NATURAL CAPITAL ACCOUNTING FOR THE RETAIL SECTOR

UNIFOODS CHARCOAL PILOT CASE STUDY

UNU FLORES
NAMIBIA UNIVERSITY OF SCIENCE AND TECHNOLOGY
Biodiversity Research Centre
Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

2025

Acknowledgements

The case study presented has been written under the project "Biodiversity Economy Project in Selected Landscapes of Namibia In collaboration with the NUST Biodiversity Centre," which is financially supported by the German Federal Ministry for the Environment Agency. The publisher is responsible for the content of this publication.

United Nations University—Institute for Integrated Management of Material Fluxes and of Resources (UNU-FLORES)
Zellerstr. 7 · 01069 Dresden · Germany
Phone: +49 351 8921 9370
Author: Inonge Guillemin

January 2025

UNU FLORES
NAMIBIA UNIVERSITY OF SCIENCE AND TECHNOLOGY
Biodiversity Research Centre
Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection
giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

LIST OF ACRONYMS

- **NCA - Natural Capital Accounting**
- **FSC - Forestry Stewardship Council**
- **CBD - Convention on Biological Diversity**
- **GDP - Gross Domestic Product**
- **MEFT - Ministry of Environment, Forestry and Tourism (Namibia)**
- **UN - United Nations**
- **CO2 - Carbon Dioxide**
- **REF - Reference**
- **D.F.N. - Directorate of Forestry Namibia**
- **B2B - Business-to-Business**
- **B2C - Business-to-Consumer**

A Journey of Environmental Accounting and Success

Overview

Natural capital accounting (NCA) has emerged as a resonant phrase globally. First conjured in 1970 by the insightful David Pearce and embraced by ecological economists in the 1990s, it sought to weave the threads of the environment into the fabric of economic valuations (Missemer, 2018). In our present world of finite resources, natural capital assessments empower companies to discern and evaluate their impacts and dependencies on nature's bounty.

Through the biodiversity economy in selected landscapes of the Namibia project, pioneering NCA pilots have been used to explore various business models grounded in natural capital protocols. These case studies aim to illustrate the intricate relationships between business and nature, revealing how enterprises rely on ecosystem services and the environmental impacts of their actions, thus paving the way for data-driven decision-making.
In the quest to nurture a green biodiversity economy, such insights enable businesses to mitigate risks, enhance efficiency, support compliance, and cultivate sustainable growth. By weaving environmental considerations into its operations, NCA fortifies resilience, aligns with global sustainability aspirations, and bestows competitive advantages through transparency and accountability.

This framework has been meticulously used in this case study, which explored the four phases (Why, What, How, and What Next) to illustrate how sustainable practices can enrich resource management, amplify cost efficiency, and foster sustainability. ultimately reducing environmental degradation and business profitability in the long run.

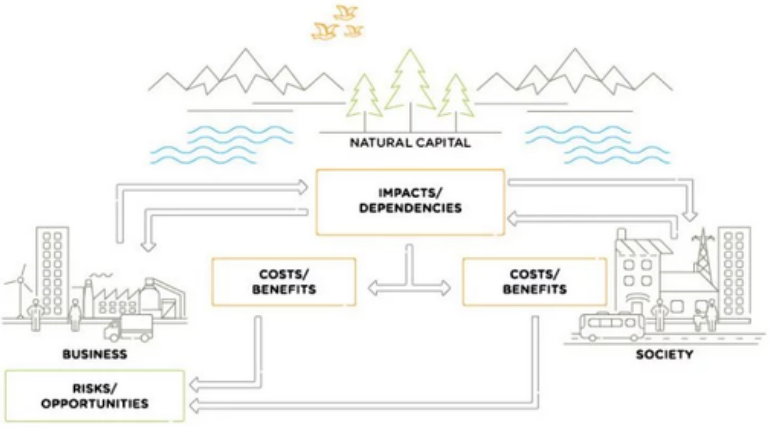
Background

This case study examines how UNIFOODS Charcoal integrates Natural Capital Accounting (NCA) to monitor the link between business activities and ecosystem health. It aims to identify challenges in presenting NCA information and suggests research and policies for broader adoption in retail and charcoal production. The study outlines the business's resource flows and the associated impacts, both positive and negative, translating into costs and benefits for society. Practical examples emphasize the importance of assessing impacts on natural capital for sustainable growth.

