CLIMATE CHANGE STRATEGY
for the Nairobi Convention

UNEP

Nairobi Convention

WIOMSA

SWEDEN

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The Climate Change Strategy was presented as a draft Strategy to a Partnership Meeting; Science to Policy Meeting and the Meeting of Heads of Delegation at the Eighth Meeting of the Contracting Parties held in Seychelles in 2015 and in Decision CP8/8: Climate Change Adaptation and Mitigation the Secretariat was asked to expedite the finalisation of the leading to the production of the final version which was approved by the Bureau of the Convention in November 2015. I this regard we wish to thank the all focal points that participated in the preparation of the strategy, namely; Zoubert Maecha Hamada & Fatima Athoumani (Comoros); Marie-Anne Mortelette, Nadia Deckert & Charles-Henri De Barsac (France); Charles Sunkuli & Geoffrey Wahungu (Kenya); Jacquis Rasoanaina (Madagascar); D.S. Lan NG YUN WING & Ramchurn Seenauth (Mauritius); Ivete Joaquim Maibaze & Alexandre Bartolomeu (Mozambique); Flavien Joubert & Nanette Laure (Seychelles); Abdikadir Sidi Sheikh (Somalia); Esther Makwaia & Sihaba Vuai (Tanzania); and Lisolomzi Fikizolo & Yamkela Mngxe (South Africa) and members of the Bureau (Didier Dogley, Alain de Comarmond & Flavien Joubert (Seychelles); Wahungu Geoffrey (Kenya); Seenauth Ramchurn (Mauritius) and Yamkela Mngxe (South Africa) that provided guidance for the completion of the strategy.

Foreword

The marine and coastal ecosystems of the Western Indian Ocean region are invaluable in terms of their natural, built, human and social capital. The Western Indian Ocean region, also referred to as the Nairobi Convention area, has a unique geology that contributes to remarkable biodiversity and high endemism. More than 2,200 species of fish, 300 species of hard coral, 10 species of mangrove, 12 species of seagrass and 1,000 species of seaweed, as well as hundreds of species of sponges, molluscs and crabs, are found in the coastal and marine environment of the countries of Kenya, Mozambique, Somalia, South Africa and the United Republic of Tanzania, and the island States of Comoros, Madagascar, Mauritius, Reunion (France) and Seychelles.

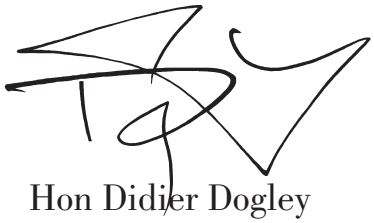
The Western Indian Ocean region has a young and growing human population, especially in coastal urban centres. Over 65 million people along the region's coastline depend on the goods and services of the marine ecosystem to sustain their livelihoods. However, these resources are under immense human pressure likely to rise from a current of 212.6 million in 2014 to over 450 million by 2015 in a changing climate. The biodiversity of the marine and coastal areas is increasingly threatened. Key threats include over-exploitation to feed the growing population, pollution from land and marine sources, unregulated developments, including tourism, introduction of alien species and a changing climate change. Current assessments indicate that climate change in the WIO region is increasing environmental variability, with ramifications for weather, fisheries and biodiversity. Oceanographic effects from climate change such as elevated water temperatures and changes in storm frequency have also contributed to increased variability in catch and species composition. Climate impacts due to increasing air and sea surface temperature increases, precipitation changes, increasing frequency and severity of extreme weather events, and sea level rise are compounded by concerns about ocean acidification due to elevated levels of atmospheric carbon dioxide.

The WIO countries are committed to take remedial or proactive actions for the protection of the marine and coastal environment as parties to the Nairobi Convention. The Countries have adopted an integrated management approach to the management of marine and coastal environment, blending responses to both climate and non-climate stressors that promote the dual goals of promoting climate-resilient and sustainable development. Strategic responses to protect climate-sensitive ecosystems will be increasingly important for management, since impacts resulting from climate variability and change are already evident and will persist into the future. While there are inherent uncertainties associated with the magnitude and timing of future climate changes and their impact on ecosystems, it is both possible and essential for adaptation to proceed using the best available knowledge.

The Climate Change Strategy for the Western Indian Ocean region, developed by the Western Indian Ocean Marine Science Association and the Secretariat of the Convention for the Protection,

Management and Development of the Marine and Coastal Environment of the Western Indian Ocean (Nairobi Convention), is an operational framework to foster regional cooperation in addressing the impacts of climate change by assessing the degree of preparedness and the vulnerability and adaptive options of communities within the Nairobi Convention area.

The Climate Change Strategy takes into account the existence of national climate change strategies and complements national actions by encouraging collaborative efforts by States with the aim of sustainably managing marine and coastal ecosystems by enhancing the resilience and adaptive capacities of socio-ecological systems, individually or collectively, in order to maximize resource use, and by avoiding duplication of effort. On behalf of the Nairobi Convention I wish to thank WIOMSA, and Mr Jim Anderson, the consultant who drafted the Strategy together with the National Focal Points, experts and teams in the Nairobi Convention Secretariat and WIOMSA that helped to finalize the climate change strategy.



Hon Didier Dogley
The Minister of Environment, Seychelles and the Chairperson, the Bureau of the Nairobi Convention

Executive Summary

Climate change impacts will affect both natural and human systems in WIO coastal and marine environments, in many cases amplifying existing anthropogenic threats (non-climate stressors) to effective management of these resources. The main climate change impacts of concern are: higher surface and sea temperatures; extreme events such as droughts, floods, and severe storms; precipitation variability including variations in annual rainfall, timing, duration, frequency, and intensity; sea level rise; and ocean acidification.

At the regional level, WIO countries' priorities and needs in the area of climate change are reflected in a number of documents such as 'Climate Change in the Western Indian Ocean: A Situation Assessment and Policy Considerations' prepared by the WIO-C and the 'Climate Change Impacts in Coastal and Marine Areas of the Western Indian Ocean Region: An Assessment of Problems, Solutions, and Strategic Options for Promoting Climate Resilient Development in the WIO Region' prepared by WIOMSA. Further, priorities and needs are also drawn from national plans, the outcomes of the UNFCCC Conferences of the Parties (such as Paris Agreement – Annex 1) and the outcomes of related international meetings.

Countries of the WIO region recognize their commitment to sustainable development is a national responsibility but realise that regional-level efforts could enhance effectiveness of their national level initiatives. Within this context the Strategy identifies broad priorities for WIO region. It provides a strategic platform not only for use by policy and decision makers at all levels, but also for the development and strengthening of partnerships for implementation of national and regional initiatives. It does not create legal rights or impose obligations under international law.

The Nairobi Convention provides a mechanism for regional cooperation, coordination and collaborative action in solving challenges facing the coastal and marine environments of the Western Indian Ocean, and a strategic framework through which to enhance and extend partnerships in solving climate change challenges. This strategy endeavours to respond to regional needs in the management of shared transboundary resources which require regional actions to address climate change impacts and challenges.

The Strategy provides a roadmap for the Nairobi Convention Secretariat together with contracting parties to address the impacts of climate change. It describes key results and objectives to guide actions under four integrated components: climate change adaptation on political agenda, climate change policy formulation, adaptation policy implementation, and adaptation monitoring and evaluation. Further, the Strategy will provide the basis for the development of a regional Climate Change programme for the Nairobi Convention. It is envisaged that the strategy will provide the Nairobi Convention Secretariat a basis or a priority set of strategies within which to collaborate with the Contracting Parties and partners to implement a regional Climate Change programme for the Nairobi Convention.

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Introduction

A VISION FOR THE STRATEGY

'Development in a harsher climate'[1]

The overall vision pursued by the Amended Nairobi Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Western Indian Ocean (hereinafter referred to as the "Nairobi Convention") is of one of a prosperous Western Indian Ocean region with healthy rivers, coasts and oceans[2] and much progress has been made by our member States towards attainment of this vision. Over recent years, the Convention's members have contributed towards the implementation of solutions to a range of non-climate stressors, including land-based sources of marine pollution and over-exploitation of marine resources. The Convention has also developed a regional capacity across a broad range of technical, managerial and policy arenas. The addition of a further stressor, in the form of climate change, now places some of these achievements under threat.

The Consensus Statement formulated by the 150 participants at the regional conference on the topic: "Climate Change Impacts, Adaptation and Mitigation in the Western Indian Ocean Region: Solutions to the Crisis", organized by the Western Indian Ocean Marine Science Association (WIOMSA) in collaboration with the Mauritius Oceanography Institute and the Nairobi Convention secretariat and held in Mauritius in March 2011, included, in its preamble, the following observation:

"We, senior experts from the Western Indian Ocean (WIO) region… [note that] climate change is likely to exacerbate on-going declines in coastal fisheries … in the WIO region, due to higher sea temperatures, ocean acidification and loss of important habitats like coral reefs, seagrasses and mangroves".[3]

The Nairobi Convention provides a mechanism for regional cooperation, coordination and collaborative action in solving challenges facing the coastal and marine environments of the Western Indian Ocean, but a strategic framework to enhance and extend that partnership in solving climate change challenges has hitherto been lacking. This strategy endeavours to respond to regional needs in the management of shared transboundary resources which require regional actions to address climate change impacts and challenges.

The Convention is fully aware of the adaptation and mitigation strategies already in existence at the national level; consequently, the strategy has been formulated as a targeted response to climate-specific stressors, delineating actions that require the collaboration of the contracting parties to the Nairobi Convention.

In addition, marine environments in the Western Indian Ocean region are shared transboundary resources, and many countries will face relatively similar climate change impacts and challenges.

1. Stern, 2009

2. www.unep.org/NairobiConvention/The_Convention/Nairobi_Convention_Text/Amended_Text.asp.

3. www.acclimate-oi.net/files/etudes_asconit_pareto/wiomsa-climate-change-conference-summary-report-final.pdf.

Indeed, the technical report *Africa's Adaptation Gap 2*,[4] launched in 2015, projects a number of impacts, including sea-level rise, that will be experienced almost universally across African coasts. Consequently, the existence of a regional strategy, to be implemented collaboratively by countries of the region, will go a long way towards harmonizing responses to the shared challenge, thereby creating a synergy of efforts and avoiding the duplication and resulting wastage of resources that would be the case with a disjointed response.

The regional strategy will buttress national adaptation and mitigation strategies that may be weak on responses to transboundary impacts and on coastal and marine adaptation and mitigation actions.

While there is little that can be done in the short term to reduce climate change, at least in terms of global greenhouse gas emissions, there are opportunities to reduce the negative impacts of climate change. The capacity of an ecosystem and its human components to cope with change or even reduce the degree of change is captured by the term "resilience". The present strategy will focus on building such resilience and has the following vision:

To make coastal communities, economies and marine ecosystems in the Western Indian Ocean resilient to the effects of a changing climate and climate variability.

4. http://apps.unep.org/publications/pmtdocuments/-Africa%E2%80%99s_Adaptation_Gap_2__.pdf.

Building Resilience to Climate Change

Resilience implies that a social and ecological system, whether in reference to its environmental, plant and animal components, or its human social, political and economic components, or all of these combined, is able to withstand or, if necessary, to adapt to, disturbance (Walker and others, 2002). A resilient system is less likely, in the face of some form of internal or external stressor (such as climate change and all that it implies), to undergo an uncontrolled change from its current general configuration to a different – and possibly undesirable – configuration. Building resilience to climate change can therefore be seen to be a positive endeavour, supporting the continued productivity of ecological and social systems in the face of the challenges brought by changing rainfall patterns, and changes in sea surface temperatures, ocean acidification, and other properties.

That said, there are some situations where resilience can be seen to be a negative property. In the case of social systems, for example, this might be exemplified by the persistence of normative behaviour that is resilient to what would be deemed to be a positive change by other stakeholders. For example, State agencies may be slow to change policies to increase and improve the participation of otherwise marginalized social groups in coastal resource management (Folke and others, 2010). It is important for the strategy to recognize that it might in fact be beneficial to reconfigure some characteristics – admittedly few in number – of coastal social and ecological systems in the Western Indian Ocean, rather than maintain or persist with them.

Building resilience in social and ecological systems calls for actions that, for example, reduce

the vulnerability of human communities to food insecurity and social, economic or political disturbances. (Levine, 2014).

