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"The Role of The Corporate Sector in Advancing Green Industrialization in Namibia: Challenges, Opportunities, And Policy Implications"

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Abstract:

Green industrialization is critical for Namibia's sustainable economic growth, ensuring environmental preservation while promoting industrial development. The corporate sector is a key driver in this transition, adopting sustainable business models, clean technologies, and responsible resource management to align with national policies and global climate commitments. However, limited private sector engagement and regulatory challenges hinder progress.

This study aims to analyze the role of the corporate sector in advancing green industrialization in Namibia. It explores corporate sustainability initiatives, green technology investments, and policy alignment. The research also identifies challenges and opportunities for businesses to contribute to eco-friendly industrialization. A mixed-method approach is employed, including qualitative analysis of corporate sustainability reports, interviews with industry stakeholders, and a review of government policies on green industrialization. Furthermore, the study also utilized the SCOPUS database, and a comprehensive bibliometric analysis was conducted on 104 articles published between 2015 and 2024. VOS spectator version 1.6.20 was employed to generate visualizations and analyze keyword co-occurrence and clustering patterns. The findings indicate that the literature predominantly spans disciplines including energy, environmental studies, climate change, economics, business, and management.

While some Namibian corporations have adopted green practices, overall participation remains limited due to financial constraints, inadequate policy incentives, and a lack of technical expertise. The corporate sector has the potential to drive Namibia's green industrialization, but stronger policy frameworks, financial incentives, and capacity-building initiatives are needed. Public-private partnerships and regulatory support can accelerate corporate engagement, ensuring a sustainable industrial future for Namibia.

Keywords: Corporate social responsibility; Climate Change; Sustainability; Environmental Management; Stakeholders; Corporate Governance; Sustainable Development.

Introduction

The Brief (2024), Vision 2030 commits Namibia to becoming an industrialised nation. What does that mean exactly? Industrialisation is defined as the process by which a country transforms itself from being a mainly primary sector-driven economy into one based on the manufacturing of goods. Industrialization has traditionally been connected to high carbon emissions and environmental degradation.

Conversely, with the growing urgency of climate change and resource exhaustion, the need for a new model of industrial growth, green industrialization, has surfaced. Green industrialization pushes to balance economic development with environmental stewardship through the adoption of green technologies, resource efficiency, and sustainable development. Whereas governments play a critical role in providing the direction and regulatory framework for this transition, the corporate sector functions as a key implementer and innovator in this process. This article studies the role of the corporate sector in promoting green industrialization and ascertains key areas where its influence is most impactful.

According to Yang, Z., et al. (2017) in their study, they reveal that, corporate sector plays an important supervisory role to address ecological issues together with government regulation and enterprise implementation and the findings suggest that cooperate sector are helpful in solving environment issues by bridging the gap between private and public sectors.

According to Gold, N.O., et al. (2022), in their study, they revealed that there is a positive and highly significant influence of stakeholder pressure, while country-level attributes partially played a significant role in the sustainable operation of firms. The study further discovered that the industry-specific factors variable has a significant influence because industry leaders (firms in high carbon-intensive sectors) exhibit poor sustainability performance, suggesting a negative attitude towards environmental issues.

As global attention to sustainable development intensifies, environmental, social, and governance (ESG) factors have become crucial for firms in managing stakeholder relationships and risks (Deng, 2025). Specifically, by adopting clean production technologies, reducing emissions, and improving energy efficiency to improve environmental performance, firms can obtain financial subsidies or policy support from regulatory agencies or the government (Zhang et al., 2023a).

Furthermore, considering that consumers are another key stakeholder for firms, developing green and environmentally friendly products and services meets their growing environmental demands and builds consumer loyalty to withstand market fluctuations (Mishra and Modi, 2013).

Methods

The methodology of this study includes case studies, national publications, decomposition, and comparative analysis. The study is based on an extensive list of sources. The bibliographic information and citation data for the analysis of this study were collected from the SCOPUS database. The search criteria and article selection focused on the 2015 to 2024 period based on the keywords used in the document search.