Objectives of the analysis

- Identify Business Dependencies: Analyze the company's reliance on natural capital, such as biomass from bush encroachment, to ensure the long-term viability of its operations and supply chain.

- Enhance Decision-Making: Integrate Natural Capital Accounting data into business strategies to identify opportunities for sustainable growth, cost savings, and improved environmental stewardship.



Natural capital impacts and dependencies: conceptual model (NCC 2016)

UNIFOODS CHARCOAL

UNIFOODS Charcoal, established in 2005 under the holding company Corridor Logistics (Pty) Ltd, is situated in the industrial area of Outjo, Kunene Region, Namibia. The company specializes in the processing, packaging, and distribution of sustainable charcoal. Unlike traditional producers, UNIFOODS sources its charcoal from local farmers who harvest it as part of initiatives aimed at mitigating bush encroachment. By supporting these farmers, the company not only promotes rangeland restoration but also provides an eco-friendly alternative to conventional charcoal. The packaged charcoal is sold to retailers throughout Namibia and exported to international markets, including Europe, South Africa, and the United States. UNIFOODS is dedicated to marketing and selling sustainable charcoal beyond Namibia's borders, thereby contributing to global environmental goals through adherence to sustainable land-use practices.

The company's operations bolster local socio-economic development by creating approximately 280 jobs, including positions for women, while enhancing the flow of foreign currency through exports. Furthermore, UNIFOODS minimizes environmental impacts by effectively managing localized noise, dust, and sewage generation.

As one of the leading global exporters of charcoal, UNIFOODS plays a crucial role in enhancing the industry's value chain. Its commitment to sustainability, social responsibility, environmental stewardship, and market expansion positions it as a leader in promoting locally and internationally eco-friendly charcoal. Under its corporate social responsibility agenda and initiatives for women's empowerment, UNIFOODS Charcoal has also established a school catering to over 40 children of its employees, providing daycare and educational opportunities for the workers' children, as illustrated in 3 below

Scope of the pilot study

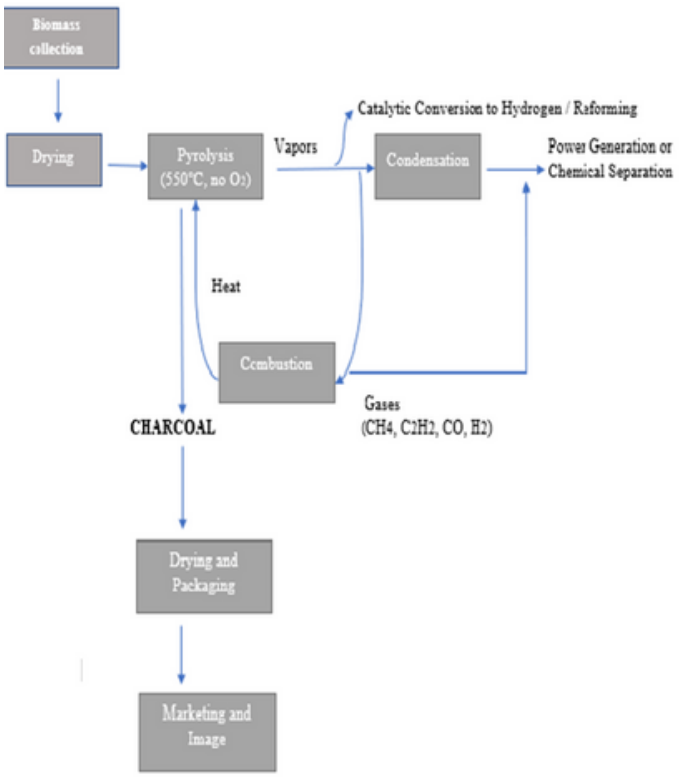
The study analyzes UNIFOODS Charcoal's operations in Namibia, focusing on the impact of charcoal processing and the company's business model's reliance on local and international markets. It examines sustainable sourcing, processing, and exporting practices while assessing the environmental effects and contributions of the charcoal industry to Namibia's economy.

Established in 2005 under Corridor Logistics (Pty) Ltd, UNIFOODS Charcoal is a prominent charcoal processor located in Outjo, Kunene Region, Namibia. The company sources raw charcoal from local farmers engaging in bush encroachment mitigation, processes it, and packages it for distribution. With approximately 34 employees, UNIFOODS serves both business-to-business and business-to-consumer markets locally and internationally, positioning itself as one of the leaders in sustainable charcoal solutions.

