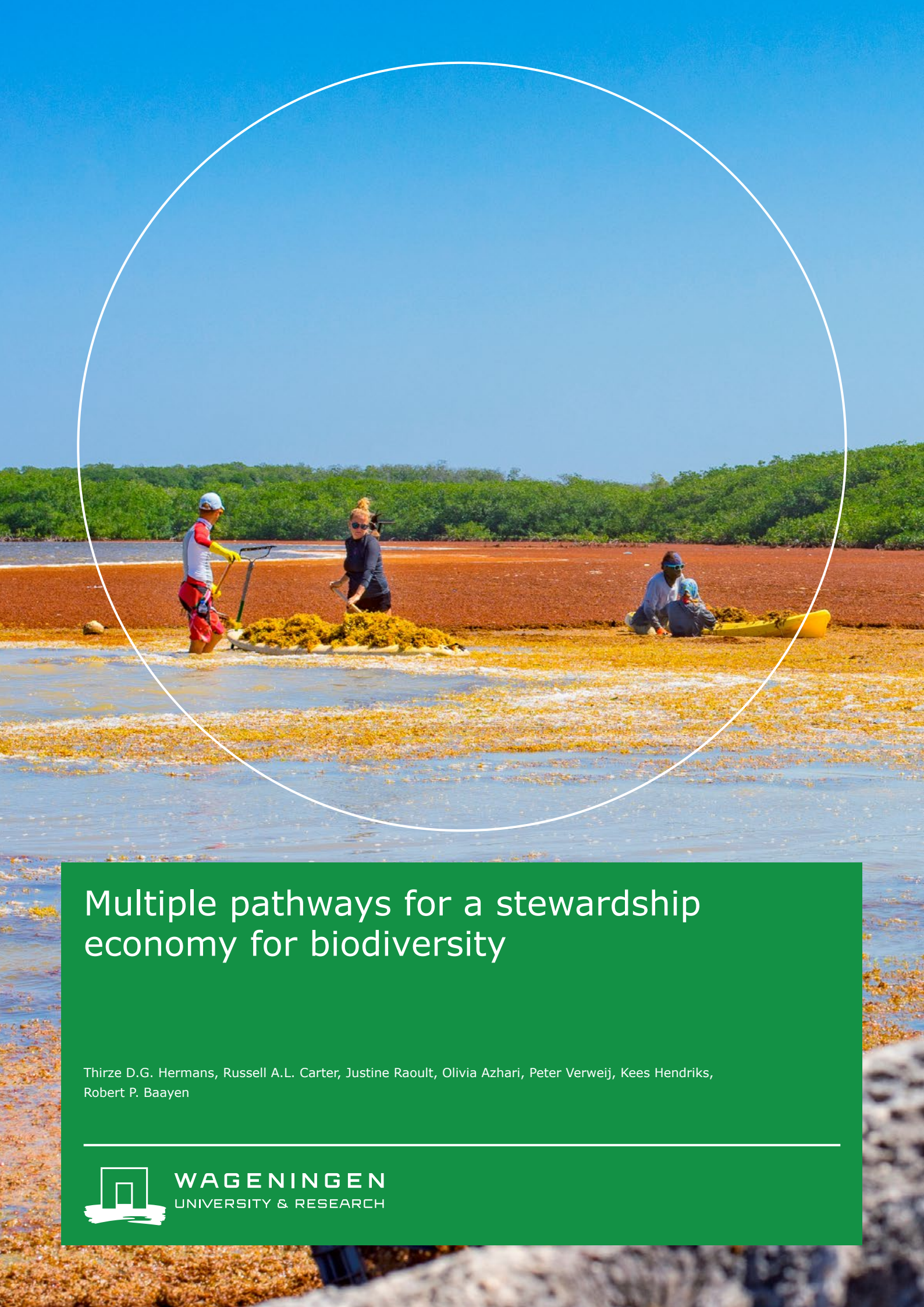

Multiple pathways for a stewardship economy for biodiversity

Thirze D.G. Hermans, Russell A.L. Carter, Justine Raoult, Olivia Azhari, Peter Verweij, Kees Hendriks, Robert P. Baayen

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Multiple pathways for a stewardship economy for biodiversity

Thirze D.G. Hermans,[1] Russell A.L. Carter,[1] Justine Raoult,[1] Olivia Azhari,[1] Peter Verweij,[2] Kees Hendriks,[2] Robert P. Baayen[2]

1 Wageningen Social & Economic Research

2 Wageningen Environmental Research

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Nature conservation often relies on market-driven methods, but these can overshadow values like civic responsibility and fairness. The stewardship economy concept emphasises preserving nature's diverse values, though its implementation is unclear. This report explores pathways to a stewardship economy for biodiversity through case studies in Ethiopia, the Netherlands, Bonaire, and Indonesia. Key pathways include amplifying nature awareness, recognising biodiversity's cultural importance, safeguarding social foundations, fostering partnerships, supportive policy, biodiversity-positive norms, and financial support. Using O'Brien's three spheres of transformation - practical, political, and personal - the report categorises actions to illustrate interconnected pathways covering changes in behaviour, institutions, and beliefs. Meaningful change as reflected in pathways requires interaction among all three spheres.

Natuurbehoud vertrouwt vaak op marktgestuurde methoden, maar deze kunnen waarden zoals burgerlijke verantwoordelijkheid en eerlijkheid overschaduwen. Het concept van de rentmeestereconomie benadrukt het behoud van de diverse waarden van de natuur, hoewel de implementatie onduidelijk is. Dit rapport onderzoekt paden naar een rentmeestereconomie voor biodiversiteit via casestudies in Ethiopië, Nederland, Bonaire en Indonesië. Belangrijke thema's zijn het vergroten van natuurbewustzijn, het erkennen van de culturele waarde van biodiversiteit, het waarborgen van sociale fundamenten, het bevorderen van partnerschappen, ondersteunend beleid, biodiversiteitspositieve normen en financiële steun. Met behulp van O'Brien's drie transformatiesferen - praktisch, politiek en persoonlijk - categoriseert het rapport acties om onderling verbonden veranderingen in gedrag, instellingen en overtuigingen te illustreren. Betekenisvolle verandering vereist interactie tussen alle drie de sferen.

Key words: biodiversity, pathways, stewardship, transformation

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P.O. Box 88, 6700 AB Wageningen, The Netherlands, T +31 0317 48 48 88, E info.wser@wur.nl, http://www.wur.eu/social-and-economic-research. Wageningen Social & Economic Research is part of Wageningen University & Research.

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Contents

Preface

The urgency of our global biodiversity crisis is widely shared in the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) reports. Traditional market-driven methods like cost-benefit analysis and pollution control measures, while useful, often fail to capture the full spectrum of values essential for effective nature conservation. Civic responsibility, respect for non-human life, and fairness are critical values that are frequently overshadowed by economic considerations.
This report delves into the concept of a stewardship economy, which emphasises the necessity of recognising and preserving the diverse values of nature and biodiversity. Despite its importance, the implementation of a stewardship economy remains largely undefined. Our research aims to fill this gap by exploring various pathways towards achieving this goal.

The relevance of this research is underscored by the recent IPBES reports. The IPBES Nexus Assessment highlights the need for integrated policymaking to address interconnected challenges of climate change, biodiversity loss, and food, water, and health security, while the Transformative Change Assessment emphasises the urgency of deep, fundamental shifts in how people interact with nature to halt biodiversity loss and achieve a sustainable future. Our findings provide a roadmap for achieving a stewardship economy that not only addresses the biodiversity crisis but also benefits communities worldwide.

This study has been executed by a multidisciplinary team from Wageningen University & Research including Thirze D.G. Hermans, Russell A.L. Carter, Justine Raoult and Olivia Azhari (Wageningen Social & Economic Research), and Peter Verweij, Kees Hendriks and Robert P. Baayen (Wageningen Environmental Research). We would like to thank all interviewees for sharing their experiences, case study research assistants for their help, and Krista Kruft and Vincent Linderhof for reviewing this document.

Mr. O. (Olaf) Hietbrink MSc
Institute Manager Wageningen Social & Economic Research
Wageningen University & Research

Summary

S.1 Main objective

Nature conservation efforts often depend on market-driven methods like cost-benefit analysis and pollution control measures, but overreliance on these can overshadow crucial values such as civic responsibility, respect for non-human life, and fairness. The stewardship economy concept underscores the critical necessity of acknowledging and preserving the diverse values of nature and biodiversity, though its implementation remains undefined. In this report we explore a needs-based approach with case studies to investigate different pathways towards achieving a stewardship economy for biodiversity.

S.2 Methodology

Pathways are sets of strategies and actions undertaken over time by groups of change agents operating within their specific contexts. These pathways aim to achieve sustainable and equitable futures, particularly in a stewardship economy for biodiversity, where priorities include biodiversity net gain and carbon sequestration (Baayen et al. 2025). The case study base approach, including semi-structured interviews, identified actions towards a stewardship economy within the case studies of Lake Dembel (Ethiopia); the National Forest Strategy (the Netherlands); The island of Bonaire (Dutch Caribbean), and Awig-Awig in Lombok (Indonesia).

S.3 Messages

The key identified pathways, following a needs-based approach with case studies for a stewardship economy for biodiversity, are:

- Amplifying nature connectedness and awareness
- Recognising biodiversity's cultural importance
- Safeguarding social foundations
- Fostering effective multi stakeholder partnerships (MSPs) and collaborations
- Developing and implementing supportive policy, linked with enforcement
- Achieving biodiversity positive norms and rules of institutions; and securing adequate financial support.

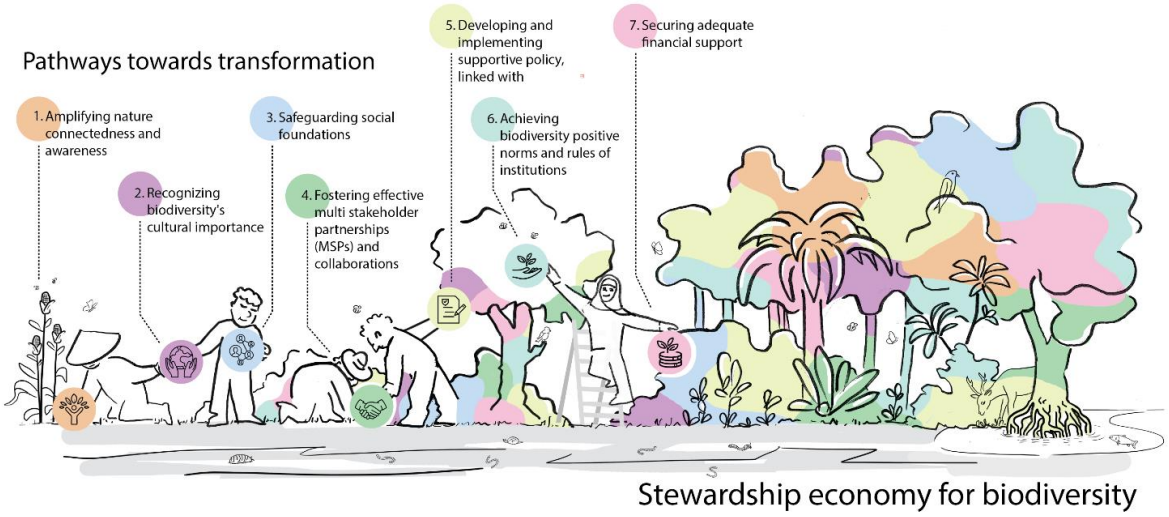

Figure S1 *The identified pathways for a Stewardship economy for biodiversity*
Source: Designed and created by Eline van Remortel.

These pathways represent common strategies while acknowledging contextual variations in the actions, offering a roadmap for achieving a stewardship economy that benefits biodiversity and communities. They aim to enhance the foundational elements of the stewardship economy for biodiversity, with some strongly interconnected pathways, such as nature connectedness and awareness promoting the cultural value of biodiversity. A shift from individualism to a collective approach underscores the need for a cross-scale strategy, addressing both individual and collective pathways. Societal support at multiple levels, from local to national, reflects broader societal backing for biodiversity stewardship.

