Climate change adaptation in coastal and marine areas (Blue CCA)
Handbook for participants

Development and well-being of human societies are invariably linked to ecosystems and the benefits they provide. Recognizing the correlation between these ecosystem services and development is a success factor for development planning. Managing ecosystems to sustain the flow of ecosystem services can provide immediate economic benefits, and strengthen the resilience of those systems, especially in the face of climate change.

The Blue Training Course has been developed by the Blue Solutions Initiative, funded by the International Climate Initiative (IKI) of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU).

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Integrating climate change adaptation into development planning A practice-oriented training based on an OECD Policy Guidance. Training Manual
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Adapted for Marine and coastal environments.
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Introduction to the course

Background

Coastal development and climate change are changing the world’s coastlines. Sea-level rise, coastal erosion, and extreme weather events severely affect millions of people, infrastructure, fisheries and tourism. Rising water temperatures and ocean acidification impact Coastal and oceanic ecosystems dramatically. Risks to tropical reefs, for example, are of great concern, since they sustain the livelihoods of millions of people in developing countries. The poor are and will be affected disproportionately.

Adapting to climate change and sea level rise is a rapidly growing challenge, particularly for developing countries. Development and investment choices today influence the adaptive capacity of people and their governments well into the future. We cannot afford to delay adaptation planning and action. Yet, many (coastal) development policies, plans and projects currently do not take into account climate change due to a lack of knowledge, awareness and clarity on how to effectively develop and integrate adaptation options. Integrating adaptation into development cooperation provides an essential opportunity to make more climate-resilient development investments. Thus, the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, in close coordination with the OECD, developed a training course based on the OECD Policy Guidance on Integrating Climate Change Adaptation into Development Co-operation. The training course goes hand in hand with GIZ tools for mainstreaming climate change into development cooperation activities.

This particular training course is part of a modular training package on coastal and marine planning developed by the Blue Solutions Project. It focuses on coastal and marine areas and is based on the original GIZ/OECD training, yet also incorporates elements of the Blue Solutions training on Integrating Ecosystem Services (IES) into coastal and marine planning, the UNEP Ecosystem-Based Adaptation Guidance as well as the Guide for Vulnerability Assessment and Local Early Action Planning (LEAP Guide) from the U.S. Coral Triangle Initiative Support Program.

Aim

The aim of the training is to enhance capacities among development actors in coastal and marine areas and to support institutions in successfully taking action on climate change adaptation (CCA). This course therefore provides an introduction to the theory and to the practical starting points of climate change adaptation in coastal and marine areas.
Participants will learn
- to understand and be able to explain the basic concepts of climate change and climate change adaptation
- to understand the relevance of climate change as a topic for coastal and marine development
- to apply the basic steps of climate proofing (vulnerability analysis, identification of suitable CCA options/measures, monitoring and evaluation) and identify entry points for CCA
- to understand the role ecosystem services can play for climate change adaptation and understand the basic concept of ecosystem-based adaptation (EbA)
- how to approach the integration of CCA in their own work context.

Participants

Overall, the training package is primarily intended for professionals responsible for the planning and management of coastal and marine areas and their natural resources, preferably not only from the environment sector, but from other sectors (e.g. fisheries, coastal protection) as well. It aims, at varying degrees of detail, at decision makers as well as technical staff.

This training course addresses representatives from Blue Solutions’ partner organizations as well as national and international staff in international cooperation working in coastal and marine development projects with CCA relevance. It is particularly beneficial for participants working at the planning level and being actively involved in development and/or adaptation planning. Basic notions of climate change and CCA are advantageous.
Course Overview

The course is designed for duration of up to four days. Due to its modular structure it can be “tailored” to the specific learning needs of the target audience.

The training course comprises several training elements: case work group exercises, theoretical inputs and several interactive learning sessions.

The training course consists of six exercises that largely follow the logic of the climate proofing approach:

1. Introduction to the course
2. Assessing vulnerability
3. Identifying adaptation options
4. Selecting adaptation measures
5. Implementing change (including Monitoring & Evaluation)
6. Learning transfer

Training Methodology

The course is based on the Harvard Case Method, which conveys teaching messages mainly through interactive practical work by trainees. The training deals with the fictitious country of Bakul, a case closely based on real life conditions and challenges. The methodology can also be applied to a real case, yet this involves further preparation in advance of the training course in order to gather and process necessary information.

All modules follow the same sequence, including the following crucial elements:

1. The introduction, given by the trainer, provides the necessary theoretical background and introduces participants to the casework.
2. The casework gives participants the opportunity to work through the different aspects linked to climate change adaptation in a systematic manner. Participants assume the roles of ‘case work experts’ in charge of the specific module’s task.
3. The ‘case work experts’ present their results to the plenary. This is the opportunity to share experiences and for mutual learning. Trainers offer alternatives and corrections when necessary.
4. In a final reflection, the participants reassume their own real-life position. They reflect on their experiences and link them to their own work in order to make the newly gained knowledge more applicable. Trainer’s support through guiding questions.
5. In addition, “Blue Solutions” – successful cases – complement the training by illustrating theoretical inputs and case work learning. They serve as real case examples for “what works” (key success factors) in different situations.
Bakul is facing many environmental problems and especially the coastal areas are under threat. The beautiful Bakul reef is under threat from oceanic pollution as well as uncontrolled and increasing tourism, shipping, and fishing. Climate change is exacerbating existing problems: tropical cyclones along with increased sea surface temperature have caused major coral bleaching and destruction in the past.

The last months were especially hard for the coastal region of Bakul. The dry season lasted longer than usual and one of the two main rivers of the province, the Milaku, almost dried out. And, as if that was not hard enough, the wet season was characterized by relatively few but heavy rainfall events. During the last month, a major storm hit Bakul coast and has caused great damage to local villages, the coastal tourism infrastructure, and the fisheries sector. Many artisanal fishers have reported damage or loss of their fishing gear and boats.

The government realised that climate change adaptation action is needed and contacted you as consultants and asks for your help finding suitable adaptation options for Bakul’s coastal and marine areas. You must now travel to Bakul to consult with its leaders and community members. Along your voyage, you will receive guidance from the trainers and collaborate with other consultancy groups in finding adaptation options for Bakul. At times, you will stop to reflect on what you learnt by using a logbook. This will help you apply the insights and ideas you have gathered to your real work context.
Introduction to Bakul

*From Wikipedia, the free encyclopaedia*

Bakul, officially the Republic of Bakul (Bakulesi: Sathalanalat dschoik Bakul), is a tropical developing country covering an area of 300,000 km² (a size similar to the Philippines, Ecuador or Ivory Coast). It is famous for its beautiful beaches and islands, the world-famous Bakul Barrier Reef and the Coroné delta in north eastern Bakul.

The Mighty Mountains, a high-altitude belt (up to 2000 meters) running north south along the west of the country, split Bakul into two main geographical regions: the western highlands and the eastern lowlands including the Coroné delta in north eastern Bakul.

**Demographics**

Bakul is a multi-ethnic country formed by a combination of different groups over centuries. As of 2010, the total population is 15 Million, with 55% living in coastal areas. The population growth rate is currently 1.9% per year, but declining slowly. Bakul’s major cities are located near the coast. According to 2010 data, 31.3% of Bakul’s total population is classified as poor, including 9.8% that is extremely poor.

Bakul’s major cities are located near the coast: its capital city Haku in Indare province and Moneila city in Exportul province, the latter being the economic and financial heart of the country, attracting financial capital to be invested luxury tourism resorts along the coast. Urban areas are home to a growing middle class, as well as growing areas of extreme poverty, especially due to the influx of unskilled and semi-skilled rural immigrants.

**Governance**

Bakul is a representative democratic republic that gained independence in 1964. International observers report that recent elections have been reasonably open and fair. Due to the central government’s weak enforcement of national laws and international treaties, there is a strong presence of NGOs and advocacy organisations.

Administratively, Bakul is divided into three provinces: Indare, Exportul and Belandu. The three provinces have considerable autonomy, as well as limited taxation powers. Although each province owns revenue funds the state recurrent budget, most of the development budget is provided by the national government. Ministries cover all important sectors at both national and provincial levels. Most important are the Prime Ministry and Ministries of Planning, Finance and Economy, Industry, Water Resources, and the Ministry of Agriculture, which is also responsible for Fisheries. A Ministry of Environment has been created in 2004. Unfortunately, resources allocated to the Ministry are insufficient and enforcement of environmental regulations is lacking.

The National Meteorological Service is the principal advisor and negotiator for the government on climate change matters. The Chief Meteorologist is the Focal Point for the United Nations Framework Convention on Climate Change (UNFCCC), which was ratified by Bakul in 1994. Bakul became a signatory to the Kyoto Protocol in 2003, and since this time has established a designated national authority to certify Clean Development Mechanism (CDM) projects, and is in the process of creating national regulations.

There is no established system of coastal zone management or marine spatial planning. This was not a problem in the past, when
- the tourism sector was still small;
- fishing was still limited to artisanal fisheries
- aquaculture was limited to small isolated plots,
- and climate change impacts did not pose an immediate threat to Bakul’s coast.
Therefore, in 2014 the Government of Bakul established the Coastal and Marine Management Authority (CMMA).

The Bakul Coast

The coast is important to Bakul for its biological and cultural significance and draws tens of thousands of tourists to the country annually. Covering about 40,000 km², the Coroné delta in the north of Bakul is a low-level plain no more than three meters above sea level at any point. Mangrove forests used to cover the whole intertidal area; yet they have declined significantly in recent years, primarily due to the expansion of shrimp farming and on-going population pressure. Within the Coroné delta lie the Nelam Wetlands, internationally known for their outstanding flora and fauna. The Nelam Wetlands were recognised as an Endemic Bird Area for having the largest number of restricted-range birds on the continent, coming every year to nest from April to September. The Coroné delta is particularly exposed to floods, which have become increasingly common due to rises in sea level as a result of climate change.

The shallow waters of Bakul’s coast are home to one of the world’s largest population of manatees, three species of sea turtles and other remarkable marine life. Important marine ecosystems in Bakul include vast sea grass beds and the outstanding Bakul barrier reef system. This reef system stretches almost 1,000 km along the coast of three countries: Mariba, Bekule and Bakul. Currently, it includes several protected areas and parks, including the Bakul Barrier Reef Reserve in Bakul. Despite protection status given by this classification, the reef is under threat from oceanic pollution, caused by fishing and by the runoff of waste from aquacultural and agricultural activities, as well as from uncontrolled tourism, shipping and unsustainable fishing practices such as dynamite fishing and overfishing. In addition, tropical cyclones along with increased sea surface temperature have caused major coral bleaching and destruction in the past. Recent findings show that over 50% of Bakul’s coral reef has been damaged since 1998. The Bakul Barrier Reef Reserve lacks personal and financial resources to enhance enforcement of protective measures.

A north-south current dominates the coast’s oceanography. It used to be known to carry crustacean, coral and fish larvae to Bakul from its northern neighbour Bekule, where until a few years ago, large areas of mangrove forest were well-conserved. Yet in recent years most mangrove forests in Bekule have been converted for extensive shrimp aquaculture. As a result, large amounts of sediments and nutrients originating from these shrimp farms are nowadays being brought to the waters of northern Bakul. Hypernutrification and eutrophication in these waters negatively impact benthic communities.

Bakul’s coastal habitats also comprise a dozen of small scattered sandy beaches and two islands. Turtle Island and Manatee Island offer an ideal base for diving tourists who wish to explore the jewels of the reef. Three coastal beaches as well as Turtle Island are used by a population of endangered leatherback marine turtles for nesting from March to July. These nesting sites have been selected by the Ministry of Environment for nomination as protected areas. This is part of a strategic effort to raise from 4.5% to 10% the proportion of protected marine and coastal area by 2020 in Bakul and contribute to Aichi target 11 of the CBD strategic plan for Biodiversity 2011-2020.

The majority of the inland vegetation that was still to be found in southern Bakul in the middle of the century became removed in the past decades for palm oil plantations and other cash crops, leading to soil erosion. After years of intensive use, soil fertility is now decreasing and water supply problems are aggravated by longer dry periods caused by climate change. Some of these lands, deemed to be no longer suitable for agriculture, are increasingly being converted for housing, agriculture and transport infrastructure.

In recent years, fertilizers and nutrients runoff originating from agricultural activities has contaminated the Milaku River. To address that problem, the water company of Hanku city constructed a new water treatment plant at the mouth of the river.
Climate

The great variety of Bakul’s climate zones is largely determined by altitude. In the mountain valleys, the weather is mild all year round. The rainforest areas of the lowlands are characterised by a humid climate. The coastal area has a tropical climate with a severe rainy season. Bakul’s seasons are defined by how much rain falls during a particular period. The year can be split into two distinct periods, the dry season known to the residents as summer, and the rainy season, known locally as winter. The summer goes from December to April, and winter goes from May to November, which coincides with the cyclone season. During this time, it rains constantly and sometimes severely in some regions. Average rainfall in Bakul varies considerably, from 1,350 mm in Indare province to over 4,500 mm in the extreme south of Exportul province. Seasonal differences in rainfall are greatest in the northern and central regions of the country where, between January and April or May, less than 100 mm of rainfall per month. The dry season is shorter in the south, normally only lasting from February to March.

Temperatures vary according to elevation and proximity to the coast. Average temperatures in the coastal regions range from 24 °C in January to 27 °C in July. Temperatures are slightly higher inland. Overall, the seasons are marked more by differences in humidity and rainfall than in temperature. The coastline is vulnerable to tropical cyclones from July through to October. Heavy rainfalls accompanying these storms contribute a significant fraction towards the high wet-season rainfall totals.

Observed recent climate hazards include:
- Mean annual temperature has slightly increased since the beginning of the 20th century.
- Prolonged dry period during the last couple of years.
- Increased incidents of flooding during the rainy season.
- Increased ocean warming and ocean acidification has been observed on a global level.
- The average sea level at the Hanku coastal monitoring station has risen about 6cm during the last 40 years.

Anticipated climate hazards in 2030 (compared to the reference period from 1961 to 1990) include:
- Increasing mean annual temperature 0.8 -1.5°C (virtually certain)
- Slight decrease of annual rainfall amounts, especially during the dry season (likely)
- Increase of total rainfall in heavy events in May, June and July leading to more frequent floods (very likely)
- Continued rise of upper ocean temperature and ocean acidification
- Continued rise of the global mean sea level of up to 1 m towards the end of the 21st century (virtually certain)
- More intense cyclone events (more likely than not)

Economy

Bakul is a developing country with a market-oriented economy. The IMF estimates its 2010 per capita income at US$5,195. It has a medium Human Development Index score of 0.723 based on data from 2013. Historically, the country’s economic performance has been tied to exports, which provide hard currency to finance imports and external debt payments. Although these exports have provided substantial revenue, self-sustained growth and a more egalitarian distribution of income have proven elusive.

