning outcomes (Driesel-Lange & Klein, 2025; Ostendorf et al., 2018).

4.4.3 MSBI within School-to-Work Transition Frameworks

Within school-to-work transition frameworks, mandatory school-based internships are regarded as a key mechanism for supporting young people during an often uncertain and unequal transition phase (ILO & OECD, 2025; Ntholeng, 2024). Transitions from school to employment are shaped by varying institutional conditions and individual resources, which can result in unequal starting positions for students (ILO & OECD, 2025; Neuenschwander et al., 2018). Internships contribute to reducing transition-related uncertainty by providing early exposure to working life and creating initial proximity to the labor market (Hübner et al., 2025; Margaryan et al., 2019).

While internships do not replace formal employment or vocational training, they have an important preparatory function (Margaryan et al., 2019). By offering structured encounters with the world of work, internships help students to develop realistic expectations and to navigate the transition from education to employment more confidently. In this sense, mandatory school-based internships are embedded within broader transition frameworks that aim to support young people in managing the risks associated with school-to-work transitions, particu-

larly in relation to orientation and decision-making (ILO & OECD, 2025; Ntholeng, 2024).

4.4.4 Importance of Mandatory School-Based Internships

The introduction of mandatory school-based internships at secondary school level has the potential to address several structural challenges within the South African education system. Mabunda and Mayombe (2025) report that students who participate in internship programs are more likely to engage in entrepreneurial activities, including the establishment of micro-enterprises. This suggests that internships not only enhance employability but also contribute to economic self-reliance.

Mseleku (2021) further demonstrates that key employability skills – such as teamwork, problem-solving, communication, and decision-making – are more effectively developed through workplace exposure than through classroom-based instruction alone. Employers similarly perceive internship participants as more work-ready, with Ohei et al. (2019, cited in Mabunda & Mayombe, 2025) noting that students with internship experience demonstrate satisfactory work performance and adaptability.

Moreover, Pitan and Muller (2020) argue that internships facilitate a smoother transition from school to work by familiarizing learners with workplace norms, expectations, and professional responsibilities. In the South African context, where youth unemployment remains persistently high, the integration of mandatory school-based internships into the secondary school curriculum could play a critical role in improving career decision-making, enhancing employability, and strengthening the link between education and the labour market.

5. Methodology

5.1 Research Design

This study adopted a qualitative, comparative, and exploratory design as it aims to gain an in-depth understanding of participants' experiences, perceptions, and attitudes, rather than to measure or quantify variables. Given the study's focus on the education systems, a multiple case study was employed to examine how secondary schools in Vietnam, Germany, and South Africa integrate practical work experience into their education systems.

Each country represents a distinct case, allowing for an in-depth understanding of the local context, school practices, and teachers' perceptions. This approach was appropriate because it enabled the researcher to examine the phenomenon within its real-life education settings while facilitating cross-case comparisons. By analyzing these three distinct contexts, the study aimed to identify similarities and differences, and existing limitations in how practical learning activities are implemented globally.

5.2 Participants

A total of nine participants (N = 9) were involved in this study, with three participants selected from each country (Vietnam, Germany, and South Africa). All participants were secondary school teachers or educators from diverse institutional backgrounds, including public, vocational, and private schools. Purposive sampling was employed to select this diverse group, ensuring that the collected data captured a wide range of perspectives and provided rich, comprehensive insights into the educational practices of each nation.

5.3 Data Collection Instruments

The primary instrument used for data collection was a semi-structured interview guide consisting of 10 open-ended questions. This instrument was developed by the researchers and validated by a supervisor to

ensure content validity. This format was chosen to ensure consistency across the three case studies (Vietnam, Germany, and South Africa) while retaining the flexibility to ask follow-up questions based on the participants' unique responses.

The interview guide was designed based on the study's research objectives and a review of relevant literature. It was divided into three main sections:

1. Context and Demographics (Question 1-2): This section gathered background details regarding the teachers' experience and their professional views on the primary goals of secondary education in their respective countries.
2. Core Practices and Implementation (Question 3-6): Open-ended questions focus on the current state of education, exploring how practical work experience was integrated into the curriculum, the specific skills students acquired, and the level of teacher preparedness.
3. Challenges, Perceptions, and Recommendations (Question 7-10): Questions exploring the limitations teachers face and their suggestions for systemic improvement and identifying successful models.