Techniques for analysis

To ensure the relevance and quality of the dataset for bibliometric analysis, a systematic filtering process was employed. Initially, the SCOPUS database was queried, yielding 490 documents. Filters were then applied to select only English-language articles and conference papers, excluding other types of literature. The search scope was further narrowed to encompass themes within Energy, Business, Management, Accounting, and Economics. Subsequently, a meticulous manual screening of article titles and abstracts was conducted to assess their pertinence to the study's focus on the corporate sector's role in green industrialization. This rigorous selection process resulted in a final dataset comprising 104 documents, which were then subjected to comprehensive bibliometric analysis using VOSviewer version 1.6.20. This approach aligns with established methodologies in bibliometric research, ensuring the reliability and validity of the findings.

Results

Lithon (2024). With its commitment to sustainability and an abundance of sun, wind, and other natural resources, Namibia is set to lead the way towards cleaner energy sources. Not just for ourselves, but for the rest of the world too. Namibia is poised to become a green energy hub through the exportation of green energy, green ammonia, and other carbon-neutral derivatives.
Transport infrastructure is vital for supporting industrialization. Namibia benefits from well-maintained roads, extensively regarded as some of the best in Africa, which presently support the country's mining industries.

Result On SCOPUS

Year-wise publication trend

The publication trend in sustainable development and green industrialization has shown a marked increase in recent years, reflecting a growing global emphasis on transitioning to greener economies. This surge is influenced by heightened awareness of climate change, the imperative for sustainable practices, and the collective commitment to achieving net-zero emissions by 2050. The concept of a "just transition," which seeks to ensure that the shift to a low-carbon economy is equitable and inclusive, has gained prominence in international policy discussions, notably within the framework of the Paris Agreement.

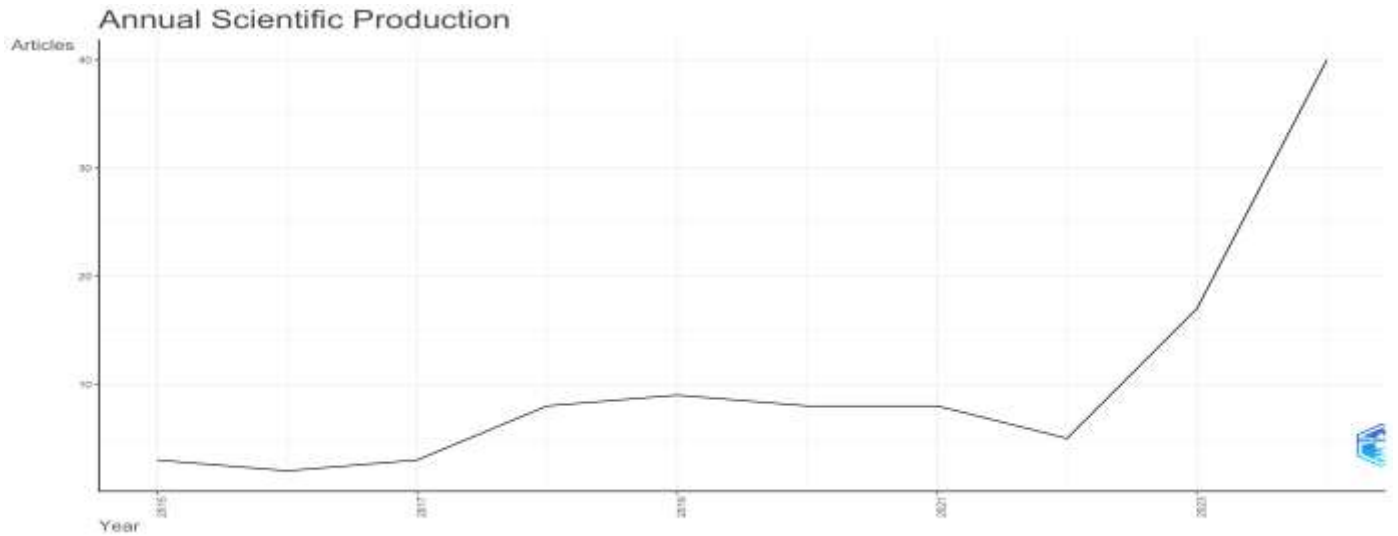

Figure 1: Annual Scientific Publication

Bibliometric analysis of top influential countries/territories

China has emerged as a leading contributor to scholarly publications on sustainable development and green industrialization. This prominence is largely attributed to its rapid economic growth and industrial expansion, which have spurred significant investment in green innovation and environmental governance.

