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Unlocking Value: A Business and Natural Capital Accounting Case Study on Nakara Leather (PTY) Ltd.

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Abstract

Natural capital accounting systematically calculates the total stocks and flows of natural resources and services. This framework integrates environmental and social considerations into business decision processes and enables businesses to evaluate, recognise, measure and manage the resources they impact and depend on. Even though the tannery business sector plays an important role in economies, providing social security and household income. The tannery business has vastly grown over the years and has become heavily industrialised with waste, chemical use and environmental degradation consequences. As tanneries and business industries face scrutiny over their environmental impacts, the NCA provides a structured approach to measuring material usage such as water, energy, land, and biodiversity within the tannery business operations and value chains. Material flow cost accounting (MFCA) is utilised in this pilot case of Nakara Leather (PTY) Ltd to test the usability of the MFCA and how tannery businesses can account for natural capital and identify inefficiencies within production processes, providing insights into resource use, waste generation, and energy consumption. The study findings demonstrate that there is an efficient utilisation of raw materials, which included 30,000 m^2 of animal hides processed monthly. Investments included N$70,056 (US$3,980) in energy (10%), N$8,556 (US$486) in water (2%), and US$78,300 in labour (15%). With leather export prices peaking at US$61.15/kg, returns highlighted variability and dependency on market trends, projecting a 2024 price of US$10/kg. Waste management costs, comprising 5% of operational expenses, illustrate the need for more innovative sustainable practices to enhance the overall return on investment (ROI) and profitability. This case study provides a useful resource for businesses on their natural capital accounting journey in the leather tannery supply chain. It highlights Nakaras (PTY) Ltd. efforts toward sustainable and environmentally conscious practices, helping others gain a better understanding of the concept. This understanding will aid in businesses identifying dependencies and impacts and pathways of monitoring material in businesses.

Keywords: Business, Biodiversity, Natural Capital, Sustainable Resource Use, Leather Tannery, MFCA

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Introduction

Over the years, the leather industry has expanded significantly in the industrial context. Leather production, a by-product of the livestock sector, is an ancient business that relies on the meat industry. This business uses various animals, i.e. cows, goats, sheep, crocodiles and wildlife species products that considerably influence the pricing and supply of leather. This industry processes animal hides into leather materials and goods, including mats, bags, and clothing. As of 2024, the global leather market is valued at approximately $404.81 billion and is projected to reach $590.48 billion by 2029, reflecting a compounded annual growth rate of 7.9%, according to The Business Research Company (2024).

Leather production involves several value-addition stages before the creation of finished products, notably the tanning of hides. These methods are used within the tanning process, such as chrome tanning, which utilises chromium salts to produce fast, durable, and water-resistant leather, and vegetable tanning, a traditional approach that employs plant-based tannins to yield firmer and more eco-friendly leather. Other tanning methodologies include aldehyde, synthetic, and oil tanning, each presenting distinctive characteristics and environmental implications.

A principal challenge tannery businesses face on a global scale is the need to mitigate their substantial environmental footprint, particularly concerning water consumption, chemical usage, and waste management throughout the production and supply chain. Tannery processes are resource-intensive, demanding significant volumes of water and energy while generating hazardous waste, which primarily consists of substances such as chromium (III), calcium hydroxide, sodium sulfide, ammonium chloride, biocides, aldehydes, dyes, and emissions, all of which pose grave environmental risks. The industry's heavy reliance on finite natural resources necessitates integrating environmentally sustainable practices into their management practices. Furthermore, very few studies within the tannery sector demonstrate pathways toward sustainable leather production and resource management.

In this case study, Nakara Leather PTY is used to demonstrate how adopting Natural Capital Accounting (NCA) and Material Flow Cost Accounting (MFCA) is an innovative model for other tannery enterprises in Namibia and countries facing comparable economic and environmental challenges. By recognising and accounting for natural capital while implementing sustainable business practices, Nakara Leather exemplifies how industries dependent on natural resources can achieve economic viability without compromising environmental integrity, especially in light of the environmental degradation for which tannery businesses globally have been held accountable. This approach enhances the company's financial sustainability and aligns with international efforts to foster sustainable business practices that contribute to the preservation of biodiversity and the health of ecosystems. For Nakara Leather, this pilot initiative has established a foundation for more informed decision-making, which is crucial for achieving long-term sustainability and ensuring compliance with prevailing international environmental standards.