FRAMING THE STUDY

Figure 2 illustrates the process of biomass utilization in the production of charcoal, emphasizing the various stages and their contributions to sustainability. Biomass, often sourced from invasive species such as bush encroachment wood, is collected, promoting rangeland restoration and sustainable land management. The biomass is then dried to reduce moisture content, ensuring an efficient pyrolysis process with minimal energy loss. During pyrolysis, conducted at high temperatures (550 °C) in the absence of oxygen, biomass decomposes to produce charcoal as the primary product, along with vapours and gases (e.g., methane, acetylene, carbon monoxide, and hydrogen), which can be repurposed for energy generation or chemical production. The heat generated from gas combustion maintains the pyrolysis process, enhancing energy efficiency. The condensed vapours are separated into valuable chemicals, contributing to the overall resource efficiency. After the charcoal is dried and packaged, it is marketed as an eco-friendly fuel, appealing to consumers seeking sustainable alternatives. This process supports sustainability by converting waste biomass into valuable products, reducing reliance on fossil fuels, and mitigating environmental damage. It also fosters economic opportunities, particularly in rural areas, by creating jobs and stimulating local economies while decreasing the carbon footprint by utilizing biomass from sustainable sources. This integrated approach demonstrates how biomass utilization can lead to substantial environmental, economic, and social benefits.

FIGURE 1: CHARCOAL PRODUCTION VALUE CHAIN



NCA: MEASURE AND VALUE STAGES

Stage 1 : Why? (Frame Phase)

This phase identifies the relevant impacts and dependencies of UNIFOOD CHARCOAL's activities on natural capital. This includes considering both internal and external stakeholders, such as local communities, environmental groups, and industry partners. The goal is to determine how charcoal production, biomass sourcing, and related processes might affect or depend on natural resources like water, soil, and biodiversity.

Stage 2 : What? (Scope Phase)

The assessment defines the natural capital considerations for UNIFOOD CHARCOAL. A materiality process identifies significant environmental impacts and dependencies related to business activities and stakeholder views, focusing on key aspects such as carbon emissions, land use change, and water consumption for evaluation.

Stage 3 : How? (Measure and Value Phase)

This phase focuses on identifying data to collect and choosing measurement methods for impacts and dependencies. It involves gathering specific metrics on biomass sourcing, charcoal production, emissions, and resource usage, while tracking changes in natural capital over time. Techniques like cost-benefit analysis or ecosystem service valuation may be used to quantify these impacts and dependencies.

Stage 4 : What next? (Apply Phase)

After data and valuation are completed, the results of UNIFOOD CHARCOAL's operations on natural capital are interpreted. This phase involves decision-making based on findings, formulating sustainability strategies, and challenging assumptions to ensure the approach aligns with current natural capital dynamics and aims for a net-positive impact.

STAGE 1: WHY? (FRAME PHASE)

In the frame phase of UNIFOOD CHARCOAL's Natural Capital Accounting process, senior management, including Director Andre Neil, committed to applying the Natural Capital Protocol to guide the assessment of their environmental impact. This commitment is critical for the success of the analysis. In a series of meetings with senior management, the team developed a vision of achieving a "net-positive impact" on all activities associated with UNIFOOD CHARCOAL.

This vision entails accounting for the value of natural ecosystems before human interference, where positive contributions, such as sustainable biomass sourcing or reforestation, are added, and negative impacts, such as deforestation or soil degradation, are subtracted. The aim is for the net-positive impact to reflect a higher value due to sustainable charcoal production practices compared to the baseline state of untouched nature.

Subsequent discussions and meetings with senior management and operational managers allowed for a deeper understanding of the various factors contributing to the net-positive impact. The team focused on defining the specific effects and dependencies of UNIFOOD CHARCOAL on the natural environment. Key questions explored during these sessions included:

- What are the impacts of UNIFOOD CHARCOAL's operations on the natural environment, such as soil health, biodiversity, and carbon sequestration?

- What are the dependencies of UNIFOOD CHARCOAL on critical natural resources, such as water availability, soil fertility, and the integrity of surrounding ecosystems that support sustainable biomass supply?

- These discussions form the foundation for identifying the most relevant natural capital factors to be assessed throughout the project.