Presently, the main export crops are palm oil, fish and shrimp, and, to a lesser degree, timber. Fluctuations in world market prices can have a substantial domestic impact. Together, the agricultural and fisheries sectors generate more than half of the national GDP. Thereby, small-scale fishing and subsistence agriculture remain key pillars of the economy for more than 45% of the population living in coastal and rural areas.

Industry is largely oriented towards servicing the domestic market, with some exports reaching to countries within the region. However, this is meant to change, considering plans from the Ministry of Transport to expand by 2025 the existing Historic Harbour. The objective by 2025 is to achieve a handling capacity of 60 million tons of cargo/year.

Tourism is gaining importance as the nation’s fastest growing industry in terms of revenue. It is mainly based on the country’s beautiful beaches and coral reefs.
Aquaculture

The Coroné delta is by far Bakul’s most productive region in aquaculture. According to the fisheries administration, shrimp aquaculture accounts for around 12% of GDP. Because of its high economic return, shrimp farming has been promoted in the recent past as a way of helping to boost the national economy and to provide a source of income for local communities. Over the past five years, aquaculture companies have been acquiring land in the coastal area of Indare province and started converting the pristine mangrove forest into shrimp farms. Their objective is to produce shrimp for export and to build processing factories in the province, which they promise will create hundreds of jobs for local communities. Yet, the aquaculture industry is having difficulties expanding shrimp farms, as much of the suitable land is either located within the Nelam Wetland Reserve, where aquaculture farming is prohibited, or is already zoned for coastal tourism development.

Projected climate impacts for the aquaculture sector:

- Higher water temperatures will exacerbate stratification (thermal stability of water layers) within ponds and increase the loss of shrimp crops through deoxygenation of the water.
- Macrobrachium prawn aquaculture is also likely to benefit in the short term, but increasing temperatures are likely to have negative effects on prawn farming in the longer term.

Fisheries

People’s livelihoods along the coast nowadays mainly rely on artisanal fisheries, which employ no less than 15,000 people. As of 2010, a total of 6000 vessels under ten meters length operate in Bakul’s coastal waters. Bakul Barrier Reef is internationally known for having diverse and rich fishing grounds. The fisheries sector is partly dependent on goatfishes, which stay in shallow coastal waters with sandy sediments mainly during summer while they leave for deeper waters in autumn.

The fisheries administration issues fishing permits to vessels over twelve meters in length, yet it lacks personnel and equipment to effectively control compliance. As a result, the number of semi-industrial vessels operating in Bakul’s waters has increased drastically over the past two decades, from 230 in 1995 to 1,000 in 2015.

Recently, five large industrial bottom trawlers have been added to Bakul’s fishing fleet, which is not only benefiting the fishing industry but also the developing Hanku harbour. Industrial fishing is expected to further develop significantly, considering the Ministry’s objective to add at least eight large industrial bottom trawlers to Bakul’s fishing fleet and to increase the annual value of the industrial catch from 12 million USD to 30 million USD by 2020. The dramatic increase in the industrial fishery fleet is already resulting in conflicts over sea use between industrial and artisanal fishers who are often competing for the same resource, and such tensions are expected to intensify in the future. In addition, foreign fishing fleets from Bekule are frequently seen illegally fishing in Bakul’s waters.

Projected climate impacts for the fisheries sector:

- Rising sea surface temperatures, ocean acidification, and more intense cyclones are expected to negatively impact reef structure. Consequently, reefs can provide less structural habitat for fish and shellfish.
- Sea level rise and ocean acidification will have negative impacts on mangroves, and intertidal flats (supporting coastal fisheries) leading to a decline in area of these habitats.
- Changes in ocean temperature are also expected to have direct effects on the reproduction, dispersal and growth of fish. Fisheries productivity fish and invertebrates are expected to decline.
- Near shore pelagic species are likely to be influenced by local changes in coastal productivity related to nutrient supply.
- Open water fish stocks will shift in their distribution due to increasing water temperatures, with profound impacts on commercial fisheries and alteration in community interactions.
- More stationary fish species, such as reef fishes, suffer from habitat destruction / habitat loss caused by coral mortality as a result of multiple stressors (climate change, human impact, natural disturbances).
- Ocean acidification may lead to reduced growth and reproduction of fish stocks.
Tourism

The tourism sector has recently been growing rapidly. The Bakul Barrier Reef with its large potential for diving has been gaining importance as a tourism site. Bakul Island is still a pristine place but offers a few hotels and a small harbour to tourists. Another tourist hotspot can be found just north of Hanku city, the Nelam wetlands. Tourism is driving urbanisation and construction of new coastal development such as hotels and cruise ship ports, mainly along the coast of Indare province, where new hotels are being built right along the beach. Resulting increased real estate prices are driving local communities off their land, either voluntarily or as a subject to forced evictions. These people lose their livelihoods and end up working in hotels as low paid service personal or migrate to cities such as Hanku and Moneila.

Projected climate impacts for the tourism sector

- Tourism infrastructure will be exposed to more frequent floods, storm surges and more intense cyclones.
- Sea-level rise and ocean acidification will threaten natural attractions such as the Bakul Barrier Reef. Weak coral structures provide less protection to the coast (settlements and infrastructure).
- Changing precipitation, increased evaporation and sea level rise will affect fresh water availability, especially during the dry season.
- Beaches are exposed to more coastal erosion threatening coastal infrastructure as well as the desirability of Bakul as a tourist destination. Beach erosion could reduce the prices that operators can charge for accommodation.

Coastal Settlements

Fisher folks were the first settlers along the coast of Bakul. They typically built their homes near the shoreline, where smooth landing of artisanal fishing boats was most convenient. Traditionally, wooden stilt houses were built near or sometimes in the water. Nowadays, fishing villages have extended further inland, but remain close to the shore. Most fishers cannot afford to build concrete houses and live in shanties. Settlement is largely unregulated in Bakul and no building codes exist. Today, coastal settlements include not only small fishing villages, but also a growing number of hotels and other touristic infrastructure, as well as the city of Hanku, which is located at the mouth of Milaku river.

Projected climate impacts for coastal settlements

- Coastal settlements will be exposed to more frequent floods, storm surges and more intense cyclones.
- Sea-level rise and ocean acidification will threaten the Bakul Barrier Reef. Weak coral structures provide less protection to the coast (settlements and infrastructure).
- Increased erosion, inundation and salinization will affect the health of mangroves and might lead to a decline in area of this habitat.
- Beaches are exposed to more coastal erosion threatening coastal settlements.
- Changing precipitation, increased evaporation and sea level rise will affect fresh water availability, especially during the dry season.
### Key features of Bakul

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
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<tbody>
<tr>
<td><strong>Area</strong></td>
<td>300,000 km² (a size similar to the Philippines, Ecuador or Ivory Coast)</td>
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<tr>
<td><strong>Ecosystems &amp; climate</strong></td>
<td>Bakul is a tropical country with a great variety of Bakul’s climate and ecosystems:</td>
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<td></td>
<td>- <strong>Mighty Mountains</strong>: a high-altitude belt (up to 2000 meters) running north south along the west of the country, large parts are still covered by forests with a mild climate all year round.</td>
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<td></td>
<td>- Low-lying lands to the east with a humid climate in the rainforest areas.</td>
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<td></td>
<td>- Coastline: Coroné Delta and the Nelam Wetlands (Endemic Bird Area) with its large Mangrove forest in the north and palm oil plantations and agricultural lands for cash crops in the south as well as many beaches and islands and the world-famous Bakul barrier reef including the Bakul Barrier Reef Protected Area</td>
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<tr>
<td><strong>Population</strong></td>
<td>15 Million; with 55% living in urban and 45% in rural areas</td>
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<tr>
<td><strong>Population Growth Rate</strong></td>
<td>1.9% per year; mainly in urban areas due to continuing rural to urban migration and natural growth</td>
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<td><strong>Government</strong></td>
<td>- Representative Democratic Republic</td>
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<td>- Three provinces: Indare, Exportul and Belandu with considerable autonomy, yet limited taxation powers</td>
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<td><strong>GDP per capita</strong></td>
<td>US$5,195 (2010)</td>
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<td><strong>Composition of economy</strong></td>
<td>- Market-oriented economy; tied to exports</td>
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<td>- Main export crops: palm oil, fish and shrimp, rubber, timber and, to a lesser degree, cacao and tropical fruits</td>
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<td></td>
<td>- Small-scale fishing and subsistence agriculture remain key pillars of the economy for more than 45% of the population living in coastal and rural areas</td>
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<td></td>
<td>- Tourism is gaining importance as the nation’s fastest growing industry in terms of revenue.</td>
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<tr>
<td><strong>Human Development Index</strong></td>
<td>0.723 (2010)</td>
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<td><strong>Portion of population living below national poverty line</strong></td>
<td>31.3% of Bakul’s total population is classified as poor, including 9.8% that is extremely poor</td>
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<tr>
<td><strong>Environmental Problems</strong></td>
<td>- No established system of coastal zone management or marine spatial planning</td>
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<td></td>
<td>- Growing tourism and fisheries industry threaten the health and integrity of Bakul’s coastal and marine areas by activities such as clearing mangroves, overfishing, destructive fishing methods and pollution</td>
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<td></td>
<td>- The Coroné delta is particularly susceptible to floods, which have become increasingly common due to rises in sea level as a result of climate change.</td>
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<td></td>
<td>- Tropical cyclones along with increased sea surface temperature have caused major coral bleaching events in the past.</td>
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Exercise 1: Getting familiar with Bakul country:

Applying a climate lens

Learning objectives of the exercise

- Get familiar with the case Bakul.
- Consolidate basic concepts ecosystem and ecosystem services and their relevance as a topic for coastal and marine development.
- Understand the relevance of climate change as a topic for coastal and marine development.

Context

The Government of Bakul is aware that the country’s development is affected by climate change. Furthermore, the Government realised that the country’s coastal and marine ecosystems and their services are already under stress from competing resource uses (aquaculture, tourism and industrial fishing). The overarching development goals of poverty reduction and sustainable economic growth in particular are endangered and climate change impacts will exacerbate many of the existing challenges. As a consequence, the Government has decided to review major goals of its development plan and to further explore the links between development objectives, human well-being and ecosystem services. The Bakul Development Committee has established a climate change advisory group to support this process. Your task is to review the development

Instructions for case work

You are members of the climate change advisory group. Your task is to review the development goals with relevance to Bakul’s coastal and marine areas.

Matrix 1 assists in examining these goals through a ‘climate lens’ in order to identify the relevance of climate change to each goal. Table 1 provides an overview on coastal and marine ecosystem services.

Your task

The Bakul Wikipedia provides a first overview on Bakul and projected climate change impacts. Read the text carefully, considering the following questions for each goal:

- Which ecosystems and ecosystem services are most important for that goal? Identify the most relevant ecosystem services and describe the dependency of the goal on these ecosystem services. Consult if you need help.
- How could the goal be affected by climate change? In particular, consider how the relevant ecosystem services could be affected.

Which stakeholders are involved and should contribute to next steps?

Matrix 1: Getting familiar with Bakul

<table>
<thead>
<tr>
<th>Goal</th>
<th>Which ecosystems and ecosystem services are most important for that goal (dependency)?</th>
<th>How could the goal be affected by climate change? (Consider also ES identified in previous column)</th>
<th>Which stakeholders are involved and should contribute to next steps?</th>
</tr>
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<tbody>
<tr>
<td>Enhance and diversify (coastal) livelihood opportunities.</td>
<td></td>
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<td>Enhance fish exports</td>
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<tr>
<td>Enhance shrimp exports</td>
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<td></td>
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<tr>
<td>Enhance tourism in coastal areas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enhance coastal protection</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 1: Examples for coastal and marine ecosystem services

<table>
<thead>
<tr>
<th>Service</th>
<th>Description</th>
<th>Examples of marine and coastal ecosystem services</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Provisioning services are the products people obtain from ecosystems.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food</td>
<td>Ecosystems provide food in wild habitats and in managed agro-ecosystems.</td>
<td>Fisheries and aquaculture supplied the world with about 128 million tonnes of fish for consumption in 2010. Marine capture fisheries alone (theoretically) put one fillet per week on every person’s plate. Healthy coral reefs can yield an average of 15 tonnes of fish and other seafood (e.g. shellfish) per square kilometre each year. 1.2 per cent of the world’s tropical coral reefs nourish up to 1 billion people.</td>
</tr>
<tr>
<td>Raw material</td>
<td>Ecosystems provide a great diversity of materials for construction and fuel.</td>
<td>Many marine and coastal ecosystems provide coastal communities with construction material, such as mangrove wood as building materials for boat construction.</td>
</tr>
<tr>
<td>Fresh water</td>
<td>Ecosystems provide surface and groundwater.</td>
<td>Healthy coastal ecosystems protect rivers and other inland freshwater systems from storm surges.</td>
</tr>
<tr>
<td>Genetic resources</td>
<td>Genes and genetic information used for animal breeding, plant improvement, and biotechnology.</td>
<td>Marine sponges have been considered as a gold mine during the past 50 years, with respect to the diversity of their secondary metabolites. Sponges have the potential to provide future drugs against important diseases, such as cancer, a range of viral diseases, malaria, and inflammations.</td>
</tr>
<tr>
<td>Medicinal resources</td>
<td>Many plants are used as traditional medicines and as input for the pharmaceutical industry.</td>
<td>Many new pharmacological compounds have been discovered in marine and coastal ecosystems</td>
</tr>
<tr>
<td><strong>Regulating services are the benefits people obtain from the regulation of ecosystem processes.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carbon Sequestration</td>
<td>The extraction of carbon dioxide from the atmosphere serving as a sink.</td>
<td>Marine ecosystems play an important role in climate regulation due to their ability to sequester and store carbon dioxide from the atmosphere.</td>
</tr>
<tr>
<td>Natural hazard regulation</td>
<td>Capacity of ecosystems to reduce damage caused by natural hazards such as floods, storms, and landslides.</td>
<td>Coral reefs, mangroves and sea grass beds provide protection from floods, and buffer land from storms.</td>
</tr>
<tr>
<td>Water purification</td>
<td>Microorganisms in soil and in wetlands decompose human and animal waste, as well as many pollutants.</td>
<td>Mangroves have a great capacity to absorb heavy metals and other toxic substances in effluents. Estuaries, marshes and lagoons play a key role in maintaining hydrological balance and filtering water of pollutants</td>
</tr>
<tr>
<td>Erosion prevention and maintenance of soil fertility</td>
<td>Role vegetative cover plays in soil retention.</td>
<td>Mangroves and sea grass beds reduce coastal erosion and stabilise land by trapping sediments.</td>
</tr>
<tr>
<td>Biological control</td>
<td>Ecosystems are important for regulating pests and vector borne diseases.</td>
<td>Bees commonly inhabit mangroves, and provide pollination services for other plants.</td>
</tr>
<tr>
<td>Pollination</td>
<td>Role ecosystems play in transferring pollen from male to female flower parts.</td>
<td></td>
</tr>
</tbody>
</table>
Cultural services represent the spiritual, educational, recreational enjoyment derived from healthy ecosystems.

