BUSINESS AND NATURAL CAPITAL ACCOUNTING CASE STUDY: GONDWANA COLLECTION

Biodiversity Economy in Selected Landscapes of Namibia Project

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2024

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LIST OF ACRONYMS

AC – Air Conditioning

CAMP – Conservation, Accommodation, and Management Program

CEO – Chief Executive Officer

CO_2 – Carbon Dioxide

CSR – Corporate Social Responsibility

DML – Damara Mopane Lodge

ESC – Etosha Safari Camp

ESL – Etosha Safari Lodge

FH – The Farmhouse

GHG – Greenhouse Gas

ISO 14051 – International Standard for Material Flow Cost Accounting

KAL – Kalahari Anib Lodge

MFCA – Material Flow Cost Accounting

NCA – Natural Capital Accounting

NDVI – Normalized Difference Vegetation Index

OECD (2018) – Organization for Economic Co-operation and Development (2018)

SDG(s) – Sustainable Development Goal(s)

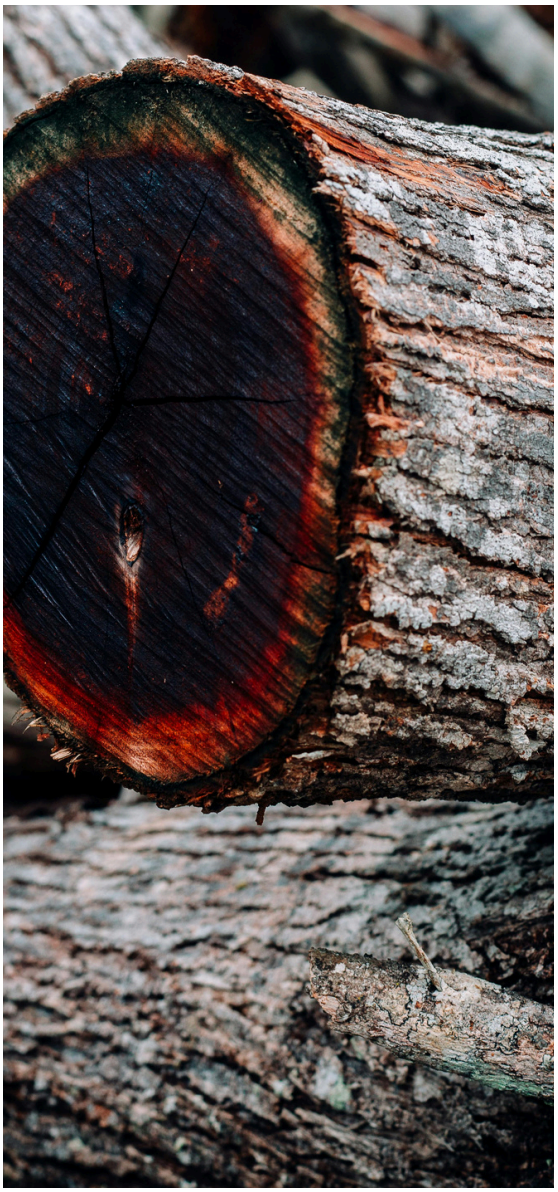
UN – United Nations

UNU-FLORES – United Nations University Institute for Integrated Management of Material Fluxes and Resources

OVERVIEW

In today's globalised and highly competitive business environment, companies increasingly leverage sustainability as a competitive advantage . This paper explores how natural capital accounting (NCA) offers a structured approach to measure and value natural resources, enabling businesses to better align their operations with social, ecological and economic sustainability.This case study on Gondwana Collection Namibia applies a resource nexus to analyse natural capital usage through material flow cost accounting (MFCA), a framework aligned with ISO 14051, to trace material and energy flows, identify inefficiencies, quantify costs, and optimise resource management. This paper was prepared for the biodiversity economy in selected landscapes of Namibia project to demonstrates how sustainable practices can enhance resource management, cost efficiency, and sustainability in the tourism sector by integrating natural capital accounting into business operations.