STAGE 2: WHAT? (SCOPE PHASE)

In the initial scoping phase, the purpose of UNIFOOD CHARCOAL's natural capital assessment was articulated, centered on identifying pivotal impacts and dependencies that hold significance for the business and its stakeholders. This phase sought to delineate the assessment's boundaries, ensuring it embraces all pertinent environmental dimensions that may influence or be influenced by the company's operations.

To commence, a materiality process was undertaken to pinpoint the most critical natural capital impacts and dependencies, guided by the company's activities and the insights of external stakeholders, including local communities, environmental advocates, and regulatory bodies. This discernment involved recognizing which environmental elements are vital for the company's prosperity and the health of the ecosystems it touches.

Key inquiries addressed during this phase include:

- What are the fundamental environmental challenges of charcoal production, encompassing biomass sources and pyrolysis?
- Which natural resources, such as land, water, and biodiversity, are indispensable to the company's operations, and how are these assets managed?
- What environmental repercussions (e.g., carbon emissions, deforestation, soil degradation) demand urgent attention?

The findings from this phase directed the scope of data collection in the subsequent stage, ensuring that the most pertinent impacts and dependencies are rigorously evaluated.

Moreover, stakeholder engagement proved essential to gather insights and nurture collaboration in this phase. By inviting a spectrum of groups, the company guarantees that its assessment resonates with broader environmental and social aspirations while capturing valuable perspectives that might be overlooked. This collective endeavour fortified the assessment, cultivating trust and transparency with stakeholders.

The following significant impacts and dependencies were unearthed:
Inputs:

- Energy Use: The energy consumed during biomass processing and charcoal production.
- Water Use: The water needed for biomass conditioning and cooling processes.
- Land Use: The land employed for biomass sourcing and the broader effects of land conversion.

Outputs:

- Greenhouse gas emissions: emissions from pyrolysis, transportation, and energy consumption.
- Wastewater: effluents produced during charcoal manufacturing.
- Waste: solid waste generated from processing, packaging, and distribution.

Dependencies identified include:

- Water Resources: A crucial direct dependency necessary for both biomass production and the manufacturing process.
- Biodiversity: An indirect dependency where thriving ecosystems are vital for sustainable biomass sourcing and the preservation of land productivity.

STAGE 3: HOW? (MEASURE AND VALUE PHASE)

Based on the Scoping phase of the assessment, the analysis focused on various resource **Impacts identified** through the meetings with company representatives:

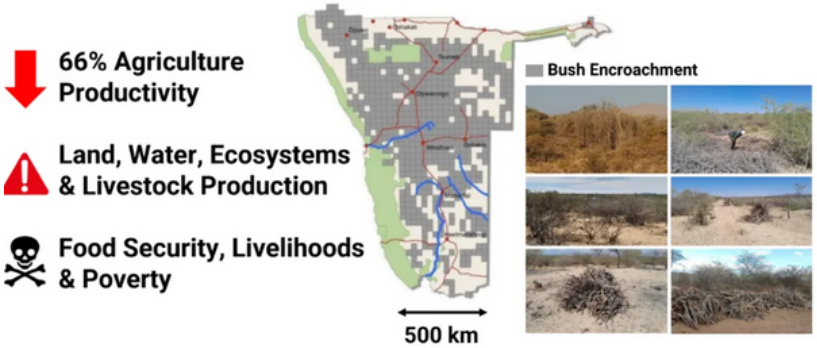
Water resource

Water is a critical yet scarce resource in Namibia, necessitating careful monitoring of Unifoods Charcoal Factory's water footprint. The factory uses approximately 2,000 liters per day, primarily for biomass conditioning, cooling systems, and maintaining hygiene in the production process. Seasonal variations and production volume significantly influence daily consumption. Water use is highest in biomass conditioning, which accounts for 70% of total consumption, followed by cooling systems at 20% and cleaning processes at 10%. Climatic factors, such as higher temperatures during summer, exacerbate water demand for cooling. Unlike urban water use, which averages 163 liters per person per day in Windhoek, the factory's operations rely heavily on industrial-scale water usage, creating a higher footprint.
Efforts to mitigate water use include installing closed-loop cooling systems, recycling wastewater, and exploring rainwater harvesting. A more detailed analysis is required to monitor trends and identify further opportunities for water conservation in line with sustainable practices.