A number of key principles have been identified by researchers that can guide the building of a resilient social and ecological system (SRC, n.d.; IPCC, 2014). These principles include maintaining biodiversity, and recognizing system connectivity; they highlight the importance of understanding system variables and feedback loops, and of establishing processes that foster adaptive systems. The principles stress the importance of integrated governance systems and of broad and multi-level participation in decision-making.

In fact, the Nairobi Convention is already involved in programmes and activities that address many aspects of resilience. For example, in exercise of the Convention's extensive mandate to prevent coastal and marine pollution, a new protocol and strategic action plan have recently been formulated for the control of pollution from land-based sources and activities, representing a major contribution to the preservation of coastal biodiversity and a recognition of the connectivity of ecosystems. Other such examples include the Convention's work on promoting the ecosystem-based approach to management, and building the capacity of the region's marine protected area professionals. At the same time, the continuing development of an integrated coastal zone management (ICZM) protocol constitutes a major step in boosting the effectiveness of governance and increasing the range and extent of opportunities for stakeholders to participate in coastal zone decision-making.

The complexity of social and ecological systems, however, makes it particularly difficult to build resilience: this applies as much to the social and economic components as to the biological components. In the case of the social components, this is because contemporary livelihoods are becoming less and less self-sufficient and are increasingly reliant on interactions with other systems, perhaps outside the management supervision of a particular governance authority. For example, resource users may undertake seasonal migrations to reach distant resources. There

is also significant cross-border trade between Nairobi Convention member States, while some communities rely heavily on remittances generated from the use of other ecosystems, perhaps even ecosystems located overseas. Geopolitical disturbances and fluctuations in globalized trade, including international commodity prices, and increasingly cheap, international tourism, may also adversely affect local livelihoods in a particular ecosystem (Adger and others, 2005; Levine, 2013).

In practical terms, building economic resilience may require the development of new and diversified economic opportunities to augment or even replace those based on current types and levels of natural resource use. Although this is a straightforward premise, in a real-world context, conditions may simply not be suitable to supply the required opportunities (at least in the short term). This may be attributable, for example, to the limited availability of suitable raw materials, low levels of educational opportunity, and poor infrastructure and communications, among other factors. It may also be due to the influence of cultural norms and practices. Furthermore, many Convention member States are experiencing very high population growth, which will continue to place enormous pressure on livelihood diversification initiatives and on the ecosystems supporting those livelihoods.

As a result of this inherent complexity, expectations of strategies to enhance climate change resilience need to be measured and incremental.

THE MISSION

This strategy seeks to provide a framework for the contracting parties to the Nairobi Convention to work towards ensuring that marine and coastal ecosystems in the Western Indian Ocean, including their communities, resource governance systems and economies, are resilient to a changing climate.

The two basic pathways or attainment of this goal are ***mitigation*** and ***adaptation.*** Mitigation and adaptation are not mutually exclusive: adaptation may include changes to ecosystems, in respect of both ecological and social (in particular, economic) components, which can mitigate future emissions and therefore the scale and effects of future climate change.

An important caveat on adaptation is that it is not necessarily going to work as a strategy ad infinitum – if mitigation of greenhouse gas emissions fails, then at a certain point, depending on the particular type of ecosystem and its level of resilience, adaptation alone will not be sufficient to cope with the effects of the resulting climate change.

Climate Change Adaptation

The strategy identifies climate change adaptation as the principle means by which member States can maintain or enhance the resilience of their ecosystems. This approach has been mandated as a number of political and scientific forums.

Thus, in the Nairobi Declaration on the African Process for Combating Change, adopted at the special session of the African Ministerial Conference on the Environment (AMCEN), in May 2009, African ministers of the environment stressed that Africa's priorities were to implement climate change programmes with a focus on adapta-

tion in such a way as to achieve sustainable development, in particular to alleviate poverty and attain the Millennium Development Goals.5[(5)] In the same vein, in paragraph 1 of their Consensus Statement, participants at the 2011 WIOMSA regional conference on climate change cited above recognized that

"…for the WIO region, adaptation remains the top priority for tackling the impacts of climate change and variability" (WIOMSA, 2011).

Further momentum for climate change adaptation in developing countries, including those of the Western Indian Ocean, was generated during the seventeenth meeting of the Conference of the Parties to the United Nations Framework Convention on Climate Change, held in Durban, South Africa, in 2011. The Conference called on all countries to address adaptation and to implement institutional arrangements to facilitate their national adaptation plan process, building on existing institutions and consistent with their national circumstances (Munang and others, 2013).

The major focus of the present strategy will therefore be on the identification of areas where contracting parties to the Nairobi Convention can collectively promote adaptation. Given that the Western Indian Ocean region's industrial greenhouse gas emissions are globally insignificant, the region can contribute to mitigation in a modest way through localized emissions reduction. Mitigation may also be furthered by member countries, however, through actions that increase the local sequestration of carbon (enhancing the sinks) – or so-called "blue carbon" initiatives. Such initiatives can include conserving (or re-planting) mangroves, conserving sea-grass meadows, and conserving coral-reef structures. Blue carbon initiatives can also yield substantial co-benefits, in the form of reduced coastal erosion, improved fisheries and increased tourism revenues, etc.

5. Nairobi Declaration on the African Process for Combating Climate Change, thirteenth preambular recital.

The strategy therefore recognizes that there are avenues along which the contracting parties can contribute to existing mitigation initiatives of this type, while maintaining its overall focus on adaptation. Mitigation measures are better addressed in detail, however, through national climate change adaptation plans.

Adaptation is nothing new to human society, including those in the coastal communities of the Western Indian Ocean (Clar and others, 2013). At local scales, households in the Western Indian Ocean coastal region have historically tended to develop a portfolio of livelihood strategies and behaviour to account for seasonal and inter-annual variability in rains, and the seasonal availability (or accessibility) of fish stocks. The uncertainty that characterizes natural resource-based livelihoods also extends to adaptation (Niang and others, 2014), with major implications for efforts to evaluate the success of adaptation programmes.

The wider political and economic landscape of the region today is also different from that of one or two generations ago, and significantly different from that of a century ago, with significant political change, economic development and associated urbanization, social and cultural changes, improved access to relatively cheap new technologies and access to new national, regional and international markets. The development of large urban markets has promoted adaptation in transport and marketing in the fisheries sector, for example.

The inherent capacity of human societies to adapt to the internal and external driving forces behind variability or change is once again being called into action to meet the contemporary challenge of climate change.

The **mission of this strategy** is therefore as follows…

To support governments, civil society, the private sector and coastal communities of the WIO in the process of adaptation to climate change.

The existing adaptive capacity of households, communities and economies inevitably varies within and across the region, while the type and extent of the climate change adaptation required also depend on particular locations, ecosystem characteristics and their current levels of resilience (IPCC, 2014). It is crucial therefore to avoid implementing a set of ready-made adaptive actions that may actually be inappropriate for particular sites or situations (or that risk becoming inappropriate for future conditions): a practice known as "maladaptation". Climate change impacts on one particular social and ecological system can also have a number of indirect effects on other systems, such as through the economic impact of the migration of people away from the worst affected areas or ecosystems, and the subsequent increased demand for services in recipient or downstream social and ecological systems.

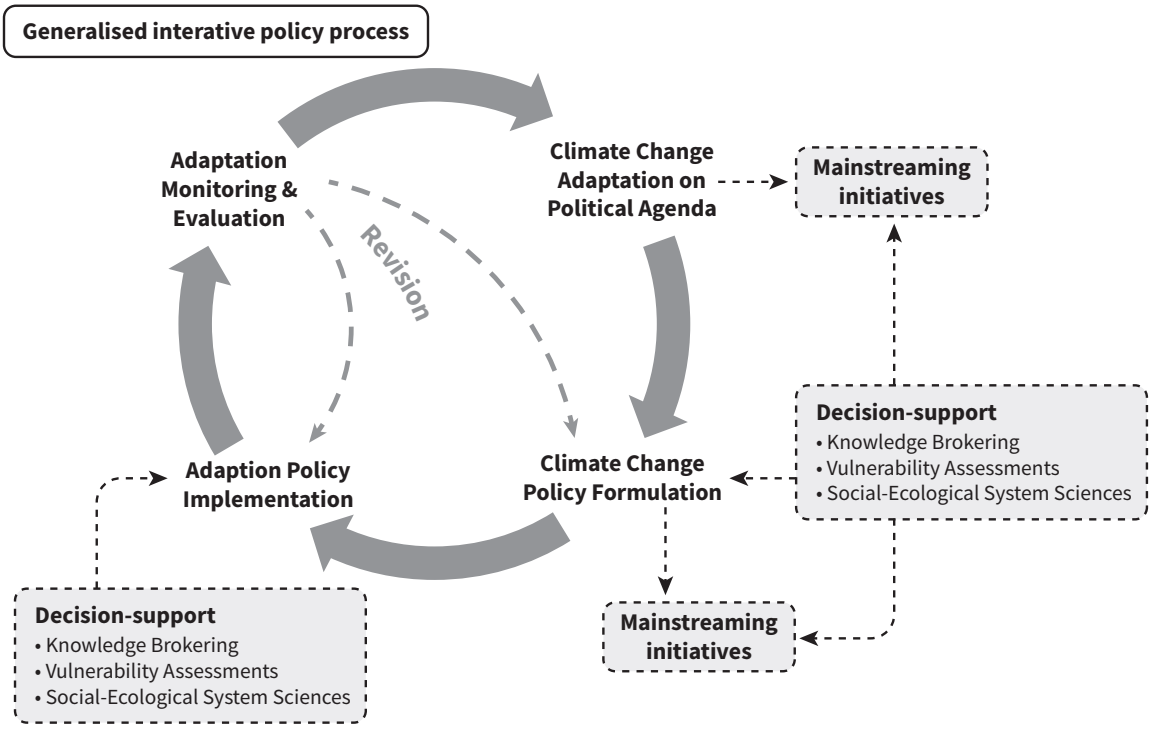
Climate change is taking place in political, social, economic and ecological systems that are dynamic in nature and, in a dynamic system, the impacts of climate change may be significantly exacerbated, or perhaps moderated, by non-climate change events in wider social and ecological systems. It is therefore crucial to recognize that many pre-existing constraints on the development of resilient social and ecological systems may be constraints on building adaptive capacity and subsequent resilience to climate change.

This all means that adaptation which builds resilience to current and potential climate change impacts is complicated in nature. It is therefore vital that the present climate change strategy be viewed in the wider context of socioeconomic development and pre-existing stressors. It is also for this reason that the content of the strategy is designed to complement the over-arching Action Strategy of the Nairobi Convention.

STRATEGIC OUTCOMES

In order to realize the mission – and ultimately the vision – of the climate change strategy, four strategic outcomes have been identified for the Convention to support. Each outcome includes observations on monitoring and evaluation. These outcomes, and their respective result areas, will seek to address the components of a generalized and iterative policy process, as depicted in the figure below (Walker and others, 2003; Moser and Ekstrom, 2010).

The first outcome is **improved adaptation policymaking**. In other words, the relevant policies and the appropriate governance structures are in place, and together these contribute to building resilience and promoting successful adaptation across the membership of the Nairobi Convention. This does not, however, necessarily entail developing new and specific climate change policies or institutions for coastal and oceans ecosystem management. The strategy envisages the application of principles of adaptation to existing resource management and development policies. This first outcome therefore has three result



areas: adaptation and the political agenda; supporting policy formulation itself; and the mainstreaming of these adaptation policies beyond climate change, into existing coastal and oceans management policies and into wider development policies.

The second outcome of the strategy is its contribution to **effective decision support** for the adaptation policy process. In the Nairobi Convention, ministers recognize that, notwithstanding the impressive scope of scientific research undertaken in recent years across the region, there remain important gaps in our knowledge base. These gaps are observed in specific components of the science itself, and also geographically across the region, with some ecosystems and sites enjoying substantial research coverage, while others remain relatively unresearched. This imbalance may be observed both between and within member countries. The second outcome also comprises three key result areas: two on the generation of information and knowledge and the third on the communication and brokering of knowledge to inform the shaping of policies and the subsequent monitoring and evaluation of their performance.

