



Seascapes Planning in the Bismarck Sea, Papua New Guinea: A Guidance Document



Conservation and Environmental Protection
Authority



**CORAL TRIANGLE
INITIATIVE**
ON CORAL REEFS, FISHERIES AND FOOD SECURITY



*Empowered lives.
Resilient nations.*

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Executive Summary

The objective of the Coral Triangle Initiative on Coral Reefs, Fisheries and Food Security (CTI) is to '*achieve conservation of marine biodiversity and food security through sustainable resource management*'. Goal 1 of the CTI is '*to designate and effectively manage priority Seascapes*'. Seascapes are large, multiple-use marine areas, defined scientifically and strategically, in which government authorities, private organisations, and other stakeholders cooperate to conserve the diversity and abundance of marine life and to promote human well-being. Priority Seascapes have high biodiversity values and socio-cultural or economic values, and existing or potential conflicts between them.

While much has been achieved to define and delineate Seascapes amongst the CTI partners, there are few examples of how to implement Seascapes management. In 2015-2017 the Australian Government funded a collaborative program, *Building Capacity for Sustainable and Responsible Development in the Bismarck Sea, Papua New Guinea* (PNG), which aims to provide a demonstration site for Seascapes practice. The program is a collaboration between PNG's Conservation and Environmental Protection Authority (CEPA), the East New Britain (ENB) and West New Britain (WNB) Provincial Administrations, The Nature Conservancy, and Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO). CEPA has identified the Bismarck Sea as a priority Seascape, because it holds globally-important marine biodiversity, and there are many opportunities for seabed mining, fisheries, coastal commercial agriculture and tourism which, if developed without adequate foresight, could impact upon future livelihood and conservation objectives and values of the region. Kimbe Bay, in WNB, is also the focus of an internationally-recognised network of Locally Managed Marine Areas (LMMAs).

This Guidance Document outlines the approach taken to implementing Seascapes practice in the Bismarck Sea. It is intended to provide a step-by-step guide for Seascapes management, and is targeted at provincial administrations in the Bismarck Sea and PNG more broadly, PNG Government ministries and agencies, national and international NGOs and donors, and other CTI partner countries and stakeholders. Although Seascapes differ in their local contexts, we suggest that the principles, processes and tools developed by this program are transferrable to other locations. This document presents our initial approach, which will be iteratively tested and refined in the Bismarck Sea. We invite other Seascapes to test this approach, so that CTI partners can collectively learn and improve Seascapes practice across the Coral Triangle region. All program materials can be accessed on the website: <https://research.csiro.au/bismarcksea>.

Our approach focusses on building the capacity of decision-makers to make transparent and evidence-based development decisions that can maintain or enhance the features and ecosystems that people value in a Seascape. The ultimate goal of decisions is to implement actions to reach the Sustainable Development Goals (SDGs) despite rapid change and future uncertainties. Our approach is based on three key principles which could improve decision-making in the complex context of a Seascape:

1. Taking a holistic **Ridge to Reef** systems view that understands the social and ecological linkages between land and sea
2. **Adaptation pathways**, which has a future focus that anticipates rapid change, uncertainty and shocks, and enables stakeholders to maintain options and flexibility
3. **Evidence-based and transparent decision-making**, which is achieved by providing more relevant information, creating partnerships between important stakeholders, empowering those with less power, facilitating networks and coordination between them, and enhancing their knowledge and skills to apply the information (Figure 1).

We tested a 'learning loop' of six steps which applied these principles:

Step 1: Understand the decision-making processes for major developments in the Seascape

Step 2: Identify and map what is valued in the Seascape, on land and sea, and by whom

Step 3: Develop decision-support tools that can assess the potential ‘footprint’ of development proposals, and also identify current and future pressures that will threaten values (e.g. climate change, population growth)

Step 4: Carry out pilot planning exercises with decision-makers to explore potential outcomes of development decisions for values, both positive and negative, and actions to achieve the SDGs

Step 5: Training for decision-makers to use the tools and information

Step 6: Evaluate the process, and feedback lessons learned to stakeholders on an ongoing basis to enable them to adjust and refine the next learning loop and actions.

Our program in the Bismarck Sea has carried out one cycle of this process in 2015-2017, focussing on ENB and WNB. This process should be repeated to coincide with statutory provincial development planning cycles, and extended into the other provinces surrounding the Bismarck Sea. Our evaluation (Figure 1) suggested that the initial learning loop had provided more relevant information (e.g. population projections, values maps), and enabled its application by understanding politics and enabling empowerment (e.g. women’s representation), enhancing networks (e.g. between CEPA and provincial administrations), and building knowledge (e.g. improved understanding of decision-making responsibilities). This had already led to evidence-based decisions being made, and actions taken, for example ‘stop work’ orders on some oil palm developments in ENB, and new LMMAs established in Kimbe Bay.

Potential improvements were also identified for the next learning loop, including the need to engage more powerful national planning ministries; better communication of the approach and information to communities; more training in the tools and processes for stakeholders; and targeting of youth and future decision-makers.

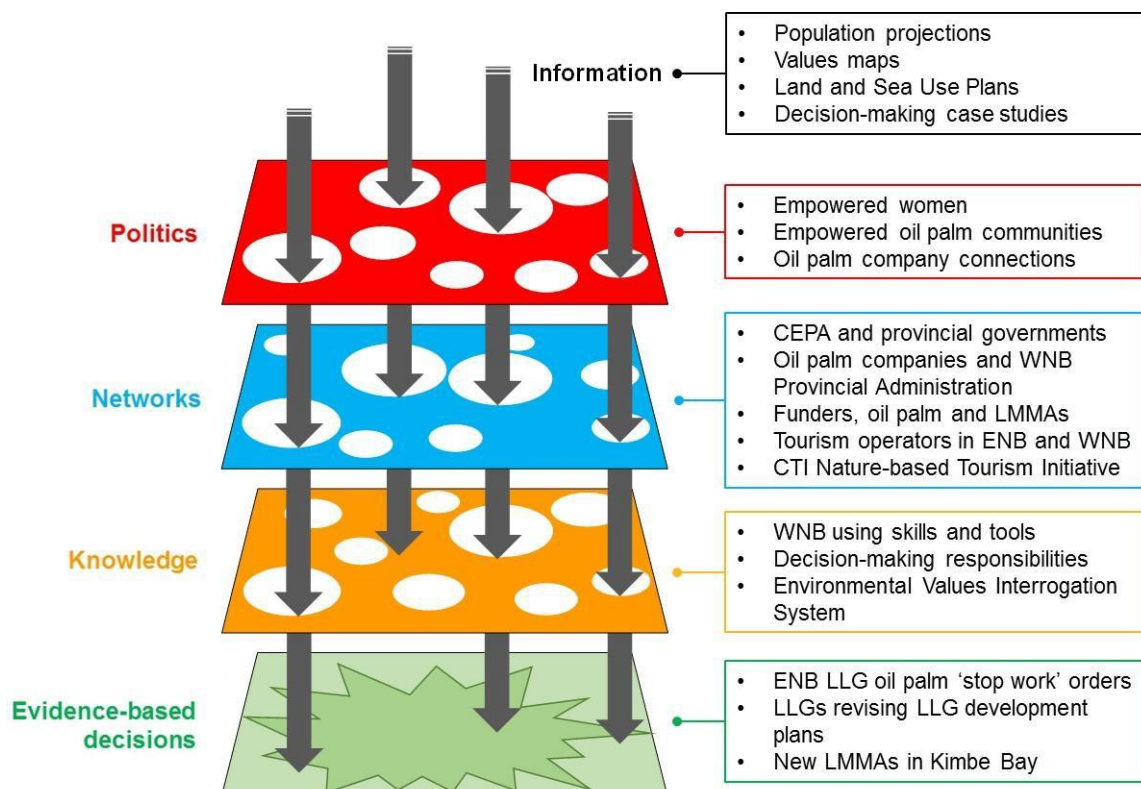


Figure 1: Our approach to enabling evidence-based decision-making, achieved by providing more relevant information, and creating windows of opportunity for its use by tackling stakeholder politics, enhancing networks and knowledge. A summary of evaluation results is also shown.

1. INTRODUCTION

1.1 The Coral Triangle Initiative and Seascapes

The objective of the Coral Triangle Initiative on Coral Reefs, Fisheries and Food Security (CTI) is to *'achieve conservation of marine biodiversity and food security through sustainable resource management'* (Coral Triangle Initiative Secretariat 2009). The CTI has five goals:

- Goal 1: Priority Seascapes designated and effectively managed
- Goal 2: Ecosystem approach to management of fisheries and other marine resources fully applied
- Goal 3: Marine Protected Areas established and effectively managed
- Goal 4: Climate change adaptation measures achieved
- Goal 5: Threatened species status improving

Under Goal 1, Seascapes are large, multiple-use marine areas, defined scientifically and strategically, in which government authorities, private organisations, and other stakeholders cooperate to conserve the diversity and abundance of marine life and to promote human well-being (Atkinson et al. 2011). Priority Seascapes have high biodiversity values and socio-cultural and/or economic values, and existing or potential conflicts between them. Goal 1 has established two targets: Target 1 is *'priority Seascapes are designated, with investment plans completed and sequenced'*, and Target 2 is *'marine and coastal resources within all priority Seascapes are being sustainably managed'* (Coral Triangle Initiative Secretariat 2009).

Conservation International has led the development of tools to implement Seascapes, starting with a nine step diagnostic toolbox and a Seascapes Guidebook (Atkinson et al. 2011). Through ongoing Regional Exchanges for Seascapes meetings, CTI partners have shared and refined their understanding about Seascapes and their design and implementation in the Pacific and South East Asian geographies (e.g. CTI-CCF 2014). However, there are few examples of how to actively apply Seascapes management in order that Target 2 can be achieved.

In 2015-2017 the Australian Government funded a collaborative program, *Building Capacity for Sustainable and Responsible Development in the Bismarck Sea, Papua New Guinea* (PNG), which aimed to provide a demonstration site for Seascapes practice in the PNG context, and thus progress Target 2. The program is a collaboration between PNG's Conservation and Environmental Protection Authority (CEPA), The Nature Conservancy (TNC), and Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO). CEPA has identified the Bismarck Sea as a priority Seascape, because it holds globally-important marine biodiversity, and there are many opportunities for seabed mining, fisheries, commercial agriculture and tourism which, if developed without adequate foresight could impact upon future livelihood and conservation objectives and values of the region.

This Guidance Document outlines the approach taken to implementing the Seascapes concept in the Bismarck Sea. It is intended to provide a step-by-step guide for Seascapes practice, and is targeted at provincial administrations in the Bismarck Sea and PNG more broadly, PNG Government ministries and agencies, NGOs and donors, and other CTI partner countries and stakeholders. No two Seascapes are likely to be the same. However, we suggest that the principles, processes and tools developed by this program are potentially transferrable to other locations. This document presents our initial approach, which will be iteratively tested and refined in the Bismarck Sea. We invite other Seascapes to apply this approach, and to collectively implement, learn and improve Seascapes practice across the CTI.

1.2 The Bismarck Sea Seascape

The Bismarck Sea covers an area of approximately 40,000 km², and is surrounded by the maritime provinces of East and West New Britain, New Ireland, Manus, Morobe and Madang (Figure 2). CEPA has

identified the Bismarck Sea as a priority geography because it holds globally-important marine biodiversity, with a particular focus in Kimbe Bay (West New Britain), where an internationally-recognised network of Locally Managed Marine Areas (LMMAs) has been established since the 1990s (Figure 3; Green et al. 2009).

The Bismarck Sea is a priority Seascape because the region has abundant natural resources which are largely unexploited. Of unique relevance is the Solwara 1 seabed mine, which is the first of its kind in the world. Due to the Bismarck Sea's volcanic geology there are numerous opportunities for the mining of sulphides, copper, zinc, silver and gold, and mining exploration leases cover much of the land and seabed (Figure 2). In addition, large scale coastal commercial agriculture is expanding, particularly through oil palm development in East and West New Britain (Figure 2). Rapid economic growth in the Asia-Pacific region is driving increased shipping traffic through the major sea lanes that traverse the Bismarck Sea. As well as mining and commercial agriculture, there are many opportunities for large scale fisheries and tourism development, and Kimbe Bay has recently been highlighted as one of three priority locations in the CTI for the development of nature-based tourism (Coral Triangle Sustainable Nature-based Tourism Project 2017).

Although it does not cross international boundaries, the Bismarck Sea involves potentially competing development and conservation objectives. It requires collaboration amongst six provinces which are largely responsible for managing resources on land and for 12 nautical miles to sea (Figure 2), national and local governments, and the private sector involved in potential agriculture, tourism and mining developments.