Background

Founded in 1980 and restructured as a limited company in 2018, Nakara Leather has emerged as a prominent leather manufacturer in Windhoek, Namibia. The company operates on a 15,810 m^2 site and employs over 145 personnel. It maintains retail outlets throughout Namibia, including Swakopmund, a coastal town 352 km west of Windhoek. Nakara is a business-to-business (B2B) and business-to-consumer (B2C) brand that received international recognition as Africa's Tannery of the Year in 2011 (see Figure 2 for its location in Namibia). Nakara Leather is a leather and tannery business that produces Swakara skins and leather products which adhere to international standards. The company has a diverse portfolio, from upholstery leathers exported to furniture manufacturers in Africa and Europe to leather garments, ostrich bags, and game skin accessories and aniline and semi-aniline bovine leathers, kudu and oryx leathers, and waxy pull-up, fully pigmented, full-grain, and corrected-grain leathers.

In 1990, Nakara entered a joint venture with the Finnish company Gruenstein, facilitating its entry into the global markets with Swakara and leather garments tailored for international consumers. This led to investments in cutting-edge machinery and equipment in the late 1990s and early 2000s to cater for the international market. With a strong commitment to sustainability, Nakara has implemented advanced technologies to reduce its environmental impact (Nakara leather PTY, 2023). The tannery employs sustainable tanning processes that ensure wastewater is treated according to municipal standards before discharge. Furthermore, the hair from bovine hides and game skins is filtered during the initial processing stages, significantly lowering the effluent's Chemical Oxygen Demand (COD). With 44 years of industry experience, Nakara aims to establish itself as the preeminent leader in raw-to-finish leather manufacturing throughout Southern Africa. By emphasising excellence, innovation, and sustainability, the company continues to fulfil the global demand for high-quality leather products while actively contributing to Namibia's socio-economic development and conservation efforts (Nakara leather PTY, 2023).

Figure 1: Nakara Leather PTY location on map

Why Natural Capital

Natural capital accounting is essential for managing resources sustainably and significantly benefits local communities and the environment. This case study focuses on natural capital accounting in the tannery industry, using Nakara Leather as an example. It applies Material Flow Cost Accounting (MFCA) to evaluate Nakara's business model, and the flow of materials involved in its operations. Nakara Leather sources its raw materials through Namibia's conservation-based initiatives, such as Community-Based Natural Resource Management (CBNRM). These initiatives enable local communities to manage wildlife resources sustainably while earning financial benefits. This approach encourages the protection of ecosystems and helps maintain healthy wildlife populations (Wenborn et al., 2022). Through CBNRM, communities earn income from selling animal skins, which supports their livelihoods and conservation efforts (Naidoo et al., 2016). Nakara ensures that game skins are sourced under strict regulations to maintain sustainable use, particularly in areas with abundant wildlife. Its business model integrates conservation principles, creating economic value from wildlife while reducing poaching and preventing land degradation. This approach highlights Nakara's role in environmental stewardship and its support towards Namibia's biodiversity conservation and sustainable development goals.

Materials and Methods

The case study used secondary data from the sustainability reports of Nakara and other leather companies, and articles on leather companies were used. Additionally, Nakara Leather PTY was purposely selected based on the criteria that the business is reporting on sustainability actions, which makes it easier to analyse content on the natural resources associated with the tannery and leather production across Nakara Leather's operations. Qualifying both material inputs (water consumption, energy use and animal hides and skins) and the outputs (water, chemical and solid waste) gives tannery and leather production companies significant information about their

environmental impact and possible effects of their operations on the ecosystem and natural resources. The resource nexus was also used to understand the relationship between impacts and dependencies in a tannery business. A process flow diagram showing the steps followed in the identification of the relevant impact drivers (materiality assessment) in Table 1 below:

Table 1: Materiality assessment

Activities	Resources	Potential Impact drivers	Relevance
Raw Material Sourcing	Land, biodiversity, water, soil	Overharvesting, deforestation, habitat loss, unethical sourcing	**High:** Direct impact on ecosystems and resource availability.
Tanning	Water, energy, chemicals, waste	Water contamination, high energy use, hazardous waste, air pollution	**High:** Significant environmental burden due to resource intensity and chemical use.
Manufacturing	Energy, water, raw materials	Energy inefficiency, material waste, greenhouse gas emissions	**Medium**: Opportunities for process optimisation and waste reduction.
Logistics	Energy, fuel, packaging	Carbon emissions, transportation-related pollution	**Medium:** High emissions, with potential for low-carbon solutions.
Retail	Packaging, energy	Non-biodegradable waste, energy consumption	**Low:** Packaging and energy can be optimised for minimal environmental impact.
Marketing	Energy, materials (digital & print media)	Misaligned consumer expectations, lack of sustainable messaging	**Medium:** Consumer demand for transparency and sustainability is growing.
Community Engagement	Land, biodiversity management, social capital	Employment creation, local development, cultural preservation	**High:** Positive social and environmental outcomes through equitable practices.