Energy

The energy use at Unifoods Charcoal Factory was analyzed to identify operational efficiencies and cost drivers. The factory consumes approximately 250,000 kWh annually, primarily sourced from Nampower's energy grid. Energy-intensive activities include biomass pyrolysis, machinery operation, and cooling systems for processed charcoal. Outliers, such as the seasonal increase in cooling demands or the potential introduction of automated packaging systems, require further investigation.
Key energy consumers are the sorting machinery, which accounts for 60% of total energy consumption, followed by processing and packaging machinery at 25%. Currently, 100% of the energy demand is met through non-renewable sources, but plans for transitioning to solar energy systems are underway. Fixed energy costs, such as maintaining machinery idle power, and variable costs, which depend on production volume, significantly affect overall consumption.
Due to limited data, longer-term monitoring is essential to identify trends, optimize energy use, and align with sustainable energy practices.

Land



Land is essential for ecosystem services and economic productivity. In Namibia, bush encroachment affects 45 million hectares, reducing agricultural output by up to 66% and threatening biodiversity. UNIFOODS addresses this by using invasive biomass (Acacia spp.) for charcoal, which can restore rangelands, enhance livestock productivity, and improve ecosystem functionality. This sustainable resource approach also helps reduce deforestation and carbon emissions. Incorporating land into natural capital accounting emphasizes its importance for livelihoods and long-term sustainability, aligning UNIFOODS with global sustainability standards and promoting green growth and rural development.

RECOGNISING NATURE RELATED RISKS AND OPPORTUNITIES

Category	Nature-Related Risks	Nature-Related Opportunities	Value Proposition	Value Creation and Delivery	Value Capture
Operations	Over-reliance on bush encroachment charcoal supply, risking resource depletion.	Promote sustainable harvesting practices and rangeland restoration.	Sustainable charcoal sourced through eco-friendly practices.	Partner with local farmers to implement bush management programs and sustainable supply chain practices.	Ensure long-term resource availability, reduce supply risks, and improve ecological outcomes.
	Dust and noise from processing activities impacting local communities.	Invest in dust suppression and noise reduction technologies.	Cleaner and more community-friendly processing operations.	Introduce modernized equipment and implement environmental safeguards at processing sites.	Improved community relations and compliance with environmental regulations.
Regulatory & Legal	Increased regulation on emissions and resource usage.	Proactively comply with regulations by adopting sustainable processing methods.	Environmentally compliant charcoal production.	Develop and implement natural capital accounting frameworks and regular environmental reporting.	Avoid penalties, improve compliance, and enhance trust with authorities.
	Stricter sustainability certifications for export markets.	Achieve international certifications (e.g., FSC).	Certified sustainable charcoal for premium markets.	Partner with certifying bodies and integrate traceability systems into the supply chain.	Access to high-value markets and competitive advantage through certification.
Reputational	Damage to brand image due to unsustainable sourcing practices.	Establish UNIFOODS as a leader in sustainable charcoal processing.	Eco-friendly charcoal brand identity.	Transparent sustainability practices and marketing efforts highlighting natural capital benefits.	Enhanced customer trust, loyalty, and global competitiveness.
Market and Product	Increasing demand for sustainably sourced charcoal in global markets.	Expand product lines with certified sustainable charcoal options.	High-quality, eco-friendly charcoal for local and export markets.	Develop innovative packaging and marketing to highlight sustainability credentials.	Increased market share and premium pricing opportunities.
	Competition from other sustainable charcoal exporters.	Leverage Namibia's bush encroachment mitigation as a unique selling point.	Charcoal that supports ecological restoration and community livelihoods.	Collaborate with Namibian government and stakeholders to promote sustainable practices.	Strengthened market position and enhanced global reputation.
Social	Limited local employment opportunities in rural areas.	Create jobs through sustainable bush clearing and charcoal processing.	Socially responsible business supporting community livelihoods.	Provide training programs and fair employment opportunities for local workers.	Improved social license to operate and stronger community support.
	Conflicts over land use and resource allocation.	Engage communities in collaborative decision-making processes.	Inclusive and community-focused charcoal supply chain.	Partner with local stakeholders to ensure equitable resource access and usage.	Strengthened relationships with local communities and reduced operational risks.