<table>
<thead>
<tr>
<th>Cultural services</th>
<th>Recreation and ecotourism</th>
<th>Aesthetic values</th>
<th>Spiritual, religious and ethical values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recreation and ecotourism</td>
<td>Recreational pleasure people derive from natural or cultivated ecosystems.</td>
<td>The beauty and aesthetic values of nature in all its appearance</td>
<td>Spiritual, religious and ethical values people attach to ecosystems, land- and seascapes, or species.</td>
</tr>
<tr>
<td>Aesthetic values</td>
<td></td>
<td>The beauty of coastlines, reefs and islands is an inspiration for art in many different cultures</td>
<td>There are many examples throughout almost all coastal cultures around the world. Some more specific examples include the significance of the salmon to the many coastal First Nations cultures of the Northeast Pacific. The Bajau peoples of Indonesia and the aboriginal people of the Torres Strait (Australia) have a culture intimately connected to oceans.</td>
</tr>
<tr>
<td>Spiritual, religious and ethical values</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Supporting services are necessary for the delivery of all other ecosystem services.

<table>
<thead>
<tr>
<th>Supporting services</th>
<th>Providing habitats</th>
<th>Primary productivity</th>
<th>Nutrient cycling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Providing habitats</td>
<td>Habitats provide everything that an individual plant or animal needs to survive. Migratory species need specific habitats along their migrating routes to enable their success.</td>
<td>The formation of biological material by plants (e.g. algae) through photosynthesis and nutrient assimilation.</td>
<td>Ecosystems play a major role in the flow and recycling of nutrients (e.g. nitrogen, sulphur, phosphorus, carbon) through processes such as decomposition and/or absorption.</td>
</tr>
<tr>
<td>Primary productivity</td>
<td>Mangroves provide shelter to many species of fish and crustaceans during their early life history stages.</td>
<td>Coastal and marine ecosystems contribute about half of the Earth’s primary production through plants and algae.</td>
<td>Mangroves and saltmarshes play a key role together in cycling nutrients. For example, saltmarshes in the Red Sea region contribute nitrogen to adjacent mangroves. Beaches and sandy shores are important in the delivery of land-based nutrients to the near shore coastal ecosystem.</td>
</tr>
<tr>
<td>Nutrient cycling</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

References

- UNEP (2011): Taking steps towards marine and coastal ecosystem-based management
Guidance for effective group work:

A group should nominate (for each exercise):

- A **Group Facilitator**: moderating and making sure everyone participates;
- A **Time Manager**: ensuring that activities are achieved and stop on time;
- A **Presenter**: recording and presenting the groups’ findings and reminding group mates to keep their “Parking Lots” up-to-date; and
- Before starting the exercises, take your time to read through the task description and see if everybody is on board.
- The working groups work independently.
- Make assumptions and work with them.
- Trainers can be asked for advice.
- The main learning objective is to learn about the strategic approach, rather than to be comprehensive in the task.
Bringing it home: Applying a climate lens

Climate change is a core development issue and presents risks to the achievement of poverty reduction and development goals. This requires development that is both low carbon (mitigation: renewables, energy efficiency, land management for carbon storage etc.) and climate-resilient (adaptation).

Adaptation is a complementary risk management strategy to mitigation. There is a need to reduce exposure (i.e. mitigate greenhouse gas emissions in order to ‘avoid the unmanageable’), and also insure against potential negative effects (i.e. adaptation activities to ‘manage the unavoidable’).

Adaptation is crosscutting. Dealing with climate change requires responses in key areas (e.g. fisheries, coastal protection, water), as well as integrated planning and budgeting (such as marine spatial planning, coastal zone management) and financing over the near and long term for both urgent and strategic investments.

Political interest in climate change is growing, and the need for adaptation is increasingly being recognised. In many countries, climate change impacts are evident and adaptation is increasingly being recognized as a priority area for policy development. In some countries, there is still a need to clarify that adaptation is a part of sustainable development and to provide evidence of the benefits of anticipatory action. In some countries, climate change and adaptation are highly political issues.

There is broad international consensus among scientists about the key dynamics of climate change and many impacts on terrestrial and ocean systems are already evident:

- Each of the last three decades has been successively warmer at the Earth’s surface than any preceding decade since 1850;
- Mean global temperature rose by +0.85°C over the period 1880 to 2012;
- Ocean warming dominates the increase in energy stored in the climate system, accounting for more than 90% of the energy accumulated between 1971 and 2010;
- On a global scale, the upper 75 meters of the oceans warmed by 0.11 °C per decade over the period 1971 to 2010;
- Over the last two decades, the Greenland and Antarctic ice sheets have been losing mass, glaciers have continued to shrink almost worldwide, and Arctic sea ice and Northern Hemisphere spring snow cover have continued to decrease in extent;
- Over the period 1901 to 2010, global mean sea level rose by 0.19m; and
- The ocean has absorbed about 30% of the emitted anthropogenic carbon dioxide, causing ocean acidification.

Continued emissions of greenhouse gases will cause further warming and changes in all components of the climate system:

- Global surface temperature change for the end of the 21st century is likely to exceed 1.5°C relative to 1850 to 1900 for all RCP scenarios except RCP2.6.
- Changes in the global water cycle in response to the warming over the 21st century will not be uniform. The contrast in precipitation between wet and dry regions and between wet and dry seasons will increase, although there may be regional exceptions
- The global ocean will continue to warm during the 21st century. Heat will penetrate from the surface to the deep ocean and affect ocean circulation.
- It is very likely that the Arctic sea ice cover will continue to shrink and thin and that Northern Hemisphere spring snow cover will decrease during the 21st century as global mean surface temperature rises. Global glacier volume will further decrease.
- Global mean sea level rise for 2081–2100 relative to 1986–2005 will likely be in the ranges of 0.26 0.82 m depending on the RCP.
- Further uptake of carbon by the ocean will increase ocean acidification.
- Most aspects of climate change will persist for many centuries even if emissions of CO2 are stopped.
Rationale

A climate lens is the first step in identifying how to address climate change risks in relation to an initiative or objective. The objective of applying a climate lens is to help a policy, programme, plan or project become more resilient to climate change or more supportive of adaptation by understanding the relevant climate change risks and opportunities.

At the same time healthy and productive oceans and coasts provide vital ecosystem services essential to human wellbeing. Healthy coasts also help alleviate the impacts of climate change. They reduce the risk of vulnerable communities to disaster and rising seas, storms and floods. And they offer valuable ecosystem-based carbon mitigation and climate change adaptation options. However, many of these services are declining due to increasing and often competing coastal activities and resource use. Trade-offs exist between the benefits of activities for human well-being and their impacts on marine and coastal ecosystems. An integrated approach to climate change adaptation and development planning is therefore of critical importance to ensure long-term sustainable development.

Desired outcomes:
- A common understanding of the relevance of climate change to development.
- Get an overview of ecosystem services and common understanding of their relevance for sustainable coastal and marine development.
- Perception of adaptation as a cross-cutting issue.

Entry points

A climate lens is applied as the first step in national, sector, local and project policy and programme planning. ‘Applying a climate lens’ helps to prioritise vulnerable sectors or adaptation programmes, e.g. in the policy formulation stage or in plan development/revisions. A climate lens can contribute to identifying priority adjustments to on-going or planned activities. This first analysis may point to the need for further analysis of the nature and scale of risks or response options.

At the national level this step could be useful when discussing:
- National long-term visions
- Marine Spatial Planning and other short-to medium-term policies (e.g. design standards, land laws, fisheries policy, etc.)
- Multi-year development plans
- Strategic national assessments

Main lessons learnt

A climate lens can generally be applied using existing information and in a relatively short amount of time. In some cases, additional information gathering and analysis may be desirable.

Based on existing information, you can assess:
1. the extent to which a strategy, policy, plan or programme could be at risk due to climate change, e.g. a hydropower-based energy system is at risk when medium-term projections for storm surge are considered;
2. the extent to which climate change risks have been taken into consideration, e.g. historic variability and recent trends of flood damage were used in designing a flood management programme;
3. the extent to which a strategy, policy, plan or programme could increase risk or miss positive opportunities, e.g. dykes may be designed to withstand historic flood levels, but they could end up increasing flood damage if flooding levels increase and overtop them; and
4. if being revised, amendments that might be warranted to address climate risks and opportunities, e.g. for a water resources management programme, climate change scenarios may be used to develop contingency plans in the event of severe water shortages.
Blue Solutions and other successful real-life examples

- “Climate sensitive planning” (Brazil), implemented by Conservation International: http://www.panorama.solutions/en/solutions/climate-sensitive-planning

References

- OECD Policy Guidance - Integrating Climate Change Adaptation into Development Cooperation, Part II: Integrating Climate Change Adaptation at National, Sectoral and Project Levels. See also:
  - Box 7.2: Applying a climate lens
  - Box 8.1: Applying a climate lens to sectoral policies, plans and programmes through Strategic Environmental Assessment
  - Table 12.2: Applying a climate lens to steps in the urban development planning process
- GIZ (2011): Climate Proofing for Development: Adapting to Climate Change, Reducing Risk

Logbook

What is one main take away or action item you need to apply or accomplish in this stage of Blue Planning when you return home?
Exercise 2: Assess risk

Learning objectives of the exercise

- Learn how to identify factors contributing to risk in a system along an “impact chain”
- Understand how to determine vulnerability, impact, risk and need for action.
- Understand that climate as well as non-climate stressors influence risk.

Context

The Government of Bakul established the Coastal and Marine Management Authority (CMMA) in 2013. The CMMA is mandated to ensure the sustainable management of the coastal and marine resources of Bakul. This includes inter alia the task to secure the integrity of the Nelam Wetlands. As coastal and marine management requires an intersectoral and supra-regional approach CMMA serves as a platform for integrated marine spatial planning. The CMMA is composed of representatives of the three provinces, of the Ministries of Planning, Industry, Water Resources, Defence, Environment, Tourism, and Agriculture. Additionally, two national environmental NGOs represent civil society. CMMA’s approach manifests in the country’s first Coastal and Marine Development Plan (CMDP), which has been drafted and is currently under revision. CMMA shall coordinate activities in the aquaculture, agriculture, fishing and tourism sector as well as with regards to coastal protection.

As climate change is expected to have a negative impact on Bakul’s coastal and marine development, CMMA commissioned a group of climate experts with an in-depth risk analysis of the coastal and marine sector. This should finally lead to the explicit consideration of climate change and strategic adaptation priorities in the new plan. Development cooperation partners have pledged support for priority activities. Coastal and marine ecosystem goods and services are recognized as important aspects for climate change adaptation.

Instructions for case work

General information

- You were appointed as member of an advisory group to the CMMA to support the integration of climate change adaptation in the development of the CMDP.
- The CMMA has decided to focus the development of the CMDP on five key areas (systems of interest):
  - Artisanal fisheries (coastal waters)
  - Industrial fishing (high seas)
  - Aquaculture in the Coroné delta
  - Coastal tourism
  - Coastal settlements

The CMMA wants to assure that the respective development goals established in the National Development Plan (NDP) 2015-2025 are met:

- Enhance and diversify (coastal) livelihood opportunities.
- Enhance fish and shrimp exports.
- Enhance tourism in coastal areas.
- Enhance protection of coastal settlements.

The task is divided in 2 parts.

- Part 1 is a preparatory step for the comprehensive assessment in Part 2. It deals with the current situation in the system of interest: stocktaking of actors and assets in your system of interest and an analysis of conditions and trends within the system of interest. (See task description next page, Matrix 2).
- Part 2 deals with the future under climate change. You analyse hazard and exposure, vulnerability and potential impacts of climate change on your system of interest, and finally define the risk / need for action. (See task description p.24, Matrix 3).
Assess risk part 1

In Part 1 you gather information to understand the current situation of the systems of interest. This will help you to do a comprehensive assessment of risk and need for action in Part 2.

Your task:

Use Matrix 2 to guide your work.

- In column A, brainstorm the natural and social assets (e.g. fish stock, equipment, community institutions, basic infrastructure etc.) and relevant stakeholders (e.g. fishers, labourers, traders) within the system of interest.

- In column B review the conditions and trends of the system of interest (including relevant ecosystems) and describe non-climate threats influencing the current condition of the system of interest, e.g. destructive fishing or overfishing. At this point to NOT take possible future climate change induced impacts into account. Explicitly consider non-climate factors influencing the system of interest. Assess the current status and possible future trends in light of the development plan.
  - The current condition describes the status of the system of interest (including the ecosystem).
  - The trend describes whether the condition is declining, improving or staying the same. This includes past trends and likely future developments. Examples are changes in fish population or steady decline of fresh water availability due to increased use from the tourism sector.

- In column C, rank the conditions and trends using the ranking system displayed in Figure 1.

Matrix 2: Assess conditions and trends

<table>
<thead>
<tr>
<th>System of interest</th>
<th>Conditions and trends</th>
<th>Condition and trend rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assets</td>
<td>Stakeholders</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NB: The new Coastal and Marine Development plan aims at maintaining a balance between future coastal and marine resources supply and demand. This has to take into account the development goals of the NDP (see Exercise 1, p. 12).

Figure 1: Condition and trend rating

<table>
<thead>
<tr>
<th>Conditions:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good</td>
</tr>
<tr>
<td>Good/Fair</td>
</tr>
<tr>
<td>Fair</td>
</tr>
<tr>
<td>Fair/Poor</td>
</tr>
<tr>
<td>Poor</td>
</tr>
<tr>
<td>Undetermined</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Trends:</th>
</tr>
</thead>
<tbody>
<tr>
<td>↑ Condition appears to be improving</td>
</tr>
<tr>
<td>– Condition does not appear to be changing</td>
</tr>
<tr>
<td>↓ Condition appears to be declining</td>
</tr>
<tr>
<td>? Undetermined trend</td>
</tr>
</tbody>
</table>
Assess risk part 2

Part 2 works through the components of risk: hazard, exposure, vulnerability (sensitivity and adaptive capacity) and potential impacts. Information from Part 1 supports this assessment.

Figure 2: Components of Risk

Your task

- Review Figure 2 above (and glossary) to ensure that you have in mind the different terms and their connection.