Conversely, the United Kingdom, while producing a comparatively lower volume of publications, boasts a higher citation count in this domain. This suggests that UK-based research exerts substantial influence and is frequently referenced in the global academic community. The high citation rates reflect the impact and quality of UK contributions to the discourse on green industrialization and sustainable development.

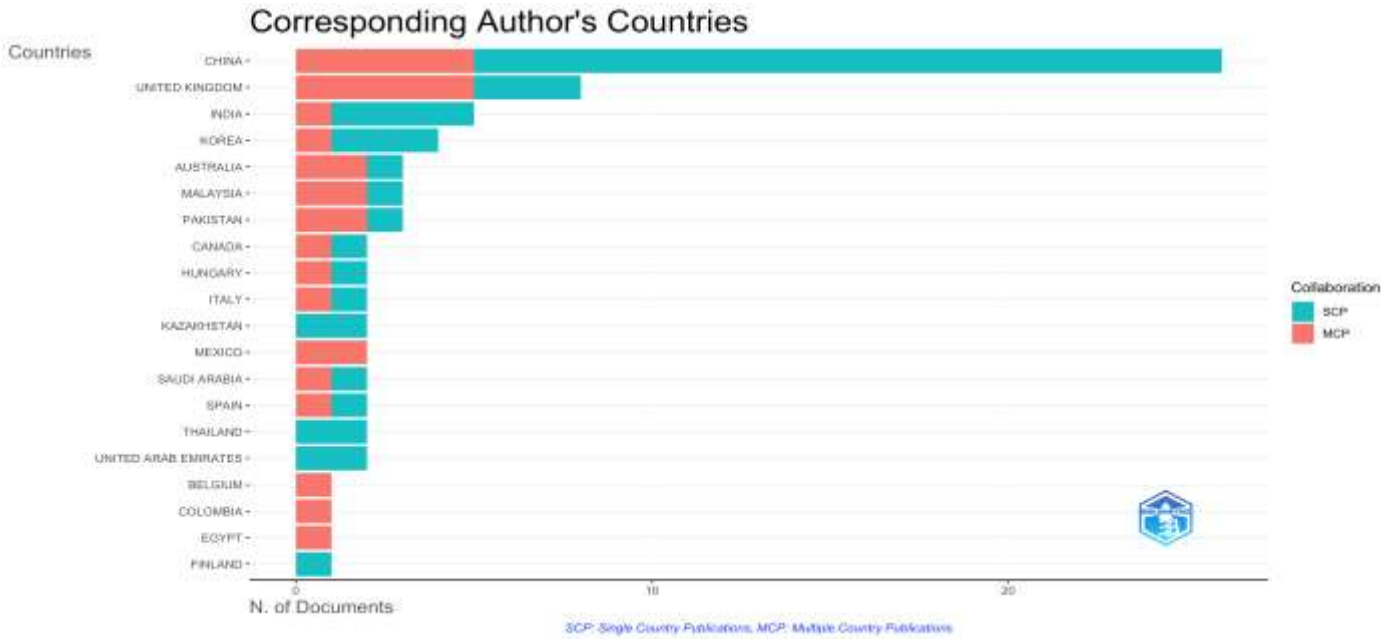

Figure 2: Corresponding Authors' Countries

Challenges

According to(TransNamib, 2019-2020), currently, Namibia's railway system is at a crossroads, urgently requiring upgrades to accommodate the anticipated increase in demand. One key element that requires urgent attention is the availability of suitable rolling stock. The rail system currently handles 1.6 million tons of goods per year and needs to scale up significantly to support potential increases of 2 to 5 million tons by 2026.