Using O'Brien's (2018) three spheres of transformation — practical, political, and personal — the pathway actions were categorised to illustrate the interconnected changes in behaviour, institutions, and beliefs. The practical sphere involves observable changes through innovations and reforms, while the political sphere focuses on systems and structures shaped by power dynamics. The personal sphere, which encompasses values and beliefs, is central as it shapes the paradigms influencing the other spheres. While overlap across the three spheres is expected in their interaction with each pathway, certain pathways were predictably linked to specific spheres. For example, pathways focusing on policy and stakeholders were closely tied to the political sphere, cultural pathways align with the personal sphere, and financial support pathways connect with the practical sphere. All case studies highlighted actions in all spheres, with most of them emphasising the political sphere. Lastly, meaningful change and transformation require interaction among all three spheres, aligning personal motivations, systematic changes, and practical actions. This interaction was evident in the pathway action tables and affects their categorisation. Actions initiated in one sphere can lead to outcomes in another, highlighting the interconnectedness of actions and spheres.

1 Introduction

The 'values assessment' report published in 2022 by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) emphasised that the prevalence of narrow, materialistic, and individualistic values in decision-making significantly hinders efforts toward sustainability and justice (IPBES 2022). Nature conservation efforts have largely relied on market-driven methods, such as cost-benefit analysis including the use of instruments like payment for ecosystem services, true pricing, and pollution control measures like taxes on water and emissions. Although these instruments can be valuable for supporting ecological initiatives, an overreliance on them can sideline essential values for effective conservation — like collective civic responsibility, respect for non-human life, and a commitment to fairness. Furthermore, focusing too heavily on market fixes often addresses only the symptoms of environmental decline, overlooking its deeper causes.

The stewardship economy concept emphasises the urgent need to recognise and care for the diverse values of nature and biodiversity, see Baayen et al. (2025); Linderhof et al. (2025); Mathevet et al. (2018); Prabhu and Colfer (2023), yet there is no clear agreement on its implementation. For a just and sustainable transition, it is essential to intertwine structural economic and institutional changes with initiatives rooted in values of care, ensuring these principles are deeply integrated into economic systems rather than remaining isolated grassroots efforts. This approach assumes that society possesses inherent caring values that can be revitalised to tackle the biodiversity crisis. At its core, a stewardship economy mandates that economic activities minimise harm but preferably restore biodiversity, and when losses occur, they must be compensated by equivalent biodiversity gains. Key challenges include 1) rethinking economic frameworks for safeguarding nature and biodiversity now and in the future by adding the responsibility for taking care of nature and biodiversity through (monetary or non-monetary) values into decision making, and 2) determining how these values and assurances are defined including their proper accounting, especially when trade-offs are necessary, while also acknowledging biodiversity's intrinsic value.

In Baayen et al. (2025) and Linderhof et al. (2025) we have identified four building blocks for a stewardship economy, namely care and responsibility, biodiversity as an indispensable element in decision-making, collective purpose and institutions that distribute power, and information, knowledge and education on biodiversity. In addition, four guiding principles were suggested:

- Caring, taking responsibility, and accountability for nature and biodiversity
- Moving to decision-making for collective purposes with nature and biodiversity at heart
- Becoming aware of the impact of economic activities on nature, on people and places over time
- Fostering integrity of facts concerning nature and biodiversity for large-scale transformation.

Having developed a vision for a Stewardship Economy for Biodiversity (Baayen et al. 2025; Linderhof et al. 2025), the next question is how this vision unfolds across various contexts and what potential pathways could lead to its implementation. Consequently, this study employs a case study approach to explore various pathways leading to a stewardship economy for biodiversity.

This study conceives pathways as sets of strategies and actions undertaken over time by groups of stakeholders operating within their specific contexts (IPBES 2024). To identify pathways for a stewardship economy focused on biodiversity, a needs-based approach is essential, emphasising the specific requirements and meaning of stewardship for different contexts. Therefore, a needs-based approach was applied to four case studies that highlight the unique challenges and opportunities faced by various stakeholders, institutions, and ecosystems. Across the case studies similarities and differences among the identified stewardship economy related actions and strategies were examined. This grounded approach not only guarantees that the pathways are relevant and practical but also enhances our understanding of the diverse values and perspectives that can contribute to a stewardship economy.

In this report, Chapter 2 will first present the methodological approach, including the four case study descriptions. In Chapter 3, the main identified pathways will be presented and discussed with examples of how they play out in the case studies (or their irrelevance for some cases). Chapter 4 presents the discussion and the conclusions.

2 Approach

2.1 Framing pathways for stewardship economy for biodiversity

Transformative pathways can be conceptualised as integrated sets of actions and strategies, which are purposefully and reflexively designed to evolve over time, to respect human well-being, human rights and ethics. Pathways help to see how visions of a sustainable and just future can be reached. There are many pathways to such a future and there are various approaches on how pathways can be developed and operationalised in case studies. In developing the pathways for a stewardship economy for biodiversity, additional objectives have been added, namely achieving rapid biodiversity net gain and carbon net sequestration (Baayen et al. 2025).

To explore transformative pathways for a stewardship economy for biodiversity, there is the need for pathways to address three spheres of transformation as presented by O'Brien (2018), see Figure 2.1: practical, political and personal spheres. O'Brien (2018) discussed the three spheres in the context of climate change and achieving a maximum increase of global temperature of 1.5 degrees Celsius. Similarly, the spheres can be applied when constructing pathways with the objective of reducing biodiversity loss and restoring biodiversity as well. The practical sphere (inner circle) involves behavioural changes, social and technological innovations, and institutional reforms, acting as the 'outcome' sphere where measurable parameters are observed. The political realm (middle circle) encompasses the social and ecological systems and structures that set the constraints and possibilities for practical transformations, influenced by political processes and power dynamics. The personal realm (outer circle) includes individual and collective beliefs, values, and worldviews that shape perceptions of the political sphere and influence what solutions are deemed possible in the practical sphere. Stewardship especially seems to refer to the need to address the personal realm, which is also often considered as the most powerful as it drives the paradigms underlying systems in the political and practical spheres. However, successful transformation pathways should address all three spheres, as their cascading can drive change in multiple dimensions (O'Brien 2018).

The complexity of a stewardship economy for biodiversity lies in its consideration of the interrelated social, political, economic, and ecological systems, which can create mutually reinforcing (positive or negative) interventions. Studies in the literature highlight the need for a combination of disruptive, incremental, and collaborative approaches to achieve desirable futures with social, political, and ecological justice (Wright 2010; O'Brien 2018; Thornton et al. 2012). Tensions or conflicts arising from contradictions between diverse values or outdated socio-political arrangements should be viewed as opportunities to shift ideas, behaviours, practices, structures, and systems toward new solutions. The embracement of those tensions can facilitate significant transformative changes.

The spheres of transformation can facilitate the categorisation of various strategic areas for actions (Figure 2.2). These strategic areas, also referred to as 'leverage points' in O'Brien (2018), demonstrate how the conceptualisation of the spheres can aid in identifying and targeting critical areas for intervention and action as part of pathways to a stewardship economy for biodiversity. Similarly, this framework is employed to analyse the actions identified in the case studies.

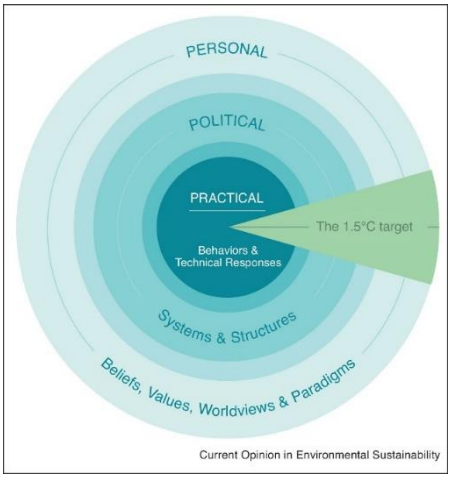

Figure 2.1 *Three spheres of transformation for achieving a 1.5 degrees Celsius target (O'Brien 2018)*

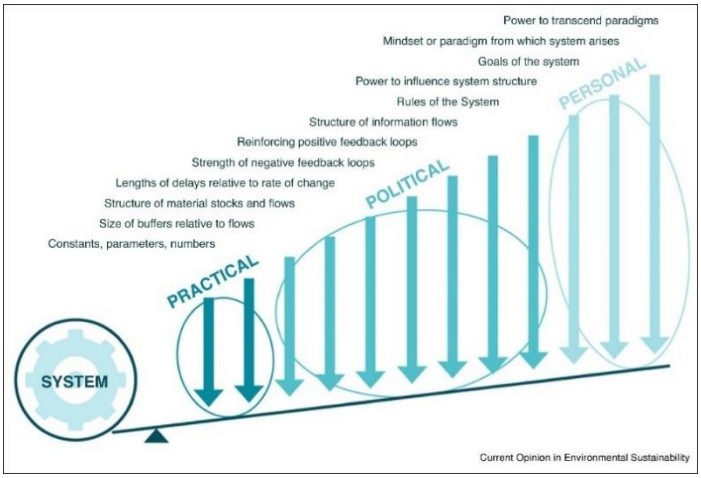

Figure 2.2 *Leverage points can be categorised into the three spheres (O'Brien 2018)*

2.2 Methodology – comparative case study analysis

This study employs a needs-based approach to identify pathways for a stewardship economy, utilising a diverse array of case studies grounded in specific contexts. A comparative case study design has been adopted to ensure geographical representation across various regions (e.g., low-, middle-, and high-income countries, and different continents) and institutional entry points (e.g., landscape-based communities, policy development, economic opportunity) while maintaining a focus on problem-centred issues. The four case studies are:

1. Lake Dembel, Ethiopia
2. Forest Strategy in the Netherlands
3. The island of Bonaire in the Dutch Caribbean
4. Awig-Awig in Lombok, Indonesia.

The cases are further described in Section 2.3. This comparative case study design allows for an in-depth exploration of how different communities tackle similar challenges related to biodiversity and ecosystem management. By engaging in comparative case study analysis, commonalities and differences in the actions and strategies (pathways) utilised by various groups of change agents are identified.

Case studies for this research were selected based on criteria that ensure a diverse, practical, and impactful approach to stewardship practices for biodiversity. Each case study needed to support (net-positive) biodiversity, and stakeholders representing sectors from public, private, or civil society. Case studies needed to be actively implemented, with ongoing interventions or partnerships that align with a stewardship economy. Furthermore, they needed to allow for analysis of how stewardship practices influence local or global economies, preferably with biodiversity impacts that are monitored. Involvement of existing networks or team members and the integration of various Wageningen Research institutes were also prioritised to promote collaborative knowledge-sharing.

After the case study selection, methods were developed to enable cross-case analysis. Semi-structured interviews were conducted across all case studies, based on a list of guiding questions (see Appendix 1). Each case study conducted 10-15 interviews with a variety of stakeholders, representing public and private sectors or community members if applicable. The guiding questions covered the interviewees' understanding of stewardship economy, the roles of different stakeholders and their motivation (using a stakeholder analysis graph), the drivers of stewardship economy (using a force field analysis) and the perspective on future pathways.

The analysis approach combined deductive and inductive methods, beginning with predefined categories to guide the examination. These categories included understanding of the stewardship economy, roles and motivations of stakeholders, key drivers of the stewardship economy, and perspectives on future pathways. Within each category, an inductive approach based on grounded theory (Charmaz and Thornberg 2021) was used to identify additional patterns and insights that emerge, allowing for a nuanced understanding of each theme. Based on this data analysis, the different case studies were analysed on common clusters of actions and strategies. These were compared across the case studies, forming the major identified pathways.

2.3 Case study description

In this section, each case study will be presented through key questions to provide a deeper understanding of its context and challenges. Specifically, the short case study description: the problems and daily obstacles encountered in advancing a stewardship economy; the enablers and barriers identified within each case to achieve the intended vision. These case study descriptions serve as the foundation for the cross-case comparison, identifying pathways toward a stewardship economy. For more detailed context descriptions of the case studies, we refer to the separate reports (e.g., Kruft and Hermans, 2024).