To ensure accuracy, the interviews were conducted in the participants' native languages – digital recording devices to capture the data verbatim. The next step involved transcribing and translating the audio recordings into English using an English translate software, followed by a final manual check for accuracy by the researchers.

5.4 Data Collection Procedure

Interviews were conducted in-person at locations convenient for the participants (e.g., school offices or quiet public spaces). Each session lasted approximately 90 minutes. Before the interview, the research purpose was explained, and informed consent was obtained from all participants. Permission to audio-record the conversation was explicitly requested and granted before the recording commenced.

5.5 Limitations

The researchers acknowledged certain limitations in this study. Firstly, the small sample size (N = 9) means that findings may not be statistically generalizable to the entire education systems of Vietnam, Germany, and South Africa. Secondly, cultural differences and languages may have influenced the interpretation of certain interview responses. However, the use of purposive sampling ensured that the data remained rich and relevant to the specific research context.

5.6 Data Analysis

The data analysis process followed an inductive Thematic Analysis approach. This method involved coding, categorizing, and identifying emerging themes that reflect patterns in participants' responses across the three countries. The analysis was conducted in four distinct phases:

- Phase 1 (Transcription and Familiarization): All recorded interviews were transcribed verbatim into written text. To ensure the data remained authentic, the natural speech of the interviewees was maintained, and notes on emotions or pauses were included. The researchers read the transcripts multiple times to obtain a holistic overview of the data before coding began.
- Phase 2 (Coding): The interview transcripts were read carefully and any ideas, phrases, or passages that reflect important themes were highlighted. Labels can be about actions, activities, concepts, differences, opinions, processes, or whatever the researchers think is relevant. For example: it is repeated in several places; it surprises the researchers; the interviewee explicitly states that it is important; the researchers have read about something similar in previously published reports, scientific articles, or it reminds the researchers of a theory or a concept.

  "Codes" were assigned to these segments, for example:

  – "Lack of practical training."
  – "Positive student engagement."
  – "Teacher workload issue."

- Phase 3 (Theme Development and Cross-Case Analysis): It was decided which codes were the most important and categories were created by bringing several codes together. Each code was grouped into themes (They can be about objects, processes, differences, or whatever – be unbiased, creative, and open-minded).
  - Theme 1: Integration of practical experience in the curriculum
  - Theme 2: Teacher's perception of student skill development
  - Theme 3: Barriers to effective implementation

  The three countries (Vietnam, Germany, South Africa) were compared to see the differences, similarities, and connections between them → It is new knowledge about the world, from the perspective of the participants in your study.
- Phase 4 (Interpretation): Finally, the identified themes were interpreted in relation to research objectives and existing theoretical literature. This step aimed to explain the significance of these differences for the education systems and propose possible improvements.

6. Findings

6.1 Key Findings from Interviews Conducted in Germany

This chapter presents the findings from three semi-structured interviews conducted with secondary school teachers in Germany. A thematic analysis was used to identify patterns and recurring themes across the collected data. Seven key themes related to career orientation and experiential learning were identified. These themes focus on the structured implementation of school-based internships in German secondary schools and highlight how such internships are planned and used to support students in their career development and decision-making processes.

Theme 1: Structured and Mandatory Internship System

The interviews conducted with teachers in German comprehensive secondary schools reveal that mandatory school-based internships are a well-structured and integral component of the education system. "At

our school, the internship takes place at the end of grade 8. It lasts for three weeks. All students have to take part, so it is a compulsory part of the school programme.". Internships typically take place in grade 8 and last between two and three weeks. They are compulsory for all students and are embedded within a broader framework of career guidance and preparation.

Theme 2: Early Preparation and Guidance

The findings show that preparation for internships in German secondary schools begins well in advance, often as early as grade 7. At this stage, students are gradually introduced to the idea of career orientation and are supported in identifying their individual interests, strengths, and potential career paths. This early preparation is considered essential, as many students initially struggle to define their professional interests or have limited awareness of possible career options. One participant says in their interview, "it is very hard for them to find anything they are interested in, and we even need to push them to go look for some placements ".