Challenges include safeguarding financing for green projects, focusing on infrastructure gaps, and building a skilled workforce are being noted. Chances exist in sectors like green hydrogen production, renewable energy, and resource-efficient industrial developments, with policy support needed to create a favorable business environment and attract investment.

Securing financing for green industrialization projects can be difficult, requiring a mix of public and private investment. Namibia needs to capitalize on infrastructure like grid connectivity and renewable energy storage to help green industrialization projects. A skilled workforce is essential for developing and implementing green technologies, requiring investment in education and training. A clear and supportive regulatory framework is needed to inspire green investments and innovation. In some cases, public investment may crowd out private investment, clogging the development of the private sector.

As shown on the map below, there is little research and publication happening in Africa and let alone in Namibia, on this subject.

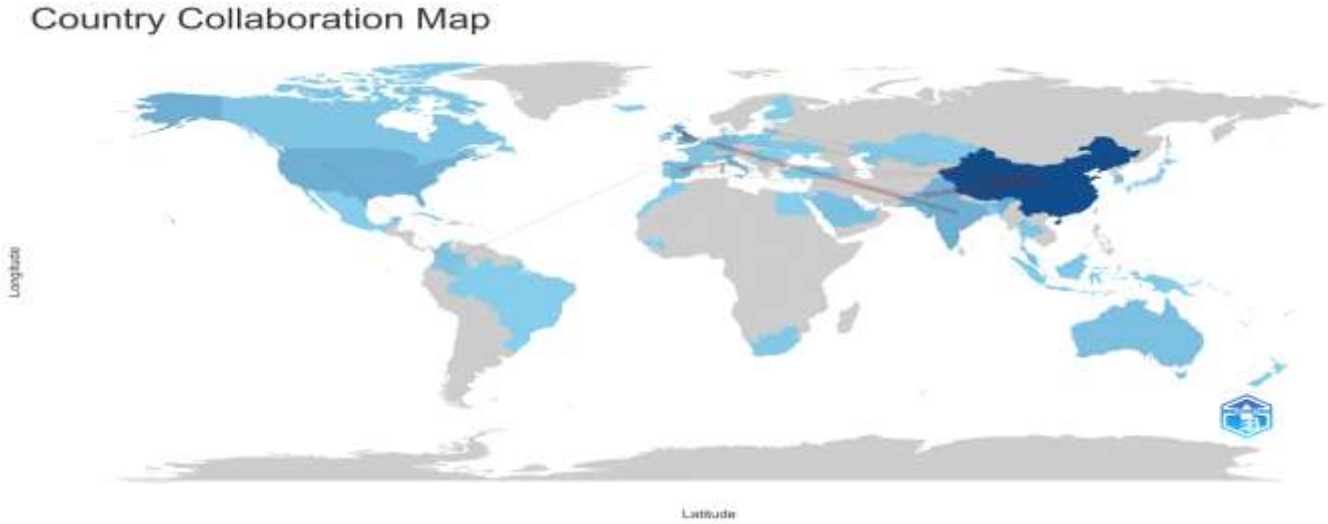

Figure 3: Country Collaboration Map

Opportunities

Namibia's abundant renewable energy resources make it a prospective leader in green hydrogen production, which can be used in numerous industries and export markets. Reassuring innovation in green technologies and developments can lead to new products and services, compelling economic growth, and creating jobs. A green industrialization strategy can attract foreign direct investment, providing capital and expertise to support growth. As it is being shown below, there are strong interest in sustainable development, green economy, corporate responsibility, and general sustainability.