BACKGROUND



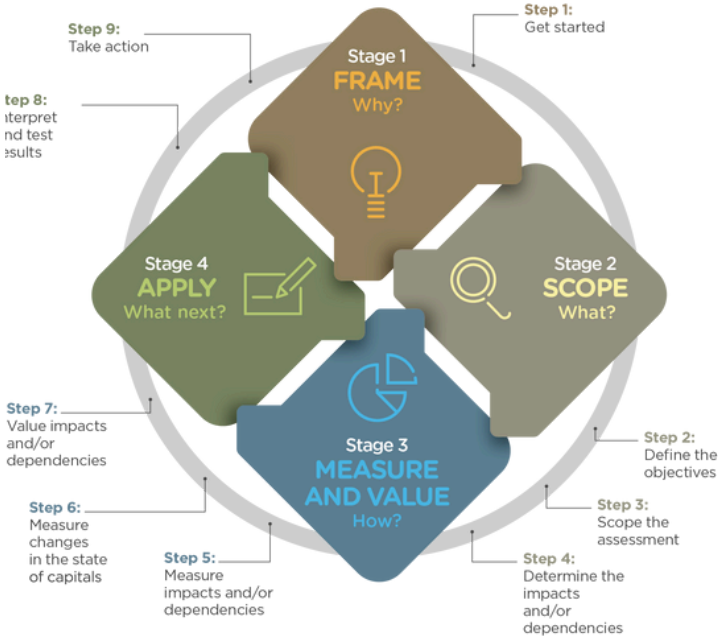
Despite their reliance on natural capital, many businesses fail to account for their environmental impacts and dependencies, leading to inefficiencies and increased vulnerability to resource scarcity globally.

According to the OECD (2018) Businesses around the world are often challenged by productivity enhancement, material usage, waste managent and resource sustainability. This is as a result of growing population and high consumption demand of raw materials. It is estimated that 50% SMEs businesses globally contribute to gross domestic product (GDP) (UN, 2018). However, these in comparison to the large scale enterprises in developing countries have significant challenges in material accounting and resource efficiency as they only monitor their production output, due to associated costs of material flow accounting (Van Hoof and Lyon, 2013).

Material Flow Cost Accounting (MFCA) is a tool, that offers a solution by tracing material and energy flows to quantify environmental and financial costs associated with resource use and waste and aligns with the ISO 14051 (Christ and Burritt, 2015). Unlike traditional accounting, MFCA assigns value to inefficiencies, encouraging sustainable practices. While extensively applied in manufacturing, its use in the tourism sector is limited.

This paper addresses the gap identified by Christ and Burritt (2015) on the lack of research on MFCA application in developing countries. The objective of the case study is to apply the natural capital accounting principals into a tourism business using MFCA tool. By combining natural capital principles with cost flow analysis, it aims to identify resource dependencies, measure ecological and financial impacts, and propose strategies to optimise resource efficiency. This approach aligns with various global sustainability frameworks, such as the UN's Sustainable Development Goals (SDGs), offering tourism businesses a path toward sustainable environmental and economic resilience.

METHODOLOGY



SOURCE: CAPITALS COALITION, NATURAL CAPITAL PROTOCAL (2021)

This paper employs case-based research methodology to assess a tourism business Gondwana Collection Namibia. The case study provides an empirical link by answering the why, what, how and what next questions of the given research on Natural Capital Accounting using the MFCA diagnostic tool to understand the impacts and dependencies of business, trace material and energy flows, and identify inefficiencies. According to various researchers, this tool has proved to be efficient in helping organisations visualise the material flows and inventory (Guenther et al., 2015). Additionally, this study will bridge the gap between research and real world applicability through observation and interactive data collection.

The case study formulation began by theoretical sampling using the Grounded Theory framework to identify relevant sectors and stakeholders in Namibia for case studies. Stakeholder interviews provided insights into industry challenges, shaping the study framework. Through the NCP framework's nine-step methodology the researchers prioritised sustainable businesses for case studies, leading to the selection of Gondwana Collection.

GONDWANA COLLECTION NAMIBIA

The name “Gondwana” was inspired by the ancient supercontinent that once united the southern hemisphere, symbolising connection and harmony with nature. Gondwana Collection, was founded in 1995 and s one of Namibia's leading tourism and hospitality business. Gondwana was founded on the premise of creating a tourism facility that is committed to conservation and community development. The business employs over 1045 people and contributes over N$5 million to the cause of conservation and community funds. Additionally, the business has spent over N$1.5 million, in goodwill contributions and donations to help the vulnerable communities through the Gondwana care trust.

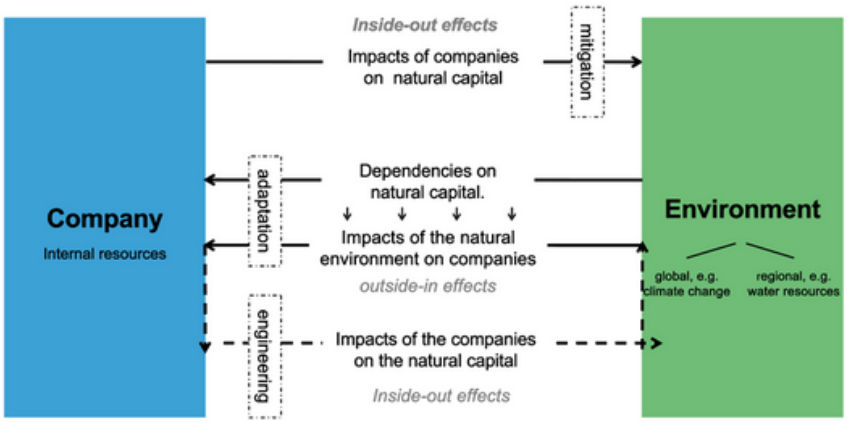
Gondwana collection has an ambition to secure and unlock tourism potential, and preserve cultural and ecological integrity. This vision led the business entity to take the first step and review its operations and the impact on the environment through a true value approach.