Conservation	Biodiversity, soil, water	Habitat restoration, sustainable land use and soil practices.	**High:** Critical for maintaining ecosystem services and enhancing reputation.
End-of-Life Management	Waste, energy, materials	Disposal issues, landfill waste, lack of recycling infrastructure	**Medium:** Opportunities for circular economy practices to reduce waste.

Table 1 illustrates the materiality assessment of Nakara leather, which was relevant in selecting activities and impact drivers for the assessment. This process involved identifying activities that could potentially have an impact on the leather business or cause it to have a change in the natural capital in its value chain activities, taking into consideration that not all value chain activities can be accounted for as it is difficult to account for all elements that could trigger a change in the natural capital. Therefore, for this assessment, most of the material resources and activities were considered based on the availability of the data, as seen in Table 1 above. The analysis aims to assess the usability of the MFCA within the context of leather production and tannery businesses to account for natural capital and identify inefficiencies within production processes, providing insights into resource use, waste generation, and energy consumption.

Figure 2:Nakara leather factory. Source: Nakara Laeather (PTY)

Data Collection and Evaluation

The materiality assessment was conducted with a literature review, data collection, and interviews to determine the most significant natural capital resources. These resources were documented in quantifiable units, such as water, energy, and animal hides, along with the types of waste produced, including chemicals, solid waste, and wastewater. This comprehensive approach clarified the company's dependence on natural capital and its environmental and social impacts. Furthermore, interviews and evaluations of existing data were performed to explore how Nakara aligns with Namibia's conservation strategies, particularly the Community-Based Natural Resource Management (CBNRM) program and the applicability of the MFCA for environmental management accounting. The MFCA was also used to assess the leather production business's corrective action and efficiency measures.

The flow of materials throughout the leather production process began with the reconstruction of material flows by individual quantity centres per unit. This entailed that some data required the calculation of some variables based on secondary literature and business organisational formulars and unit measures. Secondary market information and material flow knowledge was then used for tracking how materials are used and where they go during production for example the cost of materials that end up in the finished product and those lost as waste during the process and then calculating the waste material which is termed as material losses to determine the value of wasted materials at each stage of production. The production was divided into different production stages or "Quantity centres" and the material flow between the stages and cost of materials is tracked for each stage as seen below in figure 4