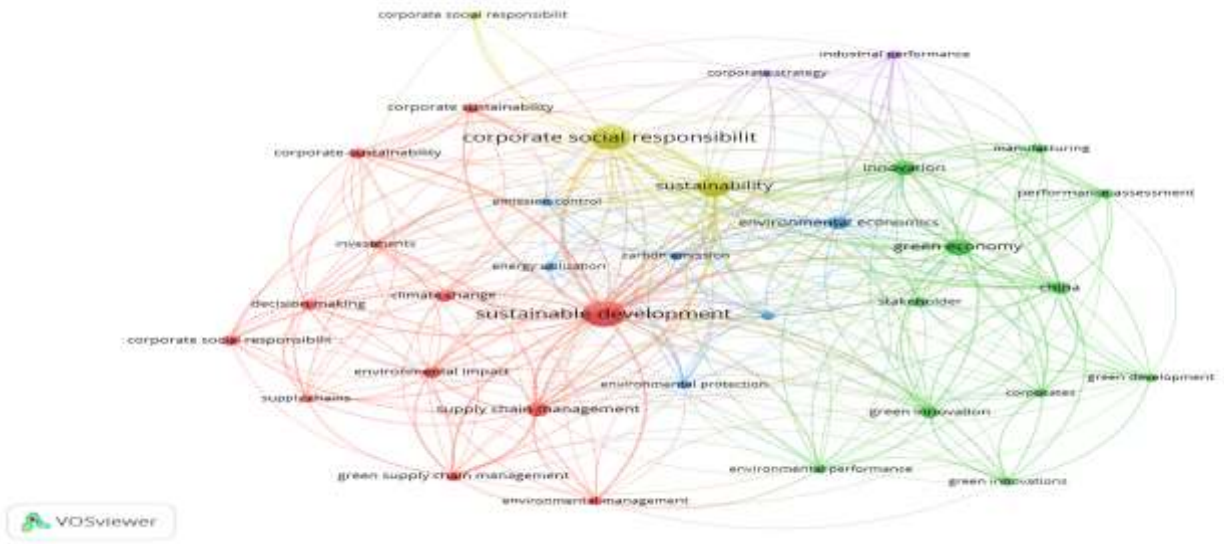

Figure 4: Word interlinkage

Policy Implications

Streamlining regulations and generating a more business-friendly environment can inspire green investments. Promoting public-private partnerships can leverage the strengths of both sectors to advance green industrialization. Realizing green industrialization in a phased approach, preliminary with pilot projects and then scaling up, can help to manage risks and shape momentum.

According to (MTI, 2011), possibly the most important asset in the development process is human capital. However, human capital that is not continuously developed is akin to dead capital. For this reason, education and skills development will continue to be an area of sharp focus in our quest for industrial development. Moreover, skills development should be linked to the type of industrial structure that we envisage under Vision 2030.

As a small open economy, Namibia will need to pay close attention to what other developed or emerging economies are doing to anticipate or adapt to future trends.

Figure 5: Word cloud

The world is moving towards green industrialisation and sustainable development, it is about innovation and ensuring environmental economic features in corporate business. The table below provides information on the strength and linkage of terms used to present a reflection of where the global sustainable development agenda is directing its efforts.

Table 1: Top 20 words by Total Link Strength

Top 20 words by Total Link Strength

Rank	Keyword	Total Citation	Total Link Strength
1	corporate social responsibility	46	108
2	innovation	16	84
3	green economy	22	81
4	China	12	75
5	environmental economics	13	59
6	green innovation	10	46
7	environmental impact	9	38
8	decision making	7	37
9	green supply chain management	7	36
10	manufacturing	6	36
11	performance assessment	7	34
12	environmental performance	6	33
13	environmental protection	6	33
14	corporate sustainability	8	32
15	green innovations	6	31
16	industrial performance	6	31
17	corporates	6	30
18	green development	5	30
19	corporate strategy	5	29
20	corporate sustainability	7	29

Discussion

There is a growing body of research focused on sustainable development and sustainable industry, reflecting a strong and emerging global interest in these areas. Many scholars highlight a clear synergy between sustainable development, corporate social responsibility (CSR), climate change, and innovation. The central message is that corporate enterprises are increasingly integrating sustainability into their strategic decision-making processes (Lara et al., 2017). To navigate environmental complexity, organizations are striving to embed sustainability as a dynamic capability within their strategies and business models.