- Review the information about Bakul and use Matrix 3 to guide your work. Work in rows.

- **Column D** contains the key climate related hazards for Bakul (observed and projected). Select the key climate related hazards (observed & projected) relevant for your system of interest, which you need to analyse further. Base your selection on the exposure, (column E).

- In **column E**, assess the level of exposure to that climate hazard:
  - Is or will the system of interest be exposed to climate hazards (observed and projected)?
  - In the future, will the system of interest be exposed to the climate hazard rarely, sometimes or frequently?
  - Rate the degree of exposure as low, medium or high.

- In **column F**, consider if and how the system of interest’s actors and assets are sensitive to climate hazards. Think of ecological and social sensitivity. Relate your assessment to the condition and trends of the system of interest:
  - How are and will climate hazards affect the condition of the system of interest?
  - Examples of sensitivity factors are local building standards, salt tolerance of crops, dependence of marine species on coral reef structures etc.
  - Rate the sensitivity of the systems of interests to the climate hazard as low, medium or high.

- In **column G**, elaborate the system’s current adaptive capacity, e.g. access to reliable seasonal weather forecasts, existence of an early storm warning system or research results on salt tolerant crops would increase the adaptive capacity of a community:
  - What is the adaptive capacity of the relevant ecosystems to withstand climate hazards?
  - What actions have been/are being taken to prepare for or cope with potential hazards? Are there existing systems in place that could reduce potential impacts of climate change?
  - What is the adaptive capacity of the people to withstand climate hazards? How have the people been able to withstand other types of hazards or challenges?
  - What is the adaptive capacity of institutions to support climate adaptation? Are national or local governments and organisations supporting planned adaptation?
  - Rate the adaptive capacity of the system of interest to the climate hazard as high, medium or low. Remember that rating the adaptive capacity is the inverse of the ratings for sensitivity and
exposure; rating adaptive capacity as “high” is a positive outcome, this means that the potential impact could be minimized. Rating adaptive capacity as “low” means the potential impact of climate change cannot be offset.

- In **column H** rate vulnerability. Transfer the “Sensitivity” and “Adaptive Capacity” ratings to the Vulnerability Ranking Matrix in Figure 3 below to assess vulnerability.

- In **column I**, brainstorm the potential impacts to the system of interest:
  - First brainstorm the potential impacts to the biophysical part of the system by considering hazard (column D), exposure (column E) in combination with the vulnerability factors (column F and G), e.g. changes in ocean temperature affect the reproduction of bottom-dwelling fish.
  - Then brainstorm socio-economic impacts resulting from the biophysical impacts, e.g. reduced fish stock and catch leading to loss of income. You may also want to consider positive impacts.
  - Finally, rate the potential impact (extend of damage) of the specific climate change signal to the system of interest as high, medium or low using Figure 4 below.

- In **column K** rate the risk. This gives an indication of the need for action.
  - Transfer the “Extend of damage” rating to the Risk Rating Matrix to Figure 5 below and rate the probability of hazard to assess the risk.
  - Add a short explanation (for documentation). This should include information on the current condition and trends and the non-climate threats impacting the system of interest, as well as the overall risk (hazard, exposure, and vulnerability).

**Figure 3: Vulnerability Ranking Matrix**

<table>
<thead>
<tr>
<th>SENSITIVITY</th>
<th>ADAPTIVE CAPACITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>RATING</td>
<td>Low</td>
</tr>
<tr>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>

**Figure 4: Impact Rating Matrix**

<table>
<thead>
<tr>
<th>EXPOSURE</th>
<th>VULNERABILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>RATING</td>
<td>Low</td>
</tr>
<tr>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>

**Figure 5: Risk Rating Matrix**

<table>
<thead>
<tr>
<th>PROBABILITY</th>
<th>IMPACT (extent of damage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RATING</td>
<td>Low</td>
</tr>
<tr>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>
The Intergovernmental Panel on Climate Change (IPCC) applies the following terms to indicate the assessed likelihood:

<table>
<thead>
<tr>
<th>Term*</th>
<th>Likelihood of the outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtually certain</td>
<td>99–100% probability</td>
</tr>
<tr>
<td>Very likely</td>
<td>90–100% probability</td>
</tr>
<tr>
<td>Likely</td>
<td>66–100% probability</td>
</tr>
<tr>
<td>About as likely as not</td>
<td>33–66% probability</td>
</tr>
<tr>
<td>Unlikely</td>
<td>0–33% probability</td>
</tr>
<tr>
<td>Very unlikely</td>
<td>0–10% probability</td>
</tr>
<tr>
<td>Exceptionally unlikely</td>
<td>0–1% probability</td>
</tr>
</tbody>
</table>

*Additional terms (extremely likely: 95–100% probability, more likely than not: >50–100% probability, and extremely unlikely: 0–5% probability) may also be used when appropriate.

Text box 1: Probability of climate hazards
Matrix 3: Assess risk and define need for action

<table>
<thead>
<tr>
<th>Artisanal fisheries</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>K</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hazard (observed &amp; projected)</strong></td>
<td><strong>Exposure</strong></td>
<td><strong>Vulnerability</strong></td>
<td><strong>Adaptive capacity</strong></td>
<td><strong>Rating</strong></td>
<td><strong>Impact</strong></td>
<td><strong>Rating (extent of damage)</strong></td>
</tr>
<tr>
<td>Increasing mean annual temperature (observed &amp; projected)</td>
<td>Rating:</td>
<td>Rating:</td>
<td>Rating:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prolonged dry period (observed)</td>
<td>Rating:</td>
<td>Rating:</td>
<td>Rating:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slight decrease of rainfall during dry season (projected)</td>
<td>Rating:</td>
<td>Rating:</td>
<td>Rating:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increased incidents of flooding during the rainy season (observed)</td>
<td>Rating:</td>
<td>Rating:</td>
<td>Rating:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase of extreme rainfall events (projected)</td>
<td>Rating:</td>
<td>Rating:</td>
<td>Rating:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More intense cyclone events (projected)</td>
<td>Rating:</td>
<td>Rating:</td>
<td>Rating:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prolonged dry period (observed)</td>
<td>Rating:</td>
<td>Rating:</td>
<td>Rating:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slight decrease of rainfall during dry season (projected)</td>
<td>Rating:</td>
<td>Rating:</td>
<td>Rating:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increased incidents of flooding during the rainy season (observed)</td>
<td>Rating:</td>
<td>Rating:</td>
<td>Rating:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NB: The revision of the Coastal and Marine Development plan aims at maintaining a balance between future coastal and marine resources supply and demand. This has to take into account the development objectives. The development objectives refer to the development goals as given in the NDP (p. 12).
Bringing it home: Assess risk

Rationale

Assessing risk is **step 1 in the basic adaptation planning process (4-step approach /climate proofing)**. The 4-step approach is a systematic and step-by-step process to dealing with all relevant questions and avoids mental blocks due to the over-complex challenge.

The objective of step 1 is to establish the basis for integrating adaptation into development efforts: The system of interest’s risk is analysed and need for action defined.

Desired outcomes:
- Collection of diverse stakeholders’ views
- Agreed identification of challenges and opportunities
- Prioritisation of entry points for action
- Increased awareness of climate change and adaptation among actors

Entry points

Assessing risk is a key step towards a clear recognition of climate risks and the need for adaptation within relevant policies and/or projects. This step is especially effective when carried out during policy formulation, strategy development and project identification, appraisal and design.

- At the national scale, the results may be needed for cross-sectoral coordination, identified geographic hotspots or priority topics within policies and plans.
- At the sector scale, the results may show the potential risks within the sector and recognise the need for coordination beyond the strict boundaries of the sector.
- At the local level, the results should integrate needs and views from affected stakeholders.
- At the project level, assessing risk would, ideally, be carried out during the scoping and design of a project.

Main lessons learnt

- Defining systems of interest and development objectives provides the reference for determining whether and how climate change impacts might be important.
- Climate is not the only dynamic factor. Anticipated socio-economic changes should be considered and how they might contribute to development challenges. The existing conditions and trends of ecosystems and their services are equally important.
- Develop a holistic perspective: In addition to exposure to climate hazards, a system’s risk and the need for action are also determined by its sensitivity and adaptive capacity (i.e. vulnerability). A system’s existing adaptive capacity is a major asset in confronting climate change.
- Include non-climate factors and existing barriers to resilience in your problem analysis. Climate risks will compound these.

How to

- Follow the systematic steps to assess the following risk functions:
  - Relevant climate change hazards and exposure
  - Characteristics of the system of interest: sensitivity and adaptive capacity (i.e. vulnerability)
  - The nature and extend of potential impacts (biophysical as well as socio-economic)
  - The probability /likelihood of hazards to occur
- Combine these factors to identify the system’s risk and the need for action.
- Existing information from national assessments or programmes is usually available as a starting point. However, information gaps should be identified and specified based on the necessary decisions. Conclusions can be drawn by ‘cross-checking’ different sources of information and consulting relevant experts to decide whether additional analyses are necessary. Adaptation experts may be needed to contribute to this step.
- Participation is key. Transparent processes are required to ensure cooperation and accountability: ask affected stakeholders, especially vulnerable groups, to participate.
- Look for positive opportunities, not just risks.
- Do not limit the analysis phase by worrying about how to deal with the challenge; this will be dealt with in the next steps.
Example: Consider a coastal fishing village with the following characteristics

Hurricanes occur seasonally. Air and sea temperatures, as well as intense rain events are increasing. Certain fish populations have declined in recent years. Most households are involved in fishing and bring their catch to a nearby port for sale without the use of refrigeration. Some households are also involved in small-scale farming. Some homes are constructed further inland while others are built along a small riverbank. Some homes are constructed on stilts. Basic wells provide access to groundwater.

**Systems of interest:** The village could be the system of interest, made up of key assets (boats, homes, wells and port infrastructure and resources (fisheries, groundwater and arable land).

**Climate Hazards:** Sea level rise, hurricanes, intense rainfall, increasing air and sea temperatures

**Exposure:** There is a certain probability that households are exposed to cyclones and saline contamination of groundwater. Settlements on the shore and at the mouth of the river are particularly exposed to storm surge. Fishing households may be exposed to declines in fish stocks associated with changes in ocean conditions as well as to potential impacts on the port. Farming households are exposed to the salinization or erosion of arable land.

**Adaptive capacity / Sensitivity factors:** The lack of refrigeration makes fish trading and processing sensitive to increasing temperatures. Households that generate their income from diverse sources like farming and fishing have a greater adaptive capacity than households relying only on a single source of income. Generally speaking, houses on stilts are less sensitive to flooding than other households. Households with access to a car or motorcycle have a greater adaptive capacity to evacuate in the case of hurricanes or landslides (assuming there is early warning).

**Vulnerability:** This village is highly vulnerable to climate change impacts. Households depending on a single source of income, in exposed, non-stilt housing and without access to transportation, are most vulnerable.

**Potential impacts:** Flooding, storm damages to assets, freshwater pollution, decline in fish stocks, and saline intrusion into groundwater

**Risk:** Risk is determined by the probability of a hazard to occur and the expected extend of damage of a potential impact. Depending on the hazard you focusing on the probability changes, sea level rise and saline intrusion are virtually certain (99-100% probability) to happen while cyclones are only more likely to happen than not (>50-100% probability). On the other hand, the extent of damage of a major cyclone might me much higher than the extent of damage from saline intrusion.

**Adaptation:** Vulnerability could be reduced, for example, by natural or physical infrastructure to protect settlements and arable land from storm surge, evacuation planning or the construction of shelters in the event of hurricanes, improving fish storage, enhanced construction standards and improving freshwater resources, either through treatment or surface water access.

Beware of maladaptation, that is, adaptation that increases the Greenhouse Gas (GHG) emissions: if large-scale and non-efficient refrigeration systems would be installed that are powered by electricity from coal or other fossil fuels, then this adaptation measure would increase.
Blue Solutions and other successful real-life examples


References

- GIZ (2011): Climate Proofing for Development: Adapting to Climate Change, Reducing Risk

For knowledge and application examples of vulnerability assessments please visit:

- CRiSTAL Tool for community scale vulnerability assessment and adaptation
- GIZ (2013): A closer look at mainstreaming adaptation to climate change.

Logbook

What is one main take away or action item you need to apply or accomplish in this stage of Blue Planning when you return home?
Exercise 3 Identify adaptation options

Learning objectives of the exercise

- Understand the different sets of adaptation options
  - Reduce exposure, decrease sensitivity and increase adaptive capacity
  - From “no-regrets” options (with benefits even without climate change, often going hand-in-hand with development as usual) to additional (often costly) measures confronting climate change
  - Types of action: policy, technical solutions, capacity building and research.
- Consolidate the basic concept of EbA and be aware of the potential role of ecosystem services for climate change adaptation.
- Learn to distinguish between this potential role and the possible impact of climate change on ecosystems.

Context

Climate change adaptation is a new challenge for the CMMA. Some existing activities may be helpful. However, additional responses have to be found to ensure sustainable coastal and marine development.

Instructions for case work

- This exercise is step two of the climate proofing approach.
- Recall that you are an advisory group to the CMMA and that you are asked to support the integration of climate change adaptation in the draft of the Coastal and Marine Development Plan. Your task as an advisory group, after having identified the need for action, is to ask: “what could be done to respond to the challenges?”
- At this point it is important to think as broadly as possible to come up with new ideas. The exercise is therefore conducted via brainstorming. (This means that for the time being all ideas that you can come up with are welcome. No idea should be criticised; limiting factors will be reflected during the analysis in the next step.)
- Matrix 4 helps you organise your work.

Your task

- Review the climate change impacts from the last exercise and select those impacts that lead to a medium or high level of risk.
- In column L devise adaptation options that can reduce risk (increase adaptive capacity and/or reduce sensitivity or exposure) with respect to the selected impacts in column K.
  - Remember to think through all categories of adaptation options (policy, technical solutions, capacity development and research). Recall that adaptation options could:
    - prevent, reduce or avoid negative biophysical and socio-economic impacts,
    - enhance opportunities from climate change, or
    - enhance the adaptive capacity of relevant actors.
- In column M reflect on main actors that will be crucial to implement the devised options.
Matrix 4: Identify adaptation options

<table>
<thead>
<tr>
<th>System of Interest</th>
<th>K</th>
<th>L</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Selected impacts leading</td>
<td>Adaptation options</td>
</tr>
<tr>
<td></td>
<td></td>
<td>to high/medium risk and</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>need for action</td>
<td></td>
</tr>
<tr>
<td>Artisanal fisheries</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industrial fishing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aquaculture in the Coroné delta</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coastal tourism</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coastal settlements</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NB: The revision of the Coastal and Marine Development plan aims at maintaining a balance between future coastal and marine resources supply and demand. This has to take into account the development objectives. The development objectives refer to the development goals as given in the NDP (p. 12).
Bringing it home: Identify adaptation options

Rationale

Identifying adaptation options is step 2 in the basic adaptation planning process (4-step approach / climate proofing).