A key aspect of this preparation is the development of application-related skills. Students are guided in writing application letters and, in some cases, curriculum vitae. Teachers actively support this process by providing instructions, reviewing applications, and helping students communicate with potential internship providers. This structured guidance ensures that students are not left alone in the process of finding a placement, which can be particularly challenging for those with limited access to professional networks.

In addition, the preparation phase includes informing students about workplace expectations, such as appropriate behaviour, communication, and responsibilities. Through classroom activities and targeted training sessions, students learn how to interact in a professional environment, which helps reduce uncertainty before entering the workplace.

Parents also play an important role in this process. Schools involve them through information events and ongoing communication, ensuring that they are aware of the requirements and expectations of the internship. One participant mentions "I started to inform the parents in year seven that there will be a work placement coming up in year eight and

that they might want to start looking for a place where their kids actually can have those work placements." In some cases, parents support their children in finding placements or making career-related decisions. However, the findings also suggest that this involvement can sometimes influence students' choices in ways that do not fully reflect their personal interests.

Theme 3: Strong Teacher Involvement

The findings highlight that teachers play a central and highly active role throughout the entire internship process. Their involvement goes far beyond regular classroom teaching and includes organizational, supervisory, and supportive responsibilities before, during, and after the internship.

Before the internship begins, teachers are responsible for organizing and coordinating the overall process. They provide students with relevant information, support them in finding suitable placements, and assist with application procedures. In many cases, teachers also act as intermediaries between students and companies, ensuring that placements meet the requirements and are appropriate for the students' age and abilities.

During the internship period, teacher involvement remains strong. Teachers maintain regular contact with both students and workplace supervisors. A key component of this role is visiting students at their internship sites, where teachers observe working conditions, discuss students' performance, and address any emerging issues. These visits help ensure that the internship is meaningful and that students are supported in adapting to the work environment. As one participant expresses, "When the students are at their work placement places, the class teachers or the teachers are supposed to visit them, or let's say at least one time, and talk to them. How are you doing? What do you think is interesting? And we also talk to the partners and find out how they behave. How do they fit into the system? Do they think it's the right place to be?"

In addition, teachers provide ongoing support in cases of difficulty. Students can contact them if problems arise, such as conflicts at the workplace, uncertainty about tasks, or organizational challenges.

Teachers then act as problem-solvers, offering guidance or directly communicating with the company if necessary.

However, the findings also indicate that this high level of involvement can create a significant workload for teachers. They are required to balance their regular teaching duties with internship supervision, which includes travelling to different workplaces and being available outside normal school hours. Despite these challenges, teacher involvement is seen as a crucial factor in ensuring the quality and success of the internship experience.

Theme 4: First Real Exposure to the Working World

The findings indicate that school-based internships often represent the first real contact students have with the working world. For many students, this experience differs significantly from their expectations, as they move from a structured school environment into a professional setting with new demands and responsibilities: “Most students realize for the first time what it is like to go to work every day, to go to work for so many hours, for 6, 7, 8, 9 hours.”

During the internship, students are exposed to typical working conditions, including fixed working hours, physical tasks, and hierarchical structures within companies. They learn that work requires punctuality, discipline, and the ability to follow instructions from supervisors. This exposure helps students understand that the workplace operates differently from school, where rules and responsibilities may be perceived as less strict.

A key aspect of this theme is the “reality check” that many students experience. Interns often challenge their previous assumptions about certain jobs. Students realise that work can be physically demanding, time-consuming, and sometimes less enjoyable than expected. For example, long working hours or repetitive tasks can lead to feelings of exhaustion, which many students encounter for the first time. “Many of them tell me when I call them for my first visit: ‘Ohhh I am so happy when school starts over, it’s so hard, my back hurts, my knees hurt, I am so tired, I have to get up so early.’ That is a crash of reality for them.”.

At the same time, this first exposure to the working world helps students develop a more realistic understanding of professional life. They become aware of the expectations placed on employees and gain insight into workplace dynamics, including communication with colleagues and supervisors. This experience is particularly important because many students have had little or no prior contact with real work environments.

Theme 5: Impact on Career Orientation and Motivation

The findings show that internships have a significant impact on students' career orientation and their motivation towards future educational and professional pathways. As internships provide direct insight into real working environments, students can compare their expectations with actual experiences.