From a bibliometric perspective, China leads in citations, followed by the UK and Canada, indicating strong research influence. In terms of publication volume, China ranks first, followed again by the UK. As the world's second-largest economy by nominal GDP and the largest by purchasing power parity, China has experienced rapid economic growth in recent decades. Although now transitioning to a phase of slower expansion, the country remains a global economic powerhouse. Despite challenges such as the property sector downturn, China's economy grew by 5% in the first half of 2024 (World Bank, 2024).

The prevalent use of terms like "sustainable" and "sustainable development" in literature underscores a rising global consciousness around environmental challenges and climate change. It also reflects the increasing commitment of corporate sectors to align with the green industrial revolution and contribute meaningfully to the broader global sustainability agenda.

The transition to green industries necessitates a workforce equipped with new skills in areas such as renewable energy, sustainable manufacturing, and environmental management.

The corporate sector also plays a role in shaping the regulatory landscape through lobbying, policy dialogue, and participation in multilateral climate platforms. While this influence can be a double-edged sword, many leading firms are advocating for stronger climate regulations, carbon pricing, and sustainable industry standards. Constructive engagement between the corporate sector and policymakers can accelerate the formulation and implementation of effective green industrial policies.

(Shikomba, et al, 2021), The issue with Namibia's industrial policy is the lack of assessment of how effective the policy is at all times. This is because, in the meantime, the Namibian government has stated that it will intervene in the market as required for economic management. Nonetheless, a 1% economic growth change increases industrial policy by 580.76% in the long run, meaning that the results suggest that, in the long run, industrial policy is beneficial to the Namibian economy as manufacturing industries

enter the markets.

Our model is robust to the Namibian economy and cannot be oversimplified to different countries or regions. Reports through The Namibian (2023), indicates that, Namibia's invasive encroacher bush and its potential for hosting abundant forests of seaweed mean that Namibia may be able to unlock sustainable sources of carbon, which, when combined with the green hydrogen molecule and other ingredients, could enable Namibia to manufacture low carbon synthetic fuels. The deployment and scaling of a green industrial economy will begin with identifying and scoping, and then advancing key priority pioneering projects.

Jia-Pe Yue., & Fu-Qin Zhang, (2022), It is worth mentioning that there is a symbiotic relationship between industrialization and urbanization. This is also being reflected in the linkages of the concept as shown below.

Dr. Humavindu's the former Deputy Executive Director in the Ministry of Industrialisation, in his introductory keynote speech at the "Localizing Green Industries in Namibia" workshop on 10th April in Windhoek, provided a comprehensive overview of Namibia's industrial policy trajectory and its strong alignment with green industrialization objectives, reflecting considerable progress already made. Namibia launched its green industrial journey with its first National Industrial Policy in 2012, followed by the Execution Strategy for Industrialization (Growth at Home) in 2014, focusing on local value addition and aligning with regional industrial goals such as those of SADC.

According to (Leung, 2024), Namibia is poised to benefit from the growing global interest in green infrastructure investments, driven by an increasing supply of projects and fluctuating investment preference among developed markets. To attract these investments, Namibia can enhance its market appeal by demonstrating low country risk and promoting regulatory reforms that open the market to private players and facilitate green industrialization.

Literature review

As global attention to sustainable development intensifies, environmental, social, and governance (ESG) factors have become crucial for firms in managing stakeholder relationships and risks. However, the heterogeneous impact of different dimensions of ESG performance on Idiosyncratic Risk (IR) remains unclear, (Deng. 2025).

According to (Thompson. 2025), in their study where they attempt to uncover how the cushioning effect of ESG on crash risk differs between ESG-sensitive industries and non-ESG-sensitive industries. The results serve as a clarion call for all firms, whether belonging to an ESG-sensitive industry or not, to actively engage in ESG activities. The results for the crisis period also imply that firms need other strategic tools in addition to ESG engagement in times of crisis.