The objective is to collect a broad range of adaptation options from a variety of perspectives. As climate change adaptation requires thinking ‘outside of the box’ (which is easier said than done) there is a specific step dedicated to this brainstorming exercise.

Desired outcomes:

- Broad possible adaptation options (including Ecosystem-based Adaptation (EbA) options)
- First steps towards thinking about implementation by listing actors/stakeholders who could/should contribute to the activities.

Main lessons learnt

- Ensure Participation: Transparent processes are required to ensure cooperation and accountability: ask affected stakeholders, especially vulnerable groups, to participate.
- Brainstorm broadly, and don’t bother with feasibility. (A strategic selection of priorities will be done in step 3).
- Consider the different characteristics of adaptation options to produce a broad variety of options for reducing risk:
  - Activities at various time scales (near future, middle-and long-term).
  - Activities within the various adaptation frames:
    - Some options will be low-regret, or justified under current or historic climate conditions. These measures often become even more justified under climate change scenarios, especially measures with strong co-benefits for development, e.g. expanding mangroves to buffer erosion or improving disaster preparedness infrastructure and planning.
    - Other options will become justified under a certain climate change scenario, e.g. include long-lived infrastructure (like flood control) or adjusted infrastructure designs, whose costs are only effective if damages are avoided. These require more certain and precise climate information.
- Activities can follow various strategies
  - Avoid or limit the impacts of climate change by reducing exposure or sensitivity of the system.
  - Stabilise or enhance the adaptive capacity of the relevant actors.
- Activities can build on various tools:
  - Adjust practices
  - Increase flexibility of the system
  - Develop capacity to improve actions and decisions
  - Change policies, regulations and incentives
  - Invest in infrastructure
- Add to your list through a second round of brainstorming with some advanced questions:
  - Which options can address short-term concerns and also support long-term objectives?
  - How can existing adaptive capacities be supported for autonomous adaptation?
  - How can barriers to resilience, e.g. availability of information, technical capacity, incentives and awareness, be tackled?
- Note: When defining adaptation options always refer to your level of intervention.
  - At the local level you may want to invest in cropping techniques.
  - At the sectoral level you may consider enhancing the extension service’s capacities.
  - At the national level you may think of adapting investment programmes to create incentives for adaptation activities.
Ecosystem-based Adaptation

“Ecosystem-based adaptation is the use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people to adapt to the adverse effects of climate change.” (CBD 2009)

People worldwide depend on functioning ecosystems and the services they provide, i.e. the benefits people obtain from ecosystems, such as soil fertility, clean water, flood protection and food. This is especially true for poor people in developing countries, whose livelihoods are closely linked to natural resources. Climate change is one of the major causes of changes and deterioration in ecosystem services and its impact will most likely increase in the future. At the same time, functioning ecosystems help people to mitigate and more importantly to adapt to climate change – this is referred to as “ecosystem-based adaptation” (EbA). For instance, wetlands act as natural water storages, buffering increasing amounts of sudden rainfalls and mangroves act as natural barriers against storms and floods in coastal regions.

Often, ecosystem-based adaptation to climate change (EbA) is confused with adaptation of ecosystems to climate change (AoE). While EbA is an anthropocentric approach, which utilizes ecosystems to provide ecosystem services to reduce humans’ vulnerability to climate change, adaptation of ecosystems in contrast, focuses on securing the integrity of a particular ecosystem for its own sake, not necessarily reducing humans’ vulnerability.

Examples of EbA measures include:

- Techniques of sustainable agriculture
- Rangeland rehabilitation
- Improving groundwater recharge
- Mangrove rehabilitation
- Community-based forest management
- Vegetative erosion control
- Rehabilitation of flood plains
- Wetland restoration

Although these measures are not new and not necessarily different from common ecosystem-based good practices, the analytical approach is different. Based on a thorough risk assessment, these measures are systematically chosen to reduce peoples’ vulnerability. Thereby EbA measures are a set of possible measures within a larger climate change adaptation approach possibly consisting of non-EbA measures as well.
Blue Solutions and other successful real-life examples


References

- GIZ (2011): Climate Proofing for Development: Adapting to Climate Change, Reducing Risk;
- USAID (2009): Adapting to Coastal Climate Change: A Guidebook for Development

Logbook

What is one main take away or action item you need to apply or accomplish in this stage of Blue Planning when you return home?
Examples for adaptation options in coastal and marine areas

<table>
<thead>
<tr>
<th>Adaptation Option</th>
<th>Climate hazard addressed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Coastal Fisheries</strong></td>
<td></td>
</tr>
<tr>
<td>• Establish and strengthen early warning systems for coastal mariners.</td>
<td>All hazards, especially increased intensity and severity of severe storms</td>
</tr>
<tr>
<td>• Improve hazard detection and warning communications.</td>
<td></td>
</tr>
<tr>
<td>• Prepare mariners with capacity to respond.</td>
<td></td>
</tr>
<tr>
<td>• Safeguard critical habitats that produce fish, including wetlands, mangroves, coral reefs, and lagoons.</td>
<td>• Increased siltation and nutrient loading from heavy rainfall</td>
</tr>
<tr>
<td>• Manage and restore vegetation in watersheds.</td>
<td>• Sea-level rise and changes in fisheries production and availability resulting from changes in oceanographic conditions</td>
</tr>
<tr>
<td>• Protect and rehabilitate habitats critical to fisheries production.</td>
<td></td>
</tr>
<tr>
<td>• Provide for landward migration of coastal fish habitats.</td>
<td></td>
</tr>
<tr>
<td>• Allow expansion of freshwater habitats.</td>
<td></td>
</tr>
<tr>
<td>• Optimize catches from coastal demersal and freshwater fish stocks.</td>
<td>Changes in fisheries productivity and availability resulting from changes in oceanographic conditions</td>
</tr>
<tr>
<td>• Sustain production of coastal demersal fish and invertebrates.</td>
<td></td>
</tr>
<tr>
<td>• Diversify catches of coastal demersal fish.</td>
<td></td>
</tr>
<tr>
<td><strong>Marine and coastal habitats</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Mangroves</strong></td>
<td></td>
</tr>
<tr>
<td>• Improve management of existing mangroves.</td>
<td>Rising sea level, increased waves and wind resulting from extreme storms, increased air and sea temperature, changes in sedimentation resulting from extreme rainfall or drought</td>
</tr>
<tr>
<td>• Reduce human impacts on mangroves.</td>
<td></td>
</tr>
<tr>
<td>• Foster mangrove green shields.</td>
<td></td>
</tr>
<tr>
<td>• Improve legislation and local management.</td>
<td></td>
</tr>
<tr>
<td>• Establish strategic mangrove protected areas.</td>
<td>Rising sea level, increased waves and wind resulting from extreme storms, increased air and sea temperature, changes in sedimentation resulting from extreme rainfall or drought</td>
</tr>
<tr>
<td>• Protect mangrove mother trees.</td>
<td></td>
</tr>
<tr>
<td>• Protect pristine mangrove forests and mangrove areas near or adjacent to known areas of abundant fish, mollusc, and crustacean fisheries.</td>
<td></td>
</tr>
<tr>
<td>• Rehabilitate existing mangrove areas and reforest abandoned fishponds.</td>
<td>Rising sea level, increased waves and wind resulting from extreme storms, increased air and sea temperature, changes in sedimentation resulting from extreme rainfall or drought</td>
</tr>
<tr>
<td>• Select “climate-smart” mangrove species.</td>
<td></td>
</tr>
<tr>
<td>• Use appropriate replanting practices.</td>
<td></td>
</tr>
<tr>
<td>• Establish nursery to raise seedlings.</td>
<td></td>
</tr>
<tr>
<td>• Plan for inland migration of mangrove areas.</td>
<td>Rising sea level</td>
</tr>
<tr>
<td>• Use sea-level projections to identify coastal inundation areas.</td>
<td></td>
</tr>
<tr>
<td>• Limit human settlement in these areas.</td>
<td></td>
</tr>
<tr>
<td>• Manage for mangrove accretion.</td>
<td>Rising sea level, changes in sedimentation resulting from extreme rainfall or drought</td>
</tr>
<tr>
<td>• Design shore structures to allow long-shore sediment drift, which is an important source of sediment for mangroves in downstream areas.</td>
<td></td>
</tr>
</tbody>
</table>
- Maintain tidal hydrology of mangrove ecosystems through the use of sound engineering designs such as culverts and trestle bridges to allow downstream transport of sediment.
- Prohibit sediment removal or dredging from areas that are a source of sediment to mangrove areas.

### Coral Reefs

| Effectively manage MPAs — particularly no-take reserves — for the long term (>20 years), preferably permanently. | Increased sea surface temperature and ocean acidification |
| Prohibit coral harvesting or destruction through any other means. | Increased sea surface temperature and ocean acidification |

- Establish networks of MPAs designed for resilience.
- Establish large, multiple-use MPAs that include but are not limited to networks of no-take reserves (areas of ocean that are protected from extractive and destructive activities).
- Protect key reproduction areas (e.g., spawning, feeding, and nursery areas).
- Apply minimum sizes to MPAs — particularly no-take reserves (depending on key species and how far they move).
- Separate MPAs — particularly no-take reserves — by minimum and variable distances (<10-20 km).
- Protect habitats known or thought to be resistant to climate change impacts.

### Adaptation Option

<table>
<thead>
<tr>
<th>Livelihoods and Economic Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adaptation Option</td>
</tr>
<tr>
<td>-------------------------------------</td>
</tr>
<tr>
<td>Develop emergency response and recovery plans for businesses.</td>
</tr>
<tr>
<td>Establish greenbelts to protect businesses and tourism industry along rivers and the coastal zone</td>
</tr>
<tr>
<td>Diversify livelihoods and build equitable access to markets for products and services to provide alternatives to communities dependent on fisheries and other coastal resources.</td>
</tr>
<tr>
<td>Diversify agricultural products with climate resilient crops.</td>
</tr>
</tbody>
</table>
## Social Services and Infrastructure

### Population and Social Services

<table>
<thead>
<tr>
<th>Action</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>Establish and strengthen early warning system for all hazards – natural and climate change-related. Improve hazard detection and warning communications. Prepare community to respond.</td>
<td>All hazards, especially increased intensity and severity of storms</td>
</tr>
<tr>
<td>Establish community-based disaster management programs to respond and recover from hazard events</td>
<td>All hazards, especially increased intensity and severity of storms</td>
</tr>
<tr>
<td>Establish coastal set-backs and other land-use zones to locate coastal development outside of hazard-prone areas</td>
<td>Sea-level rise and coastal inundation</td>
</tr>
<tr>
<td>Manage water demand through water reuse, recycling, rainwater harvesting, desalination, or other methods.</td>
<td>Changes in precipitation resulting in periods of intense drought or flooding</td>
</tr>
<tr>
<td>Promote household gardens and water harvesting systems to enhance community self-sufficiency</td>
<td>Changes in precipitation resulting in periods of intense drought or flooding</td>
</tr>
<tr>
<td>Identify agriculture and aquaculture products that are less prone to climate impacts.</td>
<td>Changes in precipitation patterns resulting in drought, heavy rainfall</td>
</tr>
<tr>
<td>Prohibit sand mining of small, low-lying islands</td>
<td>Sea-level rise, king tides, and coastal erosion</td>
</tr>
<tr>
<td>Develop relocation strategies for highly vulnerable communities</td>
<td>Sea-level rise, king tides, and coastal erosion</td>
</tr>
<tr>
<td>Develop emergency response and recovery plans for public services.</td>
<td>Severe storms and other hazards</td>
</tr>
</tbody>
</table>

## Community Infrastructure

<table>
<thead>
<tr>
<th>Action</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retrofit existing critical infrastructure to withstand climate change and other natural hazard impacts.</td>
<td>Sea-level rise, increased intensity and severity of severe storms</td>
</tr>
<tr>
<td>Establish coastal set-backs and other land-use zones to locate new critical infrastructure development outside of hazard-prone areas.</td>
<td>Sea-level rise and coastal inundation</td>
</tr>
<tr>
<td>Protect critical infrastructure using seawalls and offshore buffers or establish/strengthen natural buffers such as mangroves, sea grass beds and coral reefs.</td>
<td>Sea-level rise and coastal inundation</td>
</tr>
</tbody>
</table>
Exercise 4: Select adaptation measures

Learning objectives of the exercise

- Understand the procedure of a multi-criteria analysis for adaptation. Understand the impact of choosing specific criteria.
- Understand that in a systematic approach to adaptation, not all options can be dealt with, and focused adaptation on priority items is a success factor.
- Learn that a step-by-step narrowing down ultimately requires a crosscheck to see if the set of selected measures really covers the need.
- Learn how to effectively communicate climate change adaptation.

Context

As stated at the beginning, development cooperation partners have pledged financial support for the integration of climate change adaptation into the new Coastal and Marine Development Plan. The Ministry of Agriculture (Fisheries Department) in co-operation with the Ministry of Tourism prioritise strategic investments for priority activities to improve sustainable coastal and marine development under climate change. CMMA thus asked the advisory team, after having identified a broad set of adaptation options, to suggest a coherent selection of the most relevant measures.

Instructions for case work

- This exercise is step three of the climate proofing approach. As an advisory group you now engage in a transparent and systematic selection process.
- Following a set of criteria, you choose the most suitable adaptation options from the list compiled in step two. This selection forms the basis for defining distinct measures and developing an adapted coastal and marine development plan for CMMA.
- Text box 2 gives an overview of different possible selection criteria
- Matrix 5 provides a framework to evaluate the different adaptation options

Your task

- Transfer the the potential adaptation options from the previous exercise to column N.
- Discuss and agree on the selection criteria (as given by the OECD Guidance and add other criteria if desired – see Text box 2 below for details).
- In columns O, P, Q, R, S evaluate each adaptation option (N) based on each criteria and score by using a scale of 1 (low) to 10 (high). Be aware the scale changes for cost (1 being very high cost and 10 being very low cost)!
- In column T assess the overall score for each options and prioritise the adaptation options.
- After the rating, use a ‘bird’s eye view’ and reconsider whether the results make sense.
  - Do they address the key risks?
  - Would they be effective together?
  - Do they overlap or complement each other?