For many students, internships help to confirm existing career interests. When students have positive experiences at their workplace, they often develop a clearer idea of their future career path and become more motivated to achieve the necessary qualifications. In some cases, students even express a strong desire to return to the same company for further training or employment, which gives them a concrete goal to work towards. "Some of them felt so approved of, so empowered that they said, okay, now I only have to do one more year of school and then I can start my training".

At the same time, internships also lead to changes in career preferences. A large number of students realise that the profession they had imagined is not suitable for them. This process of eliminating unrealistic career options is an important part of career orientation, as it helps students refine their choices and develop more realistic expectations about the working world. "Most of them say, 'Oh no, that was so hard. I never imagined it would be so hard.' It is more like, 'I do not want this profession any more. I will look for something else.'".

However, the impact on motivation is not always positive. Some students experience uncertainty or disappointment when their expectations are not met. This can temporarily reduce motivation, as students may feel unsure about their future direction. In some cases, students need time to reassess their goals and explore alternative career paths.

Theme 6: Development of Soft Skills and Personal Growth

The findings indicate that internships contribute to the development of soft skills and personal growth in many students. Through their participation in real work environments, students are required to interact with colleagues, supervisors, and customers, which supports the development of communication skills. In particular, students who are placed in customer-oriented roles often become more confident when speaking to unfamiliar people.

In addition, internships encourage the development of responsibility. One participant points out that "They often seem more mature and more responsible after the internship. You could say they become a little more adult." Students are expected to follow instructions, complete assigned tasks, and adapt to workplace expectations such as punctuality and reliability. For some students, this represents a new level of accountability compared to the school environment, where responsibilities are often more flexible.

Another important aspect is the increase in self-confidence. "Especially those that have their internships in shops and had to talk to customers, they feel more confident talking to strangers.". Successfully completing tasks, learning new practical skills, and receiving positive feedback from supervisors can strengthen students' belief in their own abilities. Some students also report a sense of pride in acquiring new competencies, particularly when they are able to apply practical skills that they had not previously developed in school.

These experiences often contribute to a certain level of personal maturity. Students gain a better understanding of adult responsibilities and professional behavior, which can influence how they perceive both school and work. However, the findings also show that these developments are not universal. While some students demonstrate noticeable growth, others show little to no change in their behavior or attitudes.

Theme 7: Challenges and Limitations of Internships

Despite the overall positive assessment of internships, the findings also reveal several challenges and limitations that affect both students and teachers. One major issue is the selection of appropriate internship

placements. Some students choose placements based on convenience, such as proximity to their home, rather than their personal interests. In other cases, parents influence or decide the placement, which can lead to a mismatch between the student's interests and the actual internship experience.

Another challenge relates to the working conditions. Many students are not used to working full days of six to eight hours, which can be physically and mentally demanding. As a result, students often experience fatigue and may struggle to adapt to the expectations of the workplace "When they have an internship and say, 'oh I really liked it', that is good. But many of them say 'oh no, it is loud, it is dirty, it is hard work.'". This can reduce the overall quality of the internship experience and affect students' motivation.

The requirement to produce written reports after the internship is also perceived as problematic. Some students find report writing difficult or unmotivating, which can lead to a lack of engagement with the reflection process. In some cases, students may attempt to avoid the effort required, for example, by relying on external tools rather than reflecting on their own experiences.

In addition, the strong involvement of teachers creates a considerable workload. Teachers are responsible for organizing internships, supporting students, visiting workplaces, and being available in case of problems, often alongside their regular teaching duties. This can lead to time pressure and organizational challenges.

Finally, a small number of internships are terminated early due to inappropriate student behavior or difficulties at the workplace. This highlights that not all students are equally prepared for the demands of a professional environment and that internships do not always function smoothly.

6.2 Data Analysis and Findings from South Africa

This chapter presents the findings from three semi-structured interviews conducted with Life Orientation educators in Delft, Cape Town. A thematic analysis was used to identify patterns and themes across the gathered data. Six key themes related to career guidance were re-

vealed by the data with regard to development, and systemic challenges within the South African education context.