2.3.1 Lake Dembel, Ethiopia

In this case study we consider the Dembel-Shala sub-basin as a landscape around Lake Dembel, where multiple stakeholders partnerships have been formed to promote sustainability including both livelihood development and biodiversity improvement (for detailed case study analysis see Kruft and Hermans 2024). Lake Dembel in Ethiopia is surrounded by diverse landscapes, where both smallholder and commercial farmers play vital roles. Smallholders primarily focus on subsistence farming and serve local markets with staple crops, while larger commercial farms focus on producing export-oriented crops, driving significant economic growth. However, this agricultural diversity brings challenges, including intense competition for natural resources, leading to acceleration of already existing land degradation and water scarcity. The region faces added pressures from climate change, shifts in land use, and political instability, compounded by drivers like population growth, expanding tourism, and commercial farming ambitions. A stewardship economy might offer meaningful pathways to balance these competing demands, but its implementation requires a nuanced, context-specific approach to effectively harmonise local livelihoods with environmental resilience.

To address these issues, farmer associations, with government and NGO support, have launched the Tiyo-Hetosa multi-stakeholder partnership (MSP) focused on landscape restoration through reforestation, agroforestry, crop diversification, and stewardship practices to improve ecosystems and ensure food security. Around Lake Dembel in the lower areas, environmental degradation has prompted the Dembel-Shala sub-basin MSP. Both MSPs are collaborative efforts by public and private stakeholders to promote sustainable landscape management. However, they differ in production scale, ecological diversity, technological complexity, investment levels, and their tools for collaboration and spatial planning. By situating both MSPs within their local economic context, the case study assesses how technological, social, and institutional innovations either hinder or support the transition to a stewardship economy, while identifying the roles of various stakeholders and sustainable pathways. In addition, this case study shows how stewardship for biodiversity plays out in a context of political and social unrest and tension. In such an environment, working on agendas such as biodiversity restoration may be highly affected and require different transition pathways.

In both MSPs of the Dembel-Shala sub-basin, multiple enablers and barriers for a stewardship economy were identified spanning across the multiple forms of institutions. The findings have been organised using the institutional categorisation as prepared in Baayen et al. (2025), namely institutions of action (products and services), control (policies and strategies), association (organisations and networks) and meaning (beliefs, norms and values) (Woodhill 2008). In *institutions of meaning*, religion and churches, customary systems like the Gada,[1] education, advocacy, and media foster stewardship practices, although a nationalised

[1] An indigenous democratic socio-political system of the Oromo. https://ich.unesco.org/en/RL/gada-system-an-indigenous-democratic-socio-political-system-of-the-oromo-01164

disconnect from the land (through a legacy of establishing government ownership of all Ethiopian land) poses a barrier. Within *institutions of association*, collaborative stakeholder partnerships, local participatory governance, civic initiatives (when not interfered by politics), and women's leadership were perceived as enablers that promote accountability and ownership. For *institutions of control*, policy frameworks that support implementation of policy, resource pricing (e.g., paying for water use – which is now free), and regulations at various levels were found to be enablers; however, inconsistent policies, weak enforcement, mandate ambiguity between levels and departments of government, and gaps between macro planning and micro implementation impede progress. Lastly, within *institutions of action* community mobilisation, balancing environmental with socio-economic needs, and sociopolitical stability were mentioned as foundational issues that could be catalysts for stewardship, though the lack of institutionalisation for development projects hinders lasting impact.

2.3.2 Forest Strategy in the Netherlands: Forest for future generations

In 2020, the Forest Strategy for the Netherlands was published (Interprovinciaal Overleg and Ministerie van Landbouw, Natuur en Voedselkwaliteit 2020). In the cover letter of the strategy, the Minister of LNV mentioned that the strategy was needed to create more consistency between forest, nature and climate policy, and to enhance societal support (Ministerie van Landbouw, Natuur en Voedselkwaliteit 2020)[2]. The main ambition of the strategy was to pass the forest, with all its different functions, in good shape on to future generations (Interprovinciaal Overleg and Ministerie van Landbouw, Natuur en Voedselkwaliteit 2020). Such an ambition might fit perfectly in a stewardship vision for a sustainable future, depending on the way it is implemented. The main question for this case study was to evaluate to what extent the Forest Strategy succeeds in this respect, and to explore how different stakeholders interpret this ambition and how they find ways to balance the different functions of forest in their policies and measures. This was done in conjunction with exploration of the EU Forest Strategy (EC 2021), which impacts on the Forest strategy for the Netherlands.

Forests have several functions (e.g., biodiversity, timber production, recreation, carbon sequestration, drinking water, etc.), which fit perfectly well within the well-known People-Planet-Profit (triple P) concept as elaborated in the vision background report (Baayen et al. 2025). Forests, biodiversity, forest landscapes, and climate mitigation and adaptation all fit in the Planet aspect. Recreation, inspiration, spiritual and relational values fit in the People aspect. Wood products and non-wood forest products relate to the Profit aspect. In the Forest Strategy, all these functions are considered as important, however, biodiversity and climate mitigation and adaptation are mentioned as the most important objectives. Besides these main functions, wood production is also mentioned as important for future generations, so as to fulfil the future need for, preferably, high-quality wood products. Precisely on this point, there is quite some debate in the Netherlands how to implement the policy for these functions in the forest management and the forest and nature sector. In this case study, we explored the various views how to balance the different forest functions in such a way that biodiversity is safeguarded.

Biodiversity, social functions, e.g., recreation, spirituality etc., and climate functions, e.g., flood protection, carbon sequestration, do have large support amongst all of the stakeholders which were interviewed. However, the views of stakeholders diverged as to how this should be implemented in forest management. In the forest management tradition of the Netherlands, multi-functional management has been deeply rooted. While there was more or less consensus and a general agreement about this concept on how to implement it in forest management at the end of the 1990s, there has been an increasing debate since 2024, and stakeholders' opinions seem to drift away to more polarised points of view (e.g., all forests should be managed as nature reserves, or alternatively, production does not harm biodiversity in any way). This can be seen as a barrier for objectively determining best practices for biodiversity.[3]

One example of such a polarised discussion is that there is quite strong opposition to tree cutting, because people are convinced that it harms biodiversity. This belief relates to the fact that forest appeals to a sort of

[2] Since 2 July 2024 the name is Ministerie van Landbouw, Visserij, Voedselzekerheid en Natuur (LVVN).

[3] For example, following cases of excessive logging, a Code of Conduct for small-scale clearcuts supported by private sector, several large nature conservation organisations and the government was recently challenged successfully in court by activist NGOs as conflicting with the Netherlands' nature conservation legislation and the EU Habitats Directive (ECLI:NL:RBGEL:2024:9180).

primeval nature, and the assumption is that nature values in forests can best be protected by abstaining from active management measures. Related to the different functions of forests, a debate has been started on the size of harvesting measures and the interpretation of what is named a clearcut. Den Ouden and Mohren (2020) conducted a study on the scale of harvesting in the Netherlands and concluded that most of the harvest activities are smaller than 0.5 ha. In the Netherlands, felling areas larger than 0.5 ha are named clearcut areas. In other countries, clearcuts are much larger in scale and may comprise tens or hundreds of hectares (Den Ouden and Mohren 2020). The term 'clearcut' in the Netherlands seems to be interpreted by some parts of the public as referring to large-scale clearcuts from abroad. The contrast in opinion is also about the perception of sustainability. People who consider wood a renewable and sustainable resource, essential for a sustainable fossil-free future, tend to have a more sympathetic view of wood harvesting compared to those who prioritise biodiversity over the availability of wood for construction and other purposes. Education and awareness raising is important to make people more aware of the trade-offs between different forest functions.

Another barrier is the competition for land. One of the goals in the Forest Strategy is to increase the forest area by 37,000 ha, which equals 10% of the current area. This expansion of the forest area is aimed to improve biodiversity, climate mitigation (carbon sequestration) and wood production. However, land is needed to create this new forest, which is scarce in the Netherlands, and which makes it expensive. In general, only agricultural land and nature land are eligible for (re)forestation. A special problem is that agricultural land is much more expensive than forest land, which means that if agricultural land is converted to forest land, the land's value will depreciate, and the government will need to compensate for this loss. However, the Netherlands' Forest strategy explicitly did not come with any budgetary support.

Furthermore, a target has been set by the government for mitigating climate change through carbon sequestration in forests. In the Netherlands' national climate pact, and the Forest Strategy as part of that, a target of 0.4 to 0.8 Mton CO_2 is aimed at. However, too much focus on carbon sequestration in forests endangers biodiversity restoration.

Another barrier is that nature policy in the Netherlands has been decentralised to provincial level. Each province draws up its own regional forest strategy, as a result of which there is little consistency in the approaches to protect nature and biodiversity. This may hamper biodiversity protection and restoration in places where connectivity is important for genetic exchange between populations, or to manage environmental conditions such as water availability (e.g., water retention) and air quality (e.g., nitrogen deposition).

Pathways to protect and improve biodiversity in forests (enablers) mentioned in the interviews were better coordination of nature policy and environmental policy. Environmental policy must facilitate the feasibility of nature goals. This is very important, because if nature goals prove to be unattainable, it may generate criticism on nature management in general and impact the support for financing nature management.

Certain subsidies for wood production (e.g., subsidy for reforestation after clearcuts) seem to conflict with the interests of biodiversity, although opinions are divided on this point. It would be worthwhile to convert wood production subsidies into subsidies that directly stimulate biodiversity (e.g., improve a more diverse species composition, improve the vertical structure of the forest, or improve the amount of deadwood) and compensate forest owners for refraining from harvesting.

Altogether, forestry in the Netherlands has limited economic importance, and the surface of forest areas is small although forests are highly appreciated for their social functions. This has led to a situation where the general public exerts significant pressure for stewardship forestry. This contradicts with the situation of EU Member States for which forestry is of major economic importance, such as the Scandinavian countries, Germany, Austria, France and Spain, and where large-scale felling and clearcuts are considered normal. At EU level, this has resulted in unresolved conflicts concerning the place of felling and clearcuts in sustainable forestry, with clearcuts of 2 ha being proposed by way of compromise (Nabuurs et al. 2024).[4] In the EU

[4] Page 37 of Nabuurs et al. (2024) provides a diplomatic interim solution: 'Clearcut size can be monitored and is quantifiable both in field and remotely assessed as single size patches of cover changes. Given that most clearcuts in Europe are far under 5 ha per event (3.3 ha average in Sweden in 2021 with 30% of the clearcuts in northern Sweden over 20 ha, a related quantitative biodiversity-friendly indicator threshold for sustainable finance should stay under 2 ha/event, noting that national legislation may even provide a lower threshold.'

Forest strategy, the production of wood (timber) and biomass, among others for climate change mitigation, is much more evident than in the Netherlands' Forest Strategy.

2.3.3 Bonaire, It's in our nature

This section looks at how partnerships and initiatives are promoting and strengthening the natural landscape, biodiversity, and local culture on the island of Bonaire by involving education, households, tourists, businesses, and governments. Bonaire, a small tropical island near Venezuela, spans nearly 300 km² and has a population of 24,000. As a special Dutch municipality outside the EU, it features an international airport, harbour, hospital, and self-produced electricity and water. Despite its tropical location, it receives little rain due to the rain shadow effect from Venezuela. The landscape includes dry tropical forests, mangroves, remnants of agriculture, and a growing urban area driven by tourism, which constitutes 40% of its gross domestic product (GDP). Bonaire faces challenges in managing mass tourism, off-island entrepreneurs, labour immigration, population growth, and urban expansion, leading to habitat and biodiversity loss exacerbated by climate change. The island relies heavily on imported food, adding pressure to its environment, while tourists expect lush greenery, diverse wildlife, and vibrant coral reefs, which are increasingly threatened.

Multiple partnerships, organisations, and initiatives in Bonaire promote nature and practice stewardship principles, driven by a mix of intrinsic, instrumental, and relational motivations. Key partnerships include the Dutch Caribbean Nature Alliance and Nature Platform, which unify conservation NGOs and businesses to grow and plant native species; the blue destination certification initiative led by the Tourism Corporation Bonaire; collaborations between coral reef growers and dive schools involving tourists in coral restoration; and the Cultural Park Mangazina di Rei, which promotes cultural connections with the natural environment. Individual organisations also contribute significantly. Local farmers produce leafy vegetables, fish, fruits, and chicken branded as Bonaire-grown, reducing dependence on food imports and diversifying the economy. The Mangrove Maniacs work with volunteers to restore mangroves, while Stichting Nationale Parken Bonaire (STINAPA)'s junior ranger programme engages the island's youth to foster a sense of stewardship. The World Wildlife Fund (WWF) organises beach clean-ups with volunteers, and a small project developer preserves larger trees during urban development instead of clearing entire plots. Lastly, government and research-driven initiatives observe impacts like soil and habitat degradation and loss of social cohesion from over-development and over-tourism. These impacts are measured through field studies and surveys (e.g., studies from World Bank 2024, Wageningen University and Research (Verweij et al. 2022), and the Rijksdienst Caribisch Nederland 2024), highlighting the need for stabilisation or even degrowth.