UNIFOODS could encounter challenges like resource depletion, more stringent regulations, and possible land use conflicts. Nevertheless, the company has the potential to capitalize on opportunities in sustainable harvesting, obtaining international certifications, and enhancing social responsibility. Assessing these risks and opportunities is crucial for guaranteeing long-term resource availability, adhering to regulations, and maintaining market competitiveness, all while supporting community development and aligning with global sustainability standards.

STAGE 3: HOW? (MEASURE AND VALUE PHASE)

The review of water, energy, and land use at UNIFOODS Charcoal business highlighted key areas for improving sustainability. Water is essential but limited in Namibia. The factory uses about 2,000 litres per day, mainly for preparing biomass (70%), cooling systems (20%), and cleaning (10%). Hotter weather in summer increases water use, and industrial needs are much higher than urban use in Windhoek (163 liters per person per day). Efforts like recycling water, using closed-loop cooling systems, and harvesting rainwater can help reduce water consumption, but more detailed monitoring is needed to find additional ways to save water.

Energy use showed that the factory consumes around 250,000 kWh every year, with sorting machines using the most energy (60%), followed by processing and packaging (25%). All energy comes from nonrenewable sources, but there are plans to switch to solar power. Better monitoring and adjustments can help reduce energy costs and make operations more efficient.

For land use, the factory's focus on using invasive plants like Acacia helps tackle bush encroachment, which affects 45 million hectares in Namibia. This approach improves grazing lands, biodiversity, and carbon storage while reducing deforestation. However, relying too much on these plants for charcoal could lead to resource shortages, so sustainable harvesting is necessary.

With these insights, UNIFOODS is poised to lead in sustainable business practices. By integrating innovative technologies and sustainable strategies, the company can enhance its environmental footprint and achieve economic benefits. Engaging with local communities and stakeholders will be crucial to ensure the initiatives are inclusive and beneficial to all parties involved.

Implementing educational programs and workshops can raise awareness among employees and the wider community about the importance of sustainability. This can foster a culture of environmental stewardship and encourage collaborative efforts to innovate further solutions.

Moreover, partnerships with research institutions like UNU-FLORES can provide access to cutting-edge research and development opportunities. These collaborations can lead to the development of new methods for optimizing resource use and improving efficiency across operations.

In the future, UNIFOODS could explore expanding its sustainability efforts by examining the supply chain and seeking ways to ensure that all production aspects align with environmental goals. This might involve working closely with suppliers to adopt greener practices and exploring circular economy principles to minimize waste.

These findings show the importance of carefully managing resources like water, energy, and land to protect the environment while maintaining production. By investing in better systems and regularly tracking progress, UNIFOODS can continue to improve its operations and set an example for sustainable charcoal production.

By continuously assessing and refining its practices, UNIFOODS can achieve its sustainability targets and inspire other industries to follow suit, contributing to a more sustainable future for Namibia and beyond.

CONCLUSION AND WAY FORWARD

The assessment of Unifoods Charcoal Namibia highlights a significant business model that incorporates sustainable practices, aligns with environmental conservation goals, and supports local economic development. The company's efforts in utilizing invasive wood species from FSC-certified farms contribute to biodiversity restoration and carbon sequestration, which are positive environmental impacts. Furthermore, by creating income-generating opportunities for local communities and promoting sustainable harvesting practices, the company has the potential to further its role as a leader in the charcoal industry.

However, the assessment also identifies areas that require additional data to fully understand the long-term sustainability of the operations. For instance, more detailed information on the environmental impacts of the charcoal production process, such as the exact rates of deforestation, carbon emissions, and water consumption, would provide a clearer picture of the company's ecological footprint. Additionally, a deeper analysis of the social impacts, particularly regarding potential conflicts over resource access with local communities, is necessary for addressing any socio-economic risks.Body

WAY FORWARD

- Data Collection for a Comprehensive Pilot Study: To enhance the understanding of the company's sustainability and natural capital accounting, further data should be collected on resource consumption, waste production, and emissions at each stage of the charcoal production process. This would enable a more accurate environmental impact assessment and guide decision-making regarding sustainable practices.

- Monitoring and Reporting Systems: Establish continuous monitoring systems for tracking the impact of charcoal production on deforestation, water usage, and emissions. A robust reporting system would allow the company to evaluate its environmental performance regularly and adjust as needed.

- Innovation and Diversification: Invest in research and development for new charcoal-based products, such as activated charcoal or biochar, to diversify product offerings and reduce dependency on traditional charcoal sales. This would also create opportunities to tap into new markets and enhance profitability.