Theme 1: Limited and Fragmented Career Guidance

Participants emphasized that career guidance within schools is limited, with inconsistent implementation, across all grades. Participant 1 noted that "we do not do much regarding career guidance," while Participant 3 emphasized that guidance is mainly focused on Grade 9 and Grade 11 and is "not the amount of guidance learners deserves." This suggests that career guidance is curriculum-bound and insufficient to meet learners' needs, particularly in under-resourced contexts such as schools situated in Delft, Cape Town.

Theme 2: Exposure as a Catalyst for Career Awareness

All participants highlighted the importance of career awareness initiatives such as university visits, career days, and exhibitions. Participant 2 stated that such experiences "opened and broadened their minds," while Participant 3 described organized career exhibitions involving universities and government departments. These findings suggest that exposure to career awareness plays an important role in broadening learners' awareness of career opportunities beyond their immediate surroundings.

Theme 3: Socio-Economic Context Shaping Career Aspirations

The findings indicate that learners' future career aspirations are strongly impacted by their socio-economic environment. Participant 2 explained that learners often choose careers they see around them, while Participant 3 highlighted financial constraints as a major barrier, noting that many learners cannot pursue their goals due to a lack of funding or financial assistance. Additionally, social expectations and stigma around non-university pathways further limit career choices.

Theme 4: Experiential Learning as a Tool for Confidence and Inclusion

All participants emphasized the value of experiential learning. Participant 1 referred to job shadowing as providing "practical experiences," while Participant 2 noted that such exposure "makes them confident." Participant 3 added that not all learners are academically inclined and that practical learning allows different learners to excel. This suggests that experiential learning enhances both confidence and inclusivity within the education system.

Theme 5: Structural and Systemic Barriers

Participants identified several systemic barriers, including a lack of resources, rigid curriculum structures, and policy constraints. Participant 3 specifically criticized the CAPS curriculum as "rigid" and dominated by "red tape," while Participant 2 highlighted limitations imposed by government frameworks. These barriers limit the implementation of practical initiatives such as internships and reduce the effectiveness of career preparation.

Theme 6: Need for Inclusive and Systemic Educational Reform

Participants agreed that meaningful change requires collaboration between government, schools, and the private sector. Participant 1 suggested that NGOs and private stakeholders must be involved, while Participant 2 emphasized state-led implementation. Participant 3 further highlighted the need for inclusive education models that cater to diverse learner abilities and skills. These findings suggest that system-wide transformation is necessary to create sustainable and equitable career development opportunities for all learners.

6.3 Data Analysis and Findings from Vietnam

This chapter presents the findings from two semi-structured interviews conducted with secondary school teachers in Vietnam. A thematic analysis was used to identify patterns and themes across the gathered data. Six key themes related to career orientation and experiential

learning were revealed, focusing on the current implementation challenges and the potential for internship programs within the Vietnamese educational context.

Theme 1: Limited and Fragmented Career Guidance

Participants noted that while career orientation exists, it is often limited to monthly thematic sessions and is frequently overshadowed by academic pressures.

- *Participant 1* explained that although they follow a national curriculum to identify student strengths, students are "quite busy preparing for their exams".
- *Participant 2* added that these sessions are part of extracurricular activities designed not to "take too much time away from their main subjects". This suggests that career guidance is currently a foundational effort that struggles to compete with the heavy demands of the formal academic schedule.

Theme 2: Exposure as a Catalyst for Career Awareness

Both educators highlighted that moving beyond textbooks is essential for broadening students' perspectives on the professional world.

- *Participant 1* suggested that activities like "One Day at Work" or visiting "high-tech factories and creative studios" would be highly engaging.
- *Participant 2* remarked that seeing "real-world value" through office or factory visits is much more effective than "just reading books". These findings indicate that direct exposure to workplaces acts as a powerful motivator for students to connect their studies to future careers.

Theme 3: Socio-Economic Context Shaping Career Aspirations

The findings show that career choices and participation in orientation activities are heavily influenced by the cultural emphasis on high-stakes testing.

– *Participant 1* described the 10th-grade entrance exam as a "life or death" wall, noting that parents fear outside activities might lower test scores.

– *Participant 2* confirmed that "exam pressure is very high," which leads to parental hesitation regarding experiential learning. This highlights a systemic conflict where the pressure for high GPAs often takes precedence over the development of practical career skills.