MEASURING IMPACTS AND DEPENDENCIES

Figure 1, depicts the dynamic relationship between a business and the environment, highlighting the impacts and dependencies. The figure highlights two perspectives on the intricate relationship between business and environment of Inside -out effects and Outside -in effects. The inside-out effects represent the impacts business have on natural capital (e.g., emissions, resource extraction, pollution) and how employing mitigating actions like efforts to reduce negative effects could be responses to the impacts.

Whereas, the Outside-in effects demonstrate the dependencies and influence by natural capital and environmental changes (e.g., availability of raw materials, climate risks) on business and how adaptive and engineering strategies can be applied to address these dependencies . Therefore, this figure illustrates the importance of understanding the relationship of a business and nature to ensure risk mitigation and sustainable equitable operations.

FIGURE 1: IMPACTS AND DEPENDENCIES



SOURCE: IMPACTS ON AND DEPENDENCIES OF NATURAL CAPITAL (SOURCE: PROF. GUENTHER)

NCP Accounting Stages

In line with the Natural Capital Accounting Protocol Stages, Gondwana collection developed the vision of a "net-positive impact of all Gondwana activities" and went through 4 stages to understand their relationship to nature and to society :

- **Stage 1:** Why? In the frame phase potentially relevant impacts and dependencies are identified by taking into consideration internal and external stakeholders.
- **Stage 2:** What? In the scope phase the objective of the assessment is defined; the scope and the most relevant impacts and dependencies are selected in a materiality process based on the business and the stakeholder perspective.
- **Stage 3:** How? In the measure and value phase data to be collected and methods to be selected are decided upon. Changes have to be tracked and the value of the impacts and the dependencies should be assessed.
- **Stage 4:** What next? In the apply phase the results have to be interpreted and decisions have to be taken. Finally, assumptions have to be challenged.

Stage 2 : Impact of internalisation assessed

In the scope phase the project team specified how to measure the net-positive impact along the impacts and dependencies and the following impacts were considered the most relevant;

1. **Inputs:**

- energy use,
- water use, and
- land use.

2. **Outputs:**

- greenhouse gas emissions,
- waste water, and
- waste.

In measuring dependencies, Gondwana collection identified water resources as a direct dependence and biodiversity as an indirect dependency (in terms of untouched nature, wide landscapes, iconic fauna and flora) as the key reason for tourists to visit the lodges. Additionally, to increase resilience to dependencies on natural capital a proactive approach of anticipating developments, and responding to them is key. The analysis was also complemented by the societal impact taking the perspectives of different stakeholders such as:

- Staff
- Communities
- Land owners
- Tourists

STAGE 3: MEASURE AND VALUE

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

A. Energy use

Three lodges and camps were chosen for analysis, as shown in Figure 2, to identify differences in best practice sharing. Figure 2 demonstrates that lodges use more energy than camps, and the lodge Damara Mopani Lodge (DML) uses more energy than the lodge ESL. Reasons for this could be a higher number of pools and rooms or larger rooms, reflecting that more luxurious lodges and camps have a higher energy consumption. Cost drivers have to be identified. A detailed analysis could show e.g. that the staff uses only a small percentage of the energy. Moreover outliers, e.g. the existence of a butchery with the attached cold storage, should be removed for the analysis. 100% of the energy requirement is covered by the network of Nampower and the corresponding energy mix. At present, however, the planning of solar systems is being driven forward. Key consumers of electricity are the pumps for the pools and cooling facilities. Due to the small data set trends are not visible yet, a longer-term analysis should be strived for to inform decision making. Moreover, the capacity use in terms of the number of guests has an impact on the results and fixed (independent of the number of guests) and variable (dependent on the number of guests) energy use should be differentiated.