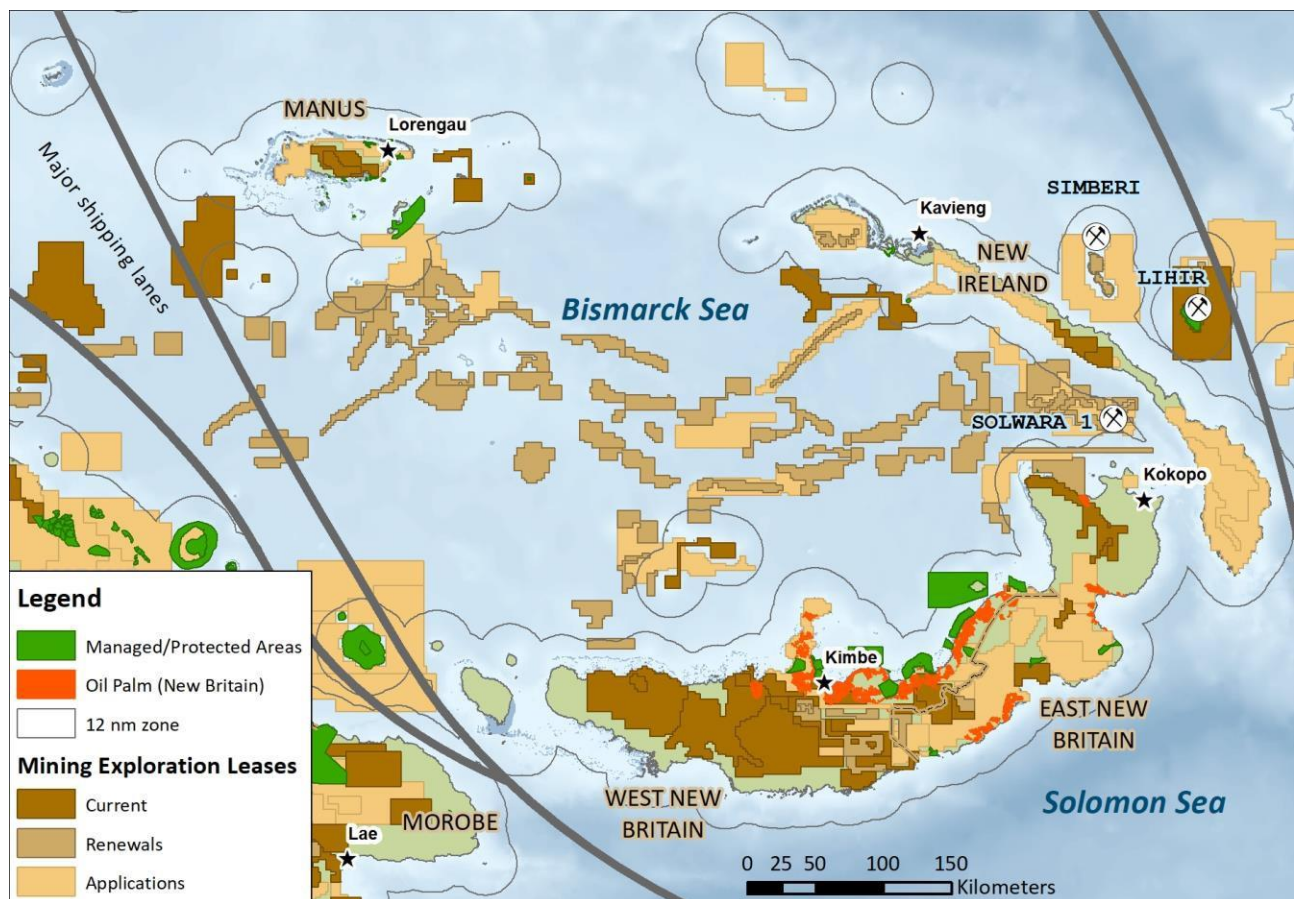


Figure 2: The Bismarck Sea Seascape, the surrounding maritime provinces of East New Britain, West New Britain, New Ireland, Manus, Morobe and Madang, mining leases (land and seabed), shipping lanes, protected areas and oil palm developments

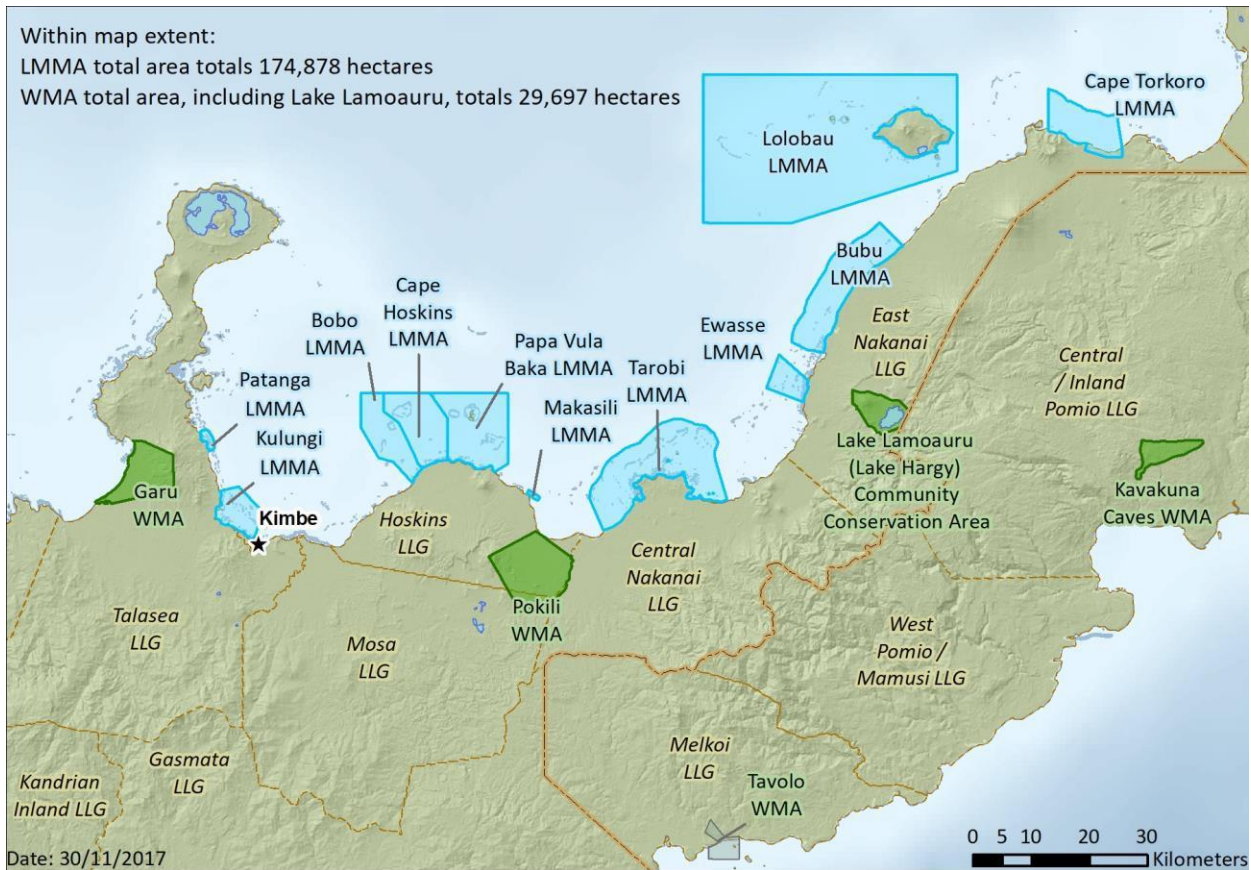


Figure 3: The Locally Managed Marine Area (LMMA) network established in Kimbe Bay, West New Britain

To aid the design of the *Building Capacity for Sustainable and Responsible Development in the Bismarck Sea* program, an Advisory Committee was established. This was also intended to provide linkages to PNG's CTI National Coordination Committee, and therefore included representatives of the primary national government agencies involved in the CTI: CEPA, the National Fisheries Authority, the Climate Change and Development Authority, and the Coastal Fisheries Development Agency. The Advisory Committee and the Australian Government's Department of the Environment and Energy agreed that the program should begin by focussing on East (ENB) and West New Britain (WNB), since this would build on the LMMA network, plus a previous CTI project, *WNB Livelihood Futures* (Butler et al. 2012). In addition, the focus on ENB and WNB would enable synergies with the United Nations Development Program's Global Environment Fund 4 *Community-based Forest and Coastal Conservation and Resource Management* program, which was also active in these provinces, and ultimately supported a component of this program's activities in WNB. It was intended that the program's process would be extended sequentially to the other Bismarck Sea provinces in coming years.

2. DECISION-MAKING PRINCIPLES

The program was founded on three core principles designed to improve decision-making within the complex conditions of a Seascape. These are explained in the following sections:

- Ridge to Reef planning,
- adaptation pathways, and
- evidence-based and transparent decisions

2.1 Ridge to Reef planning

Ridge to Reef planning has been variously defined. For example the International Union for the Conservation of Nature describes it as “linking action and implementation in river basins and coasts... to support ecosystem services and improve riparian and coastal livelihoods” (IUCN 2016), and the Global Environment Facility suggests it is an integrated approach to land, water, forest, biodiversity and coastal resource management which can contribute to poverty reduction, sustainable livelihoods and climate resilience (GEF 2016). In essence, a Ridge to Reef approach recognises the connectivity from land to sea when managing natural resources and planning development (Figure 4).

In our program, we expand the concept to mean a systems-based approach, which acknowledges that what happens on the land has consequences for the marine environment, and vice versa, both socially and ecologically. For example, commercial agricultural development may impact coastal reefs through sediment and chemical run-off into river systems. Commercial agriculture also attracts immigrant labourers. Without a historical connection to the land and sea, these workers may fish illegally, again impacting the marine environment and fishery resources. This idea can even be extended to ‘ridge to trench’, considering that the Solwara 1 seabed mining project is located in deep off-shore waters and that it is likely to establish shore-based activities, which will have potential impacts on local communities’ livelihoods and the coastal and terrestrial environment.



Figure 4: A Ridge to Reef approach recognises land-sea connectivity when planning development (Image: Sevuloni Tora)

2.2 Adaptation pathways

In 2015 countries around the world, including PNG, signed up to the United Nations' Sustainable Development Goals (SDGs). The SDGs cover 17 wide-ranging issues, including poverty eradication, food security, gender equality and climate action, which are to be achieved by 2030 (UN 2015). These are all directly compatible with the Seascapes dual and linked aims of maintaining the diversity and abundance of marine life (SDG 14) and to promote human well-being. Also, in PNG the SDGs and the aims of Seascapes are mirrored by the National Strategy for Responsible Sustainable Development (StaRs) and the 2050 Vision (Government of PNG 2014).

However, the world is changing more rapidly than ever before, and due to globalisation and increased connectivity social, political and environmental shocks are likely to be more frequent and far-reaching. Hence decision-makers must anticipate and adapt to change, since pressures and unexpected shocks will constrain the options available for communities to reach the SDGs. Faced with this challenge, decision-making must keep future opportunities open by avoiding development that is irreversible, or which exacerbates pressures that hinder SDG outcomes (Figure 5). Such an anticipatory, future-focussed approach is termed 'adaptation pathways' (Wise et al. 2014a), and is particularly useful in developing countries where change is rapid, and decision-making is complex and involves multiple stakeholders with varied objectives and knowledge, and multiple drivers and pressures influence decisions (Butler et al. 2014a).

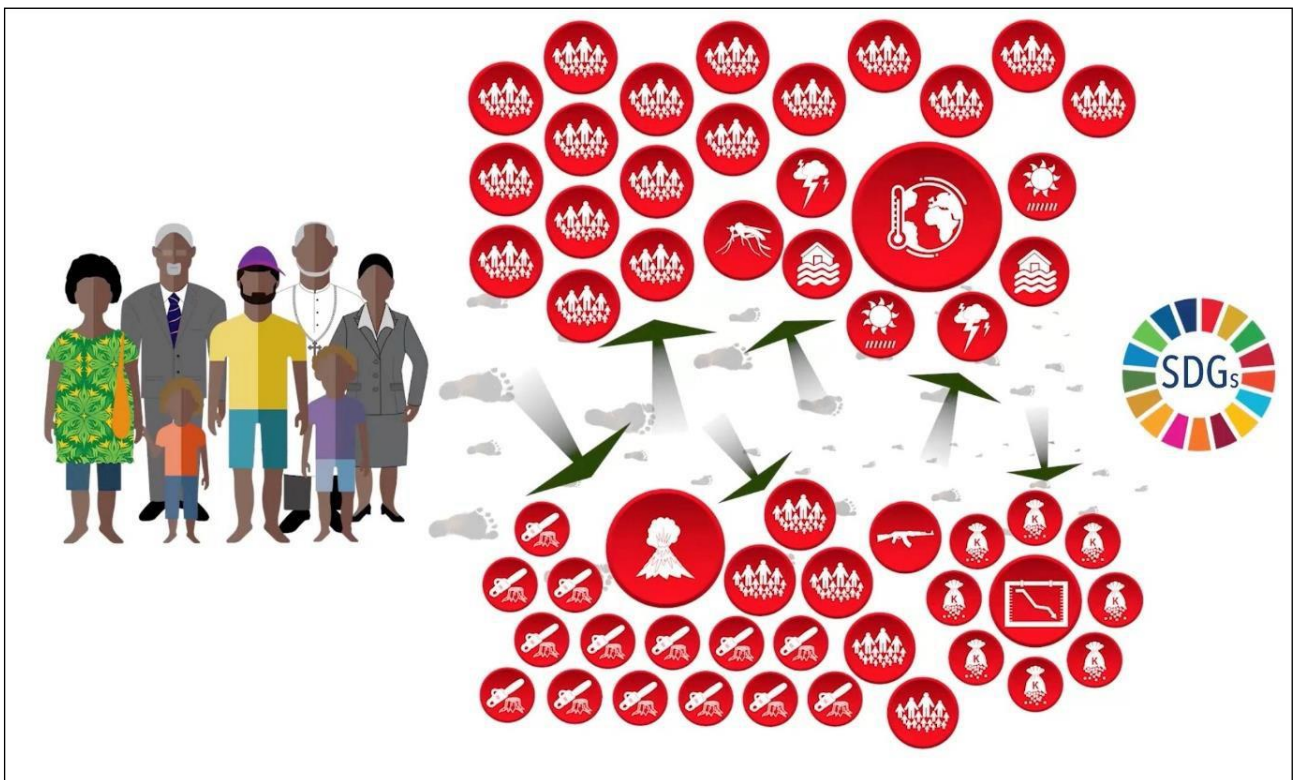


Figure 5: Adaptation pathways involves decision-making that anticipates future change, maintains flexibility and avoids development that exacerbates pressures and shocks, thus keeping the 'adaptive space' open to achieve the SDGs.