Theme 4: Experiential Learning as a Tool for Confidence and Inclusion

The interviews revealed that practical, hands-on learning could significantly improve student morale and their understanding of academic purpose.

– *Participant 1* argued that replacing theory with practice would "greatly boost their confidence" and help them see that subjects "have a purpose beyond just passing a test".

– *Participant 2* observed that students become more interested in "creative or tech jobs" when they see the real-world application of their lessons. This suggests that experiential learning helps students bridge the gap between classroom theory and professional reality.

Theme 5: Structural and Systemic Barriers

Participants identified significant administrative and curriculum-related hurdles that prevent the implementation of formal internship programs.

– *Participant 1* emphasized the necessity of an "official Letter of Introduction with the school's red stamp," stating that without it, no company will host students.

– *Participant 2* reiterated that "you can't just walk into a company" and that the "red tape" makes leadership support difficult to obtain.

Furthermore, a "very full" curriculum leaves almost no time for activities lasting more than a single day.

Theme 6: Need for Inclusive and Systemic Educational Reform

For a sustainable internship model to exist, participants agreed that change must come from the highest levels of educational governance.

- *Participant 1* called on the Ministry to "formally recognize these activities and reduce the theoretical workload".
- *Participant 2* stressed the need for "clear, official guidelines" regarding safety and legal frameworks to make the organization easier for schools. The findings conclude that a "sensitive balance" involving the Ministry, schools, companies, and parents is required to shift the focus from grades to practical future readiness.

6.4 Cross-Context Comparison of Central Themes

The cross-context comparison reveals both similarities and significant differences between Germany, South Africa, and Vietnam in terms of career guidance, experiential learning, and structural conditions.

A major difference can be observed in the structure of career guidance systems. In Germany, career orientation is highly structured, begins early, and is embedded within the school curriculum through mandatory internships. In contrast, both South Africa and Vietnam show more limited and fragmented approaches. In South Africa, career guidance is inconsistently implemented and often restricted to specific grade levels, while in Vietnam, it is present but frequently overshadowed by academic pressures and examination requirements. This highlights that Germany provides a more systematic and continuous approach to career preparation.

Differences are also evident in the role of experiential learning. In Germany, students participate in multi-week internships that provide direct and in-depth exposure to the world of work. In South Africa, experiential learning exists mainly in the form of job shadowing, career days, or exhibitions, which offer valuable but shorter and less immer-

sive experiences. In Vietnam, experiential learning is largely discussed as a desirable approach but is rarely implemented in practice due to structural constraints. This suggests that while all three contexts recognize the importance of practical experience, only Germany has successfully integrated it into the education system.

The impact on career orientation also varies across contexts. In Germany, internships strongly influence students' career decisions by helping them confirm or reconsider their career interests. In South Africa, career aspirations are more strongly shaped by socio-economic conditions and limited exposure to diverse career options. Similarly, in Vietnam, students' career choices are heavily influenced by examination pressures and parental expectations. As a result, students in Germany are more actively supported in making informed career decisions, whereas students in the other contexts face stronger external constraints.

In terms of student development, all three contexts acknowledge the positive impact of experiential learning on skills and confidence. In Germany, internships contribute to the development of soft skills and personal maturity, although not all students benefit equally. In South Africa, experiential learning is seen as particularly important for building confidence and supporting learners with diverse abilities. In Vietnam, teachers emphasize the strong potential of practical learning to increase motivation and understanding, even though such opportunities are currently limited. This indicates a shared recognition of the value of experiential learning across all contexts.

However, the comparison also reveals significant differences in structural and systemic barriers. In Germany, challenges are mainly practical, such as finding suitable placements, managing workloads, or dealing with student motivation. In contrast, South Africa faces broader systemic challenges, including limited resources, rigid curricula, and socio-economic inequalities. Vietnam, on the other hand, is characterized by strong bureaucratic requirements and an intense focus on examinations, which restrict the implementation of practical learning approaches. This shows that while Germany deals with operational challenges, the other contexts are constrained by deeper structural issues.

Finally, the role of institutions and policy differs considerably. Germany already has an established system that supports the implementation of internships. In South Africa, participants emphasize the need for greater collaboration between government, schools, and external stakeholders such as NGOs. In Vietnam, significant changes at the policy level are required, including official recognition of internships and clearer regulatory frameworks. This highlights that systemic reform is necessary in both South Africa and Vietnam to enable the integration of practical career-oriented learning.