The third outcome is the **support furnished to member States in implementing** ecosystem-based approaches to climate change adaptation and the fourth outcome is the resulting focus on considerations for the **evaluation of the strategy**.

Strategic outcome 1 improved adaptation policymaking

Strategic outcome 1 has three key result areas, two of which address particular stages in the policy process – the long-term presence of climate change adaptation on the political agendas of contracting parties (key result 1.1) and the translation of that presence into effective and equitable policies (key result 1.2). The third key result area is the mainstreaming of adaptation concepts into a wider array of development policies (key result 1.3).

KEY RESULT 1.1
CLIMATE CHANGE ADAPTATION AND THE POLITICAL AGENDA

1. The first requirement for an issue to be addressed through policy is that it has sufficient visibility on the political agenda. Globally, a range of institutions, including the Framework Convention on Climate Change, governments (of both developed and developing countries), the Intergovernmental Panel on Climate Change (IPCC) and its teams of research scientists, international NGOs and civil society groups, lobby for climate change mitigation and adaptation to be placed high on the international political agenda. Under article 4, paragraph 1 (f) of the Framework Convention on Climate Change, for example, parties commit themselves to "take climate change considerations into account, to the extent feasible, in their relevant social, economic and environmental policies and actions".[6]

6. Article 4.1 (f) of the Framework Convention on Climate Change.

2. Closer to home, the significant damage caused by the bleaching of many coral reefs in the Western Indian Ocean region in 1998, and the apparent risk that the frequency of such events will rise above the natural background rate (Hoegh-Guldberg and others, 2007), helped to focus attention in the Western Indian Ocean region itself. As a result, all Nairobi Convention members had ratified the Framework Convention on Climate Change by 1999 and its Kyoto Protocol by 2008. The additional climate-related threats of sea-level rise, changes in coastal agricultural productivity, and catastrophic flooding or drought events have further prompted States in the Western Indian Ocean region to place climate change higher on their agendas.

3. Additional political momentum in the Western Indian Ocean was created by the 2011 WIOMSA regional conference on climate change impacts, adaptation and mitigation, which was attended by some 150 policymakers, scientists and representatives of NGOs and received wide coverage in established national and regional media outlets.

4. The following year, in 2012, at the seventh meeting of the Conference of the Parties to Nairobi Convention, discussions were held on the Western Indian Ocean coastal challenge as a platform for development planning in the context of climate change. The Conference also called for the development of a regional strategy on climate change impacts, adaptation and mitigation in the Western Indian Ocean (UNEP, 2012). In the

meantime, all contracting parties to the Convention have now completed some form of national climate change strategy or national plan of action or both. In addition, both the Southern African Development Community (SADC) and the Intergovernmental Oceanographic Commission (IOC) have recently developed climate change strategies. This is of particular relevance because of the membership overlap between the Nairobi Convention, SADC and IOC.

5. More generally, many stakeholders from governments, civil society and the wider community across the region have, over recent years, benefited from specific climate-change programmes, delivered with bilateral or multilateral development partners, while a number of climate change initiatives are currently under way or being developed. In parallel, a significant amount of coastal and marine ecosystem scientific work is taking place in the region, providing important evidence of change and improving our understanding of potential adaptation options.

6. It is clear from these various engagements with the issue of climate change that the governments of our member States, along with a diverse range of stakeholders – from school-children to coastal communities, and from academic institutions to local governments, NGOs and the private sector – are now broadly familiar with the challenges that climate change poses.

7. That said, however, neither climate change adaptation nor mitigation are short-term fixes that might be addressed through a single awareness programme, a single policy cycle, or one or two terms of a government. Both issues require long-term programmatic investments, coordinated across a range of sectors.

8. In the first instance, the necessary investments are more likely to be sustained if climate change adaptation specifically, and ecosystem-based approaches to resource-use management more generally, maintain their visibility on the political agenda. This is not easy to achieve, whatever

the matter in question, because of what might be termed "issue fatigue" among the public and politicians alike, cynicism, or limits to the capacity of policymakers to deliver solutions. There are further disincentives, such as the time-scale and geographical scale of impacts, the difficulty of demonstrating direct causality between climate change and its consequences for individuals (Bromley-Trujillo and others, 2014), the effect of background natural climate variability, its political complexity and the difficulty of making a definitive attribution of change to policy interventions (Pralle, 2009). It is therefore necessary, in order that the Nairobi Convention's strategy is appropriately aligned, to identify what prerequisites are most likely to deliver and maintain agenda visibility for climate change.

9. The most likely prerequisites have been identified from the experience of the Convention secretariat itself and that of the member States, but they are also drawn from published academic research, from other national and regional strategies and from meta-analyses (Ribeiro and others, 2009; Pralle, 2009; Clar and others, 2013).

10. At the outset an obvious prerequisite is that there is sufficient awareness of the need for adaptation among policymakers, at all governance levels, and among members of civil society and the immediate users of ecosystem services, including the private sector. The term "awareness" here is understood to include a shared understanding of climate change science and the terms used in discussing climate change, of the potential scope of impacts, and the risks of inaction, etc. Crucially, awareness-raising must also include awareness of possible solutions. Without solutions – even if they address only a few of the numerous challenges that climate change raises, which is better than nothing – climate change adaptation will fail to secure any meaningful position on the political agenda (Pralle, 2009; Kingdon, 1995).

11. Where target stakeholders are concerned, awareness is obviously essential for the key policymakers themselves and for their ministerial and departmental staff. While departmental staff tend to remain in post for longer periods of time, ministers will move more frequently between portfolios, or be replaced by a newly elected governing party. As such, ministers and permanent secretaries should be a specific target for awareness-raising programmes, with interventions aligned with key decision-making events in the political schedule. The delivery of this aspect of the strategy should also, where possible, take advantage of so-called "focusing events" (Marshall, 2014). Examples of such events are coral-reef bleaching episodes, major droughts or floods, or the publication of major climate change reports, etc. These may offer windows for adaptation advocates to press their case.

12. Local governments, at a range of scales, are increasingly involved in decision-making in the Western Indian Ocean, with a number of important devolution initiatives already under way. But increased responsibilities are not always matched by the necessary human and financial resources. In view of the human resources required, capacity-building is going to be a critical determinant of the extent to which climate change adaptation is achieved.

13. Awareness is also crucial, however, from the perspective of those who are at the sharp end of climate change: coastal communities, fishers and

their communities and the private sector, who together are the immediate beneficiaries of ecosystem services and who create additional economic value from those services. These groups are typically the most sensitive to the loss or reduction of ecosystem services but usually have the least access to information about the issue.

14. Building awareness of adaptation needs among the primary beneficiaries is not only important to support them in planning their individual or community responses to climate change impacts. These primary stakeholders must also be empowered to play their legitimate roles in driving political agendas, in creating pressure for government-led action and to be in a position to participate actively in policy consultations and reviews of draft policy ideas, before any implementation is even considered. This is a simple matter of good governance. There is an important role for the description of local impacts and personal experience in driving political agendas, and subsequent actions on policy and its implementation (Pralle, 2009).

15. In some areas of the Western Indian Ocean, although by no means all, the coast can be a relatively remote place, with limited infrastructure and communications, low population densities and low economic productivity. As a result of these characteristics, coastal communities may be both politically and economically marginalized, and may have been hitherto unable to exert any meaningful influence on the political agenda. This can be exacerbated by the fact that many marine-based livelihoods are components of ecosystems (i.e. estuaries, mangroves, the open ocean, etc.) that are relatively inaccessible and in which it can be difficult directly to view the impacts of over-exploitation, environmental anomalies or climate change effects, without – literally – wading into the water. This is in sharp contrast to agriculture and forestry, for example, which take place in relatively accessible terrestrial ecosystems which can be reached by four-wheel drive vehicles. The communities in those more remote coastal areas will require special attention.

16. Related to awareness of the problem, is the salience of the issue, both to the public and to policymakers, in other words, whether the issue is sufficiently prominent and important to policymakers or to those that influence them. In properly functioning democracies it is reasonable to expect public policy to be strongly influenced by public opinion.[7] But the issue is not straightforward because it appears likely that the opinion threshold, above which public opinion will be directly reflected in policy, may be significantly higher than a simple majority.

17. The strategy can play an important role in ensuring that public opinion is adequately informed (ensuring that climate change is a salient issue for the public, or at least for the core stakeholders, interest groups and their communities) and ensuring that the public has adequate opportunities to communicate that opinion. Equally, the strategy can support civil society (in the sense of its non-governmental institutional role of representing the interests of the people) to communicate with the government.

18. Efforts to maintain climate change on the political agenda can also be promoted by ensuring that decision-makers maintain political will.

7. V.O. Key (1961), cited in Bromley-Trujillo and others, 2014

The difficulty of achieving this goal has already been noted, with mention of issue fatigue, cynicism and other impediments. Political will can also diminish as a result of events on the political calendar (forthcoming elections can often inhibit policy initiatives) or the wider macroeconomic climate may attract attention elsewhere. At a lower, sectoral level, other initiatives may divert human resources and policy attention away from climate change, or ministries may piggy-back on programmes financed externally, avoiding the costs and labour of initiating and resourcing programmes, including any policy review and revision.

19. Where all else fails, one approach through which the strategy can support active stakeholders, and policy entrepreneurs, to get their message heard is through so-called "venue shopping" (Pralle, 2009). The concept of venue shopping is quite straightforward: it takes advantage of the fact that usually more than one institution is mandated to work on a particular issue. If advocates for policy action fail to attain their initial target, they may be able to garner support from another institution that takes a different position on the issue at hand.[8]

8. Baumgartner and Jones (1993), cited in Pralle, 2009

STRATEGIC OUTCOME 1: PROPOSED ACTIONS

- Awareness of the needs for adaptation will be promoted by the completion and communication of localized vulnerability assessments. These assessments will highlight ecological and community exposure and likely sensitivity to climate change effects. They will also describe adaptive capacity, particularly for the communities themselves, and which interventions are most likely to increase those capacities. The communication of the outputs of these assessments will be designed to empower the participating communities themselves, and also, crucially, to enable local and central government agencies to bring the issue on to the policy agenda.

- Awareness-raising will include the identification and provision of appropriate support to amplify local voices to describe at first hand their perceptions of the problem and their needs. This communication may take several forms, including the use of so-called "community champions" (Corfee-Morlot and others, 2009).

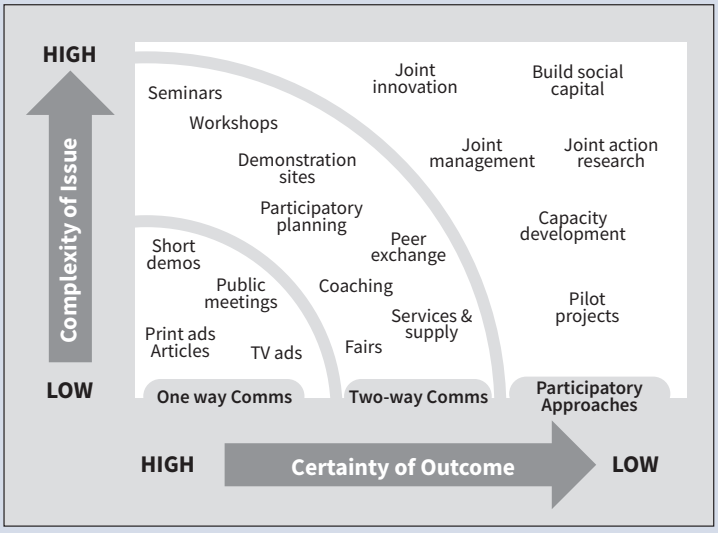
- The scope of baseline awareness-raising activities will include aspects of the ecosystem-based approach itself. The scope can be further expanded, particularly for government stakeholders, in relation to the availability of adaptation funds to support policy development and, subsequently, implementation itself. In the same way that conventional education programmes are rolled out on a continuous and essentially seamless basis, awareness related to climate change adaptation and all its facets will also need to be approached as a long-term programme and will require core funding.