Collectively, stakeholders formulated a vision for the future of Bonaire, entitled 'Bonaire 2050 – a nature inclusive vision' (Verweij et al. 2020; 2022). Enabling factors for the realisation of that vision focus on collaboration between locals and expats, with key initiatives aimed at strengthening nature while supporting a healthy economy. These enabling factors include:

- Nature restoration as a business opportunity, like divers restoring locally grown coral reefs (such as practiced by Reef Renewal Bonaire) and hotels planting native trees
- The Junior Rangers programme that offers youth dive courses, leading to careers as local dive instructors, which are preferred by tourists
- The WeConnect initiative that helps Bonaireans (and other Dutch Caribbean islanders) who studied abroad to find jobs locally, boosting the – culturally embedded – workforce;
- Education that emphasises practical skills for the island's needs, such as becoming a nature guide or cash crop farmer, rather than focusing solely on economic growth
- The implementation of corporate social responsibility that encourages businesses to engage in community projects like beach cleanups and elderly care (e.g., by Tourism Corporation Bonaire).

The focus is on affordable housing for young people, enabling them to continue to live on the island and contribute to the local economy, and the fostering of an entrepreneurial attitude that balances socio-cultural, ecological, and financial-economic priorities.

There are also barriers slowing down the implementation stewardship practises, such as the over-reliance on a few individuals and a lack of local expertise in crucial positions. Well-intentioned expatriates leave often

again after a few years, contributing to the image of work tourism and failing to bring about institutional change. As a result, the negative effects of growth accumulate and accelerate, illustrated by growth in off-island investors focusing on short-term profits through economic leakage and environmental and social exploitation. The lack of catalysing stewardship success stories and the perception of stewardship as a foreign, colonial concept with little attention for socio-cultural aspects – such as the inequality and risk of loss of income – complicate gaining traction.

There are several actions and strategies that can be adopted to enhance the viability of stewardship practices, which can be divided into short-term and long-term initiatives. In the short term, these initiatives include giving publicity to existing showcases, raising awareness of individual responsibilities, providing help for implementation (e.g., free advice), promoting rooftop water harvesting, collecting water in dams, reforesting, revegetating, and renewing reefs, and enforcing current policies (e.g., ensure sufficient capacity in waste treatment, prohibit illegal dumping, keeping goats and donkeys in fenced-off areas). Finally, entrepreneurs that already work according to the stewardship principles should be supported. On the longer term, the single sector economy – tourism – should be diversified and transformed into a nature inclusive one, i.e., an economy that interweaves and strengthens nature in all its activities and enhances the health of all diverse habitats. Stimulating local food (and inputs) production offers jobs and income security to Bonaireans. Education and job planning should focus on jobs within the adapted, 'nature inclusive' economy, while stimulating to retain experts and high-level managers on the island. The principles for the long-term vision are to bend the economy towards stability and development, instead of growth, and to improve social cohesion and equity (also known as 'leave no-one behind').

2.3.4 Awig-Awig in Lombok, Indonesia

In the Jor Bay region in East Lombok, a couple of 'local champions' from a youth community group developed the Bale Mangrove, a mangrove conservation area which provides ecotourism and educational opportunities. The mangrove ecotourism area was established on 12 September 2021 and has been providing an extension and socialisation space for local people. Additionally, it helps to raise locals' awareness about the importance of mangrove ecosystems, and how nature positive they can be, particularly from an economic perspective. Certain stewardship practices take place in the Bale Mangrove, including capacity building and providing training on mangrove restoration to the local youth, and offering extracurricular education for school children.

The Bale Mangrove has managed to flourish, due to a small number of local champions that had the motivation and knowledge required to develop the site, and they were able to work with the local government and other useful partnerships to establish themselves. The local wisdom Awig-Awig has also been established and enforced, helping to regulate various aspects of daily life, including the management of fisheries and other coastal resources like mangroves within Jor Bay. Whilst a key motivation of the development and running of the Bale Mangrove is economic, the ecotourism activities that take place help to provide local people with an increased understanding of the importance of mangrove conservation for environmental issues such as flooding and abrasion, in addition to biodiversity (in terms of fishing). In some villages, local women are active in micro, small, and medium enterprises (MSMEs) (e.g., shrimp paste production, crab shell crackers production, etc.) which can be developed jointly with mangrove ecotourism activities.

For the Bale Mangrove to be successful, there is a need for a respected figure in the area (such as the chief of village) to act as a mediator and facilitate synergies between different organisations and initiatives within the village and across other villages. However, it can cause some issues with setting clear boundaries between the facilitating stakeholders and the local organisations. In some instances, too much intervention might lead to a conflict of interest. Integrated programmes and policies among government agencies (national, provincial, and district levels) would be beneficial in ensuring the achievement of mangrove conservation and planned management strategies.

Moreover, the presence of formal institutions or a legal framework to support ecotourism initiatives, such as Bale Mangrove, is pivotal. For example, local organisations like Pokdarwis (Tourism Awareness Group) and Pokmaswas (Community Supervisory Group) play significant roles in the establishment and operation of Bale

Mangrove. The founders of Bale Mangrove, who also hold leadership positions in these organisations, have provided material support, expanded networks, and development opportunities (e.g., facilities, funding, capacity building). In contrast, other mangrove ecotourism initiatives in the area that lack the support of Pokdarwis and Pokmaswas have been found to be less developed or even stagnant.

One observation from the fieldwork is that involving the appropriate individuals at the opportune time significantly influences the success of mangrove ecotourism initiatives, such as Bale Mangrove. In our case study, the founders of Bale Mangrove were appointed as the heads of Pokdarwis and Pokmaswas in Jerowaru village around the time of Bale Mangrove's establishment. Conversely, a similar initiative in Jor Baduik Hamlet, also in Jerowaru village, failed to thrive due to the lack of support from formal institutions or a legal framework. This situation created social envy among communities; however, it also fostered competitiveness among community-based initiatives. Therefore, institutionalisation within the community is a key element for the success of community-based stewardship practices in East Lombok, Indonesia.

3 Comparing pathways: case studies comparison

3.1 Introduction

When comparing the four case studies, specific pathways emerged that were present in at least two, if not all case studies. The common themes are:

- Amplifying nature connectedness and awareness
- Recognising biodiversity's cultural importance
- Safeguarding social foundations
- Fostering effective multi stakeholder partnerships (MSPs) and collaborations
- Developing and implementing supportive policy, linked with enforcement
- Achieving biodiversity positive norms and rules of institutions
- Securing adequate financial support.

These pathways were then described with means, and a goal. Whereas shared pathways occurred, there were both similarities and differences in suggested actions for the different case studies. The pathways and associated actions for pursuing a stewardship economy are described in Figure 3.1 to facilitate better understanding.

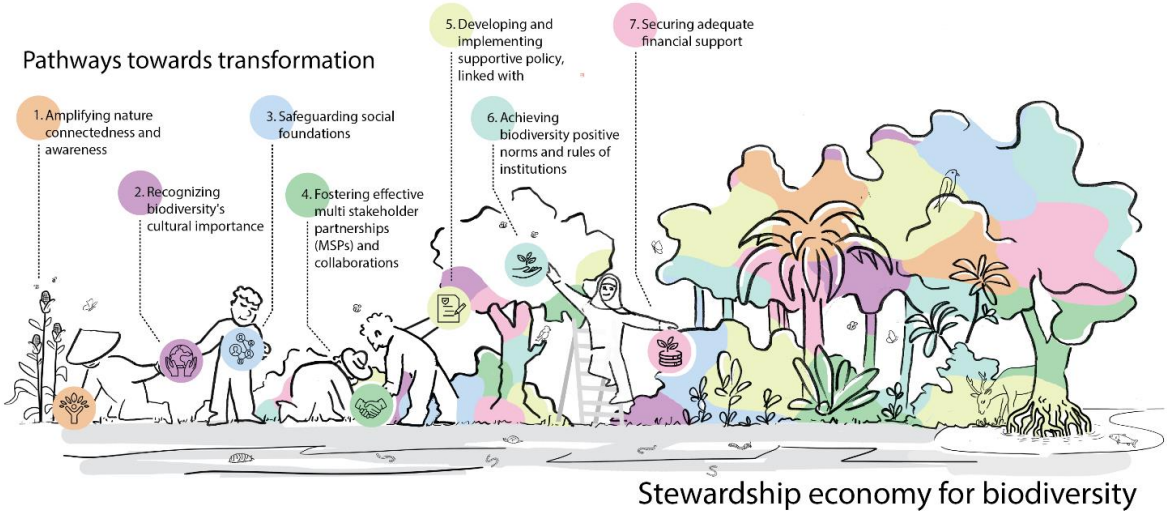

Figure 3.1 *The identified pathways for a Stewardship economy for biodiversity*
Source: Designed and created by Eline van Remortel.

To illustrate the interconnected changes in behaviour, institutions, and beliefs, pathway actions (from Section 3.2) were categorised using O'Brien's three spheres of transformation: practical, political, and personal in Section 3.3. The practical sphere highlights observable changes through innovations and reforms. The political sphere examines systems and structures influenced by power dynamics. Central to these is the personal sphere, which encompasses values and beliefs that shape the paradigms affecting the other spheres. This was done for each sphere and for each case study.

3.2 Pathways for a stewardship economy for biodiversity

3.2.1 Amplifying nature connectedness and awareness

This pathway is based upon both increasing the connection that humans have with nature and increasing the awareness that there is an inherent connection between humans and their natural world. By utilising this theme of nature awareness in the broader society, engagement can be stimulated at various levels and in various ways, such as influencing policy and causing people to become actively involved for nature. The means of achieving increased awareness and connection include education and a reorientation towards traditional knowledge and customs. Actions that were identified during the case studies include teaching and spreading awareness of how to use nature without causing harm or even regenerating nature, the different views that exist of nature and how to balance those different values.

The most common actions revealed in all case studies were a focus on education, while at different scales – including youth education, community education, extension services, and professional education. The second most common action that was identified in this pathway was to increase the connection of universities, NGOs and governments, to operationalise research and build capacity outside of academia. This was identified in Lake Dembel (Ethiopia), the Netherlands' Forest Strategy and Awig-Awig (Lombok, Indonesia).

In Lake Dembel there is an emphasis to bring elements of traditional knowledge systems, such as the Gada system, into current education courses and curriculum. In Bonaire, there is an initiative for education in the primary schools to create future ambassadors for nature (a junior ranger programme) in the natural resource management organisation STINAPA Initiatives in Lombok to raise awareness of the importance of mangroves are done through extracurricular activities and trainings for the local youth to help manage a mangrove eco-tourism area.

The Netherlands' Forest Strategy also included a set of educational actions, albeit targeted to different scales than in the other cases. On the one hand, the forest sector is supposed to stimulate reflections on multi-functional forest management. On the other hand, at societal level, improved communication is required concerning the importance of nature and biodiversity and their relation to forest management practices. Forests are rich in nature, but over-simplified solutions (prohibition of any felling of trees) may not always benefit biodiversity at short and long term (for example because coniferous timber production forest with low value for biodiversity needs to be transformed into deciduous forest with high biodiversity value in the context of nature restoration; see Baayen 2024).

3.2.2 Recognising biodiversity's cultural importance

The second pathway that was identified was recognising the cultural importance of biodiversity. This differed from the first pathway of nature connectedness and awareness specifically by being focused on cultural practices that have biodiversity and nature engrained within them, as observed in the case studies.