- Collaboration and Partnerships: Strengthen partnerships with international buyers and eco-conscious businesses to expand market reach and increase demand for sustainably sourced charcoal. Additionally, consider forming alliances with environmental organizations to bolster the company’s reputation in sustainability.

REFERENCES

- Abuja Cement Limited. (2014). Sustainability report: Integration of natural capital into operational decision-making. Retrieved from https://seea.un.org/content/business-and-natural-capital-accounting-case-study-ambuja-cement-india
- Ahmed, A., Bakar, M.S.A., Azad, A.K., Sukri, R.S., & Phusunti, N. (2018). Intermediate pyrolysis of Acacia cincinnata and Acacia holosericea species for bio-oil and biochar production. Energy Conversation Management, 176, 393–408.
- Amundson, J., Sukumara, S., Seay, J., & Badurdeen, F. (2015). Decision Support Models for Integrated Design of Bioenergy Supply Chains. Handbook of Bioenergy, 163–190.
- Beck, J. (2019). State and Trends of the Namibian Bush Biomass Sector 2019 Based on an inclusive survey in line with the DAS indicator framework. De-bushing Advisory Service (DAS), pp.10-13. Available from:https://www.n-big.org/download/studies/State-and-trends-of-the-Namibian-Bush-Biomass-Sector-2019.pdf
- Bockarie, A.S., Marais, E.A., & MacKenzie, A.R. (2020). Air pollution and climate forcing of the charcoal industry in Africa. Environmental Science & Technology, 54(21), 13429-13438.
- Britz, M.L. & Ward, D. (2007). Dynamics of woody vegetation in a semi-arid savanna, with a focus on bush encroachment. African Journal of Range & Forage Science, 24(3), 131-140.
- Brown, J.R. & Havstad, K.M. (2004). Monitoring to detect change on rangelands: physical, social and economic/policy drivers. African Journal of Range & Forage Science, 21(2), 115-121.
- Brunntrup, M., Hermann, R., & Gaebler, M. (2009). Bio-energy in Namibia: opportunities, threats and institutional challenges for rural development and food security. In XIII ICABR Conference on “The Emerging Bio-Economy”, pp. 18-20.
- Brüntrup, M. & Herrmann, R. (2010). Bioenergy Value Chains in Namibia: Opportunities and Challenges for Rural Development and Food Security.
- Brüntrup, M., Herrmann, R., & Gaebler, M. (2009). Bio-energy in Namibia: opportunities, threats and institutional challenges for rural development and food security.
- Buitenwerf, R., Bond, W.J., Stevens, N. & Trollope, W.S.W. (2012). Increased tree densities in South African savannas: >50 years of data suggests CO2 as a driver. Global Change Biology, 18, 675-684.
- Buyer, J.S., Schmidt-Küntzel, A., Nghikembua, M., Maul, J.E., & Marker, L. (2016). Soil microbial communities following bush removal in a Namibian savanna. 10
- Charis, G., Danha, G., & Muzenda, E. (2019). Waste valorisation opportunities for bush encroacher Biomass in savannah ecosystems: A comparative case analysis of Botswana and Namibia. Procedia Manufacturing, 35, 974-979.
- Charis, G., Danha, G., Muzenda, E. (2020). Characterisations of Biomasses for Subsequent Thermochemical Conversion: A Comparative Study of Pine Sawdust and Acacia tortilis.
- Christian, C. (2006). Kavango Biofuel Project - Public Information Document, Colin Christian & Associates CC, Windhoek.
- Coetzee, B.W.T., Tincani, L., Wodu, Z., & Mwasi, S.M. (2007). Overgrazing and bush encroachment by Tarchonanthus camphoratus in a semi-arid Savanna. African Journal of Ecology, 46, 449-451.
- Colin Christian & Associates cc. (2010). Environmental Impact Assessment Report, Energy for Future: Bush-to-Fuel Project. Environmental Impact Assessment Report for Energy for Future (EFF), Windhoek, Namibia.
- Cunningham, P. L., & Detering, F. (2017). Determining age, growth rate and regrowth for a few tree species causing bush thickening in north-central Namibia. Namibian Journal of Environment, 1, A-76.
- De Klerk, J. N. (2004). Bush encroachment in Namibia. Ministry of Environment and Tourism, Windhoek, Namibia, pp. 253.