- Overall, therefore, awareness-raising programmes will be multitiered, with varying levels of technical

content and a range of timelines and approaches used to communicate that content. The scope, roll-out and beneficiary profile of such programmes will depend on the particular countries and available resources, but there will be a universally applicable core content that will be developed through the Nairobi Convention secretariat on behalf of the member States. Under the present strategy, it is envisaged that non-governmental stakeholders and the local champions will receive support in seeking access to local and national government representatives to talk about the issue of climate change and to bring attention to community vulnerabilities to its effects. They will also be supported in their efforts to effectively communicate climate change information back to their organizations, members and communities.

- This Strategy will support member states to apply a range of communications approaches. The Communication, Education and Public Awareness Toolkit of the Convention on Biological Diversity, for example, provides a useful range of appropriate communication tools, depending on the particular circumstance and nature of the issue (Hesselink and others, 2007). It is important to recognize that stakeholders will respond to overtures in a variety of ways: some individuals or private sector companies will tend to be innovators and will lead the way. Others will inevitably be less enthusiastic participants in the debate and in taking action. The innovators can be usefully co-opted to support communication with stakeholders who favour less involvement.

- The issue of the salience of the knowledge that is generated through vulnerability assessments – and indeed how it is generated in the first place – will be a core concern for the secretariat. Salience will be enhanced by engaging the prospective users of this knowledge at community, expert and government levels to identify the methods through which it is generated. These stakeholders will be encouraged, and given support to that end, to work together to define the scope and content of this knowledge and to reflect on its implications (Vogel and others, 2007).



KEY RESULT 1.2
CLIMATE CHANGE POLICY FORMULATION AND REVIEW

1. The next stage in the policy process is policy formulation itself. The key role of governance arrangements in climate change adaptation is recognized by IPCC, which acknowledges that it plays a key role in promoting the transition from planning through to implementation of adaptation and for which there is high agreement among IPCC experts and equally robust evidence (Mimura and others, 2014 ; Karani and others, 2014). A number of the Malawi Principles for the Ecosystem Approach of the Convention on Biological Diversity also elucidate the need to recognize connections within and across ecosystems and the governance implications of these connections, including multi-stakeholder participation, which is a cross-cutting issue throughout the policy process (CBD, 1998).

2. Formulating explicit climate change adaptation policies, or incorporating adaptation into existing economic and development policies, can be hindered when the responsibilities of the various sectors of governance are unclear (Clar and others, 2013). No single ministry or department is typically responsible for all the components of a social and ecological system and therefore no individual ministry is in a position to formulate cohesive policies for effective ecosystem-based management or climate change adaptation.

3. Further complications can arise when existing governance arrangements do not effectively cater for multiple inputs from different sectors and actors into policy design within individual ministry portfolios. Given that ecosystem-based approaches and climate change adaptation are relatively new policy fields, it is not surprising that governance has not always been able to adjust to them.

4. It is highly likely, particularly as the costs become evident, that policy priorities will be disputed because the stakeholders involved have conflicting values and interests (Clar and others, 2013). The most obvious (albeit simplistic) clash of values and interest is that between conservationists seeking to protect biodiversity and development advocates who pursue a more utilitarian policy geared towards the exploitation of biodiversity. These contradictions must be confronted (Reisinger and Kitching, 2014), however, recognizing, as stated in the Malawi Principles, that "management objectives are a matter of societal choice", and therefore that the "appropriate balance between conservation and use of biodiversity" (CBD, 1998) is one for society as a whole to make. This decision must ideally be made by consensus.

5. A logical approach to the challenges of climate change adaptation policy formulation in the coastal zone is some form of integrated coastal zone management (ICZM) (IPCC, 2014; Nairobi Convention, in prep.). ICZM can help adaptation policymaking to take into account and to balance the interests of different sectors (Adger and others, 2005), and also to consider the often complex interactions and feedbacks that can occur as a result of isolated sector-specific policy formulation processes.

6. The ICZM approach can create a bridge between government departments, local governments, NGOs and community-based organizations, and other stakeholders at key stages in policy development, and the approach is valid at all administrative tiers, from local to national. The integration and participation of the private sector are also pre-

requisites for effective ICZM (Corfee-Morlot and others, 2009; Noble and others, 2014).

7. While ICZM has enormous potential as a governance approach for climate change adaptation and the building of social and ecological system resilience, it is acknowledged that sector-based ministries and local governments are likely to remain the bodies in which the relevant legal authority is vested. For this reason, sectoral approaches may remain in place for policy implementation, even if policies have been developed applying ICZM principles. The strategy recognizes the many useful attributes of a traditional sector-based structure for governance institutions. It is, after all, a reflection of the underlying complexity of natural ecosystems, as well as the social and economic systems that are built around them (Billé, 2008). Added to which, it manifests the necessary division of labour, allowing for the development of specialist ministries and their departments that speak the same technical language and represent a particular constituency of stakeholders.

8. The ICZM approach has been gathering pace across the Western Indian Ocean region and globally (WIOMSA, 2011). It has been an important component of a number of regional coastal zone programmes implemented over recent years, and all Nairobi Convention member States have made significant progress in further developing their ICZM frameworks. The Nairobi Convention secretariat launched a process to develop an ICZM protocol to the Convention in 2009 (Nairobi Convention, in prep.). Ratification of the Protocol will provide a key mandate for the mobilization of Nairobi Convention support for ICZM. In the interim, the present climate change strategy provides a mandate for additional support for continued implementation of ICZM in Nairobi Convention member States.

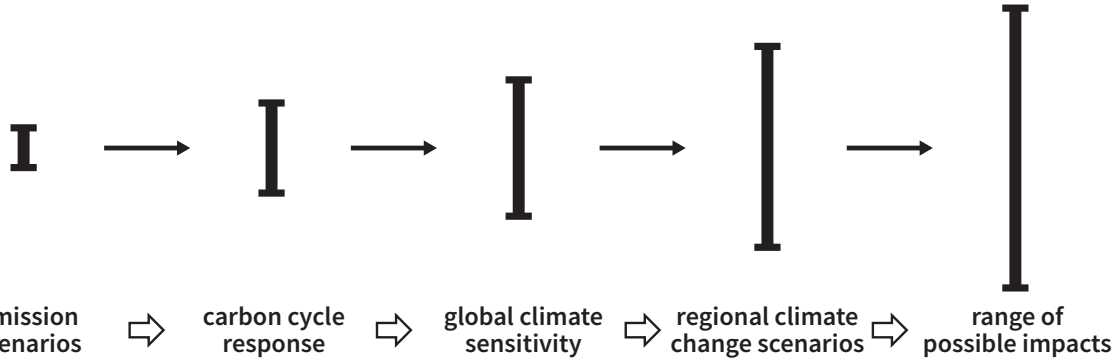
9. Science shall anchor and form the basis for important guidance to the ICZM process and final policy content. However, political goodwill, social choice, and economic opportunities and constraints will all determine the final characteristics of future policies, their implementation and their ultimate effectiveness (Naumann and others, 2011).

10. The strategy will support both formal and informal approaches to the coordination of policy formulation, while remaining within the general ICZM framework. Besides the various forms of ICZM committees, informal meetings, workshops or other forums that serve to facilitate the reaching of consensus on policy content across sectors are also potential recipients of support. These forums can provide a context conducive to effective communication, awareness-raising and negotiations. It is at this stage of the policy process that the specific tools to deliver integrated and coordinated management of social and ecological systems can be selected. These may include formal taxes, laws, regulations and other measures. This selection would be the subject of the negotiations themselves.

11. The potential contribution of ICZM to the formulation of climate change adaptation policy partly hinges on achieving effective vertical interaction between governance institutions and other stakeholders at different administrative levels, from national to local (Noble and others, 2014). In addition to vertical integration, which seeks to assure the flow of information and to extend participation between administrative levels, the issue of subsidiarity is also crucial, in the sense of management being decentralized to the lowest competent level (Billé, 2008). The strategy proposes further support to develop local governance capacity across the region, which is often limited by lack of access to financial and technical resources, while being mindful of individual national political systems.

12. To this end, having strong leadership of the ICZM process, along with an unequivocal mandate, are essential and the strategy will therefore seek to provide support to develop leadership capacity within the region.

13. In developing policy content, it is also important that the process is not unduly constrained by the uncertainty over future climate change effects on ecosystems (Jones, 2010). Uncertainty may be defined as a "state of incomplete knowledge that can result from a lack of information or from disagreement about what is known or even knowable" (IPCC WGIIAR5 Glossary, 2014). Some degree of uncertainty characterizes much of our knowledge of how social and ecological systems function, and the types of feedback and interaction that take place, or that may take place in the future. These can be visualized as a cascade of uncertainties, as depicted in the figure below (Manning and others, 2004).



14. Uncertainty can be reduced through research using scientific methods, and also by more qualitative approaches, but it will never be reduced to zero. Accordingly, advice offered by scientists or other technical specialists during policy formulation needs to be balanced by a clear description of the scientists' level of confidence in any advice offered.

15. Policy formulation within the context of uncertainty can also be assisted by risk assessments, looking at the risk related to the potential consequences of taking – or not taking – adaptive action. The provision of risk assessments is also essential to the maintenance of trust between the various stakeholders in the coastal and marine environment (CRC, 2009).

16. Overall, experts must communicate their uncertainty clearly and transparently, and using techniques adjusted to the particular audience. Experts must therefore identify suitable communications approaches, depending on the audience, and also on the nature of the issue. Furthermore, each stakeholder group tends to have its own particular set of uncertainties, with some individuals or communities more risk averse than others, and experts must be as cognizant of these as possible (Chapman, 2002; Noble and others, 2014).

17. The strategy therefore creates a framework for the Nairobi Convention to provide a range of support during the crucial policy formulation phase including, among other measures, communications support, awareness-raising, continued support for the ICZM process in the region, technical and legal support and conflict-resolution facilitators.

18. Both climate change adaptation and the ecosystem-based approach are relatively new fields of policymaking. It is perhaps inevitable therefore that a lack of expertise amongst policymakers may hinder progress in formulating useful policies and subsequent programmes of action (Naumann and others, 2011; Clar and others, 2013). Support is needed both to undertake the necessary appraisals of policy options (Royal Society, 2014) and to interpret their economic and social implications (Brown and others, 2011; Levine, 2014).

19. The communication and interpretation of science to policymakers and those potentially affected by those policies will be dealt with in more detail under strategic outcome 2.

KEY RESULT 1.3
MAINSTREAMING ADAPTATION

1. Climate change is likely directly (and indirectly) to affect many sectors of coastal economies, from fisheries, through ecotourism to coastal farming, also potentially affecting urban and rural housing, transport and other infrastructure as a result of sea-level rise, increased rates of erosion or flooding, increased impacts of storm activity, and other effects. Migration from inland areas, driven by climate change effects far from the coastal zone, may in turn affect coastal social and ecological systems, demands on infrastructure and other coastal resources.

2. Responses to these varied stresses do not easily fit within a single climate change policy, or fall under the mandate of a single ministry. Rather, these stresses demand a multisectoral response, in which climate change needs to be factored into a range of sector policies (Ranger and Gar-

bett Shiels, 2011). As stated by the Chief Executive Officer and Chair of the Global Environment Facility, Naoko Ishii, "there can be no separation between development and environment, as they are co-dependent. Healthy ecosystems are essential to secure human health, food, energy and water, and ultimately sustainable development" (Ishii, 2012).

3. The obvious approach is therefore to seek to mainstream climate change (Tompkins and Adger, 2003; Pervin and others, 2013). Indeed, at their 2012 meeting, the Conference of the Parties to the Nairobi Convention called for the mainstreaming of climate change into national programmes and policies (UNEP, 2012).

4. The strategy will therefore outline some areas of core support that can be usefully offered to member States, while at the same time recognizing that mainstreaming in member States is unlikely to succeed without national and local commitment to the approach – it cannot simply be the project of an external agency.

5. The strategy recognizes that mainstreaming is by no means a straightforward task (CIVICUS and others, 2011) and cannot be achieved through the application of a single approach across the region, but will require a range of approaches and initiatives applied across the various tiers of governance (CBD, 2008).

6. Three types of mainstreaming strategies have been identified (Pervin and others, 2013). These are, first, **integrationist** approaches, which simply aim to paste climate change adaptation on to existing policies but would not, a priori, address any inequalities or vested interests that might characterize those policies. Second, the **agenda-setting** approach is more consultative and would permit integration of an improved range of voices and interests. Third, the **transformative** approach, as the term suggests, is the most substantial in terms of expectations, seeking to change the very institutional arrangements of government and improve the equity of policies and their implementation (Pervin and others, 2013). The present strategy will support the long-term objective of achieving the transformative mainstreaming of climate-change adaptation in the region, but in the short-to-medium term it will also support the more modest agenda-setting and integrationist approaches.