Overall, the findings suggest that the German model of school-based internships offers valuable insights for improving career orientation. However, its transferability to other contexts is limited by structural, economic, and institutional differences. Therefore, any adaptation of this model must take into account the specific challenges and conditions present in South Africa and Vietnam.

7. Recommendations

7.1 Recommendations Based on Empirical Findings

Based on the findings of this study, several recommendations can be derived regarding the improvement of career orientation and the implementation of experiential learning in different educational contexts. The German model demonstrates that structured and mandatory school-based internships can play a crucial role in supporting students' career development. These internships provide students with direct exposure to the world of work, allowing them to test their interests, develop realistic expectations, and make more informed decisions about their future. Therefore, it is recommended that schools in South Africa and Vietnam gradually introduce more structured forms of experiential learning. This could include not only full internships, but also step-by-step approaches such as job shadowing, short-term placements, or project-based collaborations with companies, depending on the local context and available resources.

In addition, the findings highlight the importance of early preparation and continuous guidance. In the German context, career orienta-

tion begins before the internship itself, often as early as grade 7, and includes systematic support in identifying students' interests, strengths, and potential career paths. This early engagement helps students to approach internships more purposefully and reduces the risk of choosing unsuitable placements. Based on this, it is recommended that educational systems integrate career guidance more consistently across multiple school years. Schools should provide structured support in areas such as application writing, communication with employers, and understanding workplace expectations. This support is particularly important for students who may lack access to professional networks or guidance outside of school.

Another key finding is the central role of teachers in ensuring the success of internships. Teachers act as organisers, mentors, and intermediaries between students and companies. Their involvement includes preparing students, monitoring their progress during the internship, and supporting them in case of difficulties. However, the findings also show that this high level of responsibility creates a significant workload and can place additional pressure on teachers. Therefore, it is recommended that schools and policymakers provide additional institutional support. This could include allocating specific time for internship coordination, reducing teaching loads during internship periods, or introducing specialized staff responsible for career guidance and external partnerships. Strengthening cooperation between schools and companies could also reduce the organizational burden on teachers.

Finally, the findings emphasize the importance of structured reflection after the internship. Activities such as reports, presentations, or classroom discussions help students process their experiences and connect them to their plans. However, the data also suggests that traditional formats, such as written reports, may not be equally effective for all students. Therefore, it is recommended to introduce more flexible and diverse reflection formats, such as presentations, interviews, or digital projects, to increase student engagement and better capture their individual learning experiences.

7.2 Implications for Career Orientation and Education Policy

The findings highlight the importance of integrating career orientation more strongly into educational systems. Policymakers should recognize experiential learning as a central component of education rather than an optional activity.

In particular, education systems should aim to balance academic learning with practical experiences. The results show that internships not only support career decision-making but also contribute to the development of soft skills and personal growth.

Therefore, policies should promote partnerships between schools and companies to facilitate access to real-world learning environments. Additionally, clear guidelines and frameworks are necessary to ensure the quality and consistency of such programs.

7.3 Context-Sensitive Considerations for Vietnam and South Africa

While the German model of structured and mandatory school-based internships provides valuable insights, its direct transfer to other contexts is limited due to significant structural, cultural, and institutional differences. The findings from South Africa and Vietnam clearly show that any attempt to implement similar approaches must take into account the specific conditions of each educational system.

In the South African context, structural challenges such as limited resources, socio-economic inequalities, and uneven access to career guidance play a central role. Many schools operate under constrained conditions, which makes the large-scale implementation of mandatory internships difficult. Additionally, students' career aspirations are often shaped by their immediate environment and financial limitations, which can restrict their ability to access diverse work experiences. Therefore, rather than directly adopting the German model, it may be more effective to introduce smaller-scale and flexible forms of experiential learning. These could include partnerships with local businesses, community-based projects, or short-term job shadowing opportunities that require fewer resources while still providing valuable exposure to

the working world. Furthermore, collaboration with NGOs and private sector actors could help address resource gaps and expand access to career-related experiences.