In ENB and WNB one major pressure is rapid population growth, which is placing escalating demands on natural resources, and impinging food security and social services. Our estimates suggest that the ENB population may double by 2040 (Figure 6). Another pressure is climate change. Although sea level rise is already evident, this and wider climate change impacts could accelerate in coming decades. Linked to climate change will be weather extremes such as floods and droughts, which are becoming more frequent. Coral bleaching, caused by high sea temperatures, is already evident in the Bismarck Sea.

Sudden events such as global financial crises must also be expected. As in the last crisis in 2008, they may cause the prices of key commodities such as petrol to rise, impacting the cost of living, or collapses in global prices for local agricultural produce. Terrorism incidents or global pandemics may also restrict travel, and therefore numbers of tourists visiting PNG. In 1994 Tavurvur volcano in ENB erupted and destroyed the town of Rabaul. Future volcanic eruptions across New Britain can't be ruled out. Given the complex range, interconnections and unpredictability of the drivers of change in the Bismarck Sea, it is crucial that decision-making can anticipate, understand and mitigate the resulting pressures, thereby keeping the 'adaptive space' as open as possible to achieve the SDGs (Figure 5).

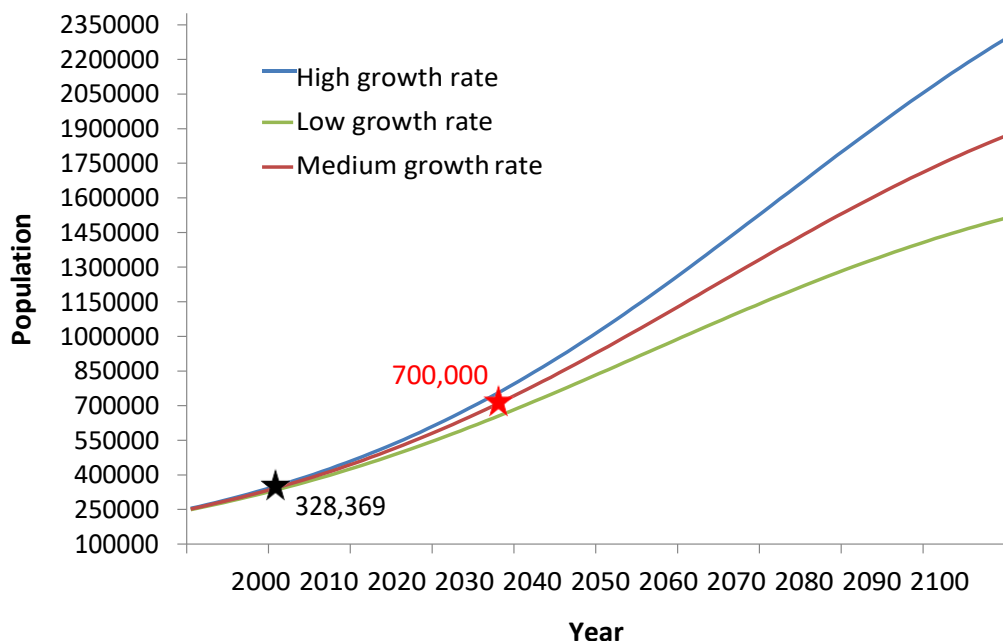


Figure 6: Population projections for ENB suggest that even under medium growth rates the population will double by 2040 (source: CSIRO)

2.3 Evidence-based decisions

The third principle is the need to encourage evidence-based decisions. Currently decision-making in the Bismarck Sea is constrained by a lack of appropriate information. In addition, what information there is may not result in evidence-based decision-making because politics, poor networks between stakeholders, and a lack of necessary knowledge and skills are likely to impede its effective use (Figure 7a).

We tackled this challenge by providing more relevant information for decision-making, such as stakeholder values, population and climate change projections. We also designed a participatory process which created 'windows of opportunity' for this information to better inform decisions. Our process deliberately encouraged partnerships between important stakeholders, empowered those with less power, facilitated key linkages and coordination, and enhanced stakeholders' understanding of information and their skills to apply it, which together facilitated more transparent and evidence-based decision-making (Figure 7b).

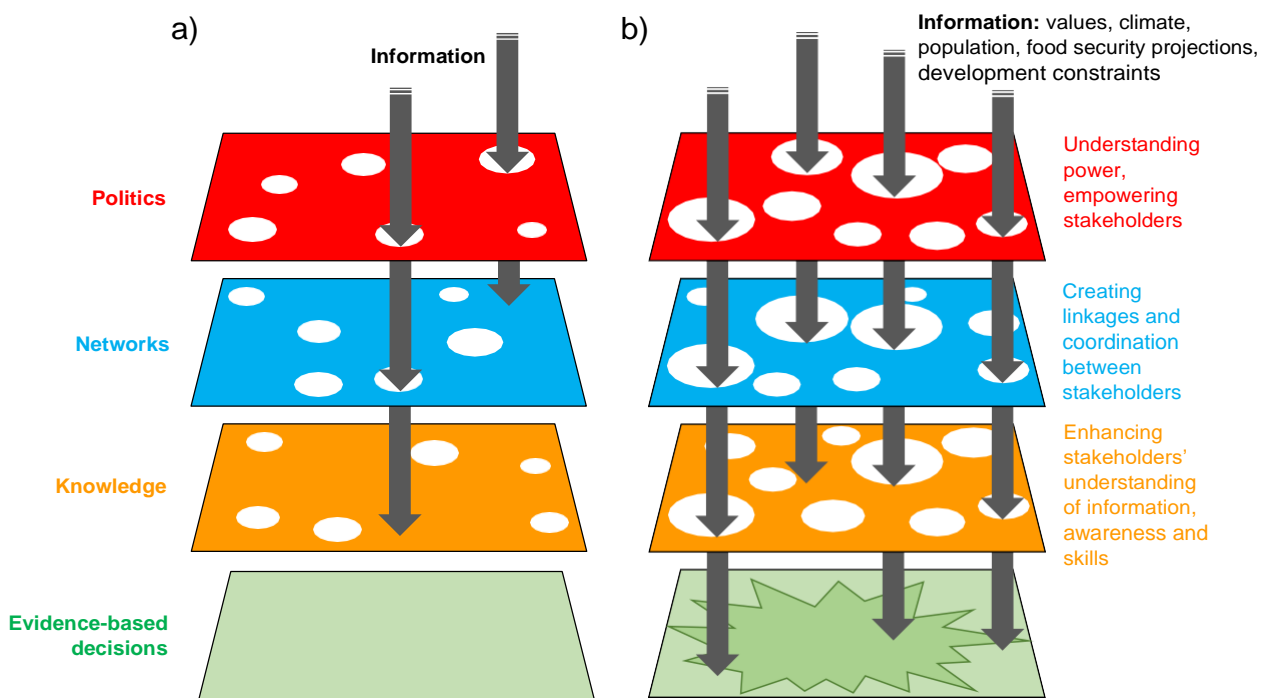


Figure 7: a) Currently evidence-based decisions are not being made in the Bismarck Sea because there is inadequate information, and its use is impeded by stakeholder politics, poor networks and their limited knowledge; b) our process addressed this by providing more relevant information, and creating windows of opportunity for its use by tackling stakeholder politics and enhancing networks and knowledge.

3. LEARNING LOOP AND STEPS

3.1 Learning loop

By applying these three principles, the program created an initial ‘learning loop’ amongst stakeholders in ENB and WNB. Decision-makers were brought together to plan, implement and reflect on large scale development proposals which could significantly influence progress towards the SDGs, both positively and negatively. The program was designed as a trial for how this initial learning process might be applied in a Seascape.

Program activities involved six sequential steps, which together formed the first learning loop (Figure 8):

- Step 1:** Understanding Decision-making,
- Step 2:** Map Stakeholders Values,
- Step 3:** Decision-support tools,
- Step 4:** Pilot Planning,
- Step 5:** Tools Training, and
- Step 6:** Evaluation and learning

While evaluation and learning formed the final step, activities and tools were applied throughout the program to engender a philosophy of adaptive management and reflection (see Section 3.7).

Each step was designed to generate and feed more information into the process, but also to understand and account for stakeholder politics, and to enhance decision-makers’ networks and knowledge. The focus varied for each step, however. For example, **Step 1:** Understanding Decision-making emphasised the analysis of politics and power amongst decision-makers, while **Step 5:** Tools Training focussed on building networks, knowledge and skills (Figure 8).

The following sections summarise activities within each step. References to reports and other products are given which provide full examples and details, and all can be accessed on the program website:

<https://research.csiro.au/bismarcksea>.

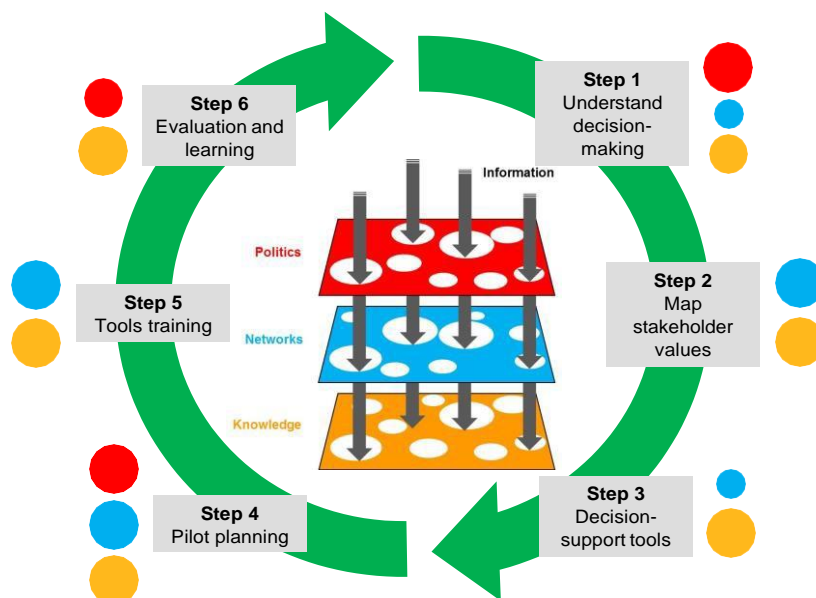


Figure 8: The program’s six steps, which together formed the learning loop process. The relative emphasis of each step in terms of enhancing and aligning stakeholder politics, networks and knowledge is also shown by the balloons

3.2 Step 1: Understand decision-making

In October 2015 the Advisory Committee recommended case studies of past decision-making in the Bismarck Sea relating to large scale development. They identified four priorities: oil palm, LMMAs, bêche-de-mer fishery closures, and seabed mining.

The aims of the case studies were to understand the statutory versus actual decision-making processes in the Bismarck Sea, identify key actors and their roles, assess their information and capacity-building needs, and provide an opportunity for enhancing networks and knowledge amongst decision-makers through the participatory review process. The identification of key decision-makers, their power and influence, plus those who were dis-empowered, then informed the design of the **Step 4: Pilot Planning** activity (see Section 3.5) and **Step 5: Tools Training** (see Section 3.6).

Methods involved a desk-top analysis of relevant statutory planning regulations, guidance policies and notes, and grey and scientific literature. Visits to Port Moresby, ENB and WNB were then carried out to engage with key decision-makers identified by the desk-top analysis, through interviews and focus groups. These meetings cross-checked the results of the desk-top analysis and assessed decision-makers' information and capacity-building needs. Subsequently further focus groups were held with the same decision-makers in Port Moresby, ENB and WNB to feedback the results, and to encourage their reflection and learning (Figure 9).

A full description of the methods and results are given in Meharg et al. (2016a, b). The case studies revealed six common issues which the program attempted to address in subsequent steps:

- Decision-making is highly complex and dynamic
- There are multiple understandings of decision-making processes
- Coordination between influential actors is poor, and networks must be improved
- Statutory approval processes involve substantial transactions costs for developers, creating incentives for illegal shortcuts
- Community resource owners ultimately determine the viability and sustainability of development initiatives, but are not adequately involved in decision-making
- Government agencies have differing levels of power and capacity, which affects their capacity to be involved in decision-making.



Figure 9: An ENB Provincial Administration officer presenting her understanding of the decision-making process and stakeholders involved in oil palm development (Photo: Seona Meharg)

3.3 Step 2: Map stakeholder values

A key aspect of Seascapes is the protection and maintenance of the high biodiversity and socio-cultural and/or economic values that are inherent in such a region. **Step 2** involves the collation of these values, and identification of the stakeholders who hold them. As a preliminary activity, the program team developed a values framework (Skewes et al. 2017), which reviewed current thinking on values and valuation to form four categories:

- Natural resource values (e.g. contribution to human well-being from food security, income, health)
- Ecosystem structure and process values (e.g. biological diversity, threatened species)
- Ecological regulatory values (e.g. hazard reduction, water regulation)
- Socio-cultural values (e.g. spiritual, recreational and tourism importance)

Two-day workshops were then held in the six rural Districts within ENB and WNB (Masike-Liri and Peterson 2016, TNC 2016). Participants were invited to represent the Local Level Governments (LLGs) and communities within each District, and included a cross-section of stakeholders, including government officers, community leaders, teachers and local NGOs. As far as possible an equal representation of men and women was sought. First, participants carried out an exercise to score the relative contribution of local natural resource values to their well-being (Figure 10). Then, they used printed maps at the provincial and district scale (1:100,000) to locate and draw on the features of interest that provided the natural resources and other values to communities and other stakeholders (e.g. tourists; Figure 11). The maps were subsequently digitised into GIS by the program team to provide comprehensive, spatially-explicit information for each District in ENB and WNB.