Similar actions within this pathway were encountered in the Bonaire, Lombok and Lake Dembel case studies. The Bonaire and Lombok case studies similarly identified the cultural practice of locally sourcing foods. In Bonaire, restaurants source local food from gardens adjacent to their facilities, and in Lombok, a traditional fishing culture exists, called 'madak' where locals will forage for fish and other resources from the seas during low tide. Further, in Lombok there is a local ceremony tradition to connect with nature called 'Selamat Laut', which takes place between January and February. During this ceremony, villagers give some offerings and partake in 'cleansing' their fishing boat to show gratitude for what the sea has provided over the past year, and to pray for safety in the coming year on the sea. Another component of the tradition is to abstain from fishing for a certain period. Locals believe that if this tradition is not followed, then it may threaten or bring harm to the villagers.

Some distinct differences were noted between the contexts of the case studies as well. For example, in Lake Dembel, religious institutions are considered to be the main driver behind environmental stewardship and act as a sort of nature preserve due to the area surrounding churches being off limits to development and extraction. Within the Netherlands' Forest Strategy case study, a cultural practice that was highlighted was

the appeal that forests have to an innate, basic sense of nature in many individuals, even though forests are not a prominent cultural factor. The Bonaire case study was unique in that it highlighted traditional physical interventions for nature protection, including rainwater capture in kunukus for irrigation and creating fencing from the candelabra cacti.

3.2.3 Safeguarding social foundations

The pathway of social foundations emerged during the case studies that were conducted at a subnational level. Based upon the Social Foundations as framed by Raworth (2017), these foundations can be considered as the 'floor' or most basic resources that must be met, to allow for a stewardship economy working towards regenerating biodiversity to exist. The 'floor' consists of 11 resources for human needs: energy, water, food, health, education, income and work, peace and justice, political voice, social equity, gender equality, housing and networks. Therefore, this pathway is based on the fact that certain basic socio-economic needs have to be met first to create the conditions for individuals to work on improving biodiversity, as it is currently rarely viewed as a path towards socio-economic development. The goal within this pathway is to create an environment where short-term needs are met, while individuals prioritise and realise long-term goals towards enhancing biodiversity. Therefore, when stimulating biodiversity focussed actions or practices one needs to be aware of and address the social and economic foundation. The importance of social foundations in the Netherlands' Forest Strategy differs from the other case studies in that way that living conditions are not directly endangered in the Netherlands, and more opportunities exist to switch livelihoods and income generating activities than in low- and middle-income countries or conflict zones. However, social foundations are important to the Dutch nature and forest sector. Since the publication of the policy document 'Nature for people, people for nature' (LNV, 2000), the social foundation of nature and forest policy has been given more prominence than before. Due to the intensification and scaling-up of agriculture and its negative effects on nature and biodiversity (e.g., eutrophication, dehydration), agriculture and nature came face to face with each other. 'Nature for people, people for nature' was, amongst others, set up to bridge that gap and to better connect values of nature to societal preferences and needs. The debate in the Netherlands concerning the ability of farmers to better cater for biodiversity without a viable earning model, see e.g., Wolberink and Baayen (2024), links into the same issue. In the Netherlands' Forest Strategy it is reflected in actions, amongst which knowledge development programmes and public-private cooperation programmes, to get more support from private sector for the socio-economic functions of forests that contribute to biodiversity, human well-being (nature's contribution to people), and a good quality of life (cultural services and relational values).

Interestingly, all case studies thus had one action in common: livelihood security that works in tandem with biodiversity improvements. The details of each action in each case study differed, but overall, they were very similar in the paths they took. In Lake Dembel, diverse and alternative livelihoods for the community were the focus and connected income and food security with nature regenerative activities. Actions in Bonaire to address the social foundations included poverty alleviation through tourism and nature conservation jobs for original Bonairians, and a return programme for individuals who have studied abroad. Lombok focused on empowering the local youth, referred to as 'local champions' by providing them with skills and financial support to complete mangrove conservation and restoration initiatives.

An important additional action taken in both Lake Dembel and Lombok was involving women in conservation and/or regeneration works, as they are often motivated to care for the environment due to its connection with their livelihoods. Within Lake Dembel, this was done by ensuring that women are involved in conservation efforts as they often go to the forest or work in nursery sites. Similarly, within the coastal community of Lombok, women play important role in supporting households' economy, this is due to the income uncertainty faced by the fishermen. Several productive activities of Lombok's women are also strongly linked to the environment and natural resources, such as mangrove-planting labours, preservation work, and running MSMEs, producing shrimp paste and crab shell crackers. Moreover, these types of livelihoods require more care, patience, and meticulousness which tend to attract women in the activities. Both case studies showcased how conservation and regeneration work is beneficial not only by supporting income generation and improving the environment.

3.2.4 Fostering effective multi-stakeholder partnerships (MSPs) and collaborations

Effective Multi-Stakeholder Partnerships (MSPs) and collaborations were identified as a pathway towards a stewardship economy by having partners with different values, sense of belonging and sense of place work together effectively. With increased collaboration between stakeholders that may be viewed as competitors, it is possible to highlight the commonalities that exist and how they are able to compromise to overcome their differences. The means to achieve this are through collaboration and strengthening cooperation between parties, with a goal of trust among members and a shared vision of the outcomes they desire, including biodiversity positive outcomes.

All four case studies were included in this pathway and had the common trait of including a drive to increase and/or strengthen stakeholder collaboration. In Lake Dembel, actions to achieve this were working to find a common understanding of the problems facing stakeholders that are involved in the MSP (international flower companies, smallholder farmers, farmer associations, governmental and non-governmental organisations), and to ensure proper representation in the MSP, and placing partners in the governing structure based upon their interests, but also capacity for involvement. An important action to incorporate into the MSP in this case is clearly identifying roles to ensure accountability between members. It was noted that when there was a facilitator assisting with implementation of the MSP, participants were involved and active, but when the facilitator handed over the MSP to the actors, involvement and accountability decreased from lack of clarity and ownership.

The Netherlands' Forest Strategy sought to increase collaboration at various levels – between provinces to create and share a common vision for forest management, and between various interest groups, including extractive industries like timber production, biomass energy producers, and recreation user groups as well as nature conservation organisations, to define common goals and strategies to balance interests and outcomes. Bonaire had some unique approaches to strengthening and increasing collaboration amongst stakeholders, by seeking to identify joint business opportunities that exist to create jobs and increase sustainable eco-tourism. Examples include leveraging the diving site resources of Bonaire by allowing dive tourists to plant corals for restoration activities and by working with local resorts to reestablish trees. Additionally creating a joint brand between participating groups, to identify the collaboration, like 'Made in Rincon'.

Actions identified in Lombok for this pathway included the involvement of a mediator or facilitator (either a village chief or respected figure in the community or government agency) that can work to mediate and synergise the different initiatives that may exist between organisations in the village. It was noted that this could cause a conflict of interest if there is too much influence or intervention from the facilitating party and the local organisations, so clear boundaries and defined roles are important to identify early in the process.

3.2.5 Developing and implementing supportive policy, linked with enforcement

This pathway is intended for effective implementation of policy that is applicable to the setting in which it is intended, including regulations and enforcement that are indispensable. The means to achieve this are, among others, through various deliberate spatial and land use planning tools, like established protected buffer zones, and zoning schemes that prioritise biodiversity and act as a reflection of the societal value that is placed on something. Further, in cases where no objective or policy exists to preserve or restore biodiversity, then it not only needs to be developed and implemented but also enforced. Policy or regulations provide a backing for individuals or organisations who have a willingness to protect biodiversity to implement the work that is needed. It is also important to note that for actors that advocate for a self-regulated system, a recognition of regulation is required, as self-regulation is still a form of regulation and needs to be explicit.

All the case studies included actions for specific guidelines for implementation of protective legislation, and Lake Dembel, Bonaire, and Lombok included improved enforcement of new and existing laws.[5] Further, this pathway had similarities including land use planning (present in Lake Dembel and Bonaire case studies) and utilising local law that is contextualised to specific settings and applications, present in Lake Dembel and

[5] In the Netherlands, the national Forest Strategy did not comprise further legislation, but certain provinces subsequently did adopt supplementary provincial legislation as a follow-up to the national forest strategy.

Lombok case studies. The actions of land use planning in both Lake Dembel and Bonaire emphasise environmental stewardship and biodiversity and include establishing legal frameworks and enforcement, such as buffer zones around bodies of water (Lake Dembel) and protecting nature by limiting development on public and private lands (Bonaire).

As for the specific guidelines, in Lake Dembel, they include regulation on investments for international companies working in the area, and placing fees associated with water use, which is currently free. The case study of Forest Strategy in the Netherlands called for creating more specific regulations and subsidies acting for the protection of biodiversity, rather than facilitating harmful operations that exist in the current management structure, like extractive industries. Nevertheless, in the Netherlands, forests have a high level of legal protection even if wood is harvested from them, due to pressure from the general public.

Bonaire included improved spatial planning to limit construction of houses and dwellings throughout the island without deliberate planning and allowing for faster implementation of policy regulations. In Lombok, policies and programmes that are integrated into government agencies at all levels to ensure mangrove conservation and management visions are achieved.

3.2.6 Achieving biodiversity positive norms and rules of institutions

The goal of this pathway is to create individual and organisational support and responsibility for biodiversity by having them identify with nature, most often done by influencing the hearts and minds of people and their organisations. For example, within a market economy, new societal values that place biodiversity as a key element in (economic) decision making can cause a mindset change at an institutional level. For policy to be influenced and changed, there needs to be societal support and backing, which is the aim of this pathway.

Actions to achieve this were varied across the case studies. The case studies of Lake Dembel and Lombok were similar in action, to create an individual or collective identity with the land, through individual or collective ownership so people not only identify but take responsibility of the land. In Ethiopia all land is currently nationally owned, so even if individuals lease the land, they do not identify with it because they know their connection is temporary. In Lombok, individual responsibility and identify for mangrove protection is encouraged through socialisation by involving locals in the deliberation of Awig-Awig.

Within the Netherlands' Forest Strategy case study, an action was to encourage consumer choices to be nature positive, so as to drive producers to respond to consumer pressure, with more nature positive or neutral products entering the market.

Bonaire sought to modify educational curriculum to cover the connection to biodiversity and the land by creating experiential programmes to instil wonder in primary school kids, with the goal of bringing the connection message back to their parents as well.

3.2.7 Securing adequate financial support

The pathway of securing adequate financial support concerns the identification of existing and novel finance structures to realise biodiversity positive measures and outcomes, like ecosystem service payments or carbon credits. The goal is to create financial conditions or mechanisms that enable and encourage biodiversity regenerative activities. By funding a biodiversity regenerative initiative or topic, rules and responsibilities can be formalised and thus indicate that biodiversity has a value or importance. This then can lead to increased accountability for biodiversity. Similar actions within Lake Dembel, Bonaire and Lombok include using tourism to pay for nature protection and restoration work. For example, placing a tourism surcharge on hotel rooms which is then invested into nature (Lake Dembel), aiming to increase low impact, high-end tourism like diving and coral reef restoration workshop events in Bonaire, and developing an integrated tourism area, like in Jor Bay, where culinary, cultural, religious and natural tourism is ingrained with mangrove eco-tourism. The actions of the Netherlands' Forest Strategy case study for this pathway took a different approach, rather than seeking to use tourism income for funding biodiversity work, utilising government subsidies for biodiversity supportive forest management and funding land acquisition for forest expansion. Also new function combination, such as with wind power and housing will be explored for

potential financing options. However, the Netherlands' Forest Strategy contained a stark disclaimer that the governments' adoption of the strategy did not imply any commitment to additional funding in any way.

3.3 Spheres of Transformation

A simple coding exercise was carried out to categorise each individual action into the spheres of transformation; personal, political and practical. The aim of this exercise was to visually understand how the different pathways relate to the personal, political and practical spheres; and to see if there is any interesting overall between the spheres. The outputs of this coding exercise are given in Table 3.1. One value corresponds to one action, with the full list of actions found in Appendix 2. The results in the table are counts, and there is no interpretation of the counts of actions. In the context of the Forest Strategy, placeholders (Xs) were utilised instead of numerical values due to the inherently political nature of the case study, which focuses on a specific policy. In contrast, the other case studies adopt a more landscape or geographical approach.