7. A key first step towards achieving mainstreaming is to identify the suitable entry points into agenda setting, institutional reform and policy implementation. It is essential therefore that those lobbying for climate change adaptation to be incorporated into government policies have a clear understanding of the decision-making processes, those responsible and its timing and schedules. Would-be lobbyists therefore need to keep up to date with government business and ensure access to decision-makers or their advisors at the most effective stage in the process.

8. The strategy will therefore make provision for guidance and material support for representatives of government, and also of non-governmental organizations, who seek to promote the inclusion of climate change adaption into national and local policy development processes.

Strategic outcome 2 improved decision suport to policymaking

1. The Nairobi Convention is building its strategy in pursuit of a vision of climate change resilience among its member States. The first strategic outcome focuses on support for the mainstreaming of climate change adaptation in the policy agenda, and identifies areas where capacity for effective policy formulation can be supported.

2. The second strategic outcome aims to support a range of science and knowledge generation, and its effective communication and use. The objective of this outcome is the provision of information and knowledge that can inform decision-makers, civil society, communities and other participants in the policy process of both policy needs and policy options related to climate change impacts in coastal and marine social and ecological systems. At the same time and given an economic climate of relatively scarce financial resources, science must also be seen to address the most immediate challenges to livelihoods arising from climate change. This can be achieved through new science, but it also requires the effective transmission of information and knowledge to influence policies. There is an explicit recognition that the final responsibility, authority and accountability for policy ultimately lies with the decision-makers themselves (Rapley and others, 2014).

3. Making informed decisions on climate change will require access to a body of ever-evolving climate change knowledge. At the sector level, for example, information is needed for the establishment of management decision thresholds, the identification of potential interventions and the justification of a sufficient stream of resources to support the implementation of coastal and marine management. At the wider, multisectoral level, information on the potential economic costs (or benefits) of climate change to the coastal zone is needed to inform ICZM processes, strategic environmental assessments, and wider local and national government planning, for example. The application of this knowledge will also go beyond the confines of a ministry or country, and will contribute to the design of international development cooperation programmes.

4. Two important caveats must be made at the outset. First, it is important to bear in mind the complexity of most social and ecological systems: ecological responses to stresses such as climate change can be non-linear, antagonistic, synergistic or even chaotic. In other words, as Fréon and co-authors caution, "Predicting the effect of climate change on marine ecosystems presents a formidable challenge" (Freon and others, 2013). Similarly complex, non-linear, responses (for example, to resource access policies, alternative livelihood development, economic subsidies, etc.) may be observed within the social, political and even economic domains of the system. For that reason, risk assessments must be communicated in scientific outputs to all policy participants. Because of these complexities more information does not necessarily lead to improved management of these systems, although more information is clearly better than less (Billé, 2008).

5. Another important issue related to scientific information, and one that is especially relevant to governments and their finance ministries in particular, is that, once the opportunity to measure elements of a system at a particular point in time and space has been missed, the data and knowledge that might have been derived from it, are in most situations permanently lost or can only be recovered with the use of special (and more expensive) techniques (CEC, 2009).

6. Whatever scientific evidence is available for the policy formulation stage, it is crucial that it is robust – in other words, that the original data have been collected systematically, and that the subsequent analyses are appropriate, transparent and credible. But evidence must also be relevant to the context of the policy formulation, and it should be provided in a timely fashion. The information and evidence base on which policy may be formulated can also be seen to have a number of components. These include statistical data, outputs from research analyses, various forms of direct stakeholder evidence and evidence from practice itself (DFID, 2010).

7. It is not the role of the present strategy to define the precise details of the science that is required for effective policy formulation. There are a number of themes, however, that can be usefully identified here, thus giving the secretariat a general mandate, and providing guidance for the subsequent implementation of the Nairobi Convention's contribution to climate change adaptation in the region.

8. The overall objective of the science is to understand better the vulnerability to climate change of a social and ecological system. There are two principal domains that are commonly used as a broad framework in vulnerability assessments – the ecological domain and the socioeconomic domain – as shown in the figure below (adapted from Marshall and Marshall, 2010; Cinner and others, 2013).

9. The two domains – ecological and socioeconomic – clearly differ substantially in their underlying structures and characteristics: the former include, among other components, fish populations, mangrove forests, subtropical

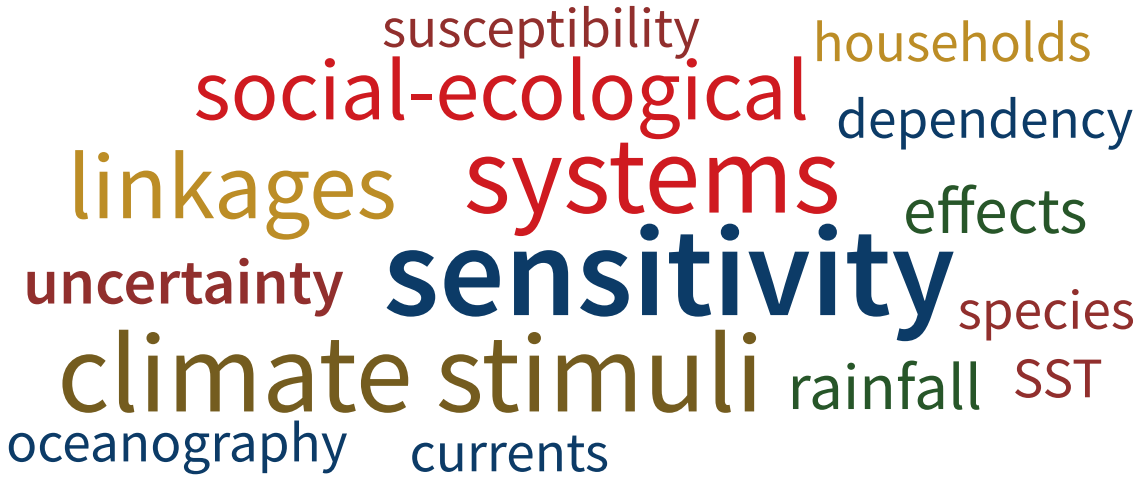
gyres, etc., and the latter include fishers, coastal communities, markets and governments, etc. Nevertheless, the two domains can be seen to be amenable to analysis using the same basic heuristic frameworks of exposure, sensitivity and recovery (or adaptive potential) that together determine the overall vulnerability.

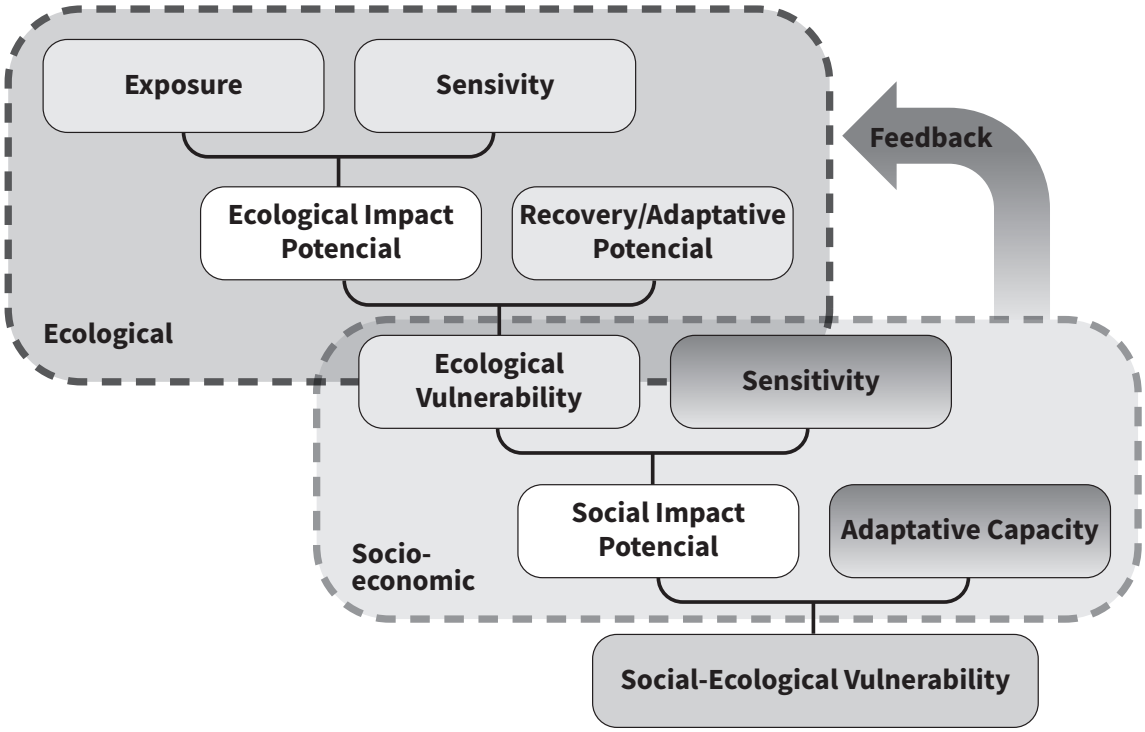
10. Understanding the potential exposure of an ecosystem to climate change requires, in the first instance, some level of understanding at regional and subregional levels of the likely (modelled) atmospheric and oceanographic responses to global carbon emissions.

11. Sensitivity can be defined as "the degree to which a system is affected, either adversely or beneficially, by climate-related stimuli" (IPCC, 2001). The sensitivity of the various biotic components (the entry point of this aspect of the strategy) of an ecological system, such as plankton, fish, mangroves, etc., is the second level of knowledge required. Account can also be taken of the sensitivity of abiotic components, such as rainfall, river discharge, sea surface temperature and others.

12. The third element is knowledge of the extent to which the different components of the ecological system (species) are likely to be able to persist in the face of change; in other words their capacity to adapt to specific short-lived events or to new conditions that may become established. Together, exposure, sensitivity and adaptive capacity combine to determine the overall ecological impact potential of climate change on a particular ecosystem.

13. The same concepts apply to the socioeconomic component of a system, but analysis of the sensitivity of fish, mangroves and other components is replaced by an analysis of the exposure and sensitivity of communities that are part of that system: fishers, their families and communities, the economies based around production from a particular ecosystem and those for which





food security is, to some degree or other, reliant on that production. Account must also be taken, of course, of the crucial aspect of their adaptive capacity.

KEY RESULT 2.1
IMPROVED UNDERSTANDING OF THE ECOLOGICAL IMPACT OF CLIMATE CHANGE

1. This section focuses on increasing scientific knowledge of how the coastal and marine social and ecological systems of the Western Indian Ocean region are likely to interact with atmospheric and oceanographic changes caused by higher atmospheric concentrations of greenhouse gases. Improved understanding is vital because these ecosystems are the primary source of many of the goods and services on which communities, the private sector and, ultimately, governments depend.

2. Determining the exposure of the Western Indian Ocean coastal and marine ecosystem to climate change effects is problematic not only because of the inherently complex nature of atmospheric and ocean dynamics in general, but also because of its connection with other systems. Despite the global scale of these processes and of the associated knowledge base, it is necessary to develop a better understanding of specifically how climate change is affecting the Western Indian Ocean region. Significant gaps in this understanding remain, however, and this deficit was highlighted in the consultations and recommendations that led to the development of the present strategy.

3. An early action of the strategy will therefore be to identify, through a series of consultations with partners, immediate science-related constraints to decision-making, and to identify the scope of potential financial mechanisms available. An interface will be established between the Nairobi Convention and science partners in each country, including regional institutions, notably the Forum for Academic and Research Institutions in the Western Indian Ocean Region (FARI) and WIOMSA. The science programme will include a strategy implemented jointly with member States to identify areas where international specialists and those from within the region itself can supplement national capacities. Full advantage will also be taken of technical exchange and training opportunities.

4. Oceanographic science: More specifically, there is a need to develop a programme of research into atmospheric and oceanographic processes across the Western Indian Ocean. The design of such a programme will build on recent and ongoing regional programmes, and also on programmes under way in individual Nairobi Convention member countries and in groups of such countries.

