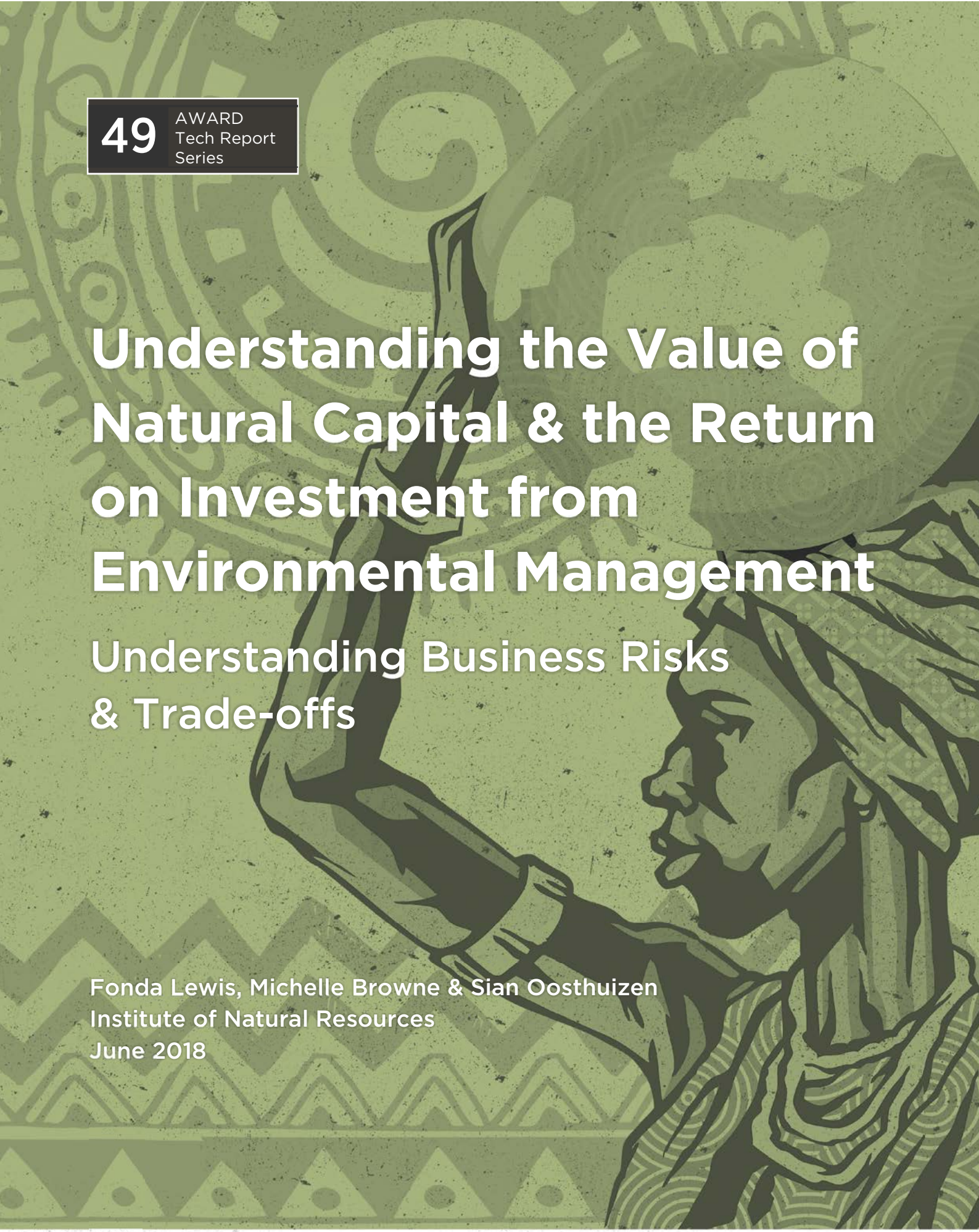

49 AWARD Tech Report Series

Understanding the Value of Natural Capital & the Return on Investment from Environmental Management

Understanding Business Risks & Trade-offs

Fonda Lewis, Michelle Browne & Sian Oosthuizen
Institute of Natural Resources
June 2018

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USAID: RESILIENCE IN THE LIMPOPO BASIN PROGRAM (RESILIM) – OLIFANTS

Acknowledgements

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About USAID: RESILIM

USAID's Resilience in the Limpopo River Basin (RESILIM) program addresses ongoing degradation in the Limpopo River Basin in southern Africa, where people face water shortages, increased floods, and declines in crop productivity as climate change further stresses an already water limited region.