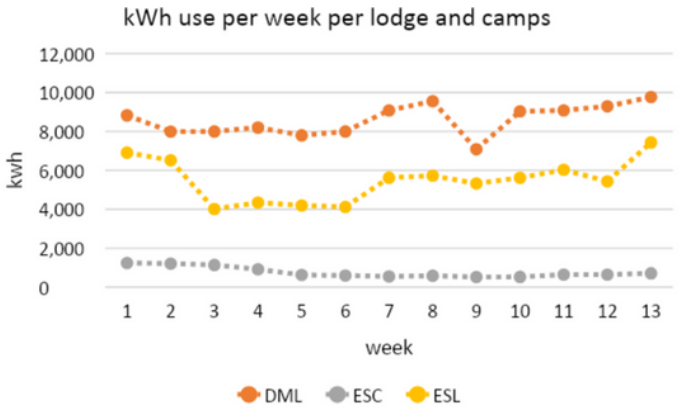


FIGURE 3: ENERGY CONSUMPTION IN LODGES DML AND ESL AND CAMP ESC PER WEEK

B. Water use

Being one of the driest countries in sub-Saharan Africa, Namibia's water is a scarce resource. Therefore, measuring the water footprint is indispensable. Figure 4 shows total water use per lodge per week. The water consumption varies widely between the lodges, but also per day. Most water use is by the guests. The lodge water consumption includes the pool water, with a high impact on the water use, especially in cases were there is more than one pool at a lodge. The results indicated that the farm house uses the most water, due to the plantations and the butchery. But also, climatic issues play an important role.

The results also indicated that, Water consumption per person per day at the Gondwana lodges varies between 60l and 250l (excluding the butchery and outliers). The average water consumption in Windhoek is 163l. A higher water consumption than in Windhoek can originate from the pools, irrigation and the different behaviour of tourists compared to average Namibians.

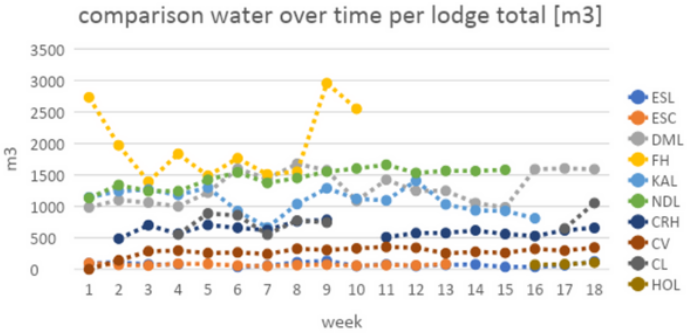


FIGURE 4: TOTAL WATER USE PER LODGE PER WEEK

C. Land use

Tourism significantly impacts natural capital, particularly through land use and greenhouse gas (GHG) emissions. Particularly, Land use for roads, accommodations, pools, farmland, airstrips, and parking lots disrupts ecosystems, leading to habitat loss, landscape changes, and biodiversity risks. These alterations lead to species alteration and suppression of others due to resource competition and human-wildlife conflicts.

Through this assessment environmental impacts were measured in two categories: direct impacts (on-site activities) and indirect impacts (from travel). Direct GHG emissions were from energy use in lodges, with significant variation across lodges. For example, emissions range from 0.31 kg CO_2/person/day Etosha Safari Camp (ESC lodge) to 51.56 kg CO_2/person/day (FH lodge), influenced by energy-intensive operations like cold storage in one facility. Namibia's electricity supply is 57% imported from neighboring countries and , is primarily hydro-based but supplemented by solar and coal-powered imports, which has an emissions factor of 0.422 kg CO_2/kWh. Since the CO2 consumption per person per day is assumed to be directly proportional to the power use, the CO2 emissions per guest at a lodge with high energy use is higher than the CO2 emissions per guest at a lodge with low energy consumption.

Indirect emissions include tourist travel by flights and rental cars. Flight emissions vary significantly, e.g., 4,367 kg CO_2 (Cologne-Windhoek round trip) to 7,571 kg CO_2 (Atlanta-Windhoek). Car trips, such as Windhoek to DML, add 179.82 kg CO_2 per person.

lodge	kWh/person/day	CO2/person/day
ESL	2.34	0.99
ESC	0.74	0.31
DML	2.16	0.91
FH	122.17	51.56
KAL	13.01	5.49

TABLE 2: DIRECT GREENHOUSE GASES IN LODGES PER PERSON PER DAY

STAGE 3: MEASURE AND VALUE

Based on the Scoping phase of the assessment, the analysis focused on the two **Dependencies identified** through consultations with company representatives:

Water resource

Namibia faces an overall water deficit, but the severity varies across regions, influencing tourism operations and sustainability.
According to the Atlas of Namibia (2019), the demand for water is steadily increasing in Namibia and is estimated that by 2030, the total water consumption will rise up to 772 million cubic metres in comparison to 334 million cubic metres in 2008. Additionally, water resource was identified as one of the major dependencies across the sectors with Irrigation accounting for 40% in comparison to tourism with 5.9%. Gondwana depend on water resources for guest services, landscaping, and other operational needs, but excessive or inefficient use exacerbates regional water scarcity. This interdependence highlights the importance of adopting water conservation measures and sustainable management practices.