5. The Nairobi Convention secretariat will support member States, task forces and Convention partners in developing a long-term and cost-effective programme of atmospheric and oceanographic science. The programme will incorporate new observation sites and research teams alongside those already in place, and will further contribute to recent improvements in the understanding of temporal and spatial oceanographic variability. More specifically, the atmospheric and oceanographic science programme will seek to:

- Contribute to an improved understanding of the El Niño-Southern Oscillation and the Indian Ocean Dipole, their interrelationships and their projected changes under climate change;
- Monitor gyres, current flow volumes and the thermal characteristics of the major current systems of the Western Indian Ocean, including the South Equatorial Current, the Agulhas Cur-

rent and the Somali Current;
- Monitor the thermocline and mixed layer depth;
- Monitor ocean chemistry, in particular to identify the rate of acidification;
- Ensure continued adequate monitoring of sea-level rise throughout the region.

6. As part of its contribution to climate-change science, the Nairobi Convention will also establish a Western Indian Ocean atmospheric and oceanographic task force. With terms of reference of a scope similar to that of the Convention's other task forces, the atmospheric and oceanographic task force will comprise regional experts, together with invited international experts where appropriate, who will lead the process of development and subsequent supervision of a regional-level science programme. In addition to ensuring that the programme is grounded in best practice, the task force will strive to ensure complementarity, to avoid unnecessary duplication and to ensure that research programmes are responsive to member States' needs. The task force will play a key role in disseminating and communicating the various outputs of the programme to governments.

7. Understanding the sensitivity of a marine ecosystem requires a description of the ecology of the system in question, and how that ecology is likely to be affected by climate and oceanographic changes, although the uncertainty (and perhaps chaotic character) of response is a recognized constraint on subsequent decision-making based on scientific outputs.

8. Ocean productivity: Primary productivity is the foundation of the Western Indian Ocean's coastal and marine ecosystems. The extent of this production is determined by a complex interaction of nutrients, acidity, temperature, ocean currents, gyres and vertical water movements, which are all potentially affected by climate change. Determining the subsequent sensitivity of primary productivity, in the form of phytoplankton, to changing oceanography can provide early warning of potentially critical changes at the base of the food chain. A regional primary productivity science programme, underpinned by sound data and guided by methodologies from global research undertakings will be established, with the aim of developing, at an early stage, a plankton biodiversity database and the monitoring of the phenology (annual life-cycles) of plankton communities in the Western Indian Ocean.

9. Coral-reef ecosystems: The Nairobi Convention secretariat, member States and partners will work on scientific programmes to investigate key determinants of resilience to climate change. This work will include the following specific themes identified by international experts as being of special importance to the resilience of coral-reef ecosystems (McClanahan and others, 2012):
- Thermal resistance of coral species;
- Effects of nutrients on vulnerability to bleaching (linkage to the land-based activities strategic action programme);
- Coral diversity and growth rates;
- Herbivore fish biomass;
- Coral recruitment and the nature of regional connectivity;
- Water movement and light penetration.

10. In addition to the targeted science programme, the Nairobi Convention will continue to work with its partners, in particular the Consortium for the Conservation of Coastal and Marine Ecosystems in the Western Indian Ocean (WIO-C),

and also with the Global Coral Reef Monitoring Network (GCRMN) and the International Coral Reef Initiative (ICRI), to maintain and expand current long-term monitoring activities related to coral-reef ecosystems. The long-term monitoring programme will include aspects such as calcification rates in corals, species composition and abundance, and recovery trajectories after bleaching events. Monitoring outputs will include refinement of existing coral-reef resilience index mapping, which can subsequently inform decision-making on the location of new protected or reserve marine areas.

11. The monitoring action will build on the two existing GCRMN coral-reef monitoring networks established since 1998, covering East Africa and the Western Indian Ocean islands. The Nairobi Convention secretariat will also support the sourcing of core funding to maintain these networks, which historically have tended to have only intermittent access to funds and to produce the biennial reports that contribute to the global status of coral reef reports. Central to this action will be the lead provided by the Convention's coral reef task force, which will provide the technical guidance for programme development, while its members will play a key role in programme implementation at the country level. A crucial function of the task force in the context of the present strategy will be to ensure in a proactive manner that the monitoring networks are informed as new knowledge on coral-reef ecosystems is generated, both from within the region and from international research outputs. In addition, the task force will support the incorporation of such knowledge into monitoring and research protocols, with a view to improving interpretation of the data and application of the results for marine conservation planning.

12. Mangrove and seagrass habitats: Scientists affirm that "mangroves, salt marshes and seagrasses are among the most cost effective carbon capture and storage systems on the planet" (Nellemann and others, 2009). Mangrove and seagrass conservation is one of the few practical interventions by which Western Indian Ocean countries can help contribute to the mitigation of climate change. But they are also important components of coastal ecology in that they can act as buffers against coastal erosion caused by sea-level rise and increased wave impact, and they are significant contributors to coastal natural resource-based livelihoods.

13. As is the case with coral reefs, many of the initiatives already under way in the Western Indian Ocean are in response to pre-existing stressors, including the uncontrolled cutting of mangrove forests for their wood products. The present strategy proposes political support and leverage through the mechanism of the Nairobi Convention itself to enhance these existing initiatives, both nationally and regionally (for example, through the Mangroves for the Future programme). The Convention's Land-based Sources of Pollution Protocol and Strategic Action Plan will also be crucial in reducing pollution stresses on mangroves and seagrass.

14. Much of the mangrove and seagrass science under way in the region is seeking a better understanding of the sensitivity and responses of these habitats to climate-change stresses and the connectivity between these and other important ecosystems, including coral reefs. In recent regional consultations on mangroves, however, further research constraints have been identified and therefore, under the strategy, the Nairobi

Convention will support member States in identifying and establishing coastal buffer zones to allow for the migration of mangroves associated with rising sea-levels and coastal inundation. The Convention's new mangrove task force will lead and ensure coordination between its member States in this work.

15. For seagrass, there is a greater need to develop substantive new research and conservation programmes. At the outset, therefore, the strategy proposes the establishment of a seagrass task force, along similar lines to those for coral reefs and mangroves. The seagrass task force will guide the development of, and track existing, seagrass initiatives in the Western Indian Ocean region and will ensure that their results and recommendations are shared throughout the region. Although the programme's feasibility will depend on the extent to which it can identify and secure the necessary funds, the task force will be initially convened to develop a coherent programme to address key knowledge gaps including:

Biochemistry

- The effect of changes to sea surface temperature;
- The effect of changing ocean chemistry (e.g. acidification);
- The effect of acidification on mollusc grazers.

Ecology

- Monitoring of the distribution of existing seagrass species;
- Monitoring for colonization by invasive species;
- Monitoring of the growth of competitive algae;
- Monitoring of effects of droughts.

16. As is the case for the other coastal ecosystems, the seagrass task force will incorporate knowledge generated from research into and the monitoring of non-climate stressors of seagrasses (e.g. land-based and marine pollution). In addition, the knowledge base on seagrasses will be augmented by the refinement of existing maps of seagrasses, including those developed for oil-spill contingency planning. The maps will be applied in seagrass conservation strategies to ensure that representative sites and species are protected through the Western Indian Ocean region.

17. Highly migratory species: The Nairobi Convention recognizes the importance of the migratory species that inhabit the Western Indian Ocean. These species, which are iconic, belong to the cultural heritage, are important to the ecosystem and have economic value, include whales, whale sharks, tuna, marine turtles and seabirds. The strategy proposes continued support for monitoring the impacts of climate change on highly migratory species, and it is expected that changes in the spatial and temporal distribution of species will be one of those impacts.

18. Connecting the task forces: Under the strategy a number of thematic task forces are proposed. It is further proposed that these task forces will identify suitable existing opportunities (for example, the biennial WIOMSA Scientific Symposium) to exchange research findings, and to ensure connectivity between the scientists, just as there is connectivity between the ecosystems that they study. The scope of the joint task force meetings will be extended to include understanding of the exploitation of these various ecosystems by coastal communities.

19. Regional capacity-building: A key element of the climate change strategy is support for the formation of a regional skills base in ecological and

social sciences. The Western Indian Ocean region already has opportunities for capacity-building through established development partnerships and programmes, and also through the contribution of universities and colleges in the region and of regional institutions, such as WIOMSA. Needs remain in this area, however, and, although it is not the function of the strategy to define the precise content of capacity-building initiatives, one of its core principles is that capacity-building elements should be routinely included in all science programmes.

KEY RESULT 2.2
IMPROVED UNDERSTANDING OF THE VULNERABILITY OF COASTAL COMMUNITIES

1. Vulnerability assessments of the socioeconomic domain are the focus of this key result. There are two main components, the assessments themselves and capacity-building to undertake the assessments. The strategy envisages that all capacity-building activities shall be explicitly motivated by specific opportunities to undertake vulnerability assessments, with the result that newly developed capacity can be more or less immediately applied.

2. Priority vulnerability assessments: The criteria for the selection of target sites (or sectors) for vulnerability assessments will be based on national priorities, which will differ from country to country. The Nairobi Convention national focal points will take responsibility for initiating the process of identifying these priorities and appropriate forums would include ICZM committee meetings. The focal points would also be responsible for ensuring that the outputs of the assessments are effectively communicated both to the beneficiary communities themselves, and to local and national government institutions. Both the national focal points and the secretariat will undertake to identify potential sources of funds to deliver these vulnerability assessments.

3. While the scope of the assessments will necessarily vary according to the available ecological and socioeconomic information, initial pre-assessment activities should identify any data and information deficiencies that may exist. Potential means by which these deficiencies can be remedied will also be identified. Specific data deficiencies and the means of remedying them will be communicated to relevant decision-makers in order that they might take the necessary action. From the outset, the social domain of the vulnerability assessments will be systematically informed by the knowledge available from the ecological domain, therefore explicitly integrating the social and ecological systems.

4. The vulnerability assessments will also explicitly recognize the multiplicity of economic activities characteristic of households in most, if not all, coastal communities in the Western Indian Ocean, and also the wider political and economic context of the globalized society and economy. For example, the assessments will include expertise on small and medium-size enterprises and trade analysis.

5. The Convention also proposes to support and lobby for ecosystem valuations, building on existing WIO-C initiatives. The incorporation of coastal and marine ecosystems into national accounts can help member States understand the costs of management inaction and encourage them to

review budget allocations for coastal and marine ecosystem management.

6. It is critical to ensure that climate change vulnerability assessments generate robust outputs that can be subsequently applied to inform decision-making from the levels of individual communities through to that of national governments. The relevant methods for the social domain of vulnerability assessments include resource-use profiling, stakeholder mapping, livelihood analysis, asset profiling, analysis of perceptions related to marine resource dynamics, market chain analyses (including fisheries, tourism etc. as appropriate) and institutional analyses.

7. In fact, the majority of these broadly social science methods have been previously developed in non-climate-change contexts. Thanks to historical capacity-building initiatives across the Western Indian Ocean and experience from the implementation of various agricultural, forestry, fisheries and health sector programmes at national and regional levels over at least the last decade, the region is already endowed with a considerable level of general assessment capacity. Add to this that fact that a number of specific climate-change vulnerability assessments have been recently undertaken in the Western Indian Ocean, and it is apparent that the Western Indian Ocean already possesses the capacity for climate change vulnerability assessments. What is needed is to ensure that this general capacity is adapted to the specific nature of such vulnerability assessments. For this it is necessary that the skills and experience of those who have already undertaken specific climate change vulnerability assessment are adequately shared, while it will also be useful to incorporate the experience of professionals from other sectors.

8. Overall, however, the expectation of this particular objective is that the capacity is directly mobilized to implement actual assessments to inform adaptation and wider economic development policies. For this reason the strategy will start from the position of implementation, with capacity-building being undertaken in response to specific needs, rather than starting with a more general capacity-building programme.

9. Communities and local business: The strategy's ethos of participation and partnership will ensure that local stakeholders fully contribute to the assessments and that the results are clearly communicated back to them, in order that they are sufficiently informed to participate in the processes that lead to the subsequent formulation of policies. In recognition of the future exposure of communities to climate change impacts, the development and dissemination of targeted learning materials for incorporation into school curricula are also proposed.