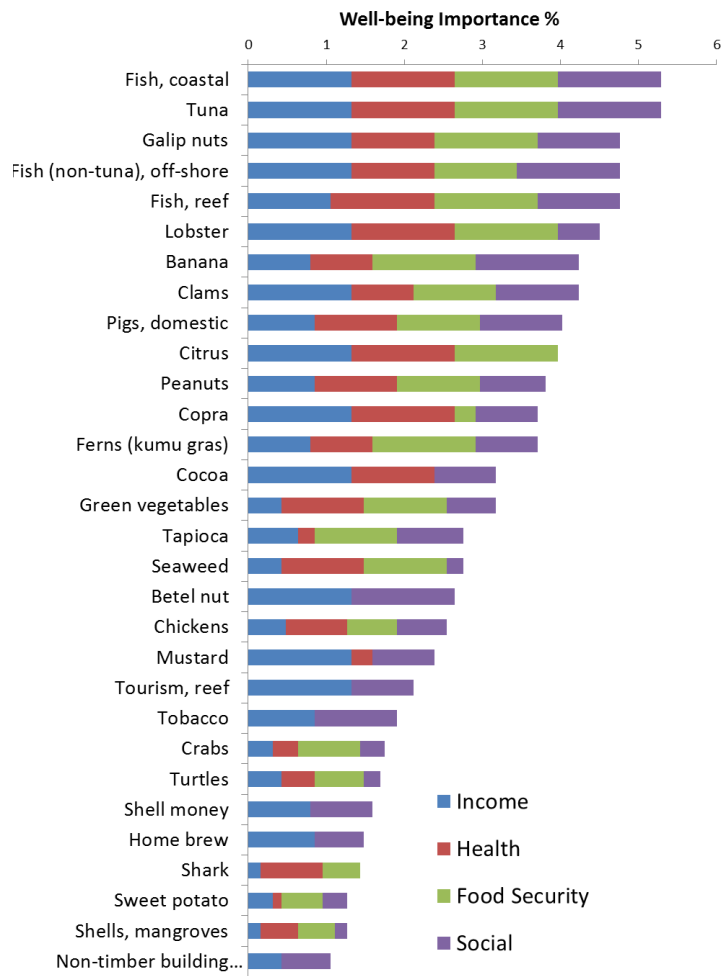


Figure 10: The relative contribution of local natural resource values to well-being in Kokopo District, ENB



Figure 11: Participants mapping features that provide values in Gazelle District, ENB (Photo: Nate Peterson)

3.4 Step 3: Decision-support tools

While a range of information was collated and provided by the program (e.g. population projections, climate change projections, food security models, statutory decision-making processes) to better inform decision-making, the primary decision-support tool was a values database. Spatially-explicit data collected in **Step 2** were collated and stored in the database, and with linked GIS maps could be produced for each of the value categories in any given area of ENB or WNB (Skewes et al. 2017). For example, a food security values map illustrated the relative importance of different features on land and sea in any given location (Figure 12).

To provide an additional level of analysis, the tool also used QGIS open-source software to enable users to query the database and its spatial layers. This add-on, named ELVIS (Environmental Values Interrogation System) allows the user to examine existing values data, and to add new features and values. Areas of interest polygons can be drawn over the maps to evaluate which values and stakeholders may be affected by a development in the polygon (Figure 13).

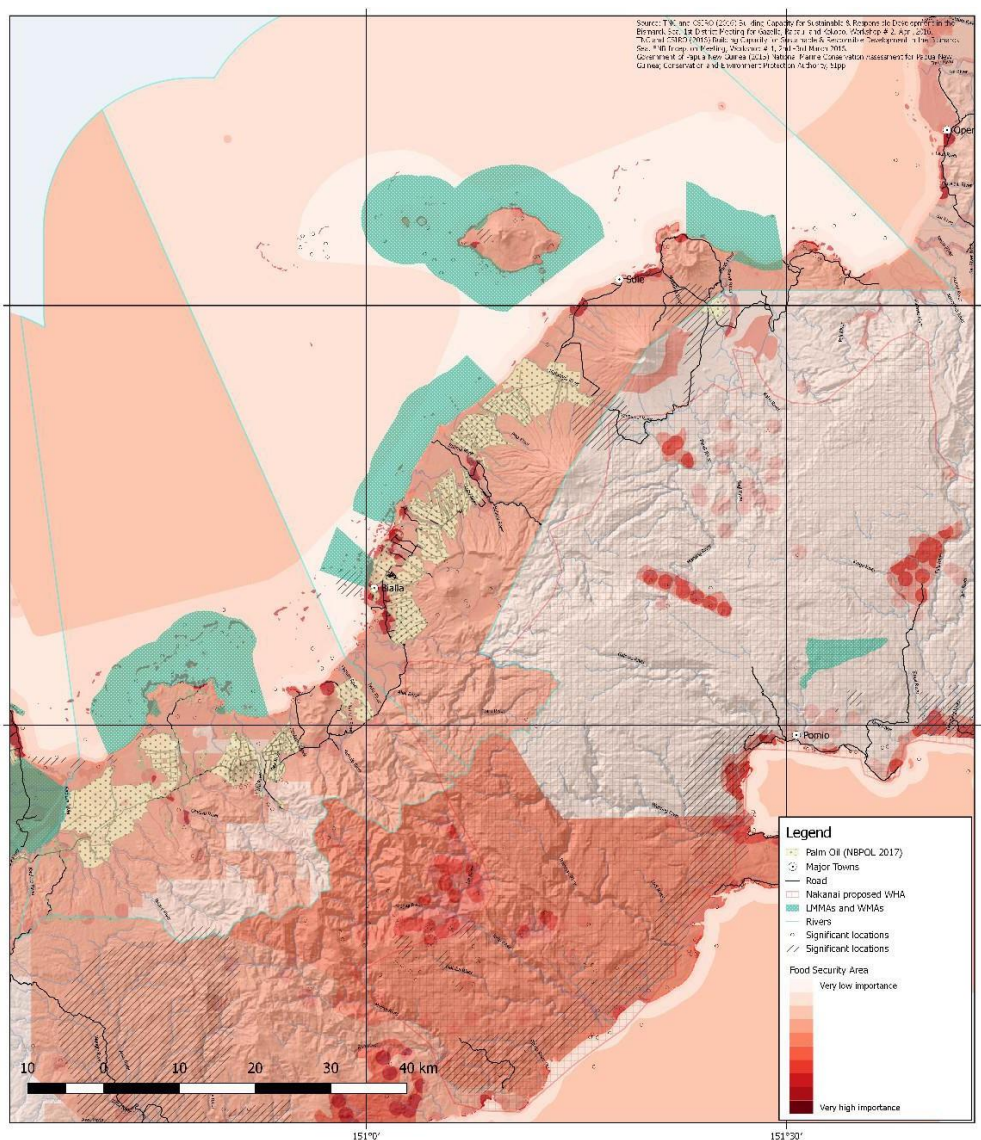


Figure 12: A map of land and sea features and their relative importance in terms of food security value (i.e. natural resource value) produced from the values database

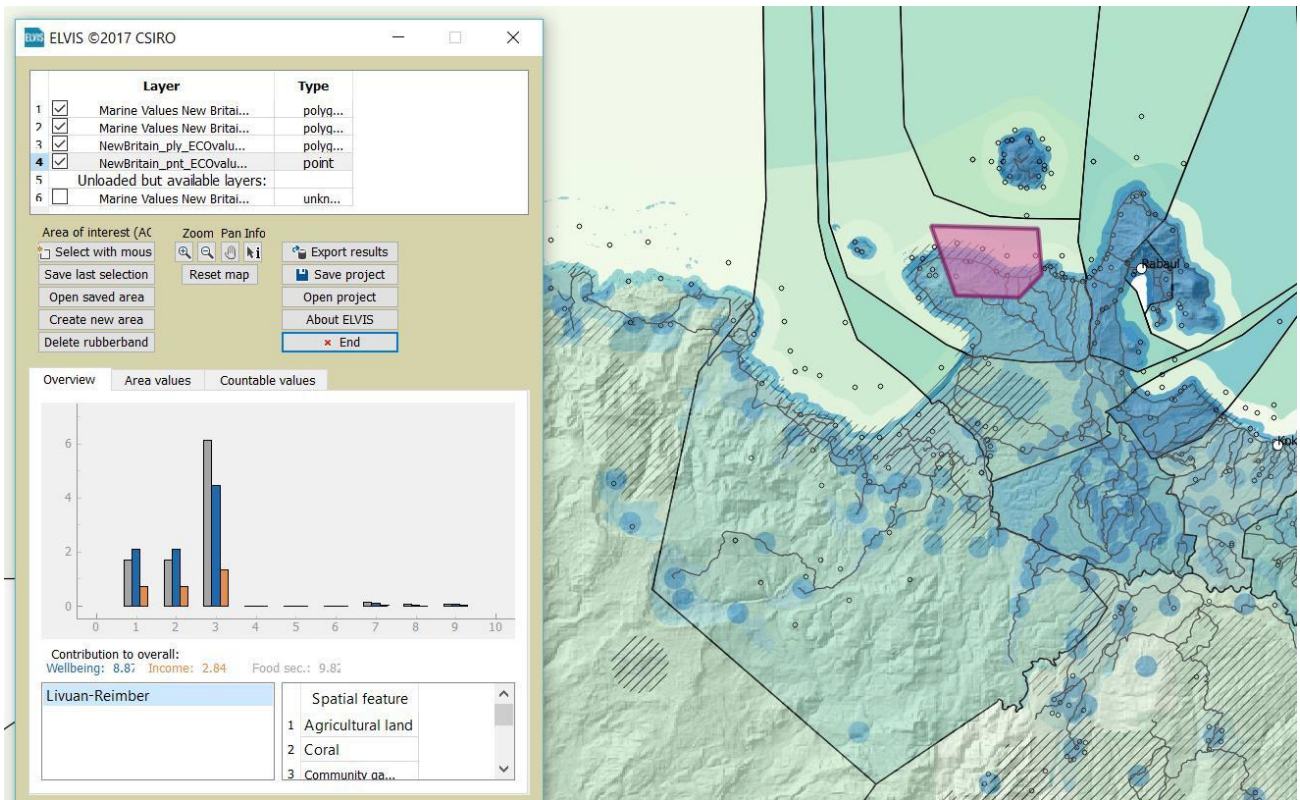


Figure 13: The ELVIS output for the footprint of a potential development (the polygon) on features providing income value

3.5 Step 4: Pilot planning

During the **Step 1**: Decision-making case studies, the ENB and WNB Provincial Administrations were asked to nominate priority large scale development issues which they would like to address in **Step 4**: Pilot Planning. The ENB Provincial Administration requested that oil palm development should be the focus, as this commercial agriculture is growing rapidly in the province (Figs. 13, 14). Also, the decision-making case study analysis had shown that oil palm application and consent processes are not operating satisfactorily.



Figure 14: The ENB Provincial Administration prioritised oil palm development to be the focus of Step 4 pilot planning activities (Photo: Nate Peterson)

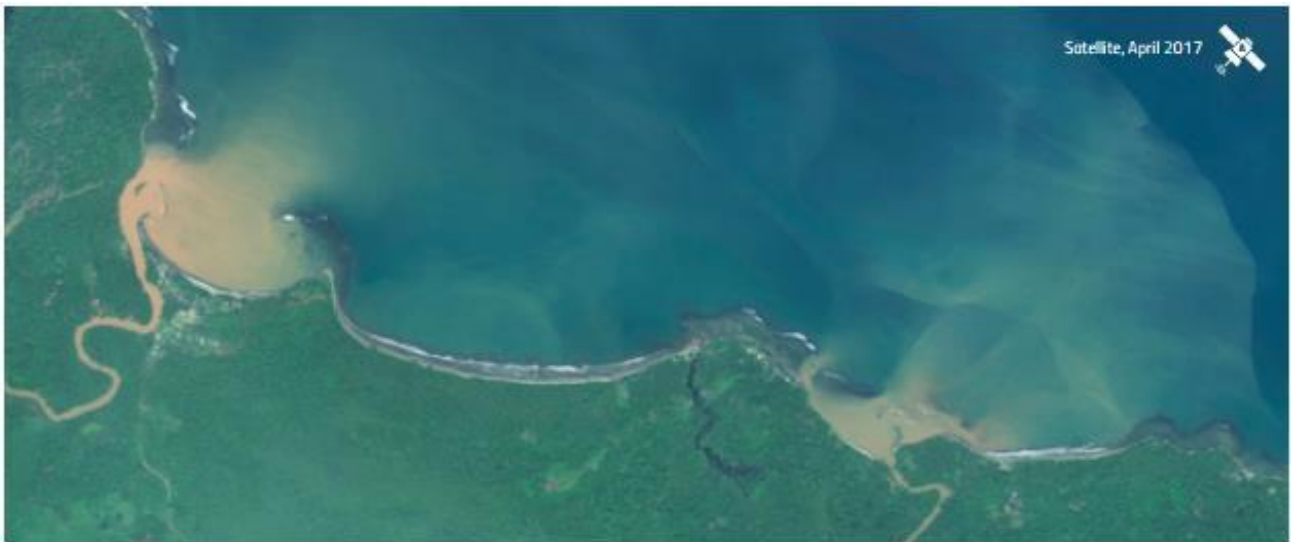


Figure 15: Sediment plumes caused by oil palm establishment in ENB (Source: <https://earthexplorer.usgs.gov>)

The WNB Provincial Administration requested a focus on tourism development, because Kimbe Bay and WNB has recently been highlighted as one of three priority locations in the CTI for the development of nature-based tourism (Coral Triangle Sustainable Nature-based Tourism Project 2017). One of the justifications for the selection of WNB is the network of LMMAs in Kimbe Bay, which potentially protect coastal biodiversity and hence provide a resource for tourism. In addition, tourism may provide a source of sustainable financing for LMMAs, which is a major weakness of the network (Wise et al. 2014b).