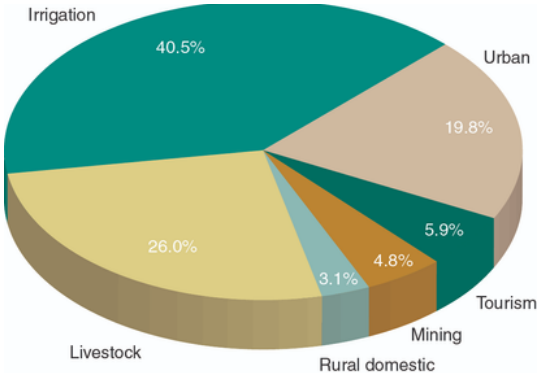


FIGURE 2: WATER DEMAND BY SECTOR. SOURCE: ATLAS OF NAMIBIA (2018).

Biodiversity

Biodiversity is a critical dependency for the Gondwana Collection, directly underpinning its value proposition and appeal to tourists seeking to experience Namibia's rich ecosystems. The vegetation index, reflecting regional climatic variations and water availability, demonstrates the diverse ecological conditions across the country. These variations support distinct vegetation types, which sustain diverse trophic networks, including game species central to the attraction of Gondwana's nature reserves.
The health and diversity of ecosystems are important for maintaining wildlife populations and the aesthetic recreational value in tourism businesses. Research indicates that vegetation and biodiversity influence human well-being (Oktaviani et al., 2018; Sobhee, 2006). This is because biodiversity supports both the ecological balance and the economic viability of Gondwana's operations in this context.

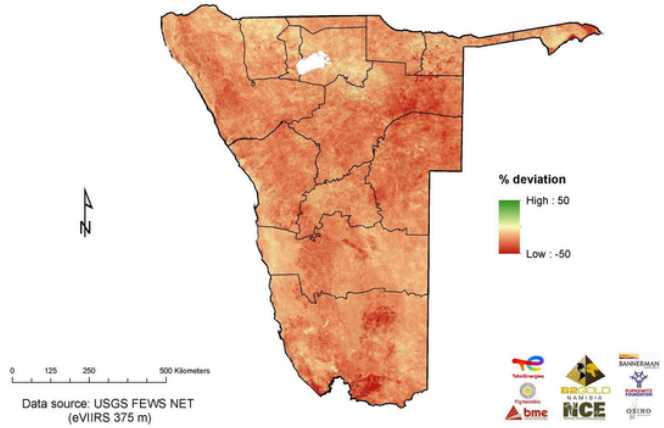


FIGURE 6: VEGITATION INDEX (NDVI) FROM THE LONG-TERM AVERAGE (SINCE 2012).SOURCE: AGRI-ECOLOGICAL SERVICES (2024).

Societal Impacts

Businesses should strive for a net-positive impact by balancing their environmental, social, and economic contributions, while ensuring accountability and leadership in sustainability. Gondwana, like all companies, has a vital responsibility to society. The profitability of its lodges affects the well-being of employees and their families and supports economic growth in Namibia. Additionally, jobs are created in the supply chain and tourism sector, enhancing the well-being of visitors and their productivity after returning home. Gondwana also focuses on educating employees to raise awareness about nature and tourist well-being. Through activities like game drives, staff share their knowledge of the natural world with tourists, fostering appreciation for the environment. These educational initiatives empower staff and support career development for Namibians. However, historical expropriation of indigenous land, that occurred decades ago has resulted in negative consequences, such as family separations due to remote work and the creation of artificial communities.
As shown in figure 7, environmental and social activities can have both positive and negative effects on the company's overall value.