There are two components to the program; one operating at a basin-scale (RESILIM-B, which is implemented by USA-based Chemonix and addresses similar issues at the scale of the four SADC member states share the Limpopo Basin (South Africa, Botswana, Zimbabwe and Mozambique) and a catchment-scale project (RESILIM-O) that is being implemented by the Association for Water and Rural Development (AWARD). Both projects share the same overall objectives. You can find out more information on the RESILIM projects on www.usaid.gov website and www.award.org.za.

The USAID's RESILIM-O focusses on the Olifants Catchment. The program aims to reduce the vulnerability of people and ecosystems in the Olifants Catchment specifically, by improving how transboundary natural resources are managed. By understanding the systemic causes of vulnerability, including climate vulnerability, it is promoting new ways of thinking and acting to promote integrated water and biodiversity management.

The RESILIM-O aims is to reduce vulnerability to climate change through building improved transboundary water and biodiversity governance and management in the Olifants Basin, through the adoption of science-based strategies that enhance the resilience of its people and ecosystems through systemic and social learning approaches.

Project partners

The Institute of Natural Resources

The Institute of Natural Resources (INR) is an applied research organization. The INR is a recognized knowledge provider, strategic and operational supporter, capacity developer, and advocate for the natural resource and environmental management sectors in southern Africa.

Partnering with government, civil society, the private sector and other leading research organisations develops cutting edge solutions to support the resolution of natural resource challenges; provides advice to practitioners, researchers and policy makers; integrates effort; builds the capacity of graduate professionals to operate effectively in the workplace; and advocates an environmentally secure future for all. The INR is an independent, non-profit, public benefit organization committed to serving the people of southern Africa.

Organisationally work is arranged into a series of interlinked thematic areas:

- Adaptation and Resilience
- Agriculture and Rural Livelihoods
- Environmental Governance and Sustainability
- Ecosystem

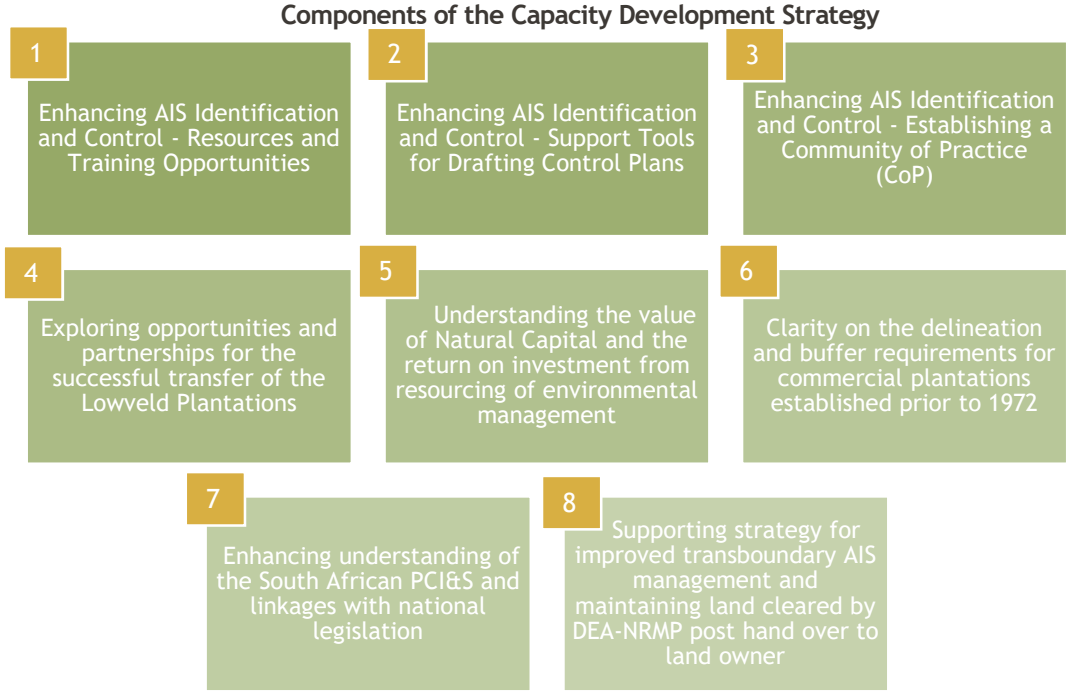
1 Overview

The RESILIM-O Restoration and Rehabilitation programme has to date highlighted a number of priorities for building resilience in the Olifants Basin, which have highlighted the need to address the negative impact of forestry operations in the catchment on biodiversity and water resources in the Blyde and Klaserie sub-catchments. Challenges in terms of complying with the requirements of relevant forestry and environmental legislation in terms of SFM have been identified by restoration practitioners working in the above sub-catchments. These priorities include, for example, the need to:

- **Conserve biodiversity and sustainably manage high priority ecosystems by supporting collective action informed by adaptive strategies and practices; and**
- **Reduce vulnerability to climate change and other factors by supporting collective action informed by adaptive strategies and practices.**