Two Pilot Planning workshops were held in each province. In ENB, LLGs which were the focus of recent and ongoing oil palm growth were selected as case studies: East Pomio and Sinivit LLGs (Butler et al. 2016), and Inland and Lassul Baining LLGs. In WNB, Central and East Nakanai LLGs were selected for the first workshop because the Coral Triangle Sustainable Nature-based Tourism Project highlighted tourism attractions in these LLGs (Butler et al. 2017a), and the second workshop reviewed the Kimbe Bay LMMAs and their governance to better link with tourism (Butler et al. 2017b).

Based on the **Step 1** Decision-making case study results for oil palm and LMMAs, and the resulting understanding of politics and power, a cross-section of decision-makers and stakeholders were invited (Figure 16) to the Pilot Planning workshops. The workshops were designed to empower those stakeholders that had previously been marginalised (e.g. community resource owners, women), to improve networks and coordination between key decision makers (e.g. national and provincial governments, ENB and WNB Provincial Administrations), and to build knowledge and awareness of current and future rapid change and uncertainty, and its implications for development. The latter was the primary vehicle for introducing Ridge to Reef systems thinking in terms of the potential impacts of large scale development across land and sea, and for applying the adaptation pathways concept.

The workshops were organised into five sessions over two days (Figure 17). Sessions were designed to encourage social learning amongst participants, to integrate participants' varied knowledge, and to identify actions to manage development in the context of rapid change and future uncertainty, in order to achieve communities' visions. This process has been successfully developed and refined by the team in PNG since 2007 (Butler et al. 2014b), including the CTI *WNB Livelihood Futures* project in 2011-2013 (Butler et al. 2012, 2013a, 2013b, 2015).



Figure 16: Participants at the Central and East Nakanai LLGs tourism pilot planning workshop, WNB
(Photo: Tom Greenwood)

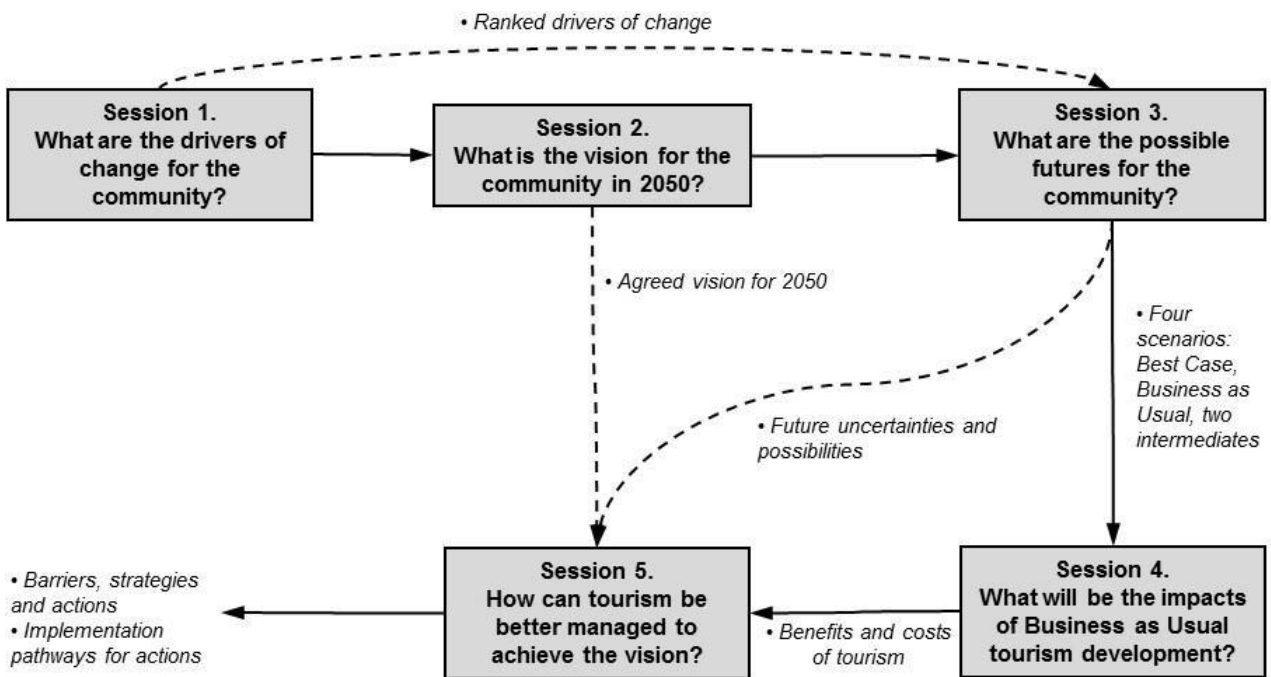


Figure 17: The Step 4 Pilot planning workshop sessions and outputs (in italics), with tourism development as an example

Session 1's output was the drivers of change that are influencing the community, which were ranked through voting (Figure 18). Session 2's output was an agreed vision for the community for 2050 (Figure 19). Session 3's output was four feasible future development scenarios for the community for 2050, ranging from Best Case (Figure 20) to Business as Usual (Figure 21), which demonstrated future uncertainty and potential shocks, derived from the drivers of change identified in Session 1.



Figure 18: Participant voting for the most important driver themes for Central and East Nakanai LLGs, WNB (Photo: Seona Meharg)

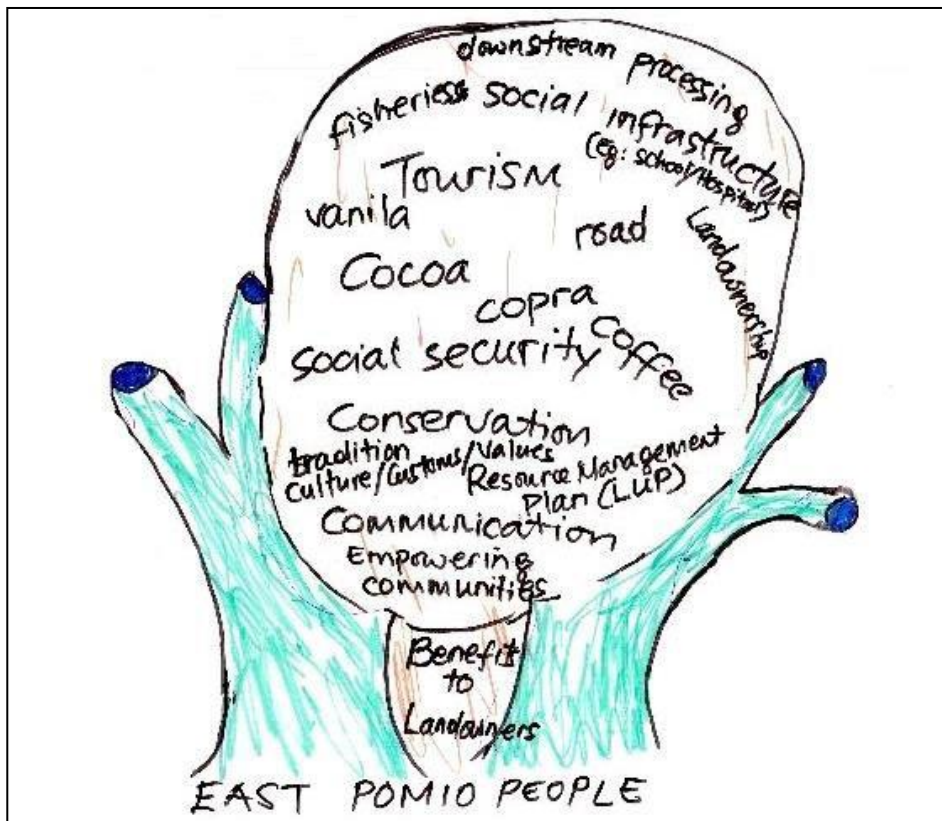


Figure 19: A vision statement for 2050 presented by participants for East Pomio LLG community, ENB

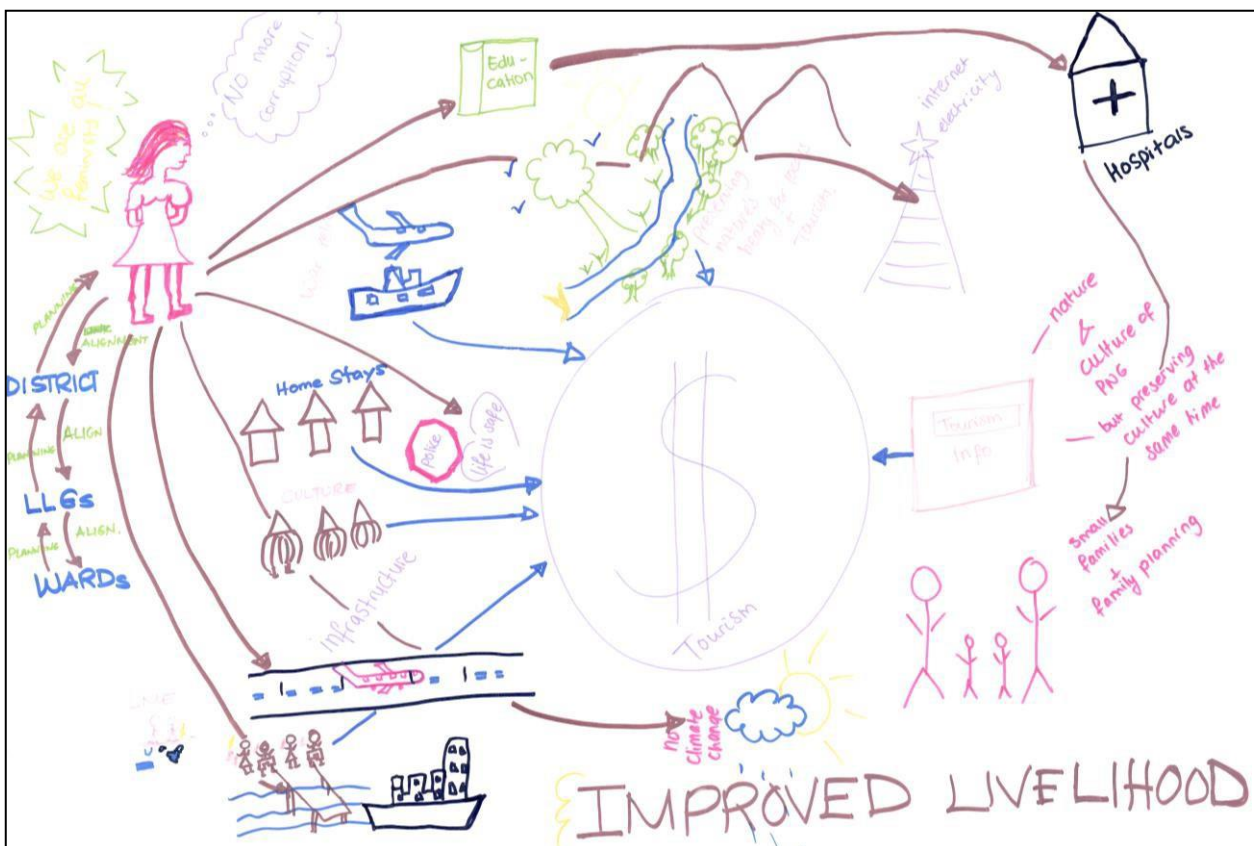


Figure 20: A Best Case development scenario for Central and East Nakanai LLGs, Educating our way to 'Future Perfect'



Figure 21: A Business as Usual development scenario for East Pomio LLG, In Silent Agony

Session 4 utilised the values maps to identify the potential future benefits and costs of a proposed development under the Business as Usual scenario (Figure 22), taking into consideration Ridge to Reef connections. In Session 5, participants referred back to the agreed components of the community vision identified in Session 2, and considered whether these components could be achieved through the proposed development. Using a ‘traffic light’ approach they identified which of the components would be achieved, any barriers to this, and proposed strategies and actions (Figure 23). Finally, groups designed an ‘implementation pathway’ for the strategy that they considered most important. This exercise asked participants to sequence actions logically over time, test the sequence against future uncertainties identified in Sessions 1 and 3 (i.e. the drivers, shocks and scenarios) and re-order them if necessary, and identify who would volunteer to take responsibility for instigating action (Figure 24). In this way, the implementation pathways demonstrated adaptation pathways practice in terms of anticipating uncertainty and maintaining flexibility in decision-making.