10. For the implementation of the strategy, efforts will be made to secure the full participation of the private sector, in particular small and medium-sized enterprises and local tourism providers, in vulnerability assessments and to promote their participation in decision-making through governance institutions such as ICZM committees.

11. The strategy recognizes, however, that private sector stakeholders (as with any stakeholder group) will respond to opportunities to participate and contribute in a variety of ways. Some individuals or companies will tend to be innovators and will lead the way. Such individuals or companies can be usefully co-opted to encourage stakeholders who are more reluctant to get involved.

KEY RESULT 2.3
CLIMATE CHANGE INFORMATION AND KNOWLEDGE IS EFFECTIVELY COMMUNICATED

1. Beyond capacity in particular scientific skills, there is a need to strengthen the extent to which science participates in and contributes to the climate change adaptation debate in the region, and to subsequent policy formulation. The successful communication of this knowledge between scientists, communities, the private sector, local governments, sectoral ministries and multisectoral governance institutions is therefore ***a sine qua non***.

2. A start has been made in Africa, with the 2010 launch of the AMCEM Climate Change Communication Strategy. This Strategy is designed to 'equip African Ministers of Environment and other African climate change actors and decision makers engaged at the technical and policy level with timely and relevant information they can use in making decisions and choices'.[9]

9. African Ministerial Conference on the Environment (AMCEM) Consultative Meeting, August, 2010. Nairobi

3. Climate change science can be complex and extensive in its scope and detail, and will require translation into concepts and actions that are accessible to all the stakeholders involved in the process. Equally important is a proper inclusion of the local context to which policy actions will be applied.

4. The impact of scientific or technical knowledge and recommendations, and the inclusion of local context into policy formulation can be enhanced by contributions from so-called "knowledge brokers". Knowledge brokering has been defined as a "strategy, approach or process that facilitates the exchange of knowledge between producers and users. Knowledge brokering serves two purposes: first, to improve the utility of knowledge such that it actively informs decision-making and has a noticeable effect on the quality of decisions, policies and processes. Second, it aims to improve the receptivity of decision-makers to new knowledge" (DFID, 2010).

5. Knowledge brokers may only be necessary as neutral intermediaries between the parties en-

gaged in the policy formulation process, or they may be engaged proactively to establish and animate a stakeholder network. They may also contribute to building the capacity of institutions (including social networks) to participate in the future and to help develop a deeper engagement between decision-makers, scientists and civil society.

6. A knowledge broker may be required to identify sources of knowledge, and to work with those who initially generate that knowledge to improve their capacity to communicate it to stakeholders who require it for policy formulation (Rapley and others, 2014; Rowson and others, 2015). As these stakeholders may be professional government staff, or volunteer or elected representatives of communities, stakeholder organizations and other bodies, a range of communications approaches is required (Michaels, 2009).

7. Knowledge-brokering (and the communication of science) will seek to employ traditional communication tools (such as workshops and meetings, posters, radio and TV broadcasts) but also evaluate the potential of social media (DFID, 2010).

8. The scientists themselves may also play a key role in this brokering and communicating process. Under the strategy, capacity-building in science is therefore expected to extend beyond the purely technical and to include the development of skills as knowledge brokers (Rowson and Corner, 2015). In taking on that role, scientists will need to have a better understanding of the needs that governments, communities and other stakeholders have for science and what science should be contributing to the policy process. This will, in turn, require the effective delivery of more inclusive governance approaches, such as the ICZM approach.

9. Improved access to knowledge is essential for stakeholders in the coastal and marine environments of the Western Indian Ocean, an observation that is common to all the consultations that

inform the present strategy. The Nairobi Convention has already been active in this arena through its development of its clearing-house and information system. The system has great potential as an information hub for the region, to contribute to learning and to facilitate access to the knowledge currently being generated on how marine and coastal systems function and how people interact with them.

10. Climate change knowledge portal: The strategy provides for a dedicated climate change knowledge portal for the clearing-house and information system. But, in recognition of the critical necessity of taking a proactive approach to the management of such portals, this action will require a portal animator. The animator will undertake regular and frequent (for example, quarterly) reviews of the contents to ensure that they are populated with relevant and current outputs from the region and selected outputs from global experience. The animator would source, among other materials:

- Vulnerability assessment reports;
- Nairobi Convention task force reports;
- Regional monitoring reports (e.g. from GCRMN, on sea-level etc.);
- Public domain climate change research outputs;
- Relevant experience from non-marine sectors.

11. Given the constraints associated with establishing public access to scientific reports published in journals, due to copyright issues, the animator would also be responsible for the production of an annotated bibliography (and selection of abstracts) of climate change research outputs, covering both ecological and social domains.

12. Given also the periodic nature of the contribution of a portal animator, the position would be filled on a short-term contract basis. The work of the animator would be informed and assisted by participation in a suitable forum where the necessary expertise is gathered. A suitable forum would be the biennial WIOMSA Scientific Conference, for which a dedicated session or side event would be organized on the climate change portal. The portal may also include a data library function (in a sim-

ilar manner to the more extensive clearing-house and information system), and for this there will be a need to define protocols for the sharing of data, based on current clearing-house and information system protocols where appropriate. Demand for further geographic information system (GIS) functionality will be assessed. The Nairobi Convention will ensure a high visibility for the portal through the secretariat and the national focal points.

13. Access to climate change finance is a crucial facility, and the portal can play a role through the periodic collation of available information and provision of simple guidelines to help interpret the often complex information, with a view to facilitating a better understanding of the modalities of access. In addition, the Convention secretariat and the national focal points will actively disseminate information on climate-change finance through appropriate national and regional forums.

14. The strategy has already explored opportunities for generating new knowledge on climate-change in the Western Indian Ocean, associated ecosystem responses and the potential vulnerability of coastal communities. The Nairobi Convention has voiced its support for a climate-change portal on the regional clearing-house website. This next aspect focuses on direct provision of knowledge to stakeholders. In achieving this, it is anticipated that the Nairobi Convention national focal points will play a key role, by creating a link between the secretariat and Convention partners and their respective ministries and country stakeholders.

15. Government ministries and local government: The Convention secretariat undertakes to support these institutions through the following activities:

- Drawing up a standardized climate change information checklist and working towards its completion by all Convention member States, with a view to establishing an initial descriptive database (in other words, containing metadata – or data on what data and information are already available);
- Providing ministries and local governments with regular reports on the status and content of the climate change portal of the clearing-house information system;
- Lobbying for funding for regional, long-term core data collection and management, and publication of the knowledge subsequently generated;
- Promoting and supporting member States' participation in regional networks (communities of practice);
- Monitoring the uptake and application of climate-change knowledge and research recommendations in the Western Indian Ocean region and identifying any constraints to their use;
- Exploring the needs and opportunities for effective communication to local government officers in particular, to ensure that they are not excluded from communities of knowledge.

Strategic outcome 3 implementation of climate change adaptation is supported

1. The strategy has so far focused on the stages of the policy process covering the agenda, policy formulation issues and the provision and brokering of information and knowledge to support that decision-making. The third strategic outcome will address the types of support that the Nairobi Convention should provide to member States in the actual implementation of policy decisions.

2. Implementation is a process of taking policy principles and translating their objectives into regulations, designing appropriate actions and then bringing these actions to fruition.

3. Many different aspects may come into play during policy implementation. Previous references have been made in the strategy to the importance of political will, the legal context, institutional and governance issues, and technical capacity, for example, in determining the formulation of policies. These issues are also crucial to the successful implementation of policies (Ribeiro and others, 2008; CRC, 2009; Corfee-Morlot et al, 2009; Moser and Ekstrom, 2010; Clar and others, 2013; Mimura and others, 2014).

4. The importance of political will to see through the process of implementation cannot be overstated. It is essential, therefore, that the political actors who will be primarily involved in supporting implementation have been adequately involved both in the initial policy formulation process and

the planning of the implementation itself. If these actors continue to display a lack of commitment, the reasons for this must be identified and addressed (IIED, 2013; Clar and others, 2013). Without such participation, policies will be seen as being nothing more than symbolic in nature with the risk that the process is discredited, with obvious implications for future stakeholder collaboration and buy-in (Newig, 2007). The Nairobi Convention will provide support to contracting parties to address political bottlenecks including lobbying through national focal points.

5. National policies, local actions: Many, if not most, adaptive policies are actually implemented through specific actions that take place at some sort of local level. Depending on the appropriate scale, the design of implementation therefore may therefore be based on a strong bottom-up or community contribution. This should not be problematic in terms of the general thrust of policy content itself if effective consultations took place during policy formulation. It is recognized, however, that coastal communities, civil society, and their local government partners will usually require some degree of technical guidance and financial support to design and then implement appropriate local responses (Mimura and others, 2014; Noble and others, 2014). It is also likely that some local actions will benefit from coordination across administrative levels and between sectors, such as through local ICZM initiatives.

6. The Nairobi Convention will therefore continue to support contracting parties in gaining access to resources to achieve local implementation. And the Convention, through its role as a platform for dialogue and through its facilitation of seminars and workshops, can also continue to promote sharing and the learning of lessons on the outcomes of local implementation across the region. The strategy also recognizes how important it is that the various actors involved in implementation have a clear and shared understanding of their different roles and responsibilities in the implementation of adaptation actions. This can be fostered by the facilitation of regular meetings of these actors or their representatives. Similarly, clear leadership is of paramount importance and the Nairobi Convention will continue to seek opportunities for the capacity-building at a regional scale of suitable candidates to take on this crucial role (Moser and Ekstrom, 2010; Clar and others, 2013).

7. Given that implementation takes place at local levels, the legal context may represent a barrier to implementation (Nilsson and Swartling, 2009; Clar and others, 2013). Thus, where implementation calls for scales of action that span local jurisdictions, there may be a requirement for adjustments to the legal arrangements. There is also a need to ensure that legal requirements for the implementation of adaptation are at least integrated with existing legal frameworks for disaster planning, land-use planning, co-management and protected area planning (EnAct, 2011). The Nairobi Convention can provide contracting partners with the necessary technical support for any work on the legal framework. Similarly, adaptation planning must take into account the effects of non-climate factors on the social and ecological system in question and the manner in which they are being addressed through existing regulations (Preston and others, 2010).

8. The strategy recognizes that personal, social and cultural limits to adaptation are likely to exist. For

example, and for a number of potential reasons, among individuals in the same community there may be varying interpretations of what climate change might mean, and crucially how they will respond (Adger and others, 2007). The strategy proposes support for an improved understanding of this so-called "attitude-behaviour" gap where it is found to be a constraint to implementation. Local social and cultural characteristics mays also reduce the opportunities for some groups to participate adequately in decisions on the design and implementation of adaptation. The Nairobi Convention's support for local implementation will endeavour to include adequate monitoring of the equity of local decision-making on adaptation.

9. Local capacity development, and the adaptation actions themselves, are not short-term projects. The Nairobi Convention will therefore have another role to play in supporting implementation, which is to maintain dialogue with donors to ensure that any support that they provide, particularly in a multilateral context, the principle sphere of the Convention's work, is sustained for the long term (IIED, 2013).

10. The complexity of ecosystems and their various feedbacks and interactions imply that there is always going to be a level of risk associated with adaptation actions. An important element of risk for all stakeholders, albeit for different reasons, is that the adaptation initiative does not achieve its objectives. There are inevitably going to be limits to the ability of adaptation measures to manage the impacts climate change on social and ecological ecosystems. Further risk arises out of the challenge of quantifying the extent to which the policy objectives have been met, as well as the potential difficulty in actually attributing any observed change to a particular adaptation policy and subsequent action. Furthermore, benefits of adaptation will tend to be distributed over a long period of time, certainly relative to the typical political cycle. These factors can further constrain decision-making on adaptation policy.