Direct and indirect impacts from plantation forestry operations in the Blyde and Klaserie sub-catchments of the Olifants Basin are recognised to have significant negative impacts on biodiversity and water resources in these catchments, which undermine resilience. This component of the RESILIM O project therefore aims to develop the capacity of target stakeholders to enhance sustainable forest management (SFM). Developing capacity to improve forest management to reduce and mitigate the negative impacts of forestry operations on biodiversity and water resource in the Blyde and Klaserie sub-catchments (high biodiversity areas and strategic water resource areas in the Olifants catchment) will contribute to resilience building. Engagement of key stakeholders in the forestry sector in the Blyde and Klaserie sub-catchments highlighted a number of challenges to sustainable forest management. Through a social learning process, these challenges were explored with stakeholders to identify capacity constraints underlining these challenges. A capacity development strategy was then developed to address the core capacity constraints. The strategy includes seven components:

Components of the Capacity Development Strategy



This document addresses component 5 of this capacity development strategy, namely **Understanding the value of Natural Capital to commercial forestry and the return on investment from adequate resourcing of environmental management.**

2 Legal Obligations for Environmental Management & Protection of Ecosystems

In terms of the National Environmental Management Act No. 107 of 1998 (NEMA), commercial forestry operations need to consider the 'Duty of Care', and adopt a responsible approach to the protection of the environment. In this regard, forestry operations should seek to minimise the impacts of operations on soil, water, biodiversity, ecosystem services, ecosystem infrastructure, natural capital and heritage resources. In the case of negative impacts arising these needs to be responsibly mitigated and managed.

Extract from National Environmental Management Act No. 107 of 1998

NEMA Section 28 (1), states that "Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment."

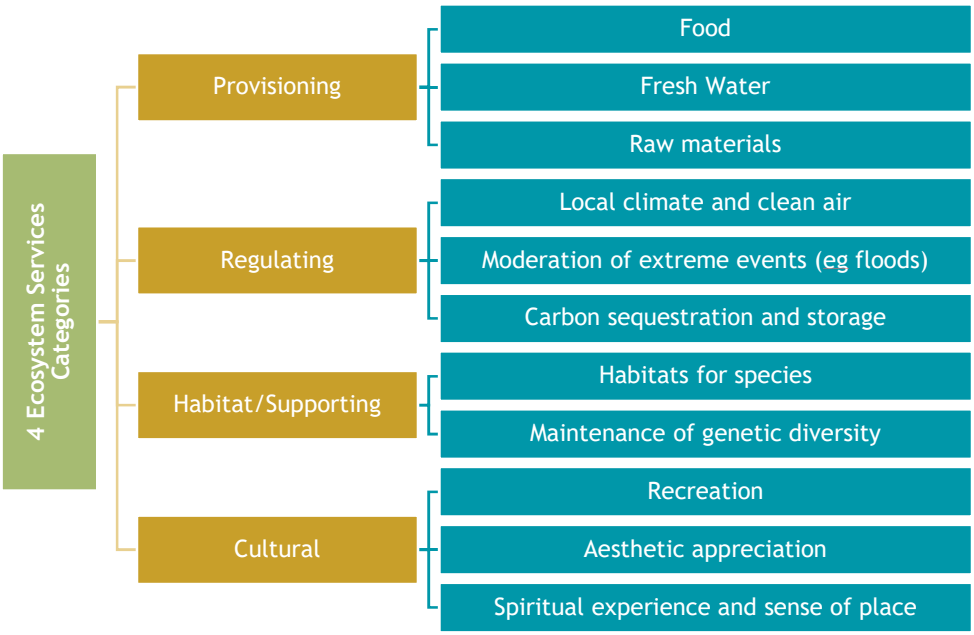
3 The Value of Natural Capital & Ecosystem Services

All ecosystems are characterised by biotic (living organisms) and abiotic components (e.g. climate, soil, rocks). There are constant biological, geochemical and physical processes that take place between these components, which is referred to as ecosystem functions. These living and non-living resources (ecosystems) form natural capital from which ecosystem services flow. Changes in the quantity and quality (health) of ecosystems result in changes in natural capital, and also in the flow of ecosystem services.

Ecosystem services are the benefits provided by ecosystems that sustain human life and well-being. Ecosystem functioning therefore needs to be maintained and protected to ensure the ongoing supply of these services.

Ecosystem-based Adaptation (EbA) is the use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people to adapt to the adverse effects of climate change (Convention on Biological Diversity 2009). Ecosystem-based Adaptation can lessen flooding, improve water and soil quality, and deliver benefits for safeguarding development and businesses in the face of climate change. EbA involves the conservation, sustainable management, and restoration of ecosystems to support adaptation to the impacts of climate change. EbA approaches include, for example, integrated water resource management, and sustainable forest management interventions that use nature to reduce vulnerability to climate change.