Figure 22: A group using values maps to identify the potential future benefits and costs of a tourism development in Central and East Nakanai LLG, WNB, under the Business as Usual scenario (Photo: Tom Greenwood)

| Vision component | Traffic light score | Strategies and actions to achieve the vision component |
|--|---------------------|---|
| 1. Resource ownership and control of development decisions | Green | <ul style="list-style-type: none"> - Conserve and protect key resource areas - Register Integrated Land Groups - Include all three clans in tourism decision-making - Establish mediation processes for community decision-making |
| 2. Diversified sources of income | Green | <ul style="list-style-type: none"> - Women's empowerment in Small and Medium Enterprises - Financial literacy programs - Fair sharing of income amongst community - Develop spin-off businesses from tourism |
| 3. People are educated (schools, teachers, training) | Green | <ul style="list-style-type: none"> - Establish tourism courses in high schools and technical colleges - Build a tourism workforce |
| 4. People are healthy and safe (clinics, doctors, water supplies, police and courts) | Yellow | <ul style="list-style-type: none"> - Build collaborations with the health authorities - Training and capacity-building in health standards and hygiene - Promote the 'Healthy Island' concept - Introduce waste management plans - Community self-policing |
| 5. Resource revenues invested into infrastructure | Yellow | <ul style="list-style-type: none"> - Community participation and consultation in tourism - Increase numbers of women executives - Review and enforce provincial investment policy - Establish trust accounts for community conservation areas - Integrate tourism sector into WNB 5 year development plans |
| 6. Land use plans developed and enforced | Green | <ul style="list-style-type: none"> - Land use plans implemented and enforced for LLGs - Develop land use policies and laws - Conduct consultation and awareness of land use plans - Meetings with landowners to address WNB Tourism Policy |
| 7. Cultural and spiritual sites and practices preserved | Green | <ul style="list-style-type: none"> - Document <i>tambuna</i> stories - Enhance intellectual property rights - Include culture in education curriculum - Rules and regulations for tourists to follow and respect local culture - Promote cultural events and guided tours - Develop management plans for cultural sites |
| 8. Population growth slowed and managed | Red | <ul style="list-style-type: none"> - Educate family planning in primary and high schools - Make birth control freely available with guidance on use - Reintroduce Vagrancy Act to control immigration - Invest tourism income into family planning - Disperse tourists across WNB to avoid local pressure |
| 9. Good governance (leadership and cooperation) | Yellow | <ul style="list-style-type: none"> - Educate citizens to become good leaders - Introduce by-laws and enforce them - Decisions based on consensus - Leaders must report back to communities - Develop social enterprise groups to ensure accountability |

Figure 23: The components of the community vision for Central and East Nakanai LLGs, and traffic light scores for nature-based tourism development's potential contribution to them (green = positive, orange = neutral, red = negative), plus strategies and actions required to achieve each component

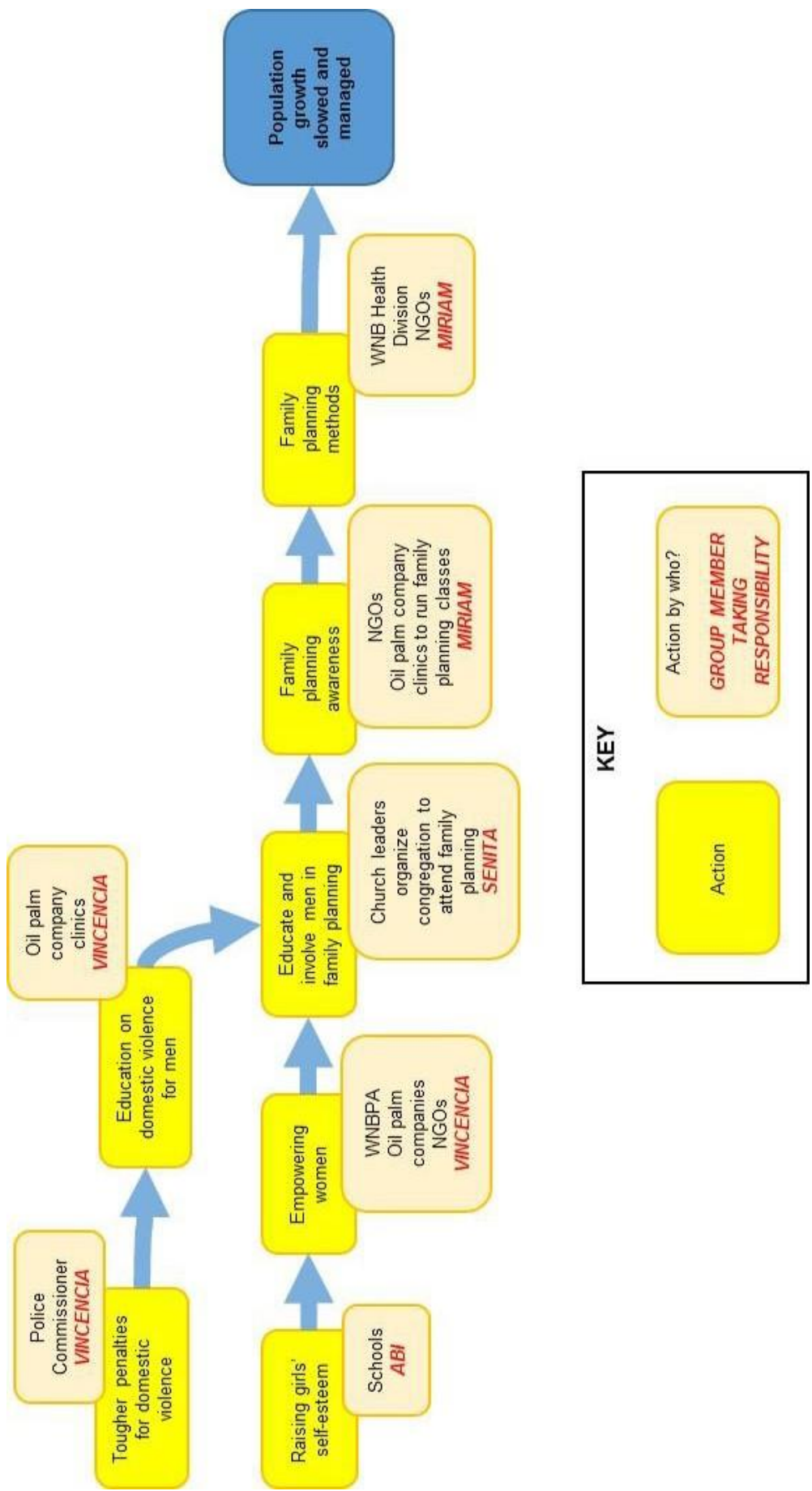


Figure 24: An implementation pathway for actions required to achieve the 'Population growth slowed and managed' vision component for tourism development in Central and East Nakanai LLGs

3.6 Step 5: Tools training

During the **Step 1:** Decision-making case studies, and in **Step 4:** Pilot Planning a key information gap identified by decision-makers was land and sea use plans to inform resource owners' decision-making in LLGs (see Figure 23). While all LLGs in both ENB and WNB have 5-year development plans, none have translated these into spatial land and sea use plans. **Step 5:** Tools Training was therefore designed to develop land and sea use planning tools, and to enhance the skills amongst decision-makers to apply them. The training also provided a further opportunity to create networks and coordination among decision-makers, particularly at the LLG and District level (Figure 8).

One 2½ day training workshop was held in each province, and targeted all LLG Managers, District Government officers and other local stakeholders (e.g. NGOs, universities). The workshops involved six sessions:

- Session 1: Introduction to data and maps (values maps, population projections, food security projections, conservation priorities, physical and conservation constraints to development, visions and scenarios from Step 4)
- Session 2: 2050 vision statement for the LLG
- Session 3: Strategies to reach the 2050 vision (food security, conservation, sustainable agriculture and freshwater security strategies)
- Session 4: Define land and sea use zones to implement the strategies (physical constraints zone, food security zone, fresh water security zone, marine and terrestrial conservation zones, forestry zone, fisheries zone, commercial agriculture zone, urban development zone)
- Session 5: Map land and sea use zones for LLGs
- Session 6: Identify conflict zones and mitigation strategies

By considering trade-offs and linkages between land and sea use, this approach applied the Ridge to Reef planning principle. In considering a future vision, and how to achieve this with growing pressure and complexity from population growth and development, the approach also integrated adaptation pathways thinking. The LLG land and sea use plans also referred directly to the SDGs and the PNG StaRs, and report cards were produced for each LLG to summarise progress towards specific SDGs in ENB (Lipsett-Moore 2017a) and WNB (Lipsett-Moore 2017b).

Key tools and data applied in the workshops were physical constraint maps (Figure 25), spatial estimates of land required for food security considering population growth (Figure 26), values maps (Figure 12) and biodiversity conservation priority areas (Figure 27). The primary outputs were a 2050 vision for the LLG (Figure 28), and a draft LLG land and sea use plan to achieve this (Figure 29).

In addition, a participatory 3D map was produced by communities at the University of Natural Resources and Environment at Vudal, ENB, to support local decision-making around oil palm and conservation in Inland Baining LLG (Figure 30). Also, training was carried out in Port Moresby with CEPA, the Climate Change and Development Authority and the Coastal Fisheries Development Agency on ELVIS and the application of the values database to conduct Environmental Impact Assessments.

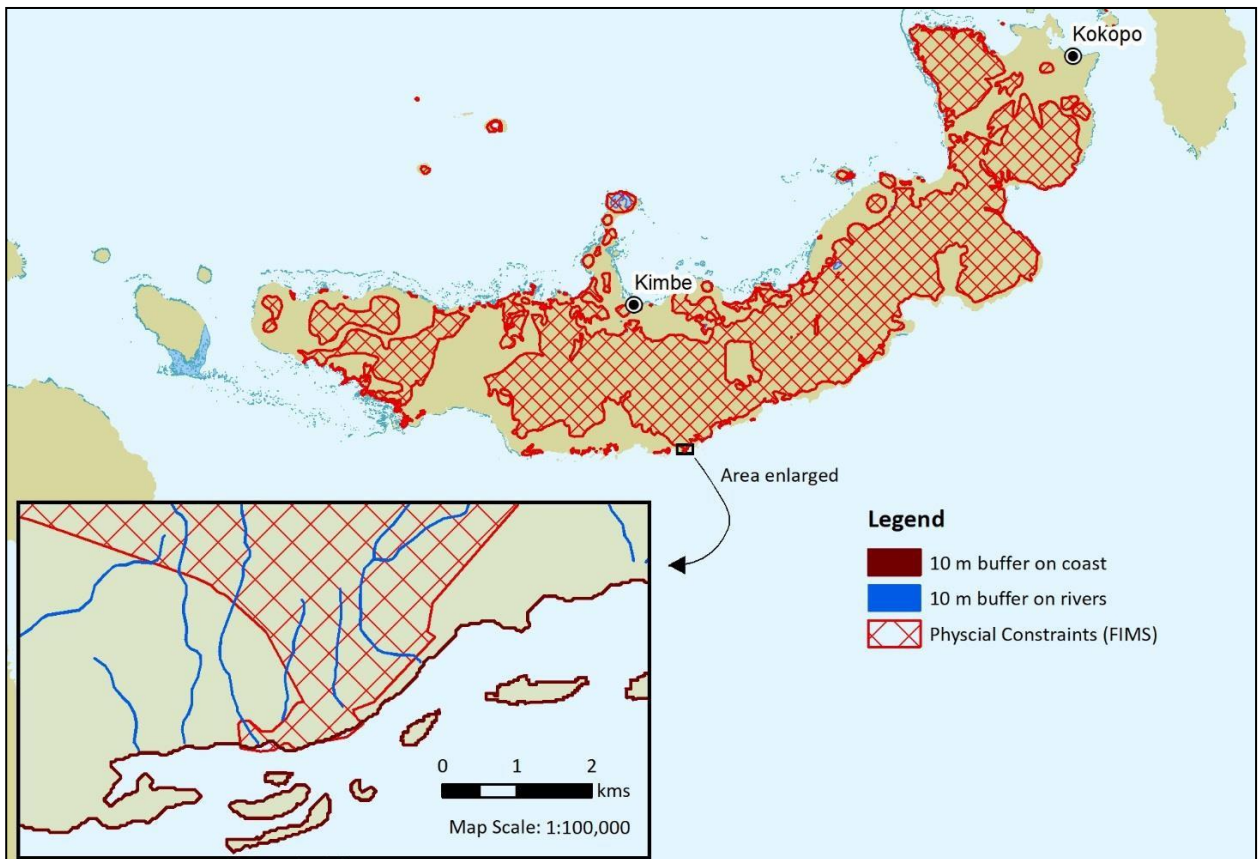


Figure 25: Physical constraints to development in ENB and WNB, derived from 10 m buffers on the coast and along river courses, and 20 degrees slope on land