Matrix 5: Select adaptation measures based on criteria

<table>
<thead>
<tr>
<th>N</th>
<th>O</th>
<th>P</th>
<th>Q</th>
<th>R</th>
<th>S</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adaptation options</td>
<td>Criterion 1: Effectiveness</td>
<td>Criterion 2: Cost</td>
<td>Criterion 3: Feasibility</td>
<td>Criterion 4:</td>
<td>Criterion 5:</td>
<td>Overall evaluation</td>
</tr>
<tr>
<td></td>
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</tbody>
</table>
The OECD Guidance recommends the following key criteria:

- **Effectiveness**: describes the extent to which the adaptation option reduces vulnerability and provides other benefits. Think of effectiveness of the adaptation option under different scenarios.
  
  Try to answer the following questions:
  
  o  With the measure, will you achieve the desired results?
  o  Does the measure reduce vulnerability (↓exposure, ↓sensitivity, ↑adaptive capacity)
  o  Does the measure address non-climate threats and root causes?

- **Cost/Benefit**: describes relative costs of an adaptation option. Think of investment costs as well as costs over time, such as operation and maintenance costs, reconstruction costs, etc. Think of economic and non-economic costs. Think of costs of avoided damage.
  
  Try to answer the following questions:
  
  o  Will the measure create more benefits than costs?
  o  Does the measure address multiple (social, ecological, and economic) benefits?
  o  Are there potential unintended or negative consequences (maladaptation) of the measure?

- **Feasibility**: answers whether the necessary legal, administrative, financial, technical, etc. resources exist. Adaptations that can be implemented under the current operational framework will usually be favoured.
  
  Try to answer the following questions:
  
  o  Is the measure feasible?
  o  What is the level of acceptance and commitment to implement adaptation measures?
  o  Is there strong leadership that supports adaptation?
  o  Are there legal barriers to implementing the adaptation measures?
  o  Is there sustainable financing for adaptation measures?
  o  What is the technical capacity to implement the measure?

Additional criteria may include, depending on the context, e.g. political and social acceptance, urgency, biodiversity friendliness, relative speed of implementation or benefits, ‘no regrets’ potential, avoid detrimental effects on other development goals, alignment with funding requirements or other eligibility criteria, alignment with policy priorities, etc.

Other relevant questions are:

- “What happens if you don’t take a specific action?”
- “If the adaptation measure is already being implemented, would it need additional funding to improve or to do more of the same?”

Text box 2: Criteria for selecting adaptation measures
Bringing it Home: Select adaptation measures

Rationale

Selecting adaptation measures is step 3 in the basic adaptation planning process (4-step approach / climate proofing). The objective of this step is to arrive at an adaptation strategy. The strategy should be made up of complementary elements and ensure (a) an effective reduction of climate change risks and (b) coherence with the priorities and practical constraints of a given situation. At this stage alternative adaptation options are considered, e.g. protect assets and resources against impacts through the use of natural or infrastructure defences or adjust by changing the location or investing in early warning systems.

Desired outcomes

- Agreed set of selection criteria and an agreed process of prioritisation
- Adaptation options (step 2) are critically assessed
- List of prioritised and complementary adaptation measures

Main lessons learnt

Once it comes to decisions, things may get tough again. This also includes the design of the decision-making process, i.e. who should participate?

- Remain realistic; decisions must be taken efficiently, but there will also be substantial uncertainty and the need to cross-check with the hierarchies. Therefore select an evaluation approach, e.g. a facilitated discussion, multi-criteria analysis, that will suit your purposes and aligns with the standards of your and your partners’ procedures.
- The set of criteria has far-reaching influences on the outcomes of your adaptation strategy process. Make sure that all relevant actors agree with the criteria. Decide if all criteria are equally weighted.

How to

Define criteria for prioritising measures, e.g.:

- Effectiveness in addressing relevant vulnerability functions;
- Cost of investment and operation; cross-check difference in adaptation costs over time, ask where early action is cheaper, e.g. long-term infrastructure investments;
- Feasibility, e.g. legal, financial, technical, etc., and acceptability;
- Strong co-benefits, e.g. reforestation to avoid landslides, also contributing to carbon sequestration and groundwater recharge, or low-or no-regret options;
- Alignment with funding requirements;
- Urgency or what happens if no action is taken;
- Windows of opportunity, e.g. when a plan comes into revision, a certain person in favour of certain ideas is in charge;
- No adverse impacts on environment (‘do no harm’, biodiversity-friendliness);

Evaluate options

- This can be done individually, e.g. voting on prepared sheets and calculation of the median, or in open discussion. In the end, the vote has to be presented in a transparent manner. All votes should be treated equally.
- Rate all criteria the same way, e.g. on a scale from 1 to 10: ‘10’ being positive in terms of implementation (a ‘1’ would mean high costs with rather unreliable data basis for example). If you don’t use the same scale for each criterion you will face difficulties calculating an overall score.
- If too many options have similar evaluations, you might think of weighing the criteria (e.g. criterion 3 ‘feasibility’ is twice as much important than others).
- Deal with uncertainty in a strategic manner:
• Recall that uncertainty is no justification for inaction
• Prioritise measures with sufficiently reliable information
• Decide on the roots of uncertainty and, if needed, agree on how further analysis, e.g. cost and feasibility assessments, can be fed in the process without delaying beyond the agree time frame
• Choose low-regret options
• Arrive at a strategic approach that reflects outcomes of earlier stages, balances stakeholder interests and addresses barriers. Consider alternative adaptation scenarios and their implications; consider complementary actions and substitutes among highly-ranked options.

Blue Solutions and other successful real-life examples

• “Mangrove conservation, climate change and food security” (Guinea Bissau), implemented by IUCN: http://www.panorama.solutions/en/solution/mangrove-conservation-climate-change-and-food-security

References

• GTZ (2007): Economic Approaches to Climate Change Adaptation and their role in project prioritisation and appraisal.
• USAID (2007): Adapting to Climate Variability and Change. A Guidebook for Development Planning:
• World Bank’s Guidance notes on Mainstreaming Adaptation to Climate Change in Agriculture and Natural Resources Management Projects (2009)

Logbook

What is one main take away or action item you need to apply or accomplish in this stage of Blue Planning when you return home?
Monitoring & Evaluation of adaptation

Rationale

Monitoring progress and evaluating the effectiveness of adaptation measures is the last step of basic adaptation planning process (4-step approach / climate proofing) and are essential for reducing climate change risks. The objective is to ensure effectiveness and measure progress with respect to reducing risk within a system of interest. Monitoring and reporting on progress in implementing adaptation measures at local or national level can catalyse on-going actions and provide opportunities for recognition and support from international sources.

Desired outcomes

- **Monitor the results** of adaptation: Are adaptation measures effective? Are they reducing vulnerability? What works and what does not?
- **Track implementation** of adaptation measures and plans: Are measures or plans being implemented? Is implementation on track?
- **Monitor climate change impacts**: How does climate change evolve and how does it affect a system of interest (e.g. an area, population or ecosystem)?

Main lessons learned

M&E for adaptation can provide answers to the following questions:

- Does adaptation take place?
- What outcomes are achieved?
- Are people / ecosystems becoming less vulnerable?
- How / why did a certain adaptation action work well or why not?

The purposes and potential benefits of adaptation M&E are:

- **Learning**: Understanding what works well, i.e. what leads to well adapted communities/ countries/policies etc.
- **Steering of activities**: Support management under uncertainty, track implementation of plans and policies
- **Demonstrating results**: Accountability and means to acquire additional funding
- **International reporting**: Gather information for use in international reporting, e.g. national communications to the UNFCCC

M&E of adaptation can build on broad monitoring and assessment experience of different sectors and disciplines. Environmental monitoring, environmental impact assessments, cost-benefit analysis and monitoring and evaluation approaches in the field of disaster risk reduction provide a wealth of tools and indicators M&E of adaptation can build upon. However, adaptation-specific challenges require adjustments of existing approaches and tools:

- Climate change adds a new dimension of uncertainty as adaptation efforts aim at addressing future climate variations and impacts in addition to current development challenges.
- **Long-time horizons** exacerbate the evaluation of results and effectiveness of adaptation activities.
- Defining the right metric for measuring adaptation effectiveness is an additional challenge: in contrast to climate change mitigation, where effectiveness can be measured by using avoided emissions as a single metric, **no universally applicable indicator exists**. Context-specific indicators are required to measure reduction in vulnerability or other proxies representing the success of adaptation.
- Complexity further increases on the national level as numerous vulnerabilities of different sectors, administrative subunits and segments of the population have to be considered.

There is no one-size-fits-all approach! Purposes and objectives of M&E frameworks for adaptation differ from country to country, and so do capacities, available resources and data for M&E.
Implementing Change

Adaptation to climate change needs a well-organized planning and implementation process. Political commitment is essential and resources need to be secured in order to implement adaptation measures. Social acceptance and active stakeholder cooperation is necessary. Challenges in successfully implementing adaptation include public engagement, decision-relevant information, political commitment and institutional design, tools for planning and policymaking and resources. The following two exercises will deal with the challenges of public engagement and political commitment.
Exercise 5: Appraise the institutional and cultural framework

Learning objectives of the exercise

- Learn about stakeholder engagement processes, and stakeholders’ positions and relationships.
- Understand the relevance of appraising the institutional and cultural framework for successful adaptation interventions.

Context

The advisory groups have conducted in-depth vulnerability assessments and identified suitable priority adaptation measures supporting sustainable coastal and marine development in the light of climate change. The CMMA decided to organize a stakeholder workshop and to invite representatives from different stakeholder groups in order to present their opinion on the different adaptation measures.

Instructions for case work

This exercise is a step in between step 2 and 3 of the climate proofing approach. During this exercise, you will not be part of the advisory team, but represent one of the stakeholder groups during the workshop. You have received an invitation letter to the workshop, but neither an agenda nor information on the objectives and participants are included.

The purpose of the following exercise is to explore the relevant institutional and cultural frameworks, particularly on:

- policies, regulations and informal rules that directly or indirectly affect your key ecosystem services and adaptation measures
- key institutions and traditional authorities that influence coastal and marine management

This information will be important for prioritising adaptation measures in the following steps.

Your task

Prepare a 5 minute statement where you will point out the main interests of your stakeholder group. Base your statement on the information gathered during the previous steps and the additional information received. You can be creative too. Try to put yourself in the position of your stakeholder! Don’t forget to choose one person to present the results during the stakeholder workshop in plenary.

Invitation

You are cordially invited to a workshop organised by the Coastal and Marine Management Authority. The event will take place in the City Hall tonight. On behalf of the Coastal and Marine Management Authority I look forward to your attendance.

Sincerely
Mrs E. Bokulesi

Director of Coastal and Marine Management Authority
Bringing it Home: Appraise the institutional and cultural framework

Rationale

This step complements the basic adaptation planning process (4-step approach / climate proofing). Adaptation to climate change needs a well-organized planning and implementation process. Political commitment is essential and resources need to be secured in order to implement adaptation measures. Social acceptance and active stakeholder cooperation is necessary. Challenges in successfully implementing adaptation include public engagement, decision-relevant information, political commitment and institutional design, tools for planning and policymaking and resources.

This exercise appraises institutional, policy, legal and cultural frameworks, and the resulting incentives structures. The objective is to understand how different stakeholders’ interests, rights and values determine the way they act and participate in adaptation measures. The identification of the factors that shape their behaviour helps to understand and manage conflicts and cooperation.

There are several reasons for carrying out a sound stakeholder analysis:
1. Better understanding of the complexity of the system of interest;
2. Understanding of the human influence on the ecosystem and its management;
3. Examining the compatibility and/or (potential) conflicts of multiple use objectives;
4. Identifying, predicting and resolving areas of conflict;
5. Discovering existing patterns of interaction.

It is important to understand Stakeholders positions, interests and needs:

Positions are what people say to protect their interests and needs (which sit underneath), and to try to get what they want. There may be no obvious connection between the position and the underlying interests and needs. Positions are always negotiable. Example: fishermen objecting to an offshore windfarm.

Interests are things that people move towards because they enhance the quality of life and are desirable. There is some room for negotiation about how the interest is met. Example: To continue fishing in fishing grounds.

Beliefs are something that people accept as true or real; a firmly held opinion or faith or trust in the reality of something; often without proof but based upon one’s own reasoning or based on ethical and religious values. Beliefs are not negotiable. Example: Fishermen trusting in the traditional fishing rights.

Needs are things that people try to avoid not fulfilling because non-fulfilment of a need causes anxiety. Needs are non-negotiable, although the means of meeting a need can be negotiated. Example: to earn a living; community.

Survival; security for children.
Once you understand the needs and know of the stakeholders’ interests and beliefs, you will be able to revise your project objectives and proposed outcomes, increasing the possibility of success. Think about at what point in time during the climate proofing process, you would analyse your Stakeholders’ positions, interests, beliefs, and needs.

### Entry Points

Appraising institutional and cultural frameworks and involving key stakeholders in the basic adaptation planning process (4-step approach / climate proofing) is essential for a number of reasons. Of these, the most important is that adaptation is a cross-sectoral issue and requires cross-sectoral cooperation. Analysing stakeholders’ interests, needs and beliefs helps to get a better understanding of the way in which stakeholders cooperate and participate. Effective stakeholder participation encourages ‘ownership’ of the adaptation plan, and engenders trust among stakeholders and decision-makers. Additional reasons to involve stakeholders in adaptation planning processes are:

- To gain a better understanding of the complexity of the adaptation process;
- To deepen mutual and shared understanding about the problems and challenges;
- To generate new options and solutions that may not have been considered individually;
- To expand and diversify the capacity of the planning team, in particular through the inclusion of secondary and tertiary information (e.g. local knowledge and traditions).

### Main Lessons Learnt

The scope and extent of stakeholder involvement differs greatly from country to country and is often culturally influenced. The level of stakeholder involvement will largely depend on the political or legal frameworks for participation that already exist.

Generally speaking, all individuals, groups or organizations that are in one way or another affected, involved or interested in climate change adaptation can be considered stakeholders. Therefore stakeholders should be involved in the process from the very beginning. However, involving too many stakeholders at the wrong time or in the wrong form can be very time consuming and may lead to the distraction from the expected or anticipated results. To involve stakeholders effectively and efficiently you need to consider three important questions:

- Who should be involved?
- When should stakeholders be involved?
- How should stakeholders be involved?
How to

- A review of existing literature, including official records (such as laws, regulations, policies etc.) as well as technical documentation, is a good starting point when evaluating the institutional, policy, legal and cultural framework. These sources will, however, usually only present limited information about ecosystem governance arrangements.

- Equally, if not more, important, will be the perceptions and insights of stakeholders themselves, including traditional knowledge and oral history. Obtaining this kind of information requires face-to-face interviews and discussions, and often involves some kind of stakeholder analysis. Such methods are an important means of obtaining information about the real situation on the ground, in terms of the principles and rules that actually govern ecosystem access, ownership, management and use, as well as the extent to which “official” institutions, laws and policies are effective. Much of the most valuable information will therefore be based on qualitative aspects of institutions, organisations and actors, and will consider stakeholders’ relative power, positions, interests and needs.