Four ecosystem services categories can be defined with a range of services in each, examples include:



4 Natural Capital and Business Risk

Human well-being depends on natural capital and the benefits that flow from it. However we all (as individuals or collectively) can degrade natural capital depending on how we use it. Similarly, all businesses depend and impact on natural capital and associated ecosystem services, directly and indirectly to some degree. For example, businesses depend on natural capital for critical production inputs such as land, raw materials, water, and energy. Businesses also depend on many regulating ecosystem services, such as natural filtration of water, waste assimilation, and protection from floods and storm damage.

Business dependence on natural capital will vary according to the sector in which they operate, their role in the value chain, and the geographic location of their operations. For example, primary sectors such as agriculture and forestry both depend on and provide a supply of essential provisioning services, such as food, water, and fibre. These provisioning services are also important natural raw materials for many manufacturing and processing operations. Regulating services such as natural pollination and pest control are critical in agriculture, while water filtration and erosion control are essential to hydropower operations and beverage companies.

Impacts to natural capital can be attributed directly to business operations or indirectly from the use of products and services. Impacts on natural capital may be negative or positive, for example:

- Negative impacts can be associated with land degradation or pollution;
- Positive impacts culd be attributed to ecological recovery due to business investment in site rehabilitation, or improved water quality due to filtration of processed water before release back into environment.

These impacts and dependencies create risks and/or opportunities for a business, which in turn can create costs and benefits for the business. Furthermore, the condition of natural capital can directly affect business performance.

Business impacts and dependencies on natural capital are closely linked. For example a company may depend on water, while the quality of its water management practices will affect the scale of impacts generated through its use of water. Their management may increase the capacity of natural capital to deliver valuable provisioning services (i.e. food and fibre), but may also reduce the capacity of the same natural capital to supply ecosystem services on which other businesses depend, such as wildlife for recreation or vegetation for flood control.

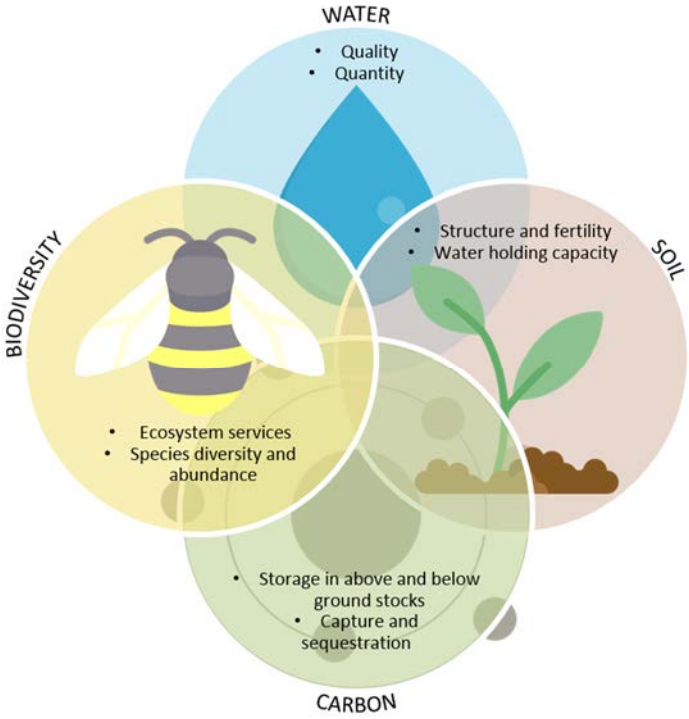
5 Natural Capital & Commercial Plantation Forestry

Commercial forestry operations depend on natural capital to maintain business productivity and profitability; management practices that degrade these resources can threaten supply chain resilience. Sustainable management of natural resources can yield significant business opportunities while supplying wood and fibre as well as goods and services in perpetuity.

Stocks of water, biodiversity and soil are deteriorating globally, and in many cases the rates of degradation are being exacerbated by climate change. If not managed sustainably, natural resource degradation will translate into risks for companies. Sustainably managing the stocks and flows of natural resources can provide tangible business opportunities (Table 1) Therefore, the sustainable management of production landscapes (ecosystems) has the potential to simultaneously benefit natural capital and build resilience of the businesses in the commercial forestry sector.