In Vietnam, the main challenges are linked to the strong emphasis on academic performance and high-stakes examinations. The findings indicate that both students and parents prioritize exam success, often viewing extracurricular or practical activities as a potential distraction. In addition, bureaucratic requirements and rigid administrative structures limit schools' ability to organise internships independently. As a result, the introduction of internship programs would require systemic changes at the policy level. This includes reducing the theoretical workload, creating space within the curriculum for practical learning, and establishing clear legal and organisational frameworks that enable cooperation between schools and companies. Without such top-down support, individual schools may lack the authority and resources to implement sustainable experiential learning initiatives.

Across both contexts, the importance of stakeholder collaboration becomes evident. Effective implementation of internship or experiential learning programs requires coordination between educational authorities, schools, companies, and, in some cases, non-governmental organisations. Clear roles, responsibilities, and communication channels are essential to ensure that students are supported and that placements provide meaningful learning experiences.

8. Conclusion

This study examined how mandatory school-based internships are organised within German comprehensive secondary schools and explored their applicability to South Africa and Vietnam. Using a qualitative comparative approach, the study analysed teachers' perspectives to understand how career orientation and practical work experience are integrated into different education systems.

8.1 Summary of Main Findings

The findings indicate that Germany has a well-structured and institutionalised system of mandatory school-based internships embedded within the curriculum. Learners are prepared early, supported by teachers, and exposed to real workplace environments. This contributes significantly to career awareness, motivation, and the development of soft skills such as communication, responsibility, and self-confidence.

In contrast, South Africa and Vietnam demonstrate limited and fragmented approaches to career guidance. In South Africa, career guidance is inconsistent and largely theoretical, with minimal structured workplace exposure. Similarly, in Vietnam, academic pressures and systemic barriers limit the implementation of experiential learning. In both contexts, socio-economic challenges, rigid curricula, and lack of institutional support hinder effective career preparation.

8.2 Contributions, Limitations and Future Research

The study contributes to the understanding of school-to-work transitions by highlighting the importance of structured experiential learning. It shows that while the German model is effective, its application in other contexts requires careful adaptation to local realities. Career orientation should be embedded as a continuous and structured process within education systems.

However, the study is limited by its small sample size and focus on teachers only. Cultural and language differences may also have influenced data interpretation. Therefore, findings should be interpreted with caution.

Future research should include a broader range of participants, such as learners and policymakers, and explore the long-term impacts of internship programs. Further studies should also investigate how mandatory internships can be implemented in resource-constrained environments.

In conclusion, mandatory school-based internships have strong potential to improve career readiness and support smoother transitions from school to work. For successful implementation, education sys-

tems must prioritise experiential learning, strengthen institutional support, and promote collaboration between schools, government, and industry.

Use of Artificial Intelligence Tools

AI tools (e.g., ChatGPT) were used exclusively for language and grammar editing. All research design, analysis, interpretation, and conclusions remain the responsibility of the authors.

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Global interconnections are increasingly shaping sustainability challenges. Technological change, energy transitions, social transformations, and climate change call for new forms of collaboration that transcend political, cultural, economic, and disciplinary boundaries. Addressing these complex challenges requires transcultural competence, the willingness and capacity to develop commonalities while respecting cultural diversity. Beyond sustainability, transcultural competence also enables the exchange and co-creation of knowledge by bringing together different perspectives, experiences, and forms of expertise.

This book is the result of the learning and knowledge-exchange journeys of the Transcultural Student Research Groups 2024 and 2025 of the Transcultural Caravan Network (TCN), a project of the Baden-Württemberg Stiftung. Twenty-eight students from diverse countries and universities collaborated through joint research, academic exchange, and intercultural learning, complemented by international research trips to South Africa and Vietnam. Through these experiences, the students explored sustainability and knowledge exchange from transcultural perspectives, learning from different contexts while developing shared understandings and new insights.

The book brings together three interconnected themes: Sustainable Energy Transitions; Business, Supply Chains, and Corporate Sustainability; and Indigenous, Transcultural, and Relational Knowledge. Across these themes, the contributions demonstrate how transcultural dialogue can enrich understandings of sustainability while enabling mutual learning, knowledge exchange, and co-creation. Ultimately, the book highlights how collaboration across cultures, borders, disciplines, and institutions can foster shared knowledge and contribute to more sustainable, inclusive, and resilient futures.

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