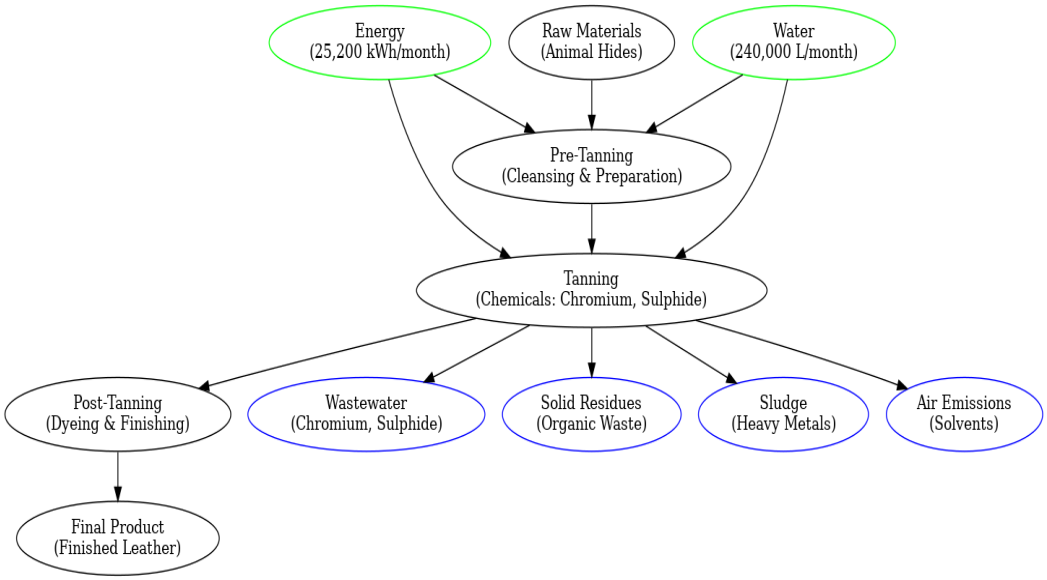

Figure 3: Material flow model of main targets selected in the production process

As illustrated in Figure 4, the process consists of key input and output stages in the leather production business, including raw materials, pre-tanning, tanning, and post-tanning, culminating in finished leather. Green circles represent critical Input, i.e. energy (25,200 kWh/month) and water (240,000 L/month). Blue circles show the waste outputs: wastewater, solid residues, sludge, and air emissions. Quantity centres track material inputs, process stages, and waste generation, emphasising resource use and environmental impacts at each stage.

Description of the analysis and Findings

The detailed flow matrix for the leather production estimation is shown below in figure 5. Which was calculated using estimates of the material loss per initial Input by cost ratio to calculate the percentage loss for each stage, based on both the mass loss (due to waste) and cost inputs.

$$Loss(\%) = \left(\frac{Waste\ Outputs}{Initial\ Input}\right) * 100$$

Then for the cost ratio, the calculations of waste cost were established against total costs at each stage based on the formular:

$$Cost\ Ratio = \frac{Waste\ Cost}{Total\ Costs} * 100$$

Table 2: Material flow costs based on authors estimations

	Input Materials	Initial Input (kg or L)	Output Materials	Waste Outputs	Direct Costs (NAD)	Waste Costs (NAD)	Total Costs (NAD)	Waste Loss (%)	Cost Ratio (%)
Raw Materials	Animal hides	1,000 kg	Prepared hides (900 kg)	Hair, dirt, unusable parts (100 kg)	50,000	5,000	55,000	10%	9.1%
Pre-Tanning	Water, chemicals (lime)	120,000 L	Cleansed hides (850 kg)	Wastewater (40,000 L), solid residues	20,000	10,000	30,000	33.33%	33.33%

Tanning	Chromium salts, water	80,000 L	Tanned hides (800 kg)	Sludge (20 kg), wastewater (30,000 L)	35,000	8,000	43,000	10.5%	18.6%
Post-Tanning	Dye, finishing agents	-	Finished leather (750 kg)	Air emissions (solvents), minor residues	25,000	3,000	28,000	5.33%	10.71%
Total	**-**	**-**	**-**	**-**	**130,000**	**26,000**	**156,000**	**-**	**-**

Table 2 results demonstrate that in the raw materials stage, 100 kg of animal hides are wasted out of an initial 1,000 kg, resulting in a 10% loss in mass, with a waste cost ratio of 9.1%. During Pre-Tanning, 33.33% of the Input (40,000 L of wastewater) is wasted, and the waste costs represent one-third of the total costs. In the Tanning phase, 10.5% of the material mass is lost (sludge and wastewater), with waste costs forming 18.6% of total costs. The post-tanning stage has a smaller material loss of 5.33%, and waste costs constitute 10.71% of total costs.

Key intervention areas based on MFCA analysis

Following the analysis, several strategies have been identified. The first is optimising raw material efficiency by minimising waste and increasing yield. Then water and chemical consumption reduction by utilising recycling systems and alternative substances. Energy efficiency can be improved by adopting renewable energy sources and upgrading equipment. Additionally, prioritising waste reduction through better sludge management and effective wastewater treatment which would then optimise labour and material costs through improved workforce management and material reuse. Finally, stabilise export prices and ensure environmental compliance, including obtaining certifications like ISO 14001, to enhance market competitiveness and support long-term sustainability.

Conclusion

The pilot case study of Nakara Leather illustrates how effective the Material Flow Cost Accounting (MFCA) method can be in identifying material losses and outlining an intervention plan. It was noted that quantifying critical costs can be challenging during the initial phase; however, this issue can be addressed through the use of the "SAP R/3" enterprise system, which automates MFCA calculations for production. Nakara Leather PTY serves as an excellent business model for assessing environmental reporting. The company has initiated several measures to embark on its sustainability journey, with a focus on natural capital and future considerations. Other leather production businesses can learn from Nakara Leather's approach to monitoring environmental impacts, particularly related to pollution and ecosystem vulnerability. This highlights the necessity for increased investment in green technologies and a stronger commitment to sustainable practices. Emphasising the sustainable use of natural capital and implementing MFCA will help ensure that Namibia's leather industry remains economically viable while protecting its unique environmental heritage.

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