TABLE 1: RISKS AND OPPORTUNITIES RELATED TO NATURAL RESOURCE DEGRADATION OR SUSTAINABLE MANAGEMENT (SOURCE: UNIVERSITY OF CAMBRIDGE CISL, 2017)

RISKS	OPPORTUNITIES
- Lack of access to raw materials and complicated responsible sourcing - Lack of compliance with global certification schemes and loss of high conservation value areas - Challenged reputation and brand identity - Expensive inputs to counter the degradation of soil water and biodiversity - Increasingly stringent regulatory demands and market forces - Stressed supply chain and decreased efficiency	- Resilient supply chains - Increased productivity and avoidance of liability caused by environmental damage - Reinforced consumer trust, investor interest and finance - Competitive advantage and market differentiation - Maintained commercial value - Recognised conservation and mitigation efforts - Wellbeing and health of forest landscapes and communities



Commercial forestry, which includes timber as well as pulp and paper, is fundamentally dependent on natural capital such as water, biodiversity, soil and carbon. It is however possible for the sustainable management of the ecosystems (production landscapes) to simultaneously benefit natural resources and build resilience in the commercial forestry sector. Better understanding of how commercial forestry impacts and depends on natural resources will facilitate appropriate action going forward.

Tables 2-5 that follow illustrate examples of dependencies, impacts and business implications for commercial forestry operations, and are replicated from University of Cambridge CISL (2017):

TABLE 2: COMMERCIAL PLANTATION FORESTRY DEPENDS AND IMPACTS ON WATER QUALITY AND QUANTITY

<table>
<tr><td>Dependencies:

Commercial forestry depends on rainwater for tree growth and to maintain the evapotranspiration rates necessary to respond to climatic changes.</td><td rowspan="2">Business implications:

- Regulatory risks can occur as a result of altering hydrological cycles and exacerbating climate change
- Reputational risks can result from disrupting community water supplies
- Remediation costs can occur because of the need to treat affected streams
- Intensified vulnerability of supply can result from natural events, including storms and fires</td></tr>
<tr><td>Impacts:

Commercial forestry practices can cause surface water acidification, changes in interception rates and in streamflow, sediment and nutrient inputs to drainage systems, transpiration reductions, water quality decreases and leaching.</td></tr>
<tr><td colspan="2">Interventions:

The implementation of riparian buffer zones may help mitigate negative impacts on stream water through nutrient sequestration, maintenance of local micro-climates, filtering of sediment and other materials and regulation of nutrient export. The importance of riparian zones and of their structural or functional values depends on the intensity of management activities and on the area’s vulnerable resources.</td></tr>
</table>

TABLE 3: COMMERCIAL PLANTATION FORESTS DEPEND & IMPACT ON SPECIES DIVERSITY & ABUNDANCE

<table>
<tr><td>Dependencies:

Biodiversity underpins many ecosystem services. The functional traits of individual species play an important role in determining ecological processes necessary for forest growth and ecosystem resilience.</td><td rowspan="2">Business implications:
- Reputational risks and result from forest fragmentation and decreased biodiversity;
- Brand impacts can occur because of NGO activity and affect customer and investor trust in the company’s ethical stance and brand;
- Raw material supply risks can result from decreased resilience because of impacted ecosystem services;
- Regulatory demands can put pressure on businesses to meet appropriate biodiversity levels and targets.</td></tr>
<tr><td>Impacts:

Forest management impacts biodiversity through clearcutting, drainage, thinning, forest fragmentation, edge effects and the use of alien species. Management practices may result in loss of ecosystem, species and genetic diversity and may therefore reduce stand resilience to epidemics</td></tr>
<tr><td colspan="2">Interventions:

The establishment of commercial plantations, including site preparation, can have severe impacts on biodiversity by threatening the indigenous and native composition and function of biodiversity in the region. When considered at the larger landscape-scale, biodiversity can be sustained by safeguarding protected areas and high conservation value areas and by setting up Ecological Networks (ENs). For example, managing unplanted areas as biodiversity corridors. These help mitigate biodiversity loss, maintain ecosystem processes and services and improve the quality of life of local communities, while at the same time ensuring the financial viability of forest operations.</td></tr>
</table>

TABLE 4: COMMERCIAL FORESTRY DEPENDS AND IMPACTS ON SOIL STRUCTURE AND FERTILITY

<table>
<tr><td>Dependencies:

Soil provides nutrients and water to support the growth and health of vegetation and it acts as an anchor for tree roots. Soil structure and fertility help regulate valuable ecosystem processes including nutrient uptake, decomposition, water availability and wood production</td><td rowspan="2">Business implications:

- Increased costs can result from the need for expensive inputs, such as fertilisers, and for machinery to counter the degradation of soil;
- Risks to revenue generation can result from poor quality soil being unable to sustain yields from existing lands;
- Increased risks around security of supply can result from soils within the landscape being degraded and prone to erosion.</td></tr>
<tr><td>Impacts:

Forest management can result in soil acidification, compaction and soil erosion.</td></tr>
<tr><td colspan="2">Interventions:

Forest management practices, including restoration, have a significant role to play in improving soil fertility. The natural recovery of degraded areas is generally very slow. Management efforts should therefore aim at restoring these areas to improve their productive and ecological values. Enrichment planting, which involves the deliberate introduction of tree seeds or seedlings into a degraded forest, has been introduced as a means of improving forest resources management. Because it has the potential to improve soil fertility, yields and restoration of degraded forests, it has gained the attention of companies wishing to secure future availability of timber.</td></tr>
</table>

TABLE 5: COMMERCIAL FORESTS DEPEND AND IMPACT ON CARBON CAPTURE AND STORAGE

<table>
<tr>
<td>Dependencies:

Biological growth of trees requires carbon from the atmosphere for assimilation, photosynthesis and transpiration. Through photosynthesis, carbon dioxide is converted into important food for trees and is fundamental for growth.</td>
<td rowspan="2">Business implications:

- Reputational pressures from NGOs and other groups can occur because of business practices that impact climate change
- Increased risks around license to operate and activities can result from climate change impacts
- Regulatory demands around carbon emissions can occur because of increased regulations from governments and civil society groups
- Influence on consumer and investor interest can result from negative brand image and identity</td>
</tr>
<tr>
<td>Impacts:

Forest management may impact carbon sequestration rates and decrease the soil carbon stock in the organic layers of the forest floor by as much as 50% through more frequent logging, drainage and site preparation operations. This can then be released into the atmosphere as CO2. Impacts are intensified after thinning interventions and at the end of rotation periods.</td>
</tr>
<tr>
<td colspan="2">Interventions:

Felling of timber results in decaying residues and soil disturbance, thereby contributing to greenhouse gas emissions and climate change, and causing significant damage to carbon stocks and to ecological integrity. Improving carbon storage through sustainable forest management. Responsible felling as well as fire management practices (e.g. of non-planted areas, fire-breaks, trash etc.) reduce carbon emissions, increase carbon sequestration and improve forest productivity and health.</td>
</tr>
</table>

6 Conclusions

The impacts of commercial forestry operations on natural capital are not insignificant. They could be considered in decision-making in the same way that quality and cost are assessed in procurement.

Enhancing resilience in the forestry sector requires better understanding and measurement of the environmental and commercial impacts of sustainably managing natural resources. Promoting appropriate action, exploring applied research and collaborating with stakeholders can support the sector in addressing its environmental management challenges.

The business case for undertaking a natural capital assessment as part of an informed decision making process is based on identifying the risks and opportunities that arise from impacts and/or dependencies on natural capital that might be invisible, overlooked, misunderstood, or under-valued. A causal loop modelling approach can be used to explore and understand the consequences and trade-offs associated with certain business decisions. Once the consequences and trade-offs of decisions have been identified, they can be valued, and you can then consider how best to integrate them into your business operations.

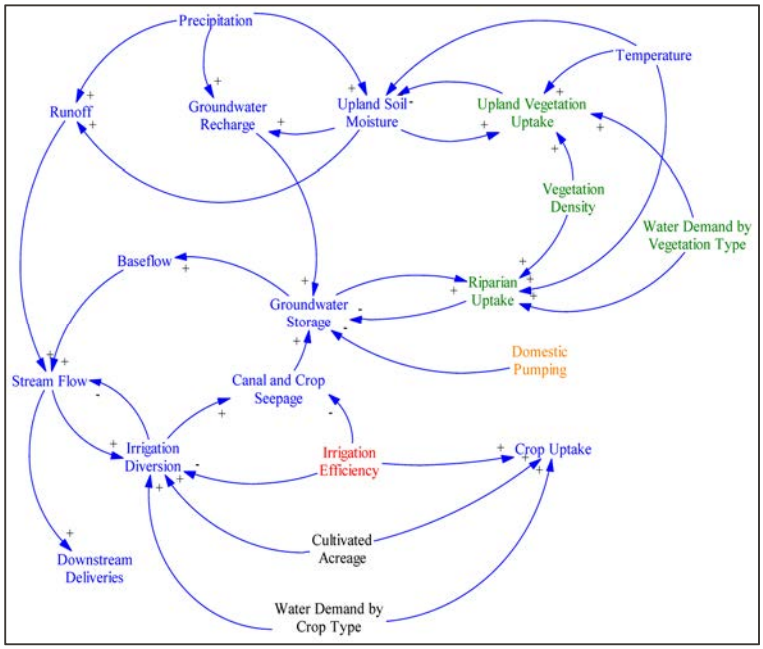


Figure 1: A causal loop model.
(Source: http://www.mdpi.com/2071-1050/4/11/2998/htm)

A causal loop model (see Figure 1) builds, in a qualitative way, the interactions between key elements and the feedback loops in the modelled system. This helps the visualizing of how different variables in a system are interrelated. Variables are plotted and arrows are used to show the influence of one variable on another. Relationships between variables may be positive or negative, and may be stronger or weaker. A positive relationship between elements defines that an increase in the "cause" element will increase the "effect" element; a negative relationship shows that an increase in the "cause" element will result in a decrease in the "effect" element (or *vice versa*).