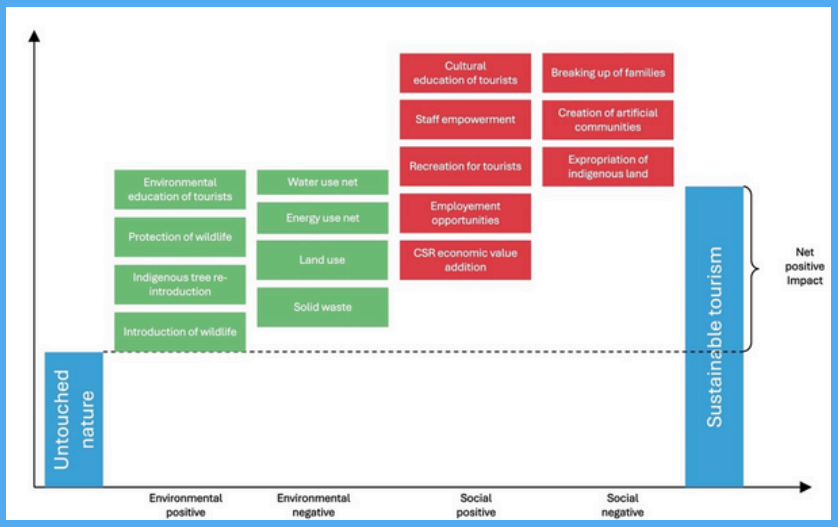
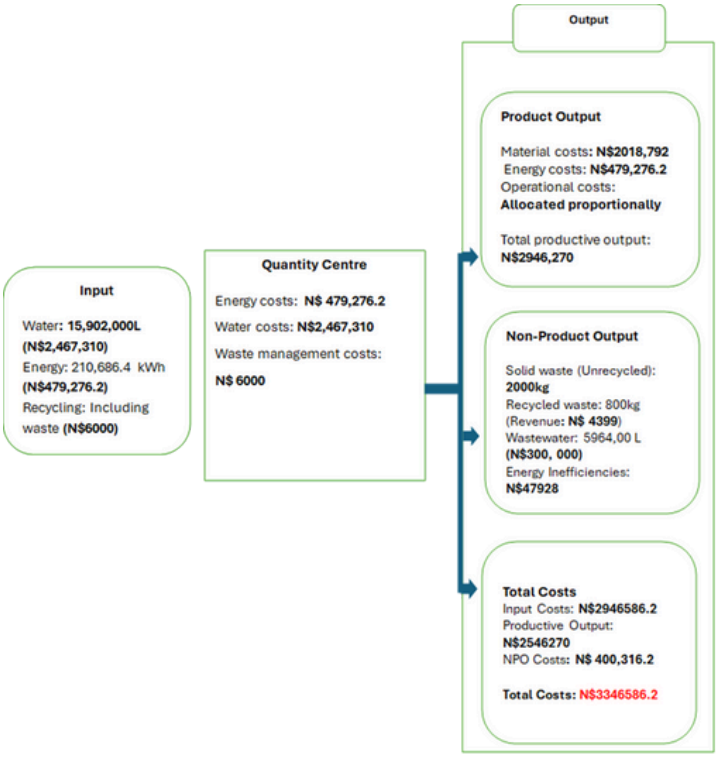


FIGURE 7: GONDWANA'S IMPACTS AND DEPENDENCIES ON NATURAL RESOURCES ADAPTED FROM ABUJA CEMENT LIMITED (2014)

STAGE 4: APPLY

In the apply phase of the assessment, the analysis concentrated on the resource dependencies identified during workshops with company representatives. Interpreting these results and making decisions is crucial for the path ahead. The structure aligns with the scope phase and previously used in the measure and value phase.

Material Flow Cost Accounting



The material flow cost account (MFCA) for Gondwana provides an overview of the financial and material flows associated with Gondwana's collection operations, highlighting efficiencies and areas for improvement. The analysis reveals significant resource inputs, including 15,902,000 litres of water, costing N$2,467,310, and 210,686.4 kWh of energy, costing N$479,276.2. Waste management and recycling contribute an additional N$6,000 to operational expenses.

The productive output, valued at N$2,946,270, comprises material costs (N$2,018,792), energy costs (N$479,276.2), and proportional operational costs. However, non-product output (NPO) contributes significantly to inefficiencies. This includes 2,000 kg of unrecycled solid waste, 800 kg of recycled waste (yielding revenue of approximately N$4,399), 5,964 litres of wastewater (costing N$300,000), and energy inefficiencies amounting to N$47,928.

The total costs of operations amount to N$3,346,586.2, with non-product costs accounting for N$400,316.2 annually. The findings highlight significant resource dependencies, particularly on water, and inefficiencies in energy use and waste management across the lodges.

However, opportunities for improvement include optimising water usage, enhancing recycling processes, and reducing energy inefficiencies to minimise costs and environmental impact. This analysis demonstrates the critical importance of integrating sustainability into operational strategies to achieve long-term resource efficiency and resilience.

FIGURE 8: MFCA ESTIMATE FOR GONDWANA COLLECTION (SOURCE: AUTHORS CALCULATIONS BASED ON ESTIMATES FROM GONDWANAS DATA: 2018)

Managing the Impacts in terms of inputs and Outputs:

Inputs

To enhance energy efficiency in lodges, consider these measures:

- Improve air-conditioning and water heating systems.
- Increase guest capacity to lower costs.
- Set and compare energy targets quarterly.
- Install power meters for monitoring and upgrades.
- Educate guests on energy conservation.
- Implement energy-saving policies, like limiting hot water use during noon.
- Use solar energy for individual room water heating.