- It is important to also identify those stakeholders that are excluded from institutional, policy and regulatory arrangements. Failing to identify these groups could mean marginalising some of the poorest and most vulnerable sectors of society.

The figure below is a useful example for visual stakeholder mapping assessing the main groups that need to be considered in the assessment.

Blue Solutions and other successful real-life examples

- “Connecting a coastal Reserve with its Surroundings” (Guatemala), implemented by Centre for Conservation Studies: http://www.panorama.solutions/en/solution/connecting-coastal-reserve-its-surroundings

References

- GIZ (2012): Integrating Ecosystem Services into Development Planning. A stepwise approach for practitioners based on the TEEB approach. Authors: Marina Kosmus, Isabel Renner, Silvia Ullrich

Logbook

What is one main take away or action item you need to apply or accomplish in this stage of Blue Planning when you return home?
Exercise 6: Communicate for effective climate change adaptation

Learning objectives of the exercise
Learn how to effectively communicate climate change adaptation.

Context
The risk analysis brought to light risks and opportunities related to coastal and marine development that were previously not foreseen. The CMMA has received funding from donor organisations to implement selected adaptation measures. However, stakeholders need to be convinced about the usefulness of the adaptation options to participate in planning and implementation.

Instructions for case work
• You are part of the advisory team who will develop an appropriate communication strategy.

Your task
Your task is to think about an appropriate communication strategy:
• In column D think about who should be involved in the activities and how. Think about what roles do the private sector and civil society play.
• In column E identify their positions, interests, needs and beliefs.
• In column F identify the key messages you want to communicate (according to the identified positions, interests, needs and beliefs). What needs to be done differently? What do you want to achieve with communicating the results? Think about the implications the results might have for the development plan. Review the hints for communicating climate change adaptation in text box 5 on page 49.
• In column G identify appropriate means of communication: How are you going to communicate the main findings – to the CMMA, the National Development Committee and to other key stakeholder groups? What communication products and channels will be most effective to reach your target audience(s)? You also may consult the Text box 4 on the next page.

Present your recommendation to the CMMA

Matrix 6: Identification of appropriate means of communication

<table>
<thead>
<tr>
<th>A Development goal</th>
<th>D Stakeholders</th>
<th>E Positions</th>
<th>Interests/Needs &amp; Beliefs</th>
<th>F Main messages</th>
<th>G Appropriate communication products &amp; channels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enhance and diversify (coastal) livelihood opportunities.</td>
<td>Enhance fish exports</td>
<td>Enhance shrimp exports</td>
<td>Enhance tourism in coastal areas</td>
<td>Enhance protection of coastal settlements</td>
<td></td>
</tr>
</tbody>
</table>


Some basic principles for effective communication include:

- **Powerful**: A powerful message is one that raises strong emotions, or fosters deep reflection.
- **Lasting**: A lasting message sticks with the audience long after the message is gone, such as a catchy song or easily remembered phrase.
- **Actionable**: An actionable message is one that clearly describes what actions are required, such as 8-inch limits on crawfish, or 50-meter riparian buffer zone.
- **Surprising**: A surprising message is one that creates pleasant tension in the recipients mind, such as a surprising comparison, an interesting fact or a new perspective.
- **Targeted**: A targeted message is aimed directly at a particular audience.
- **Interesting**: An interesting message is one that has strong visual or auditory appeal.
- **Clear**: A clear message states exactly what the key issues are, focusing precisely on the specific points, including for example: the problems cause by undervaluation, the urgency of taking adaptation measures, the importance of changing the situation, and potential means of changing the situation.

Source: Waite et al. (2014)

Possible communication products include:

- Policy briefs
- Brochures
- Posters
- Presentations or slideshows
- Videos
- Newsletters
- Press releases for the media
- Sample interview responses for media coverage
- Maps, charts and info graphics
- Website contents
- Visual aids that display trade-offs (e.g., spider diagrams, bar charts, summary tables)

Avenues for communicating and disseminating results and recommendations include:

- Traditional media
- Social media (e.g., Facebook, Twitter)
- Launch events
- Stakeholder workshops or other public meetings
- Partners’ networks
- Targeted private meetings
- Relevant conferences and events
- Information campaigns—advertisements / social marketing
- Tourist education (e.g., on importance of coral reefs and responsible diving)
- Websites

Source: Waite et al. (2014)
Text box 5: Hints for communicating climate change adaptation

1. Be aware of who speaks and who listens
   - What are your mission, mandate, and objective? (e.g. are you lobbying for activities OR are you assessing different possibilities OR are you preparing information which is as neutral as possible OR...)
   - Who is your audience? (e.g. local or national politician, donors. Local communities...) What is their knowledge about the subjects you will communicate?
   - If in doubt assume your audience does not know much and provide a sound background – but never underestimate their intelligence!

2. Make your report a trustworthy source of information and an interesting read

   2.1. Data/information base
   - If you are not a climate scientist, make sure to use validated information or team up with specialists.
   - Use your intelligence! Look critically at “expert statements”, check several sources (literature, experts).
   - Discuss with colleagues, local climate experts, stakeholders, ...

   2.2. Data/information base
   - If you are not a climate scientist, make sure to use validated information or team up with specialists.
   - Use your intelligence! Look critically at “expert statements”, check several sources (literature, experts).
   - Discuss with colleagues, local climate experts, stakeholders, ...

   2.3. Presentation of findings
   - Be precise with facts and figures: which change (e.g. sea-level rise) is projected for which time period (e.g. 50 cm in 2050 compared to 1990) in which area (e.g. all areas <50km from the coast).
   - Be clear about how likely that change is (use the calibrated IPCC language).
   - Name sources of uncertainty.
   - Make sure your audience sees clearly the risk (and the associated costs) of doing nothing compared with the risk of doing something
   - Be transparent in your methodology, criteria, and sources.
   - Avoid alarmism: the way in which a statement is framed has an effect on how it is interpreted (e.g. a 10% chance of dying is interpreted more negatively than a 90% chance of surviving).
Bringing it Home: Communicate for effective climate change adaptation

Rationale

This step complements the basic adaptation planning process (4-step approach / climate proofing). The objective is to motivate for taking adaptation action. Yet, the climate system is very complex and climate change risks are difficult to perceive and understand for lay audiences. Scientific uncertainties of future climate change impacts render it more difficult for people to decide for concrete adaptation actions. Furthermore, people have conflicting values and interests; as for example other topics are perceived as more important and/or more urgent than adaptation.

Entry Points

Ideally, stakeholder participation in an adaptation planning and implementation process is accomplished early, often and in a sustained manner throughout the process. A number of fora might already exist that allow stakeholders to participate in the planning and management of adaptation measures. You will need to decide whether you can use these existing fora or you need new ones for the participation of stakeholders in your adaptation efforts. Not all stakeholders need to be involved all of the time. Different stakeholder groups, with varying levels of interest and entitlement, can take part in different steps of the basic adaptation planning process (4-step approach / climate proofing).

The most important steps when you should consider stakeholder participation include:

- Assessing risk
- Identify adaptation options
- Select adaptation measures
- Monitoring and evaluation of adaptation
- Appraising the institutional and cultural framework

Main Lessons Learnt

Successful adaptation communication relies less on providing more information than on how it is presented. See the table below for some success factors for communicating climate change adaptation.

<table>
<thead>
<tr>
<th>Type</th>
<th>No.</th>
<th>Success factors for climate change adaptation communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>content</td>
<td>1</td>
<td>&quot;translate&quot; what climate change means for everyday life and what kind of adaptation is necessary</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>explain concepts and terms in a comprehensible way</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>suggest possible solutions (possible adaptation measures)</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>use sound scientific data and be technically correct</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>connect to local/supporters’ identity</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>connect to local knowledge</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>relate to good adaptation examples and actions in the field of climate change adaptation</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>frame and communicate the issue according to audience</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>use accepted and trusted messengers and opinion leaders (for the audience)</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>use communication formats and channels that are appropriate for the target group</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>attract and keep the audience’s attention (e. g., by surprise, use stories, escape routines, novelty)</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>use existing groups and networks</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>use pictures and visualisations (make it possible to experience climate change impacts and adaptation options)</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>elicit emotions, e. g., by eliciting feelings of safety from conducting adaptation measures</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>relate to existing social norms and values, e. g., by relating adaptation to values that motivate the audience (such as sustainability, responsibility, prevention)</td>
</tr>
<tr>
<td>evaluation</td>
<td>16</td>
<td>evaluate the effects of the communication</td>
</tr>
</tbody>
</table>
In addition to defining who should be involved and when, you will also need to identify how you will involve stakeholders during your adaptation planning and implementation process. There are many different ways to involve stakeholders, ranging from ‘communication’ with no real participation, to ‘negotiation’ where decision-making power is shared among stakeholders.

Figure 6 and Box 1 give an overview of some possible ways to involve stakeholders during the adaptation process.

![Image of different types of stakeholder participation]

**Figure 6: Different types of stakeholder participation** (Source: Ehler and Douvere 2009)

### Developing a climate change communication plan

**Communication**: Authorities responsible for MSP want to convey a message to a target audience and obtain approval for what their message asserts, suggests, and decides. Communication does not involve the stakeholders in any active way;

**Information**: Authorities responsible for MSP want to keep a target audience informed about their intentions, decisions and attempts to provide a basis of understanding, but don’t expect any particular reaction. Unlike communication, the information is intended to be objective and represents a way to empower stakeholders to react to decisions or take a position with full knowledge of the facts;

**Consultation**: Authorities responsible for MSP collect the opinions of stakeholders you have consulted with no guarantee that the opinions expressed will be taken into account;

**Dialogue**: A form of ‘horizontal’ interaction among stakeholders who are positioned as equals. There is no precise purpose other than to know and understand one another better. Dialogue is intended to create a sense of proximity and mutual understanding about the problems and solutions for a particular MSP area;

**Concertation**: A form of ‘horizontal’ interaction among stakeholders who are positioned as equals. Unlike dialogue, the purpose is to develop a common position among a group of stakeholders that can be presented or defended before the authorities responsible for MSP. (Concertation is a French term referring to musicians playing an instrument with the purpose of creating a common outcome, e.g. a concert); and

**Negotiation**: A form of ‘horizontal’ interaction in which both stakeholders and the authorities responsible for MSP have equal powers for decision making.
The CANARI communicating climate change toolbox (see references below) defines eight major steps for successful climate change communication:

- **Step 1:** Define your communication objectives: Is your communication objectives relate to public awareness and education or advocacy?
- **Step 2:** Assess the resources you will need and where you will get them
- **Step 3:** Determine your target audience or audiences
- **Step 4:** Develop your message
- **Step 5:** Identify the most effective messengers
- **Step 6:** Get the message out
- **Step 7:** Develop a time table
- **Step 8:** Evaluate your results

**Blue Solutions and other successful real-life examples**


**References**


**Logbook**

What is one main take away or action item you need to apply or accomplish in this stage of Blue Planning when you return home?
Exercise 7: Action Planning for next steps

Learning objectives of the exercise
Practically approach climate change adaptation through giving and receiving feedback on concrete and real challenges.

Instructions for case work
- Do not play any role; be yourself!
- The table below assists in planning personal action on Blue Planning

Your task
Team up in pairs and reflect on what you have learned during the seminar.
- Step 1: Start by reflecting individually: Create your own little “transfer project”: This project should be rather straightforward (nothing too complex) and include concrete steps for implementing climate change adaptation in your working context. Use the table below to briefly describe your project.
- Step 2: Then present your transfer project to your partner and vice versa. Mutually check the following in order to assure that the projects is realistic and can be implemented:
  - Is the objective realistic?
  - Can your partner achieve his/her goal more or less independently?
  - The timeline should not be too long in order to keep up motivation → better limit oneself to small achievements.
  - Is the environment clearly defined (where, what, with whom)?
  - How do we know that the objective is achieved (indicator)?
  - Adapt the project accordingly

<table>
<thead>
<tr>
<th>Objective</th>
<th>Activities</th>
<th>Deadlines</th>
<th>Stakeholders</th>
<th>Challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitize local authorities about climate proofing their local development plans</td>
<td>Prepare information brief (fact sheet) Organize workshop at local level...</td>
<td>End of June 2015  End of July 2015</td>
<td>Mayor, head of environmental commission, sector representatives (fisheries, tourism..), Coastal Protection Agency...</td>
<td>Limited availability of funding  Low motivation of stakeholders</td>
</tr>
</tbody>
</table>
Glossary of terms

**Adaptation:** The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects.

- Incremental adaptation: Adaptation actions where the central aim is to maintain the essence and integrity of a system or process at a given scale.
- Transformational adaptation: Adaptation that changes the fundamental attributes of a system in response to climate and its effects (IPCC 2014).

*In short:* adaptation means doing things differently because of climate change.

**Adaptation of ecosystems:** Adapting ecosystems and ecosystem management to climate change in order to maintain their services which can become necessary in order to sustain ecosystem services under the pressure of a changing climate.

*In short:* Supporting ecosystems to adapt to a changing climate.

**Adaptive capacity:** The ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences (IPCC 2014).

In ecosystems, adaptive capacity is influenced by biodiversity (genetic, species, etc.). In social systems adaptive capacity is determined by the individual and/or common ability to cope with change (the ability to learn, manage risks and impacts, develop new knowledge, and devise effective approaches) and the institutional setting (IUCN).

*In short:* The ability to adapt to a changing situation.

**Biodiversity:** Biodiversity is the variety of different types of life found on Earth and the variations within species. It is a measure of the variety of organisms present in different ecosystems. This can refer to genetic variation, ecosystem variation, or species variation (number of species) (UNEP/WCMC).

*In short:* The variety of plants and animals found on earth.

**Benthic communities:** Organisms living in the benthos zone, the ecological region at the lowest level of a water body, including the sediment surface and some sub-surface layers.

**Climate:** The average weather, or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands or millions of years. The classical period for averaging these variables is 30 years, as defined by the World Meteorological Organization. The relevant quantities are most often surface variables such as temperature, precipitation, and wind. Climate in a wider sense is the state, including a statistical description, of the climate system (IPCC 2014).

*In short:* The average weather.

**Climate change** refers to a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcing such as modulations of the solar cycles, volcanic eruptions, and persistent anthropogenic changes in the composition of the atmosphere or in land use (IPCC 2014).

*In short:* a change of the global climate.

**Climate Proofing:** Methodological approach aimed at incorporating issues of climate change into development planning at national, sectoral, local and project level. The approach can be applied in the planning phase or when revising plans. Properly implemented, it makes a given plan or investment more “climate-proof” (adapted from GTZ 2010).