Building causal loop models, and tools such as 'Return on Investment' (ROI) assessment and 'Cost Benefit Analysis' (CBA) can help to inform decision making that can lead to improved resilience for commercial forestry operations as well as natural capital:

Return on Investment (ROI) is a performance measure, used to evaluate the efficiency of an investment/management practices or compare the efficiency of a number of different investments/practices. To calculate ROI, the benefit (or return) of an investment is divided by the cost of the investment. The result is expressed as a percentage or a ratio. This approach has been widely used in conservation planning. In these cases ROI typically examines a portfolio of options, and generally does not convert all or even any of the benefits into monetary equivalents

A cost-benefit analysis (CBA) is a process by which business decisions are analyzed. The benefits of a given situation or business-related action are summed, and then the costs associated with taking that action are subtracted. CBA is generally used for evaluating a single or small number of options.

EXERCISE

Use a causal loop diagram to model some of the sustainable forest management / environmental trade-offs that are being made as a result of budgetary constraints and explore implications for natural capital and associated business risks. Use the key natural capital components upon which commercial forestry is fundamentally dependent (i.e. water, biodiversity and soil) as the foundation for this exercise.

Once you have developed the causal loop diagram apply a Return on Investment approach to explore the costs and consequences of current levels of investment into environmental components of sustainable forest management within your operations.

Use the outcomes to inform recommendations for revisions to current processes for allocation of resources to environmental management within the operations. An example of a causal loop and returns on investment model for a scenario on inadequate soil conservation practices undertaken as an exercise with Komatiland Forest representatives (May 2018) is attached in Annexure 1 as an example.

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8 ANNEXURE 1

Causal Loop and Return on Investment Model for a Scenario on Inadequate Soil Conservation Practices

The prioritisation of the allocation of budgets and resources to recognised core business activities (i.e. silviculture operations), is a strategy aimed at maximising income generation and financial viability of the business. Activities that are widely perceived as non-core activities that are associated with environmental management, such as soil conservation, water resource management, biodiversity conservation, soil nutrient and carbon management are frequently not given equal prioritisation in the allocation of budgets and resources. Inadequate resourcing of these activities can however have the unintended consequences of undermining the resilience and productivity of the resource base resulting in reducing returns and increasing input costs in the long term.

The causal loop model below illustrates a scenario of inadequate investment in soil conservation practices:

- Poor timber harvesting, fire management, and road maintenance practices drive soil compaction and erosion and a decrease in soils nutrient levels. This erodes the ecosystem's regulating services and drives habitat degradation. This habitat degradation is compounded by inadequate rehabilitation in degraded areas and poor control of alien invasive species (AIS). Habitat degradation can also be exacerbated by some of the impacts of climate change such as increasing frequency of extreme events such as floods and droughts, which can reduce water infiltration into soils, driving compaction and erosion. Increased sediment loads in rivers further degrade critical habitats such as wetlands and riparian areas further eroding the regulating services from these habitats;