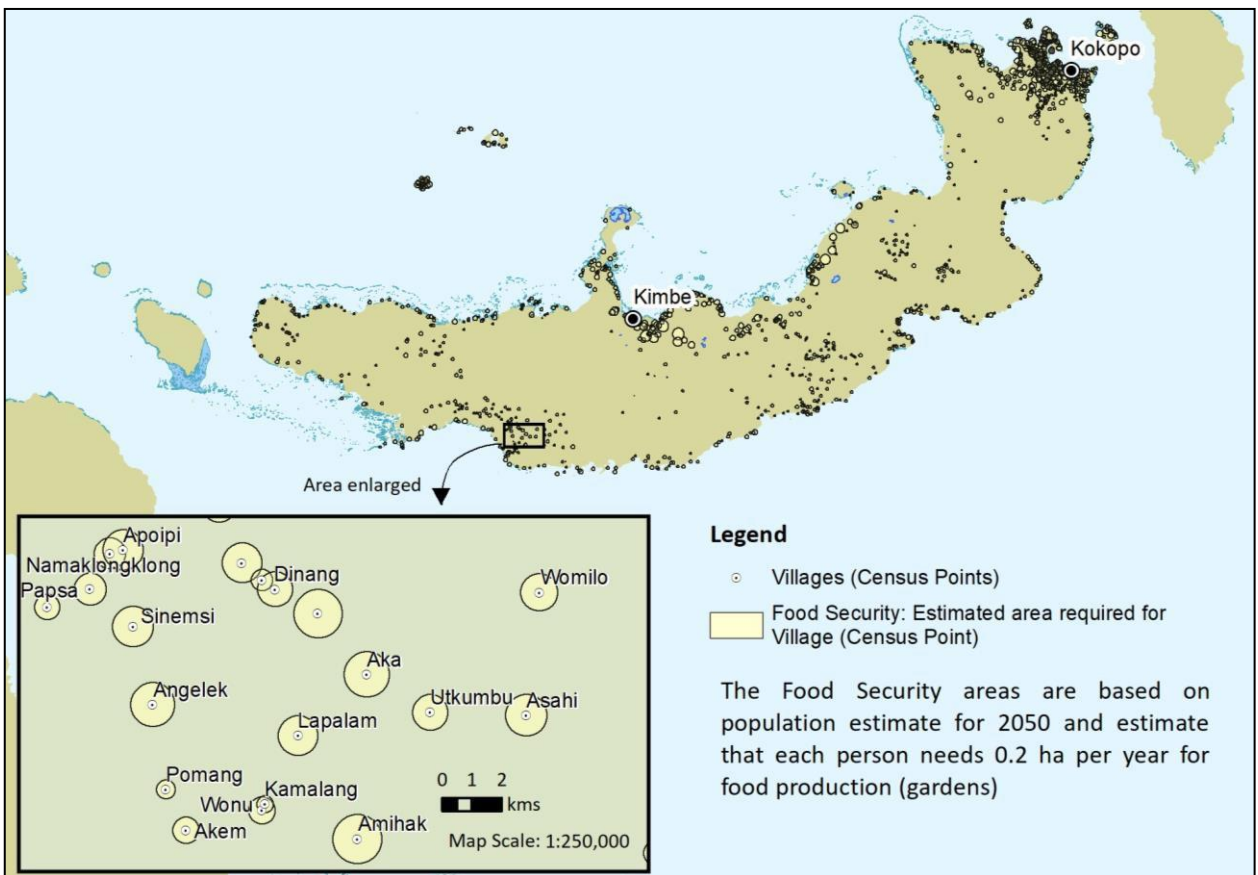


Figure 26: Spatial food security requirements around villages based on projected population growth to 2050

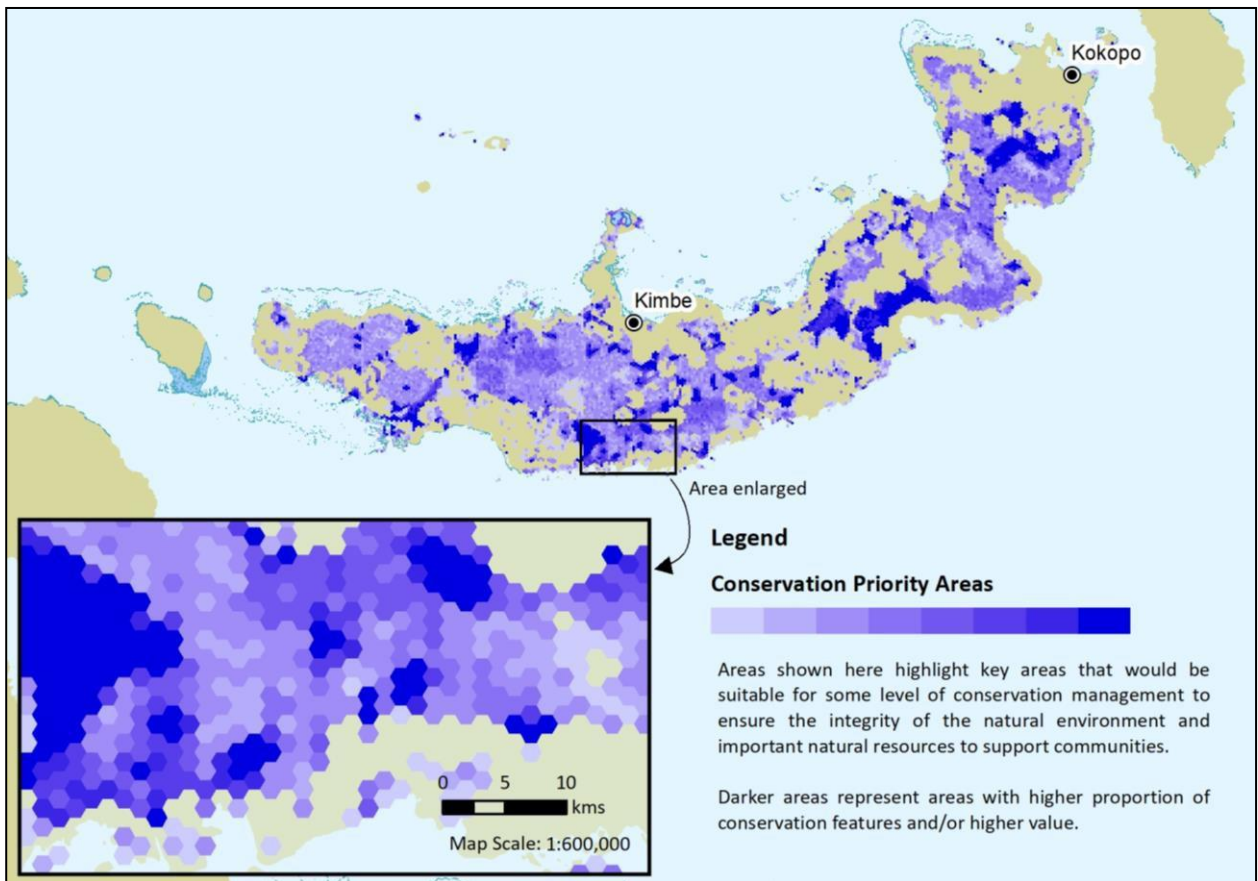


Figure 27: Terrestrial and coastal biodiversity conservation priority areas in ENB and WNB

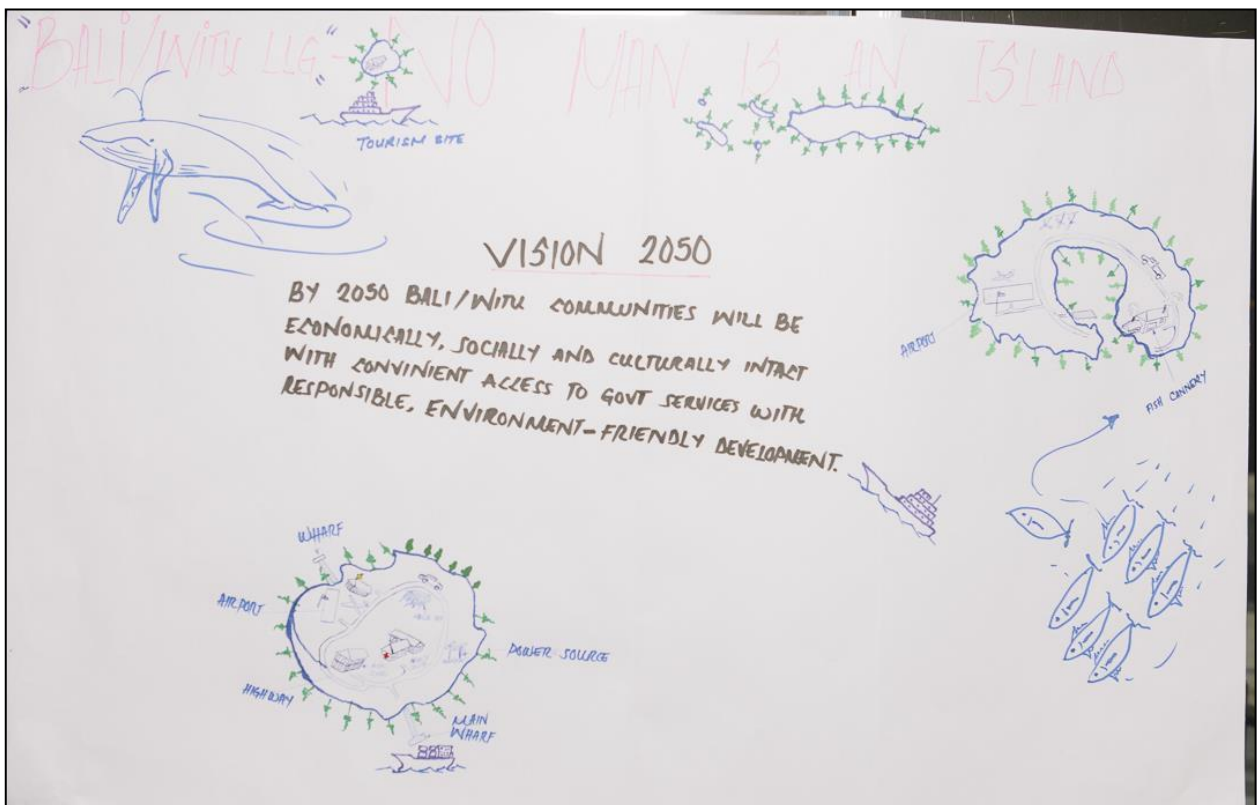


Figure 28: A 2050 vision for Bali-Witu LLG, WNB (Photo: Tom Greenwood)

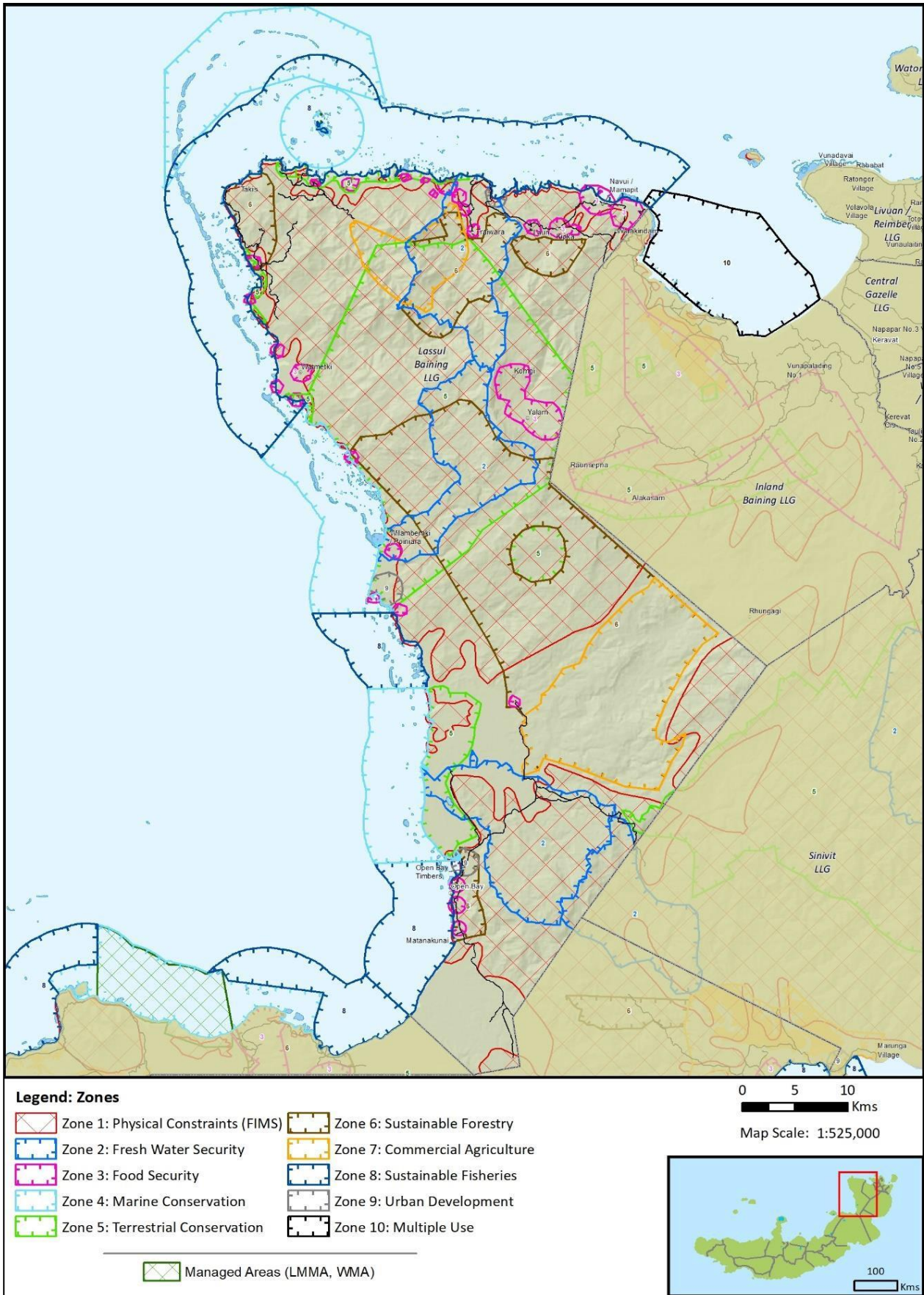


Figure 29: Draft land and sea use plan for Lassul Baining LLG, ENB



Figure 30: The 3D model produced by communities in Inland and Lassul Baining LLGs, ENB, to support local decision-making for oil palm development and coastal conservation (Photo: Tom Greenwood)