**Climate Variability:** The variations in the mean state and other statistics of the climate on all spatial and temporal scales beyond that of individual weather events (IPCC 2014). Examples of natural climate variability include inter-annual El Niño and La Niña events that occur every two to seven years and influence weather patterns over vast regions of the globe.
In short: Normal variations in the climate (e.g. dry and wet periods).

**Ecosystem**: A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit. Humans are an integral part of ecosystems. Ecosystems can vary in scale from global to local. Examples of ecosystems include forests, wetlands, open ocean, coastal, coral reefs, inland water, drylands, desert, cultivated (e.g. cropland or pasture) and urban ecosystems.

In short: An ecosystem includes all living things (plants, animals and organisms) in a given area, interacting with each other, and also with their non-living environments (weather, earth, sun, soil, climate, atmosphere).

**Ecosystem based adaptation (EbA)**: The use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people to adapt to the adverse effects of climate change. As one of the possible elements of an overall adaptation strategy, ecosystem-based adaptation uses the sustainable management, conservation, and restoration of ecosystems to provide services that enable people to adapt to the impacts of climate change (CBD 2009).

In short: the use of ecosystem for the adaptation to climate change.

**Ecosystem services**: Benefits people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as regulation of floods, drought, land degradation, and disease; supporting services such as soil formation and nutrient cycling; and cultural services such as recreational, spiritual, religious and other non-material benefits (MEA 2005).

**Exposure (to climate hazards)**: The presence of people, livelihoods, species or ecosystems, environmental services and resources, infrastructure, or economic, social, or cultural assets in places that could be adversely affected (IPCC 2014).

**Hazard**: The potential occurrence of a natural or human-induced physical event or trend or physical impact that may cause loss of life, injury, or other health impacts, as well as damage and loss of property, infrastructure, livelihoods, service provision, ecosystems, and environmental resources. In the IPCC AR5 the term hazard usually refers to climate-related physical events or trends or their physical impacts (IPCC 2014).

**Impact (CC)**: Effects on natural and human systems. In the IPCC 5th assessment report, the term impacts is used primarily to refer to the effects on natural and human systems of extreme weather and climate events and of climate change. Impacts generally refer to effects on lives, livelihoods, health, ecosystems, economies, societies, cultures, services, and infrastructure due to the interaction of climate changes or hazardous climate events occurring within a specific time period and the vulnerability of an exposed society or system. Impacts are also referred to as consequences and outcomes. The impacts of climate change on geophysical systems, including floods, droughts, and sea level rise, are a subset of impacts called physical impacts (IPCC 2014).

In short: Effects on natural and human systems.

**Biophysical impacts** refer to the biophysical parts of a system and often directly result from climate change factors, e.g. damaged infrastructure due to flooding or erosion of shorelines due to storm surge. **Socio-economic impacts** (for the bigger part) follow biophysical impacts and affect socio-economic development, e.g. reduced access to seer-vice due to damaged infrastructure or losses in tourism revenues due to shoreline erosion.

**Integrated Coastal Zone Management (ICZM)**: ICZM is a dynamic, multidisciplinary and iterative process to promote sustainable management of coastal zones. It covers the full cycle of information collection, planning (in its broadest sense), decision making, management and monitoring of implementation. ICZM uses the informed participation and cooperation of all stakeholders to assess the societal goals in a given coastal area, and to take actions towards meeting these objectives. ICZM seeks, over the long-term, to balance environmental, economic, social, cultural and recreational objectives, all within the limits set by natural dynamics. ‘Integrated’ in ICZM refers to the integration of objectives and also to the integration of the many instruments needed to meet these objectives. It means integration of all relevant policy areas, sectors, and levels of administration. It means integration of the terrestrial and marine components of the target territory, in both time and space (European Commission, 2000).
**Maladaptation**: In the OECD policy guidance, Integrating Climate Change Adaptation into Development Co-operation, maladaptation is defined as business-as-usual development, which, by overlooking climate change impacts, inadvertently increases exposure and or vulnerability to CC. Maladaptation could also include adaptation measures which in the end do not lead to reduced but increased vulnerability because of lack of information, wrong assumptions, ill-devised implementation, side effects, etc.

**Marine Spatial Planning (MSP)**: MSP is a public process of analysing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic, and social objectives that are usually specified through a political process (UNESCO-IOC-MSP Initiative).

**Mitigation**: In the context of climate change, a human intervention to reduce the sources or enhance the sinks of greenhouse gases (IPCC 2001). Examples include using fossil fuels more efficiently for industrial processes or electricity generation, switching to solar energy or wind power, improving the insulation of buildings, and expanding forests and other "sinks" to remove greater amounts of carbon dioxide from the atmosphere.

**No regret option**: Adaptation actions that benefit development and are justified regardless of climate change.

**Ocean acidification**: Ocean acidification occurs when carbon dioxide in the atmosphere reacts with water to create carbonic acid, decreasing both ocean pH and the concentration of the carbonate ion, which is essential for calcification by marine organisms such as corals (Kleypas et al., 2006).

**Resilience**: The capacity of social, economic, and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity, and structure, while also maintaining the capacity for adaptation, learning, and transformation (IPCC 2014). *In short*: The ability of a system to anticipate, absorb, accommodate, or recover from negative effects.

**Risk**: The potential for consequences where something of human value (including humans themselves) is at stake and where the outcome is uncertain. Risk is often represented as probability of occurrence of hazardous events or trends multiplied by the consequences if these events occur (IPCC 2014).

**Sensitivity**: The degree to which a system or species is affected, either adversely or beneficially, by climate variability or change. The effect may be direct (e.g., a change in crop yield in response to a change in the mean, range, or variability of temperature) or indirect (e.g., damages caused by an increase in the frequency of coastal flooding due to sea-level rise) (IPCC 2014). In ecological systems, sensitivity is described in terms of physiological tolerances to changing conditions. *In short*: The ability to respond to change.

**System of interest**: The ‘system of interest’ is the unit you chose to assess with respect to your question. You may determine your system of interest at different levels, e.g. a single crop system, an ecosystem, or a region – depending on the objective of your analysis. (Imagine looking at your house from different angles.) Elsewhere, you may find ‘system of interest’ called ‘exposure unit’.*In short*: the unit you choose for your assessment.

**UNFCCC**: The United Nations Framework Convention on Climate Change was adopted on 9 May 1992 in New York and signed at the 1992 Earth Summit in Rio de Janeiro by more than 150 countries and the European Economic Community. Its ultimate objective is the “stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system”. It contains commitments for all parties. Under the Convention, parties included in Annex I aimed to return greenhouse gas emissions not controlled by the Montreal Protocol to 1990 levels by the year 2000. The convention came into force in March 1994. In 1997, the UNFCCC adopted the Kyoto Protocol.

**Vulnerability**: The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.
• Contextual vulnerability (Starting-point vulnerability): A present inability to cope with external pressures or changes, such as changing climate conditions. Contextual vulnerability is a characteristic of social and ecological systems generated by multiple factors and processes.

• Outcome vulnerability (End-point vulnerability): Vulnerability as the end point of a sequence of analyses beginning with projections of future emission trends, moving on to the development of climate scenarios, and concluding with biophysical impact studies and the identification of adaptive options. Any residual consequences that remain after adaptation has taken place define the levels of vulnerability (IPCC 2014).

• In short: the inability to withstand the effects of a hostile environment.

Weather: The atmospheric conditions at a particular place in terms of air temperature, pressure, humidity, wind speed, and rainfall. Weather is what is happening now or is likely to happen in the very near future. You can observe the weather by looking outside to see if it is raining, windy, sunny, or cloudy. You can tell how hot or cold it is by looking at a thermometer.

References to the glossary (if not mentioned in the annotated references)


• UNEP/WCMC: A glossary of definitions for terms relating to biodiversity, ecosystems services and conservation: www.biodiversity-a-z.org

Annotated references

Beck, Michael W. (Ed.) (2014): Coasts at Risk: An Assessment of Coastal Risks and the Role of Environmental Solutions. A joint publication of United Nations University - Institute for Environment and Human Security (UNU-EHS), The Nature Conservancy (TNC) and the Coastal Resources Center (CRC) at the University of Rhode Island Graduate School of Oceanography.

The Coasts at Risk (C@R) report examines the risks that nations face from vulnerability and exposure to coastal hazards; identifies where environmental degradation contributes to these risks; and explores where environmental solutions can contribute to risk reduction.


This toolbox has been developed to help local (non-governmental, community based, and grassroots) organisations become more effective in telling their climate change stories and making their voices heard in lobbying and advocating for the policies, laws and other actions necessary to mitigate and adopt to climate change at the international, regional, national and local levels. It sets out a range of tools and approaches for effective communication about issues relating to climate change. The focus is on tools and approaches that are low-cost and easy to put into practice. It also includes suggestions on making effective use of the increasingly-affordable and accessible communication technologies that are available, such as email, the Internet, and video recorders. Although this toolbox has been developed with a Caribbean audience in mind and uses examples from this region, it is suitable for use by organisations in other parts of the world.


This review i) identifies Caribbean SIDS which highly depend on their marine ecosystems and are particularly vulnerable to climate change related risks and ii) provides a recommendation on SIDS which are most suitable for EbA approaches including restoration and climate change adaptation efforts.

GIZ (2014): The Vulnerability Sourcebook. Concept and guidelines for standardised vulnerability assessments. Building on the approach developed by Germany’s ‘Vulnerability Network’ for assessing domestic vulnerability across different sectors at the various administrative levels in Germany, the Vulnerability Sourcebook offers a practical and scientifically sound methodological approach to vulnerability assessments and their application for monitoring and evaluation of adaptation. It is illustrated with examples and lessons learned from pilot applications in Bolivia, Pakistan, Burundi and Mozambique. It thus offers a rich compendium of practical and scientific knowledge on vulnerability assessments.


This factsheet provides a short overview on the relevance of M&E of climate change adaptation, related challenges and progress and it introduces the GIZ approach to M&E of adaptation.


The brochure is designed to support the integration of climate change impacts as well as awareness of the challenges and opportunities of climate change in development planning on various levels - national, sectoral, local and project. It comprises four sections. The Introduction describes the main elements of Climate Proofing for Development. Following this, Part A introduces the methodology of the approach, while Part B presents examples of possible use at different levels, including best practices. Part C presents some lessons learnt from the Climate Proofing for Development approach.


In this report, the authors present a summary of the state of knowledge on ocean acidification based on the latest research presented at the Third Symposium on the Ocean in a High-CO2 World (Monterey, California, September 2012) and beyond. The symposium convened 540 experts from 37 countries to discuss the results of research into ocean acidification, its impacts on ecosystems, socio-economic consequences and implications for policy.

The main objective of the manual is to enhance the capacity of development practitioners and decision makers in developing countries by translating relevant aspects of climate change research into their every-day working contexts. This guide describes the concrete steps of (i) how to obtain climate change information, (ii) how to interpret it adequately, and (iii) how to communicate the resulting knowledge in a careful and responsible way.


This Guidebook is part of the on-going commitment of Filipino marine scientists to provide tools for improving coastal resources management in the Philippines amidst the backdrop of a constantly changing global climate. While the tools in this Guidebook is a living document of a work in progress, it helps to start to equip local governments and development partners with a powerful yet simple method for determining the potential impacts of the consequent effects of climate change on shorelines and coastal fisheries.

OECD (2009): Integrating Climate Change Adaptation into Development Co-operation: Policy Guidance. This Policy Guidance offers concrete information how to facilitate the integration of adaptation within development processes. The objectives of the Guidance are to: (i) promote understanding of the implications of climate change on development practice and the associated need to mainstream climate adaptation in development co-operation agencies and partners countries; (ii) identify appropriate approaches for integrating climate adaptation into development policies at national, sectoral and project levels and in urban and rural contexts; and (iii) identify practical ways for donors to support developing country partners in their efforts to reduce their vulnerability to climate variability and climate change.

Pramova E, Chazarin F, Locatelli B and Hoppe M (2013): Climate Change Impact Chains in Coastal Areas (ICCA). Final study report Published by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. The objective of the ICCA study is to understand, delineate and communicate climate change impact chains, as well as potential ecosystem-based adaptation practices, in coastal areas with a special focus on Indonesia and the Philippines. The study was conducted in two components: (i) Global literature review covering coastal areas and especially mangrove and coral socio-ecological systems; (ii) Country document review and expert interviews for Indonesia and the Philippines.


This report builds on a vulnerability and adaptation assessment, which provided information on key threats to natural resources and the socio-political context of Lami Town, Fiji, and identified potential adaptation options to climate change. To further analyse these adaptation options, this synthesis report presents a cost-benefit assessment of four adaptation scenarios. These scenarios represent the spectrum of ecosystem-based and engineering adaptation options to reduce vulnerability to storms, which was identified by the Lami Town Council as the principal vulnerability concern.

Science for Environment Policy. Thematic Issue (March 2013): Ecosystem-based Adaptation

This Thematic Issue from Science for Environment Policy brings together the latest research on EbA, providing evidence for the effectiveness of this approach and highlighting successful case studies focusing on coastal areas.


The Nature Conservancy and Wetlands International together with the University of Cambridge set out to map the current state of knowledge about the role of mangroves in coastal defence and put the different findings and views in perspective. This practical guidebook summarises the findings of the reviews and provides practical management recommendations to coastal zone managers and policymakers. It helps the reader to assess the risk context in a target area, to define hazard-specific mangrove management interventions and to incorporate these in risk reduction strategies, climate change adaptation protocols and broader coastal development planning. Case studies provide practical examples of mangrove management approaches and references to background information, practical tools for risk assessment and mangrove management are provided throughout the book.

A new 'Ecosystem-Based Adaptation Decision Support Framework' (EBA-DSF) is under development by UNEP and partners to assist national planners and decision-makers select, design, implement and track EbA approaches as part of a wider adaptation strategy.

The EBA-DSF centres around four iterative steps and strategic considerations: setting adaptive context, selecting appropriate adaptation options, design for change, and adaptive implementation.


The guidebook provides a detailed treatment of climate concerns in coastal areas. The Guidebook proposes an approach for assessing vulnerability to climate change and climate variability, developing and implementing adaptation options, and integrating options into programs, development plans, and projects at the national and local levels. It is both a tool in itself and a link to other resources to help building resiliency against the impacts of climate change in coastal areas.


This guide was developed to catalyse local early action in coastal communities through education and outreach, vulnerability assessment, and local early action planning.
Comparable to ‘region’ or ‘state in other countries.

vi A separate training on M&E for adaptation is available.

vii This exercise is adapted from Exercise 4 (Part 1) of the Blue Solutions IES training.