For water usage improvement:

- Install individual water meters in guest rooms to promote awareness.
- Monitor water pipelines for leaks and usage at facilities.
- Compare water consumption across lodges to identify trends.
- Benchmark against average household water use (163L/day in Windhoek).

Land use:

- Optimize land use for gardens, staff accommodation, roads, and conservation areas.
- Assess irrigation practices, considering drought-resistant plants or vegetable cultivation

Outputs

Carbon Compensation Projects:

- Establish a plant nursery in regions with sufficient water availability.
- Support tree-planting initiatives, prioritizing species with high carbon sequestration potential, such as the endemic Marula tree.

Community and Tourist Engagement:

- Launch social projects to raise awareness among Namibians and tourists about CO_2 emissions.
- Promote education on emission reduction and compensation strategies.
-

Managing Dependencies on the Natural Environment

Water Resources:

- Implement location-specific water management strategies tailored to the regional availability of water resources.
- Incorporate water-saving technologies and recycling systems to reduce dependence on scarce water supplies.

Biodiversity:

- Focus on targeted conservation initiatives for species impacted by tourism or environmental changes.
- Support restoration projects in degraded ecosystems to enhance biodiversity and maintain ecosystem services.

By integrating these measures, Gondwana can reduce its environmental footprint while ensuring the resilience of its operations and the ecosystems it depends on.

RECOGNISING NATURE RELATED RISKS AND OPPORTUNITIES

Category	Nature - Related Risks	Nature Related Opportunities	Value Proposition	Value Creation and Delivery	Value Capture
Operations	Water scarcity affecting operations.	Optimise water use through recycling and reuse systems.	Sustainable tourism with efficient resource use.	Invest in water recycling, centralized water heating, and efficient air-conditioning systems.	Reduced operational costs and enhanced resource resilience.
	Biodiversity loss impacting wildlife attractions.	Targeted conservation and restoration of local ecosystems.	Unique wildlife and eco-tourism experiences.	Collaborate with conservation organizations and employ sustainable land-use practices.	Improved ecosystem health, attracting more eco-conscious tourists.
	Energy inefficiencies leading to higher emissions.	Transition to renewable energy sources.	Energy-efficient and carbon-neutral lodging.	Deploy solar panels and energy-efficient systems across lodges.	Lower energy costs and improved brand image as a sustainable operator.
Regulatory & Legal	Increased regulation on water and energy use.	Proactively exceed compliance by adopting innovative sustainability practices.	Eco-compliant tourism services.	Develop environmental management plans and report on natural capital accounting.	Avoidance of penalties, fostering trust with authorities, and securing operational licenses.
	Carbon tax or stricter GHG regulations.	Develop carbon offset projects (e.g., planting Marula trees)	Carbon-neutral tourism offerings.	Partner with local communities to establish carbon sequestration programs.	New revenue streams from carbon credits and improved compliance.
Reputational	Damage to brand image due to unsustainable practices.	Position Gondwana as a leader in sustainable tourism.	Sustainable tourism brand identity.	Transparent reporting on sustainability practices and guest education programs.	Enhanced customer loyalty and competitive market differentiation.
Market and Product	Growing demand for eco-conscious travel.	Introduce carbon-neutral holiday packages.	Tailored sustainable travel experiences.	Offer carbon offset programs (e.g., tree planting) and locally sourced organic food products.	Increased revenue from eco-conscious travelers and high-value experiences.
	Dependency on imported energy affecting pricing.	Diversify energy sources to include solar and wind energy.	Renewable energy-powered tourism infrastructure	Partner with energy providers for sustainable energy solutions.	Stable energy costs and reduced dependency on external suppliers.
Social	Conflicts with local communities over resource use.	Develop social projects to support local livelihoods (e.g., Marula tree planting)	Support for local communities through sustainable tourism.	Empower local communities with conservation-based employment opportunities and education.	Strengthened social license to operate and improved community relations.

CONCLUSION AND WAY FORWARD

In conclusion, this case study demonstrates the essential role of sustainability accounting in achieving environmental and financial objectives. By incorporating material flow cost accounting, Gondwana identified inefficiencies in non-productive outputs, such as energy waste and wastewater, enabling targeted improvements in resource management. The analysis highlights that sustainability accounting goes beyond traditional financial metrics, allowing companies to quantify their environmental impacts and dependencies while uncovering cost savings and eco-innovation opportunities. By integrating water recycling, biodiversity conservation, and waste management into its operations, Gondwana exemplifies how businesses can align their strategies with sustainable development goals, creating measurable benefits for both the environment and their bottom line.