Almeida, C.M.V.B., et al. (2015), some authors underscored the need for cooperation among governments, industrial sectors, and companies to accelerate the integration of Cleaner Production into policies and practice.

Jo, H., et al, (2015), in their findings also suggest that policy makers dealing with corporate sustainability management should pursue an environment-centered industry policy not only at the manufacturing sector but also at the financial services sector, as firms in both sectors with lower environmental costs perform better.

Particularly, by adopting clean production technologies, decreasing emissions, and improving energy efficiency to improve environmental performance, firms can obtain financial subsidies or policy support from regulatory agencies or the government (Zhang et al., 2023a).

A study was done in Pakistan investigating the impact of green innovation adoption in SMEs and according to (Jun, W., etl, 2021) the results of the study show that organizational and human resource factors, market and customer factors, and government support and technological factors have a positive and significant impact, whereas external partnership

Furthermore, bearing in mind that consumers are another key stakeholder for firms, developing green and environmentally friendly products and services meets their growing environmental demands and builds consumer loyalty to withstand market fluctuations (Mishra and Modi, 2013).

Existing literature indicates that keeping good relationships with stakeholders through Environmental Social Governance (ESG) performance can provide firms with additional resources (Lee and Koh, 2024), offer financing channels (Wang and Qian, 2011), improve operational practices (Kim et al., 2014), and deliver protective measures similar to insurance to mitigate risks (Singhania and Gupta, 2024).

Saha P.K. et al. (2021), on the other hand, due to the globalization of business, it is difficult to form a common sustainability model for CSR, while its approach could be an opportunity for achieving sustainability.

Though a reliable supply of energy is often recognized as a pre-requisite to promote the overall development process, conversely, a well trade-off is also important for higher economic development and environmental wellbeing. This is since fossil fuels are employed to meet global energy demand, whereby the burning of such resources employs an adverse environmental outcome in the form of more carbon dioxide emissions, Dogan et al., (2022).

Therefore, a country is considered industrialized if such a country has moved from an agriculturally based economy to a manufacturing-based economy with the use of mechanized equipment, thereby increasing output

Leung, (2024), Namibia is poised to benefit from the growing global interest in green infrastructure investments, driven by an increasing supply of projects and a shifting investment preference among developed markets.

Conceptualisation of green industrialisation

Industrialization can be seen as the period of social and economic change that transforms a human group from an agrarian society into an industrial one, involving the extensive reorganization of an economy for manufacturing (Steven, 2003).

From the definition, the green economy can be thought to be an economy with low carbon emissions, resource efficient, and socially inclusive, Nwanakwere, JT., (2016). Therefore, a green economy is such an economy whose evolution is determined by both public and private investments and economic undertakings that reduce the rate of carbon emissions and pollution, improve energy and resource efficiencies, and preserve biodiversity and the ecosystem.

Around the world, cities, companies, governments, and households are coming to embrace solar energy as a core part of a shift toward "sustainability," decentralization, community ownership, and enhanced control over the energy supply Brock, A., et al (2021).

More recently, buyers added improved environmental performance as a new requirement for their suppliers, seeking to avoid brand risks in their supply chain due to consumer awareness Federico J., & Lindsay W., (2022).

In light of this, many nations are working to reduce their carbon footprints, and new green technologies play a crucial role in fostering this shift in the global economy, Zhen Fang, (2023).

Conceptualisation of the corporate sector and green industrialisation

A refined definition of corporate sustainability has been formulated, the specific features of corporate sustainability management in mining companies have been determined, and the specific features of corporate social responsibility have been studied, Blinova, E., et al. (2022).

In the well-known 3P ("People, Planet, Profit") concept by J. Elkington, all elements are interconnected and are a guideline for the company's operations, which projects the ideas of sustainable development from the macro level to the micro level (the social, environmental, and economic development of the company), Elkington, J.(1998).

(Gupta, et al 1999), To protect the natural resources of the environment and to make the environment green, it is inevitably necessary to evolve the concept of environmental accounting into the business corporate sector.