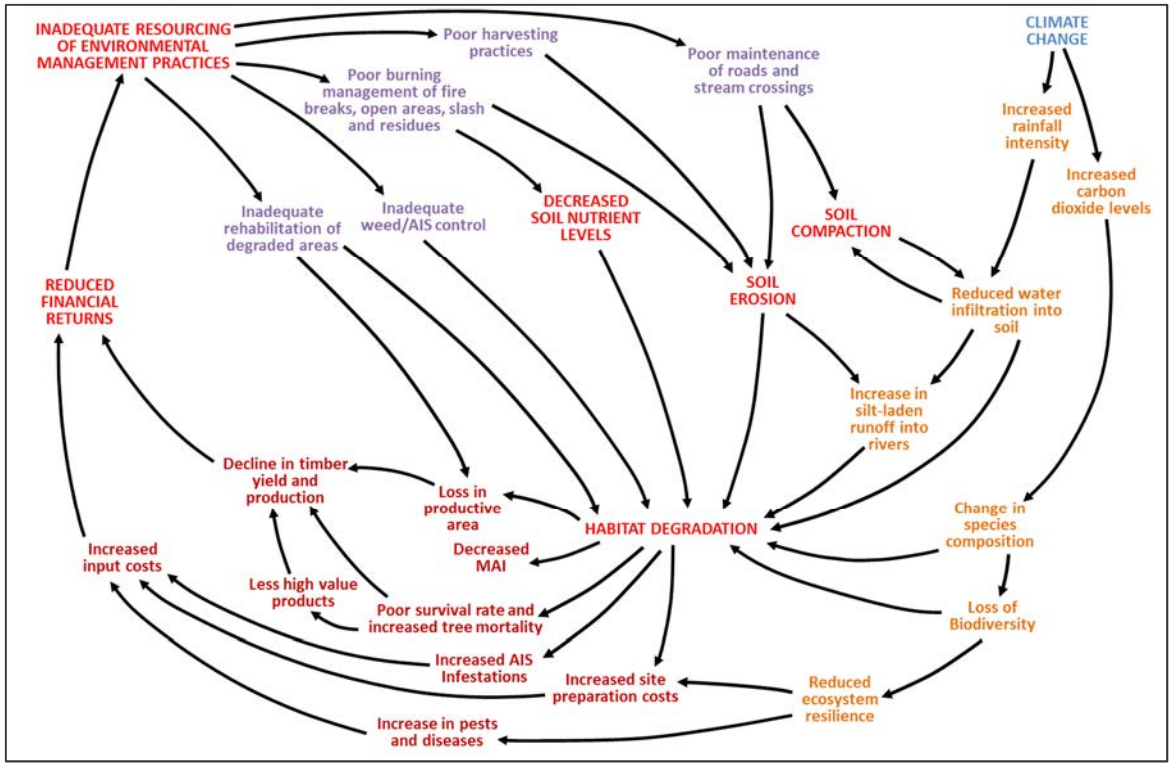

Figure 2: Causal loop illustrating inadequate investment in soil conservation practices.

- Increasing habitat degradation results for example in a loss in productive areas for silviculture operations, decreasing Mean Annual Increments (MIA), less high value products, poor tree survival rate, increased site preparation costs, and increase in pests and diseases.
- Furthermore the erosion of ecosystem resilience and degradation of ecosystem services increases the vulnerability to the impacts of climate change (e.g. floods) and the potential consequences in terms of loss of productive area, increased tree mortality rates, and loss of high value products. This translates into increased business risk and vulnerability.

As financial returns decrease, so the risk of the situation being perpetuated through negative self-reinforcing feedback loops increases - with increasingly scarce resources available for improving environmental management, soil conservation, water resource management, and biodiversity conservation.

However, the return on investment from increased resourcing of environmental management and soil conservation would contribute to:

- Reducing input costs such as AIS control (e.g. less infestation on disturbed areas), fertilizers and disease and pest control (e.g. to compensate for decreased of soil nutrients and outbreaks of pests and disease), and fire risk management (e.g. associated with extensive AIS infestations);
- Increasing timber production and yields associated with higher MIA, more high value products, lower tree mortality and higher survival rates, resulting in increased income levels;
- Enhancing the resilience of the natural ecosystems through sound environmental management also increases the capacity for ecosystems based adaptation and reducing business risks and increasing resilience of the core business of commercial timber production to the impact of climate change.

In addition to the direct financial returns, a range of non-financial benefits would also accrue to increased investment in soil conservation practices, for example:

- More resilient supply chains due to increased security of supply of raw material (timber)
- Increased productivity and avoidance of liability caused by environmental damage
- Reinforced consumer trust, investor interest and finance due to recognised conservation and mitigation efforts
- Maintained commercial value of the asset base

In the medium to long term, the return of investment from improved soil conservation practices could entirely offset the initial increase in budget allocations associated with improved harvesting practices, road maintenance, improved burning practices, effective AIS control and the rehabilitation of eroded and degraded areas. These costs and returns should be recorded and tracked over time to provide the evidence to inform responsible budgeting and resource allocation.

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The Association for Water and Rural Development

AWARD is a non-profit organisation specialising in participatory, research-based project implementation. Their work addresses issues of sustainability, inequity and poverty by building natural-resource management competence and supporting sustainable livelihoods. One of their current projects, supported by USAID, focuses on the Olifants River and the way in which people living in South Africa and Mozambique depend on the Olifants and its contributing waterways. It aims to improve water security and resource management in support of the healthy ecosystems to sustain livelihoods and resilient economic development in the catchment.

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About USAID: RESILIM-O

USAID: RESILIM-O focuses on the Olifants River Basin and the way in which people living in South Africa and Mozambique depend on the Olifants and its contributing waterways. It aims to improve water security and resource management in support of the healthy ecosystems that support livelihoods and resilient economic development in the catchment. The 5-year programme, involving the South African and Mozambican portions of the Olifants catchment, is being implemented by the Association for Water and Rural Development (AWARD) and is funded by USAID Southern Africa.

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