Personal
The pathway which most closely relates to the sphere of 'personal' is that of 'Nature and culture', with seven actions across all four case studies. As the personal sphere focus more on values, worldviews, and inner beliefs, it is logical that actions embedded in culture are a transformation that shapes the way the systems and structures are viewed (O'Brien and Sygna 2013). These personal beliefs and worldviews are important and act as a driver and motivation for these transformations. The personal actions are closely linked to culture, and in some instances local and religious customs. For example in Lombok, there is a local ceremony and tradition called 'Selamat Laut', where villagers give offerings and cleansing for their fishing boats, in order to increase their gratitude for the sea. During this time, no fishing activities are allowed, which in turn will have an impact on biodiversity and nature conservation.

Political
The pathways of 'Effective Multi Stakeholder Partnerships (MSPs) and collaborations' and 'Supportive policy, implementation and enforcement of policy' generally focused on the 'political' sphere, with a large number of actions attributed to this spheres. This is to be expected as these pathways focus on stakeholder's having a shared vision and strengthening their collaboration; in addition to providing support to ensure policies are translated into the real world. These two pathways refer closely to the systems and structures that exist within the case studies, and what constraints exist for a practical transformation to take place (O'Brien and Sygna 2013). Actions placed in the political sphere include ones restructuring of government roles and responsibilities, such as in the Netherlands' Forest Strategy and their action to ensure regulations and subsidies are more specific for protection of biodiversity rather than facilitating harmful operations, or Bonaire's (cruise)ship policy aimed at decreasing pressure on the natural environment, less over-tourism for residents and a more exclusive and tranquil experience for tourists.

Table 3.1 *Coding of actions under the three spheres of transformation*

	Spheres of Transformation	Lake Dembel	Forest Strategy	Bonaire	Lombok
Amplifying nature connectedness and awareness	Personal			2	1
	Political	2	X		1
	Practical	3		4	2
Recognising biodiversity's cultural importance	Personal	3	X	1	2
	Political				
	Practical			4	
Safeguarding social foundations	Personal	2		1	
	Political	3	X	2	2
	Practical			2	1
Fostering effective Multi Stakeholder Partnerships (MSPs) and collaborations	Personal	1			1
	Political	6	X	2	3
	Practical			2	
Developing and Implementing supportive policy, linked with enforcement	Personal				1
	Political	5	X	9	3
	Practical	3			
Achieving biodiversity positive norms and rules of institutions	Personal	4		2	
	Political		X		1
	Practical	2		4	2
Securing adequate financial support	Personal				
	Political	1		3	1
	Practical	1	X	2	3

Practical

The practical sphere is found at the core of the spheres of transformation, and are the specific targets and goals that are practical in nature, and are tangible actions, technologies or behaviours. The pathway of 'Securing adequate financial support' for example is a tangible action which has led to nine actions across the four case studies being categorised as 'practical'. The practical sphere is linked with various other pathways, as specific actions with tangible results were reported under all the case studies, such as a tourism surcharge by hotels protecting nature in Ethiopia, or a biodiversity and conservation course added to the curriculum in Lombok, or no full land clearing in construction projects on Bonaire.

Case study profiles

Table 3.2 presents the case study profiles for the spheres of transformation. Each case study encompasses all spheres of transformation, albeit to varying degrees. For instance, the Forest Strategy exhibit limited actions in the personal sphere. The Bonaire case study primarily focuses on the practical sphere, while the EU forest policy and Awig-Awig Lombok case studies emphasise the political sphere. The Lake Dembel case study in Ethiopia demonstrates a balanced emphasis on both the personal and political spheres.

Table 3.2 *Case study profiles for the Spheres of Transformation*

Lake Dembel

	Amplifying nature connectedness and awareness	Recognising biodiversity's cultural importance	Safeguarding social foundations	Fostering effective Multi Stakeholder Partnerships (MSPs) and collaborations	Developing and implementing supportive policy, linked with enforcement	Achieving biodiversity positive norms and rules of institutions	Securing adequate financial support	
Personal		3	2	1		4		**10**
Political	2		3	6	5		1	**17**
Practical	3				3	2	1	**9**

Forestry Strategy

	Amplifying nature connectedness and awareness	Recognising biodiversity's cultural importance	Safeguarding social foundations	Fostering effective Multi Stakeholder Partnerships (MSPs) and collaborations	Developing and implementing supportive policy, linked with enforcement	Achieving biodiversity positive norms and rules of institutions	Securing adequate financial support	
Personal		X						**X**
Political	X		X	X	X	X		**X**
Practical							X	**X**

Bonaire

	Amplifying nature connectedness and awareness	Recognising biodiversity's cultural importance	Safeguarding social foundations	Fostering effective Multi Stakeholder Partnerships (MSPs) and collaborations	Developing and implementing supportive policy, linked with enforcement	Achieving biodiversity positive norms and rules of institutions	Securing adequate financial support	
Personal	2	1	1			2		**6**
Political			2	2	9		3	**16**
Practical	4	4	2	2		4	2	**18**

Lombok

	Amplifying nature connectedness and awareness	Recognising biodiversity's cultural importance	Safeguarding social foundations	Fostering effective Multi Stakeholder Partnerships (MSPs) and collaborations	Developing and implementing supportive policy, linked with enforcement	Achieving biodiversity positive norms and rules of institutions	Securing adequate financial support	
Personal	1	2		1	1			**5**
Political	1		2	3	3	1	1	**11**
Practical	2		1			2	3	**8**

4 Discussion

This report explores a needs-based approach with case studies to investigate different pathways towards achieving a stewardship economy for biodiversity. These pathways, undertaken by groups of change agents within their specific contexts, aim to achieve sustainable and equitable futures, focusing on biodiversity net gain and carbon sequestration. The case studies, including Lake Dembel (Ethiopia), the National Forest Strategy (the Netherlands), the island of Bonaire (Dutch Caribbean), and Awig-Awig in Lombok (Indonesia), identified actions towards a stewardship economy through semi-structured interviews. The key identified pathways are:

- Amplifying nature connectedness and awareness
- Recognising biodiversity's cultural importance
- Safeguarding social foundations
- Fostering effective multi-stakeholder partnerships (MSPs) and collaborations
- Developing and implementing supportive policy, linked with enforcement
- Achieving biodiversity-positive norms and rules of institutions
- Securing adequate financial support.

Pathways for stewardship economy for biodiversity

The seven identified pathways demonstrate a comprehensive approach to addressing stewardship economy related challenges across the four case studies. It is noteworthy that, despite the differences in the case studies, six of the seven pathways were shared across the case studies. This indicates the presence of shared issues across different contexts. Within these pathways, there may be differences on the type of actions. For example in the case of Awig-Awig and Lake Dembel, actions for social foundations were related to issues of food security or conflict, whereas in the case of the Forest Strategy in the Netherlands it refers to the well-being aspects related to nature and biodiversity, as well as the utilisation of forests for recreation, drinking water, timber, and carbon sequestration. The references to social foundation in the first cases brings to light the ongoing debate about the interplay between poverty, instability (as part of social foundations) and conservation efforts (Fisher et al. 2020; Roe 2008; Roe et al. 2012), whereas the second underlines the importance of nature for human wellbeing.

The identified pathways aim, directly or indirectly, to enhance the foundational elements of the stewardship economy for biodiversity. These elements include caring for, taking responsibility for, and ensuring accountability for nature and biodiversity; transitioning to decision-making processes that prioritise collective purposes with nature and biodiversity at their core; increasing awareness of the long-term impacts on people and places; and promoting the integrity of facts concerning nature and biodiversity to facilitate large-scale transformation. For example, the pathways of 'Developing and implementing supportive policy, linked with enforcement', and 'Achieving biodiversity positive norms and rules of institutions' directly aim to improve the level of awareness, responsibility and accountability. The pathway 'Fostering effective multi-stakeholder partnerships (MSPs) and collaborations' on the other hand supports this by focusing on the collectiveness in this process. Lastly, the example of the pathway focused on 'Securing adequate financial support' is directly associated with reestablishing the valuation of nature, thereby prompting a shift towards decision-making processes that prioritise nature and biodiversity.

While there is a pathway addressing access to finance and policy, there is a noticeable absence of further references to pathway actions involving market mechanisms. This omission may be attributed to the selection of case studies or may reflect the participants' lack of confidence in the viability of this pathway. The initial examination focused on the interest and potential of the pathways, but further research on specific aspects is necessary to comprehensively test their applicability. Additionally, the design of policy instruments can enhance both accountability and public acceptance.

The pathways are highly interconnected. For instance, nature connectedness and awareness directly contribute to promoting the cultural value of biodiversity and vice versa. Additionally, the pathways of 'Achieving biodiversity-positive norms and rules of institutions' and 'Nature connectedness and awareness'

exhibit significant overlap. However, the distinction lies in the level of focus: the latter addresses individual mindset in regards to care, responsibility, awareness and decision-making, whereas the former pertains to institutional levels. The shift from individualism to a collective or institutional approach necessitates the creation of a common sense of responsibility. While some individuals already assume this responsibility, the institutionalisation of such efforts is often lacking and is recommended as an action point. This can be achieved through both informal and formal (policy) mechanisms. This underscores the necessity for a cross-scale approach, addressing both individual and collective pathways.

The case studies noted the need for societal support for biodiversity stewardship at the local level. The local level engagement has been shown to be important in contexts of instability (e.g., case Lake Dembel) and for reconnecting or leveraging local knowledge (e.g., Awig-Awig in Lombok). At the local level, dependency on and taking collective responsibility for nature, such as in the 'Selamat Laut' example, clearly exemplifies the notion of commonality in a stewardship economy for biodiversity. However, engagement at the national level, institutions and legislation reflect broader societal support, potentially consolidating implicit social values and norms regarding biodiversity stewardship. For example, the Forestry Strategy case study demonstrated the influence of widespread societal support for nature protection. In Dutch society, the deeply entrenched belief that trees should not be felled compels politicians, legislators and forest owners to take this into account in their policies and management. Support for strict protection of trees and forests is provided by the general public, which quite often engages in protests against felling concessions. The above examples across the case studies underscores the necessity for cross-scale and cross stakeholders efforts, where local changes and national or international initiatives mutually reinforce each other.

Spheres of transformation

Certain pathways are more strongly connected with specific spheres in a predictable manner, despite anticipated overlap across the three spheres in their interaction with each pathway. For instance, pathways that focus on policy and stakeholders are closely linked to the political sphere of systems and structures, whereas the pathway focusing on culture is more aligned with the personal sphere and the pathway focused on financial support is aligned with the practical sphere.

All case studies emphasise actions in all spheres, although most emphasise the need for actions in the political sphere. Some case studies provide more actions in one sphere compared to another. For example, the case study in Bonaire emphasises more actions in the practical sphere compared to the personal sphere. This emphasis can also be due to the focus of the case study. For example a policy oriented case study, such as the Netherlands' Forest Strategy, is more likely to address actions in the political sphere. In the current version, a decision was made to categorise each action according to the sphere that is initially affected. However, it could be a valuable exercise to categorise each action based on all the spheres it interacts with, in order to obtain a more comprehensive understanding.

Meaningful change and transformation can only exist when there is interaction between all three spheres and alignment of personal motivations, systematic changes, and practical actions. This interaction is an essential part of the 'Spheres of transformation' framework (O'Brien and Sygna 2013). O'Brien and Sygna (2013) write that 'the practical sphere is in the centre; with the political sphere representing what conditions are needed to achieve the outlined targets and goals; and the personal sphere is important for capturing the collective and individual views of the systems and solutions' (p.5). Meaningful change and transformation can only exist when there is interaction between all three spheres and there is alignment of the personal motivations, systematic changes and practical actions. This interaction can be experienced within the actions in the pathway tables, and influences how they might be categorised. Certain actions initiated within a specific sphere can ultimately produce results or outcomes that manifest in a different sphere, thereby illustrating the interconnectedness between the actions and the spheres. For example, in multiple case studies, the action of an educational programme in schools is suggested and this is categorised as a practical action, within the practical sphere. The outcome of such a programme, however, will increase awareness and potential shift worldviews and motivation for an individual, which will in turn alter the personal sphere. This interdependence highlights how efforts in one domain can influence and drive changes in another, emphasising the holistic nature of these pathways and the necessity for a coordinated approach across various levels and sectors. More insights in this interaction can target the pathways even more, which was beyond the scope of this study.