A study was done in Pakistan on examining the determinants of green innovation adoption in SMEs and according to (Jun, W., etl, 2021) the results of the study indicate that organizational and human resource factors, market and customer factors, and government support and technological factors have a positive and significant impact, whereas external partnership and cooperation, and rules and regulatory factors have an insignificant impact on green innovation adoption in SMEs in Pakistan.

(Ralph & Edward, 2020), The first issue that the government must tackle is to support the necessary local research and development to develop green technologies, systems, and business models that currently do not exist or are weak.

The table below gives an indication of the size of these sectors by region to illustrate how ESG is gaining momentum in the sustainable corporate and business strategy globally.

Table 4.1 Market size and growth for EGS sector, by region (2011)

	Market in US$ billion	*Market, USD/capita*	*% growth*
US	311.3	998.7	5%
Japan	103.3	806.4	–1%
Western Europe	256.0	737.1	2%
Australia/New Zealand	13.6	501.8	2%
Middle East	17.5	80.9	9%
Latin America	28.5	47.8	5%
Central and Eastern Europe	13.7	34.9	4%
Rest of Asia	78.0	20.1	9%
Africa	10.3	9.8	10%

Source: Data derived from Environmental Business Journal, 2012

Green industrialization in Namibia will improve existing challenges in the power generation and transmission sectors, with swelling stepwise energy demands absent from present energy planning.

To drive green industrialization efficiently, robust alignment across industrial and regulatory policymaking is crucial. The Government of Namibia has made steps in this direction and is currently iterating on, among others, a Special Economic Zones (SEZ) bill and a new Industrial and Productive Development Policy slated for early 2025. However, to fully embrace green

industrialization, Namibia must broaden its perspective beyond neighboring countries to include a wider collection of regions across the globe in its lens.

The difficulty above can be confronted through the principle of "trade-off". Particularly, the assimilatory capacity of the environment, there should be a trade-off between industrialization and economic undertakings and environmental quality.

Nwanakwere &Tochukwu, (2016), talked about the establishment of what is called "the ecological threshold". The ecological threshold is a point at which both the environment and industrial activities can intermingle constructively with little or no threat to the endurance and sustenance of each other.

Blinova, E.,et al. (2022). "For the business enterprise, sustainable development means adopting business strategies and activities that meet the needs of the enterprise and its stakeholders today while protecting, sustaining, and enhancing the human and natural resources that will be needed in the future.

Visser, W.; et al, (2010), Corporate sustainability, then, is probably better understood not so much as the discipline by which companies ensure their own long -term survival though that is part of the equation but as the field of thinking and practice by means of which companies and other business organisations work to extend the life expectancy of: ecosystems (and the natural resources they provide); societies (and the cultures and communities that underpin commercial activity); and economies (that provide the governance, financial and other market context for corporate competition and survival).

Conclusion

Namibia is rich with a prospective yet to bring to life "green industrial revolution", the Namibian people will need to green their skills and rally behind this ambitious revolution of the economy. This way, a pathway towards the goals of Vision 2030 will then be mapped.

To drive green industrialization effectively, robust alignment across industrial and regulatory policymaking are crucial. The topic of managing social issues in supply chains is slowly gaining attention. There are a number of issues in social sustainability that need urgent attention from both practitioners and researchers to understand the complexities of managing social issues in supply chains.

Blinova, E.,et al. (2022). The concept of corporate sustainability does not imply an exclusive focus on the economic efficiency and economic sustainability of the company.

Blinova, et al. (2022), for the business enterprise, sustainable development means adopting business strategies and activities that meet the needs of the enterprise and its stakeholders today while protecting, sustaining, and enhancing the human and natural resources that will be needed in the future.

Green industrialization is precarious for economic growth, ensuring environmental preservation while encouraging industrial development. The corporate sector has the potential to drive Namibia's green industrialization, but stronger policy frameworks, financial incentives, and capacity-building initiatives are needed. Public-private partnerships and regulatory support can accelerate corporate engagement, ensuring a sustainable industrial future for Namibia.

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