3.7 Step 6: Evaluation and learning

While evaluation and learning formed the final step, activities and tools were applied throughout the program to engender a culture of adaptive management and reflexivity. This further assisted the understanding of decision-making politics. Also, by using participatory methods, stakeholders were encouraged to reflect and learn as the program progressed, enhancing knowledge generation and augmenting the learning loop (Figure 8). Three methods were applied:

- A Theory of Change, developed initially by the program team and then reviewed with the Advisory Committee mid-way and near the end of the program (Figure 31)
- Questionnaires carried out before and after workshop activities to evaluate participants' learning
- In-depth interviews with key stakeholders half-way through the program, and at the end of the program

The final Theory of Change review and in-depth interviews suggested that the program had provided more relevant information (Figure 32). Population projections, values maps, the Land and Sea Use Plans, and decision-making case studies were most frequently mentioned as having built capacity for decision-making. The program had also influenced politics by empowering women, and enabling communities in ENB to participate in decision-making about oil palm development. Also, the participation of oil palm companies from ENB and WNB in the pilot planning workshops had enhanced political connections within the industry. There had been numerous outcomes in terms of improved networks, for example between CEPA and the ENB and WNB Provincial Administrations, and between tourism operators in ENB and WNB. Knowledge had also been enhanced, particularly in terms of stakeholders' improved understanding of decision-making, and ELVIS. There were suggestions that these outcomes had already contributed to evidence-based decisions being made, and actions taken, for example 'stop work' orders were being placed on some oil palm developments in ENB, and two new LMMAs were being established in Kimbe Bay. Full evaluation results are given in Butler et al. (2017c).



Figure 31: The program team’s initial Theory of Change, which was subsequently reviewed with the Advisory Committee to generate ongoing reflection and learning (Photo: Seona Meharg)

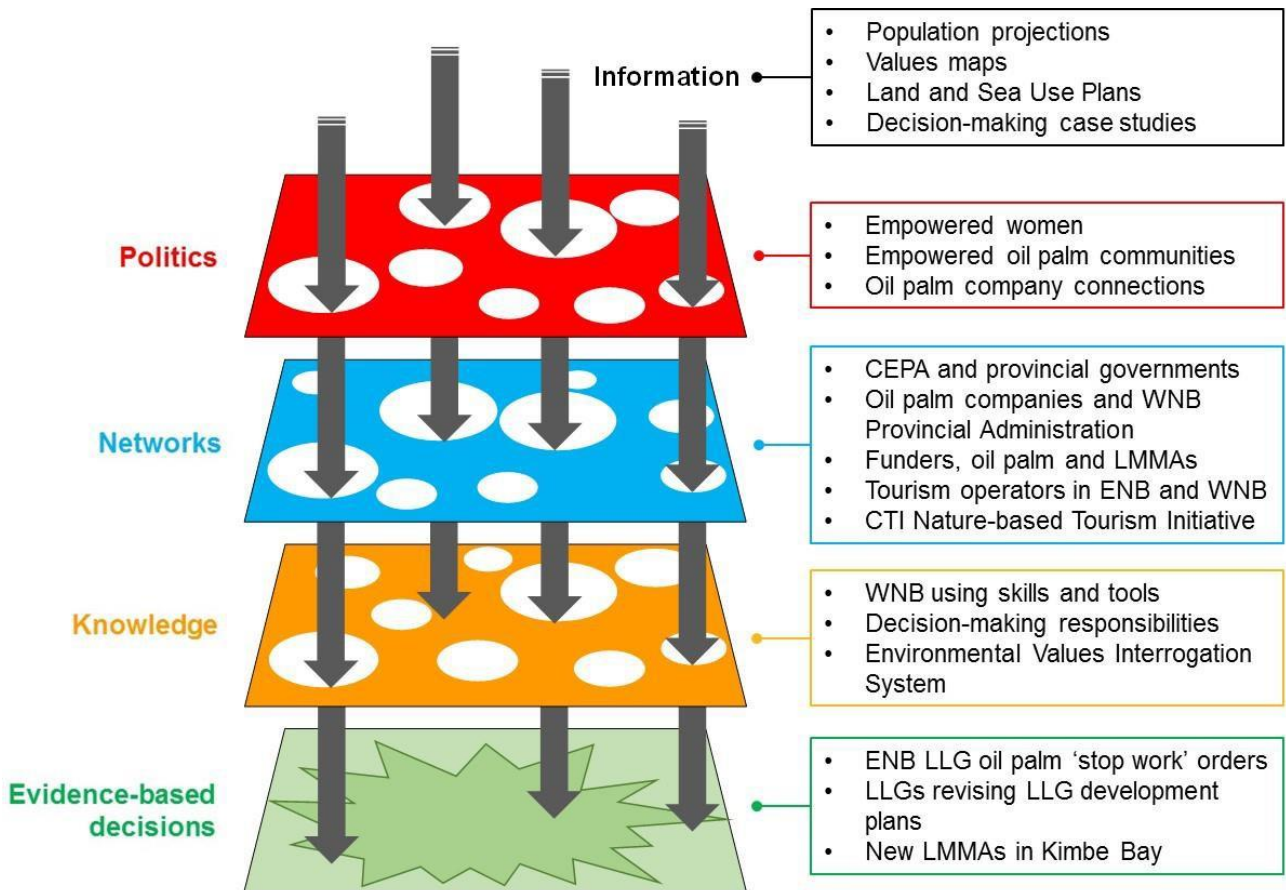


Figure 32: A summary of evaluation results relative to the aspects of evidence-based decision-making

The Advisory Committee and interviewees also identified potential improvements which should be considered for future activities in ENB and WNB, and in the other Bismarck Sea provinces, if the objective of Seascapes planning was to be achieved and sustained. The first challenge was the need to better engage the most powerful national ministries, such as the Department of National Planning and Monitoring, and the PNG Forestry Authority. While these had been identified in the **Step 1: Decision-making case studies**, and had been invited to participate in the following steps, their participation was limited. A second challenge was the need to better communicate the Seascapes approach, information and tools to communities. Some community resource owners participated in the activities, but there is a danger that their enhanced knowledge would not be passed on to other resource owners who were not directly engaged. Related to this, it was highlighted that more training in the tools and processes was necessary for all decision-makers. Finally, although the program engaged many current decision-makers, it was highlighted that greater effort was needed to engage youth and future decision-makers.

4. CONCLUSIONS

4.1 Next steps in the Bismarck Sea

This Guidance Document outlines the approach we have taken to implementing Seascapes practice in the Bismarck Sea. We believe that this advances current Seascapes thinking in the CTI by focussing on decision-makers and their decision-making. By applying Ridge to Reef systems-thinking, adaptation pathways, and capacity-building processes to enable evidence-based and transparent decision-making, we suggest that the objective of Seascapes can be reached (i.e. *'government authorities, private organisations, and other stakeholders cooperate to conserve the diversity and abundance of marine life and to promote human well-being'*). In parallel, this approach can contribute to the achievement of PNG's StaRS and the SDGs in ENB and WNB. Consequently this program has contributed to PNG's delivery of Target 2 under the CTI's Goal 1 (i.e. *'marine and coastal resources within all priority Seascapes are being sustainably managed'*).

However, this document presents our first iteration of the approach, and the evaluation indicates that there are numerous improvements that could be made. At the closing stakeholder workshops in Port Moresby, ENB and WNB, a range of next steps were suggested to maintain momentum within ENB and WNB, and to scale out the approach to other Bismarck Sea Provinces:

- Further training in the processes and tools for national and provincial decision-makers
- Application of the tools and processes in 'demonstration site' LLGs in ENB and WNB
- Transferral of the values database and ELVIS to the PNG National Oceans Office
- Collation, storage and communication of information in ENB and WNB
- Championing of the process by ENB and WNB Governors to neighbouring provinces

Our program has only carried out one 'learning loop' in 2015-2017, and focussed on ENB and WNB. Ideally this process should be repeated in ENB and WNB as part of 5-year statutory development planning cycles at the provincial, District and LLG levels. In doing so, the repeated learning loops and resulting actions form adaptation pathways which keep the 'adaptive space' open to achieve the SDGs (Figure 33).

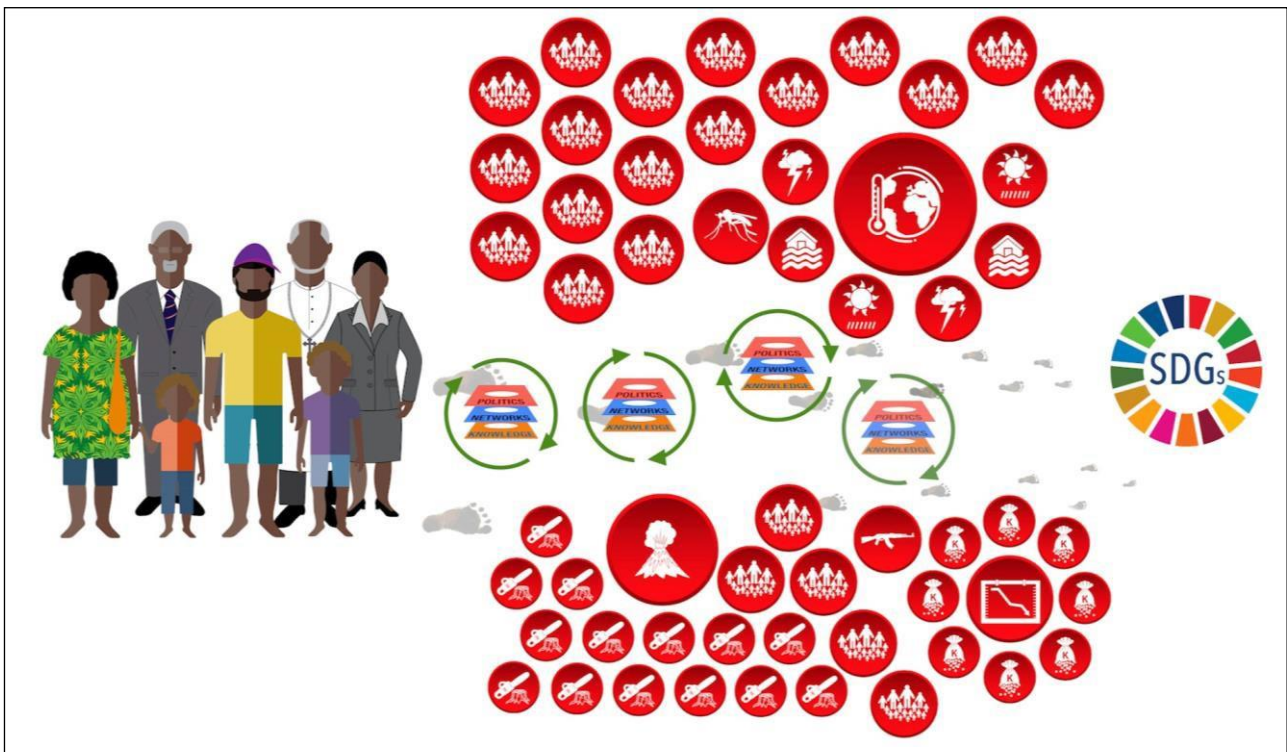


Figure 33: Ongoing learning loops form adaptation pathways which keep the 'adaptive space' open to reach the SDGs.

However, a full duplication of the learning loop, and the six steps within it, may not be necessary in ENB and WNB. For example, **Step 4**: Map stakeholder values does not need to be repeated, since features and values are likely to remain stable for some time. Instead, some of the steps (e.g. **Step 1**: Understand decision-making, **Step 4**: Pilot planning) could be selectively applied to other large scale development decisions as they arise, such as new seabed mining proposals. Equally, many of the tools and processes (e.g. population and climate projections, implementation pathways, conflict mitigation strategies) can be applied 'off the shelf' to any planning problem. Nonetheless, if this Seascapes planning approach was to be initiated in neighbouring provinces the full six steps would have to be initiated. Regardless, any future evolution of the approach in the Bismarck Sea will be iterative, and should be formally evaluated in order to learn lessons which can be shared with CTI partners.

4.2 Recommendations for other Seascapes

We recognise that the Bismarck Sea may differ from other Seascapes in the CTI. It is not a trans-national marine area, and is potentially less complex than other examples. Also, many of the development issues of concern are land-based or coastal, whereas planning and management challenges in other Seascapes may primarily be off-shore. However, we would argue that the complexity of the largely coastal development issues in ENB and WNB provide a useful test-bed for integrated, multi-stakeholder planning which should be appropriate for other contexts.

We suggest that the principles of Ridge to Reef systems-thinking, adaptation pathways, and capacity-building processes to enable evidence-based and transparent decision-making are relevant to any context. In addition, the integration of the SDGs into our approach creates synergies with broader sustainable development planning that will become more important in all CTI partner countries. Therefore we invite other Seascapes to test this approach, so that CTI partners can collectively learn and improve Seascapes practice across the Coral Triangle region.

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