Furthermore, the study showcases how a holistic approach to sustainability can transform a company's business model. Gondwana's innovations, from sustainable tourism offerings, such as carbon-neutral holidays, to process optimisations like wastewater reuse and efficient energy systems, demonstrate how operational improvements can enhance resilience and customer satisfaction. Organisational and marketing innovations, such as employee empowerment and guest education, further illustrate how fostering awareness and behavioural changes among stakeholders can amplify a company's environmental contributions. These initiatives serve not only to reduce Gondwana's ecological footprint but also to strengthen its value proposition as a leader in sustainable tourism.

Ultimately, this assessment serves as a roadmap for other businesses in the tourism and hospitality sector. By identifying and addressing natural resource dependencies and impacts, companies can transition toward sustainable business models that integrate product, process, organisational, and marketing innovations. This four-stage approach focuses on value proposition, value creation, and value capture and demonstrates how sustainability can drive profitability, customer engagement, and long-term competitiveness. Gondwana's example provides valuable insights into how eco-friendly practices can safeguard natural capital, contribute to global sustainability efforts, and ensure business success in a rapidly evolving market.

"Corporate social responsibility is nothing but maximizing the value of your company over a long period."
"In the long term, social and environmental issues become financial issues"

LESSSONS LEARNT

1. Sustainability Accounting Enhances Decision-Making:

The incorporation of Material Flow Cost Accounting (MFCA) offered essential insights into inefficiencies in resource usage, particularly concerning water, energy, and waste management. By measuring non-productive outputs like solid waste, wastewater, and CO_2 emissions, Gondwana pinpointed actionable opportunities to enhance resource efficiency and lower operational costs.

2. Natural Capital as a Dependency and Impact:

The evaluation revealed that Gondwana's operations heavily depend on natural resources such as water, biodiversity, and energy, emphasizing the need for sustainable management of these dependencies. At the same time, the company's activities, including land use and greenhouse gas emissions, affect natural capital, highlighting the necessity for mitigation strategies.

3. Alignment with Sustainable Development Goals (SDGs):

This case study illustrated how tourism businesses can align with international sustainability goals, including water conservation (SDG 6), climate action (SDG 13), and biodiversity protection (SDG 15). Initiatives like carbon-neutral tourism packages and community-focused conservation projects reinforce Gondwana's dedication to sustainable development.

4. Holistic Approach Drives Business Resilience:

By tackling environmental, regulatory, reputational, and market risks, Gondwana established itself as a leader in sustainable tourism. This all-encompassing strategy enhances resilience against external shocks, fosters customer trust, and ensures long-term profitability.

5. Tourism as a Force for Good:

Gondwana discovered that sustainability innovations—such as water reuse systems, renewable energy integration, and community-led biodiversity conservation not only protect natural capital but also improve the guest experience, giving them a competitive edge in the eco-tourism sector.

NEXT STEPS

The project's next steps are to continue assessing measures of impacts and dependencies on various business models that wish to measure their relationship with biodiversity and nature, contribute to achieving the envisaged sustainable development goals, and share the project findings and experience with others. Furthermore, The assessment will guide future monitoring indicators to be integrated into business decision-making.

GONDWANA COLLECTION NAMIBIA

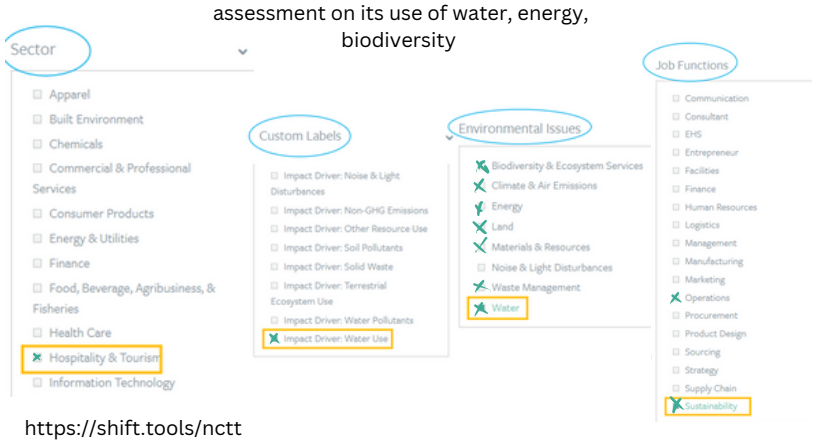
CAPITALS COALITION

Biodiversity Guidance to accompany the natural capital protocol: Application by Gondwana collection

1. Tourism Company

2. Conduct a company-wide assessment on its use of water, energy, biodiversity

3. Sustainability team



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