5 Conclusions

The concept of a stewardship economy highlights the importance of preserving the diverse values of nature and biodiversity, though its implementation remains undefined. This report uses case studies including Lake Dembel (Ethiopia), the National Forest Strategy (the Netherlands), the island of Bonaire (Dutch Caribbean), and Awig-Awig in Lombok (Indonesia), to explore different pathways towards achieving a stewardship economy, focusing on sustainable and equitable futures. Key pathways identified include amplifying nature connectedness, recognising biodiversity's cultural importance, safeguarding social foundations, fostering multi-stakeholder partnerships, developing supportive policies, achieving biodiversity-positive norms, and securing financial support. From this work, we have derived the following conclusions:

1. *Shared pathways across case studies*
   The seven identified pathways demonstrate a comprehensive approach to addressing stewardship economy-related challenges across the four case studies. Despite differences in the case studies, six of the seven pathways were shared, indicating the presence of shared issues across different contexts.

2. *Enhancing foundational element of stewardship economy*
   The identified pathways aim to enhance the foundational elements of the stewardship economy for biodiversity.

3. *Absence of market mechanisms in case studies*
   While there is a pathway addressing access to finance and policy, there is a noticeable absence of further references to pathway actions involving market mechanisms in the case studies. This omission may be attributed to the selection of case studies or may reflect the participants' lack of confidence in the viability of this pathway.

4. *Interconnected pathways*
   The pathways are highly interconnected; for instance, nature connectedness and awareness directly contribute to promoting the cultural value of biodiversity and vice versa.

5. *Cross-scale approach*
   The shift from individualism to a collective or institutional approach necessitates the creation of a common sense of responsibility. This underscores the necessity for a cross-scale approach, addressing both individual and collective pathways.

6. *Societal support at multiple levels*
   The case studies noted the need for societal support for biodiversity stewardship at the local level. Engagement at the national level, institutions, and legislation reflect broader societal support, potentially consolidating implicit social values and norms regarding biodiversity stewardship.

7. *Pathways and spheres connection*
   Certain pathways are more strongly connected with specific spheres of transformation (O'Brien 2018) in a predictable manner. For instance, pathways that focus on policy and stakeholders are closely linked to the political sphere, whereas the pathway focusing on culture is more aligned with the personal sphere, and the pathway focused on financial support is aligned with the practical sphere.

8. *Emphasis on political sphere*
   All case studies emphasise actions in all spheres, although most emphasise the need for actions in the political sphere.

9. *Interaction between spheres*
   Meaningful change and transformation can only exist when there is interaction between all three spheres and alignment of personal motivations, systematic changes, and practical actions. This interaction is an essential part of the 'Spheres of transformation' framework (O'Brien 2018).

10. *Interdependence of actions*
    Certain actions initiated within a specific sphere can ultimately produce results or outcomes that manifest in a different sphere, illustrating the interconnectedness between the actions and the spheres. This interdependence highlights the holistic nature of these pathways and the necessity for a coordinated approach across various levels and sectors.

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Appendix 1 Guiding interview questions

Interview guiding questions based on the case study Lake Dembel, Ethiopia

- Explanation of project: Project topic, partners, data management, outputs – information sheet
- Consent for notes on questions (outputs of the research, anonymised, can say no to a question, recording – we can share in a document)

Defining 'Stewardship Economy'
**may be defined as an economy that takes responsible management of land use, environmental pollution, and natural resources, and nature including biodiversity and take this responsibility systematically into account in its decision-making. This means organising ourselves in a way what we take care of land, natural resources, life and creating livelihood in a way that regenerates natural resources and nature. Stewardship economy is therefore a way that we can improve biodiversity* - NOTE: This is our definition of stewardship economy, important to see if interviewee agrees or see this differently.*

1. When you hear this definition of the concept, do you recognise (parts of) this in your work? How does it link to your work? How does it resonate with your work?
2. Could you describe the state of nature and biodiversity in Dembel-Shalla sub-basin?
   a. Have you witnessed practices by local communities of stewardship of nature and biodiversity in the Dembel-Shalla sub basin? Have you witnessed practices against? Could you give some examples? (How people relate)

Practices, values and motivation - Case study Stakeholders

3. Can you share any practices (actions) of your organisation that you would consider fitting under Stewardship of nature and biodiversity? What other actions do you see beyond your organisation (e.g., Ethiopian society)
   a. Prompt: can be in different sectors or at different scales: local, regional, national, international *Interest-influence matrix*
4. Who among the stakeholders have a high interest?
   a. What about your own organisation?
5. Who has a low influence?
6. For each of these stakeholders, what drives their high or low interest in nature and biodiversity?
   a. Prompt: What values are these practices based on? (think of nature as an intrinsic value to people, social, cultural, political, or commercial values)
   b. Prompt: can be in different sectors or at different scales: local, regional, national, international

Force field analysis

7. What are the current conditions supporting stewardship practices for nature and biodiversity around Dembel Shalla Sub basin?
   a. Prompt: why or in what way?
8. What are the current conditions restraining stewardship for nature and biodiversity?
   a. Prompt: They can be legal, economic, political or technological. Why or in what way?

Perspective on the future (pathways)

9. What is your vision on the future of the Dembel Shalla sub-basin?
   a. With respect to nature and biodiversity?
   b. How does stewardship/safeguarding/landscape approaches play a role in that?
10. Having discussed the current situation, what needs to happen to achieve this vision?
    a. Prompt: can be at different levels from local -regional -national-international
11. Who would be needed for what actions?
12. What would you like to do personally to make this vision a reality?

Interview guiding questions based on the case study Awig-Awig, Lombok

Introduction

- Explanation of project: Project topic, partners, data management (secure, anonymised, used only for this research), outputs (virtual workshop, case studies report and academic article) – information sheet
- Consent for notes on questions (outputs of the research, anonymised, can say no to a question, recording – we can share in a document)

Defining 'Stewardship Economy'

**may be defined as an economy that takes responsible management of land use, environmental pollution, and natural resources, and nature including biodiversity and takes this responsibility systematically into account in its decision-making. This means organising ourselves in a way in which we take care of land, natural resources, life and creating livelihood in a way that regenerates natural resources and nature. Stewardship economy is therefore a way that we can improve biodiversity* (care, responsibility and accountability are important) - (e.g., community-based practice)*

SE may be defined as an economic system that

- *takes responsible management of land use, environmental pollution, natural resources, and nature including biodiversity*
- *and take this responsibility systematically into account in its decision-making.*
- *This means organising ourselves in a way that we take care of land, natural resources, and biodiversity*
- *and creating livelihood that regenerates natural resources and nature.*
- *Stewardship economy can therefore be a way to improve biodiversity and take care of people's sustainable livelihoods (local economy)*
- *- NOTE: This is our definition of stewardship economy, important to see if interviewee agrees or see this differently.*

1. When you hear this definition of the concept, do you recognise (parts of) this in the work you do? How does it link to/resonate with your work?
2. Could you describe the state of nature and biodiversity in (Mangrove conservation area/ Village/Jor Bay area/East Lombok, etc.), in the area you work?
    a. Have you witnessed stewardship practices that promote nature and biodiversity by local communities in Lombok?
    b. Have you witnessed practices against nature and biodiversity?
    c. Could you give some examples? (illustrate how people currently relate to land, nature and biodiversity)

Practices, values and motivation - Case study Stakeholders

3. Can you share any practices (actions) of your organisation that you would consider fitting under Stewardship of nature and biodiversity? What other actions do you see beyond your organisation (e.g., other organisations and in Indonesian society and culture)
    a. Prompt: can be in different sectors or at different scales: local, regional, national, international
4. Can you share any values of your organisation that you would consider fitting under Stewardship of nature and biodiversity? What other values do you see beyond your organisation (e.g., other organisations and in Indonesian society and culture)
5. Can you share any motivation of your organisation that you would consider fitting under Stewardship of nature and biodiversity? What other motivation do you see beyond your organisation (e.g., other organisations and in Indonesian society and culture)
    a. Prompt: the rule of Awig-Awig

Interest-influence matrix

6. Who among the stakeholders have a high interest?
    a. Where in the matrix would you place your own organisation?
7. Who has a high influence?

8. For each of these stakeholders, what drives their high or low interest in nature and biodiversity?
    a. Prompt: What values are their practices based on? (think of: nature as an intrinsic value to people, social, cultural, political, or commercial values)
    b. Prompt: can be in different sectors or at different scales: local, regional, national, international
    c. Prompt: the rule of Awig-Awig

Force field analysis

9. What are the current conditions supporting stewardship practices for nature and biodiversity around (Mangrove conservation area/ Village/Jor Bay area/East Lombok, etc.)?
    a. Prompt: why or in what way?
10. What are the current conditions restraining stewardship for nature and biodiversity?
    a. Prompt: They can be legal, economic, political or technological. Why or in what way?

Perspective on the future (pathways)

11. What is your vision on the future of (Mangrove conservation area/ Village/Jor Bay area/East Lombok, etc.)?
    a. With respect to nature and biodiversity?
    b. What role does stewardship play in that? (use the word used by the interviewee)
12. Having discussed the current situation, what needs to happen to achieve this vision?
    a. Prompt: can be at different levels from local -regional -national-international
13. Optional: Who would be needed for what actions?
14. Optional: What would you like to do personally to make this vision a reality?

Closing

15. Reflecting back on this discussion, what sentiments come up when you consider the term stewardship practices? How do you personally feel about it?

Interview guiding questions for the Netherlands' Forest strategy

Introduction

1. Question concerning interviewee and his/her job and position

General questions concerning the Forest Strategy

2. To what extent are you familiar with the Netherlands' and EU Forest strategies?
3. What is your vision on forests in the Netherlands / Europe?

Multiple Values and People/Profit/Planet Triangle

4. In your opinion, what are the most important goals of the Forest Strategy, are you satisfied with how they are expressed in the Forest Strategy and with the actions to achieve those goals?
5. How do you see the required balance between economic, social and nature goals in forest policy? To what extent do you think that this balance differs between forest management and agriculture?
6. How do you see the required balance between commitments to climate, environment and biodiversity in forest policy?
7. What do you think of the way biodiversity is protected in the Forest Strategy? Is it effective, or what should change?
8. How do you perceive the trade-off between biodiversity and other functions of forests?

Measures / stewardship actions

9. What are the most important concrete measures / actions that help to promote nature and biodiversity in forests? Can you rank them according to importance?
10. What are the main impediments (economic, regulatory, policy-wise, land use including forest management or otherwise) in the implementation / realisation of these measures? Can you rank them according to degree of hindrance?
11. What are the main driving factors (economic, regulatory, policy-wise, land use including forest management or otherwise) in implementation / realisation of these measures? Can you rank them according to degree of support?

12. What is needed to remove these barriers and strengthen incentives?

Stakeholder interest / influence

13. Which actors have the strongest interest in forest biodiversity?
14. Which actors have the strongest influence on forest biodiversity?

Own sphere of influence

15. How do you see the influence of your own organisation on nature and biodiversity in the Netherlands / the EU?
16. How does your organisation take nature and biodiversity into account?
17. What incentives/barriers do you experience with the biodiversity goals in your organisation?

In-depth questions

18. To what extent can private landowners outside existing forest areas contribute to tree planting and afforestation in general? How do you see the opportunities and limitations of using agricultural land for afforestation and/or timber production? What does it take to do that better?
19. How could the different values of forests and trees (e.g., ecosystem services, timber production, intrinsic value of forest nature, etc.) be valued optimally?
20. How can economic forest interests (timber production), ecological interests (climate, environment, nature, biodiversity) and social interests (recreation, housing) be reconciled?
21. Would you have concrete examples of good or unfavourable forest management for biodiversity?
22. How do you see the relationship between regional (provinces), national (national), European (EU) and international forest policy (CBD)? What is going well at the various levels of government and what could be improved?
23. What is the most important advice you would like to give for the Forest strategy with regard to biodiversity?

Appendix 2 Identified actions for each pathway per case study

Table A2.1 *Identified actions per case study, categorised per pathway and coloured per sphere of transformation (personal – light blue, political – mid blue, practical – dark blue)*

	Lake Dembel	Forest Strategy	Bonaire	Lombok
Amplifying nature connectedness and awareness	Bringing back education courses and curriculum on traditional knowledge systems (e.g., Gada) and natural resource conservation from the national to the community level	Communication to society to prove the importance of nature and biodiversity through examples how rich nature in forests is (under current management practices); appeal to sense of wonder	Focus on youth: education programmes for primary schools	Providing extension/socialisation to local people, especially to raise their awareness about the importance of mangrove ecosystem. For example, by giving an understanding about how protecting nature can also positively impact them economically (both in the shorter and longer run).
	Train local leaders to become extension officers	Information for and education of the commercial sector, public health, construction sector, etc. what nature and biodiversity mean to them	Educate future ambassadors for nature e.g., junior ranger programme of the nature management organisation STINAPA	Providing training / capacity building for the local youth to be able to run / manage mangrove eco-tourism area).
	Train the trainer model	Information for and education to the forest sector itself to rethink multi-functional forest management	Increase awareness about dependency of tourism's dependence on nature	Teaching /providing extracurricular for the school children to raise their awareness about mangrove.
	Connect universities to companies, NGOs and government – strategic plan to move research findings to operational level		Stewardship must appeal more to human aspects such as motivation, drive and energy	Partnership between local universities, NGOs, and government agencies in providing training / capacity building activity for the local champions.
	Support the rights of local initiatives and link these to customary systems		Setting up show case projects and facilitate forerunners and visionaries	
			Setup (experiential) educational programmes to instill wonder at primary schools.	
Recognising biodiversity's cultural importance	Churches being viewed as nature preserves where biodiversity and nature are cared for, due to restrictions on their surrounding areas and hosting care takers.	Make more use of the fact that forests appeal to the sense of primeval nature people have (although in the Netherlands forests are not so much a prominent cultural factor in society, they very much appeal to people's basic sense of nature)	Capture rainwater to water garden and kunukus (cheaper and a cultural custom)	Using local ceremony as a way to connect with nature. For example, there is a tradition called 'Selamat Laut', which takes place between January and February. In this ceremony the villagers will give some offerings and 'cleansing' their fishing boat. The idea is to be grateful for what the sea has provided for them in the past year and pray for their safety in the sea in the coming year. They are not allowed to go fishing for a certain amount of time. It is believed by the locals, if this tradition is not followed then it might threaten / harm the villagers.

	Lake Dembel	Forest Strategy	Bonaire	Lombok
	Religion and churches are a primary driver behind individuals undertaking environmental stewardship activities		Fencing from candelabra cacti	There is a traditional fishing culture, called 'madak' where the locals will forage fish / other sea resources during the low tides. This is usually done in the mangrove area. However, recently some people (often people from outside the village) are using destructive tools to scrap more resources (e.g., clams, shrimps, crabs, etc.) from the coast. Essentially, the locals used to only use their feet to find where the resources are. When it is done responsibly, it is acknowledged that, to some extent, this traditional 'madak' activity could be a potentially interesting cultural tourism activity.
	The Gada system – traditional form of governance consisting of rituals to nature, and approaching the community as part of the environment		In the past people lived in balance with nature (carrying capacity) due to changed jobs (oil industry, tourism) money could support livelihoods and the connection with /dependency on nature was lost	
			Organise nature-culture events (e.g., Noz Zjilea)	
			Sourcing restaurants with local food from adjacent gardens	
Safeguarding social foundations	Support the rights of local initiatives and link these to customary systems		Poverty alleviation: more jobs for original Bonairians in tourism and nature conservation	Empowering the local youth (local champions) and providing them with skills and financial support to run their initiatives. Youth are more willing and able to invest their time and effort in mangrove conservation.
	Gender dynamics and involving women in conservation efforts as they often are motivated for environment		Return programme for people who have studied abroad	Involving local women in mangrove planting and preserving activities. In some villages, local women are active in MSMEs (e.g., shrimp paste production, crab shell crackers production, etc.) which can be collaborated with mangrove eco-tourism activity
	Diverse and alternative livelihoods for the community – connecting income and food security with nature regeneration		Invest in affordable housing for Bonairians	The government needs to provide a legal umbrella / institution that can back up the local initiatives. Additionally, to give access to necessary knowledge, network, and resources.
	Government is responsible to keep peace and security, to ensure checks and balances on policy implementation and address corruption		Build a solid knowledge infrastructure to make society/economy less dependent from expats that have no/little connection to Bonaire	
	Inviting international environmental organisations to provide the necessary financial and technological support		Households to grow their own food (instead of buying and having a stony garden) and share surplus production with their neightbours	

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Fostering effective Multi Stakeholder Partnerships (MSPs) and collaborations	Find an organisation that agrees to be responsible for the MSP; clear leadership is needed	Strengthen collaboration between the various interest groups concerned (nature, timber production, energy (biomass production), recreation, landscape conservation, ...)	More synergy between the Bonairian government (OLB) and private sector	It is necessary to have a mediator / facilitator (e.g., chief of village, respectable figure in the area, government agency, etc.) who can mediate / synergise different initiatives / organisations in the village. However, it is also important to have clear boundaries between the facilitating body (e.g., chief of village) and the local organisations (too much intervention from the village might also raise an issue and may lead to conflict of interest).
	Find common understanding of the problem(s)	Strengthen collaboration between provinces to have one vision	Identify joint business opportunities (e.g., growing corals and let dive tourist plant them by paying, or growing local trees for resorts)	Raising awareness and stimulating dialogues among different stakeholders are fundamental in order to synergise their actions to achieve common goal in conserving and managing the mangrove area.
	Give specific roles to each stakeholder to ensure commitment.	Strengthen collaboration of nature conservation organisations	Government to support initiatives that move in the 'right' direction (e.g., neighborhood and syntropic gardens)	Connecting the local communities, NGOs, government agencies, universities, and private companies is essential to achieve common goals in mangrove conservation and management.
	Create a good governance structure based on a democratic process		Create a joint brand (e.g., 'Made in Rincon')	Building trust is important, particularly when it comes to collaboration among local organisations.
	Ensure a good representation in the MSP and place partners in the governing structure based on their interest and capacity.			
	Connect universities to companies, NGOs and government – strategic plan to move research findings to operational level			
	Government facilitation of MSP			
Developing and Implementing supportive policy, linked with enforcement	Implementation guidelines provided with the policies that protect and put a value on biodiversity	Regulations and subsidies should be made more specific for protection of biodiversity instead of facilitating harmful operations	In general, better enforcement of regulations, e.g., prevent roaming and grazing of goats	Integrated programmes and policies among government agencies (national, provincial, and district levels) would be beneficial in ensuring the achievement of mangrove conservation and management visions.
	More regulation for investments, for water abstraction and for a buffer zone around the lake.	The national government should take more the lead in what should happen in terms of vision and action	Faster implementation of policy regulations	Enforcement of Awig-Awig, by creating a more powerful legal umbrella, for example, through the 'Joint Decree of the Village Heads'. More emphasis on biodiversity in the government programmes.
	Creating ownership of land, so people identify with the land and ultimately take responsibility		Better spatial planning; not allowing dwelling houses all over the island	Providing an incentive for the locals who are active in mangrove conservation and management.
	Government enforcement of environmental laws and CSR		Better integration of nature interest in other policies	Establishment and enforcement of Awig-Awig (re: a local wisdom which is written and enacted as a local law). This local law fosters accountability and

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				responsibility within local people. It regulates various aspects of day-to-day life of the locals. For instance, Awig-Awig of Jor Bay about the management of fisheries and coastal resources, including mangrove conservation (Chapter 5, Clause 8).
	Introduce local by-laws for enforcement – locally established fines for environmental mismanagement/degradation		Better regulations for corporate social responsibility (social and environmental)	
	Land use planning that emphasises environmental sustainability and stewardship,		Better policy and regulations for recycling	
	Federal, and regional land use planning regulation and necessary enforcement to prioritise environmental stewardship, for instance, buffer-zones around bodies of water (can only be implemented by the regional and federal government though the Rift Valley Lakes Basin Authority)		Better policy for private responsibilities (management of kunukus, rainwater harvesting etc.)	
	Government responsibility for implementation and enforcement of CSR		Utilise spatial planning to establish legal frameworks for the protection and strengthening of nature on both private and public lands	
			Setting limits to growth by the government (both inhabitants as tourism)	
Achieving biodiversity positive norms and rules of institutions	Creating individual and collective land identity, potentially through individual or collective ownership, so people identify with the land and are inspired to take responsibility for long term improvements.	Stimulate sustainable consumer choices that are nature positive/neutral and how natura can contribute to that	Setup (experiential) educational programmes to instill wonder at primary schools (kids bring the message back home to their parents)	Fostering individual ownership about protecting mangrove areas. (e.g., through socialisation, involving the locals in the deliberation of awig-awig, etc.).
	Supporting the rights of local initiatives and linking to customary systems	The EU and NL forest strategies are examples of policies intended to help, main weaknesses are partial cover-up of underlying tensions, absence of funding and absence of translation into formal legislation (utopian approach – but it does have a certain impact)	Create awards to recognise companies that cultivate biodiverse gardens	Finding the root cause of mangrove destruction and finding an alternative for it. For instance, people used to cut down mangrove trees for fuel, but recently it does not happen anymore because they use gas as an alternative.
	Reviving interest and application of knowledge from customary systems		Organise compulsory (native) tree planting days as part of CSR	Giving an understanding by example. For instance, the Youth Community in the village initiated mangrove area management & eco-tourism. In this way, local people can understand the importance of mangroves to protect their village

	Lake Dembel	Forest Strategy	Bonaire	Lombok
				from flooding/abrasion as well as providing an economic benefit for their village.
	Create a clear connection to the location that products are produced (consumers are unaware of where goods come from, so therefore are unaware of the impacts)		Have employees (of all kinds of organisations and companies on Bonaire) work on beach clean-ups, and mangrove restoration (CSR)	
	Creating individual and collective land identity, potentially through individual or collective ownership, so people identify with the land and are inspired to take responsibility for long term improvements.		Create a local connection to the origin of products that are sold on farmers markets and supermarkets	
	Integrate topics of biodiversity into educational curriculum at all levels		In the CSR (corporate responsibility strategy), individuals are encouraged to motivate each other, for example, by planting trees on public and private land, beach clean-ups, etc. Companies incorporate these activities into their CSR.	
Securing Adequate Financial support	Tourism surcharge by hotels which is invested in nature	Adequate government subsidies for biodiversity supportive forest management (remains issue of concern)	Stimulating entrepreneurship amongst Bonairians	Developing an integrated tourism area (e.g., combining several potential tourist spots in Jor Bay, such as culinary, cultural, natural, and religious tourism), where mangrove eco-tourism is a part of it. Hence, it will provide a more sustainable source of income.
	Implementation guidelines provided with the policies that protect and put a value on biodiversity	Development of nature inclusive business models for non-nature sectors	Population growth ensures a more solid economic base (but what is the carrying capacity of Bonaire?) but requires also regulations about share of growth of Bonairians and people from abroad	Connecting the local champions with good network and funding opportunities for their mangrove initiatives.
		Funds for acquisition of land for forest expansion (remains issue of concern)	Aiming at high-end tourism	Allocating more government funds for mangrove-related initiatives (e.g., from village to national levels).
		Private funds for nature and ecosystem services (carbon & biodiversity credits) may be helpful	Development of payment schemes for nature (equalising costs and benefits)	Establishing CSR initiatives or partnerships with private companies in the area, which is focusing on environment or on mangrove conservation.
			Tourism surcharge by immigration (nature fee at airport) which is invested in nature	

Wageningen Social & Economic Research
P.O. Box 88
6700 AB Wageningen
The Netherlands
T +31 (0)317 48 48 88
E info.wser@wur.nl
wur.eu/social-and-economic-research

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Wageningen Social & Economic Research
P.O. Box 88
6700 AB Wageningen
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The mission of Wageningen University & Research is "To explore the potential of nature to improve the quality of life". Under the banner Wageningen University & Research, Wageningen University and the specialised research institutes of the Wageningen Research Foundation have joined forces in contributing to finding solutions to important questions in the domain of healthy food and living environment. With its roughly 30 branches, 7,700 employees (7,000 fte), 2,500 PhD and EngD candidates, 13,100 students and over 150,000 participants to WUR's Life Long Learning, Wageningen University & Research is one of the leading organisations in its domain. The unique Wageningen approach lies in its integrated approach to issues and the collaboration between different disciplines.