11. Given the challenges related to predicting future climate change effects, and of measuring and attributing the impacts of adaptation policy, on coastal and marine ecosystems (Walker and others, 2003; Freon and others, 2013), developing no-regret actions should be a minimum objective. No-regret actions are those that would yield net ecological, social or economic benefits whatever the future climate delivers (Walker and others, 2003; Naumann and others, 2011; IPCC, 2014). If no-regret actions are informed by substantial best practice experience, then measurement and attribution in a particular context are likely to be less critical. Readers of the present strategy will be familiar with the multiple challenges already faced by communities and governments seeking to achieve sustainable use of coastal and marine ecosystems, and sustainable livelihoods derived from these ecosystems. Any action that can address, for example, the over-exploitation that currently characterizes most marine ecosystems in the Western Indian Ocean region will also in all likelihood serve to improve the adaptive capacity of ecosystems and the communities that rely on them. The Nairobi Convention, through its overall Action Strategy and also through the present climate change strategy, will continue to support member States in their efforts to address these challenges. This support will need to include opportunities for scientists, governments (both natural resource and economic development ministries) and the non-governmental sectors to share

ideas on the inclusion of no-regret options in implementing adaptive actions.

12. The present strategy provides a context in which the details of implementation actions that the member States should be applying can be defined. The detailed actions will ultimately vary according to specific site and between different natural systems, according to available technical and financial resources, and they will be influenced by local cultural features, political systems and by economic characteristics.

13. At a minimum, implementation actions should provide for the maintenance of interconnected ecosystems and the biodiversity within them; restoration or rehabilitation of degraded ecosystems and processes (coastal forests, mangroves, coral-reefs, estuaries, etc.), and the control of invasive species. More specifically, maintaining the integrity of a diversity of representative coastal and marine habitats will support resilience, and may conserve climate refuges – tools are being developed to support planning in this area (Graham and others, 2007; Morgan, 2014; Possingham, 2014; Darling, 2014). In terms of fisheries management, increased alignment between harvest levels and sustainable biomass will be essential (NOAA, 2010; Naumann and others, 2011).

14. Where institutional action is concerned, ensuring the effective application of integrated governance systems and of broad, multilevel, participation in decision-making, as also in the case of policy development, is likely to increase the effectiveness of adaptation actions (SRC, n.d.; Newig and Fritsch, 2009).

15. As for the roll-out of interventions, there is increasing evidence from the region, and globally, that the use of pilot projects is an approach that has much to commend it (CRC, 2009). The outcomes of these pilots can be used as proof of concept for wider audiences, although, given the resulting time-scales and attribution of outcomes, pilot projects must be carefully selected if they are to contribute in the short term to promoting the up-take of adaptation policy. The Nairobi Convention will work with Member States to identify, resource and implement pilot-scale projects.

Strategic outcome 4 evaluation of climate change adaptation

1. This final strategic outcome focuses on some areas where the Nairobi Convention sees opportunities to support member States in their evaluation of the climate change adaptation process. The scope of this section will include evaluation of the initial policymaking component, decision-support for that policymaking and the implementation of the climate change adaptation itself.

2. The uncertainty over future climate change effects, the existing complexity of the social and ecological systems on which these effects will be superimposed and the importance of context all pose significant challenges. Benefits from the adaptation process will tend to be distributed over a long period of time, relative at least to the political cycle, and the associated shifting baselines add further difficulties. It may also be difficult, however, to separate the effects of sector policies and the implementation of regulations from any climate change adaptation activity. This suggests that the evaluation of existing sector policies in terms of their contribution to climate change adaptation and the building of resilience would also be an appropriate measure (Brooks and others, 2011; Levine, 2014).

3. In the social context, the multisectoral nature of climate change adaptation, with a number of ministries, community-based and non-governmental organizations participating, creates further problems for monitoring and subsequent evaluation. These may be exacerbated if ministries, for example, have not established clear performance criteria or policy targets (AEA Technology Environment and others, 2005). The notion of "preparedness" for some future negative climate change impact is also difficult to measure (AEA and others, 2005; Bours and others, 2013).

4. In all contexts, there are – and will continue to be – inherent problems with the attribution of positive effects to adaptation policy and projects. This is partly because to evaluate the success of climate change adaptation, it is necessary also to measure what might be termed "non-events", because successful adaptation should prevent negative impacts and also partly because of natural system variability and the effects of the driving forces of change which are external to climate change. The definition of adaptation set out in the UNDP Monitoring and Evaluation Framework for Adaptation to Climate Change is instructive in this regard: "Adaptation is not generally an outcome, but rather consists of a diverse suite of ongoing processes (including social, institutional, technical and environmental processes) that enable the achievement of development objectives" (UNDP, 2007).

5. There is therefore no one-size-fits-all approach to evaluating the success of climate change adaptation (Pringle, 2011). In general, evaluation can be considered in two ways, outcome-based or policy and process-based approaches, and this is also the case with climate change adaptation. Overall, however, adaptation lends itself to pro-

cess-based indicators rather than outcome-based indicators. Outcome-based approaches may be useful where the expected outcomes are likely to be directly observable and are attractive because they lend themselves to being measured, but attribution remains problematic. Outcome-based approaches are particularly inappropriate for soft and mainstreamed adaptations (Ford and others, 2013).

6. Policy and process-based approaches are appropriate to a wider suite of adaptation processes measured against principles that are currently thought to be best practices. In terms of best practice governance, the principles that have been identified relating to the presence of political will and leadership, the application of multi-level governance systems, mainstreaming, the effective participation of stakeholders, and the contribution of decision-support systems are all accessible to such approaches, although their limitations are also recognized. Some simple potential indicators are presented in the following table (modified from Ford and others, 2011).

7. The present climate change strategy provides a framework for the Nairobi Convention to support member States in their evaluation activities. It is anticipated that this support would primarily take the form of regional-scale evaluation seminars and workshops to develop a common understanding of guiding principles and to initiate capacity-building. National and local evaluation procedures and approaches would then be developed by the member States themselves, with technical support and facilitation from the secretariat of the Nairobi Convention and from within the membership itself.

Adaptation Policy Process Component	Indicator	Sources of Information
Political Leadership	• Statements of importance on need for adaptation; • Inclusion of adaptation as policy priority; • National and local budgets provisioned.	• Climate change programs / policies / announcements; • Speeches at COP; • NAPA document; • Leadership identified in UNFCCC National Communications and/or National Adaptation Programmes of Action (NAPAs).
Institutional Organisation	• Lead department / agency identified with clear responsibilities; • Presence of adaptation planning documentation; • ICZM process underway and periodically evaluated.	• Lead organization specified for UNFCCC National Communications or NAPAs; • Adaptation documentations; • ICZM documentation.
Stakeholder Participation	• Stakeholders involved in national & policy consultations and VAs; • Implementation planning.	• National assessments; • Stakeholder consultation documentation.
Decision-support Systems	• National and Local VAs undertaken; • Climate change science programme; • Use of decision-making tools (e.g., cost benefit analysis, matrices etc.); • Use of climate change adaptation frameworks; • Communications programmes in place and evaluated; • Research programs for adaptation developed.	• Research needs identification in articles / reports; • NAPA; • VA documentation; • Peer-reviewed literature

Bibliography

Adger, W.N., N.W. Arnella and E.L. Tompkins (2005). Successful adaptation to climate change across scales. Global Environmental Change 15 (2005), pp. 77–86.

Adger, W.N., S. Agrawala, M.M.Q. Mirza, C. Conde, K. O'Brien, J. Pulhin, R. Pulwarty, B. Smit and K. Takahashi (2007). Assessment of adaptation practices, options, constraints and capacity. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, United Kingdom, pp. 717–743.

AEA Technology Environment, Stockholm Environment Institute, Metroeconomica (2005). Objective Setting for Climate Change Adaptation Policy. December, 2005.

Agyeman, J., P. Devine-Wright and J. Prange (2009). Close to the edge, down by the river? Joining up managed retreat and place attachment in a climate changed world. Environment and Planning A 41(3), pp. 509–513.

Batchelor, S. (2009). www.knowledgebrokersforum.org/wiki/item/summary-of-e-discussion-on-evaluating-impact-of-kb-work).

Berkhout, F., J. Hertin and D.M. Gann (2006). Learning to Adapt: Organisational Adaptation to Climate Change Impacts. Climatic Change, 78(1), pp. 135–156.

Billé, R. (2008). Integrated coastal zone management: four entrenched illusions. Surveys and Perspectives Integrating Environment and Society, 1, pp. 75–86, 2008.

Blühdorn, I. (2007). Sustaining the unsustainable: symbolic politics and the politics of simulation. Environmental Politics, Vol. 16, No. 2, pp. 251–275; April, 2007.

Bours, D., C. McGinn and P. Pringle (2013). Monitoring and evaluation for climate change adaptation: A synthesis of tools, frameworks and approaches. SEA Change Community of Practice. Phnom Penh and UKCIP, Oxford.

Brooks, N., S. Anderson, J. Ayers, I. Burton and I. Tellam (2011). Tracking adaptation and measuring development. IIED Climate Change Working Paper No. 1, November 2011.

Bromley-Trujillo, R., J. Leising and J. Poe (2014). The Importance of salience: public opinion and State policy action on climate change. Presentation at the Annual Meeting of the State Politics and Policy Conference, Bloomington, 15–18 May 2014.

Brown, A., M. Gawith, K. Lonsdale and P. Pringle (2011). Managing adaptation: linking theory and practice. UKCIP.

CBD (1998). Report of the Workshop on the Ecosystem Approach. Conference of the Parties to the Convention on Biological Diversity. Fourth Meeting. Bratislava, Slovakia, 4–15 May 1998.

CBD (2008). Connecting Biodiversity and Climate Change Mitigation and Adaptation. Report of the Second Ad Hoc Technical Expert Group (AHTEG) on Biodiversity and Climate Change under the Convention on Biological Diversity (CBD).

CEC (2009) Building a European marine knowledge infrastructure: Roadmap for a European marine observation and data network. SEC

(2009) 499 final.

Chapman, J. (2002). Systems perspective on computing in the NHS. Informatics in Primary Care, Volume 10, Number 4, 1 November 2002, pp. 197–199(3).

CIVICUS, PNUD Madagascar, MSIS and CNPC (2011). Détermination de l'indice de la société civile - Etude de cas: engagement de citoyen et volontariat, 40p.

Clar, C., A. Prutsch and R. Steurer (2013). Barriers and guidelines for public policies on climate change adaptation: A missed opportunity of scientific knowledge-brokerage. Natural Resources Forum 37 (2013) pp.1–18.

Corfee-Morlot, J., L. Kamal-Chaoui, M. G. Donovan, I. Cochran, A. Robert and P-J. Teasdale (2009). Cities, climate change and multilevel governance. OECD Environmental Working Papers N° 14, 2009, OECD publishing.

CRC (2009). Adapting to Coastal Climate Change: A Guidebook For Development Planners. USAID/CRC/NOAA.

Darling, E. (2014). Conserve climate refuges. Nature, Volume: 515, pp 28–31. 6 November 2014.

De Young, C., D. Soto, T. Bahri and D. Brown (2001). Building resilience for adaptation to climate change in the fisheries and aquaculture sector. In: Building Resilience for Adaptation to Climate Change in the Agriculture Sector. Proceedings of a Joint FAO/OECD Workshop 23–24 April 2012. Edited by A. Meybeck, J. Lankoski, S. Redfern, N. Azzu and V. Gitz.

Field, C.B., V.R. Barros, M.D. Mastrandrea, K. J. Mach, M.A.-K. Abdrabo and W.N. Adger and others (2014). Climate Change 2014: Impacts, Adaptation, and Vulnerability. IPCC WGII AR5 Summary for Policymakers.

Fisher, C. (2012). Evaluating the impact of knowledge brokering work. Analysis of e-discussions on the Knowledge Broker's Forum. Institute of Development Studies. January, 2012.

Ford, J.D., L. Berrang-Ford, A. Lesnikowski, M. Barrera and S. J. Heymann (2013). How to track adaptation to climate change: a typology of approaches for national-level application. Ecology and Society 18(3):40. http://dx.doi.org/10.5751/ES-05732-180340.

Fréon, P., F. Werner and F. Chavez (2013). Conjectures on future climate effects on marine ecosystems dominated by small-pelagic fish. In Checkley, D.M., J. Alheit, Y. Oozeki, C. Roy (Eds.) (2013) Climate Change and Small Pelagic Fish. Cambridge University Press.

Graham, N.A.J., S.K. Wilson, S. Jennings, N.V.C. Polunin, J.P. Bijoux and J. Robinson and T. M. Daw (2007) Lag effects in the impacts of mass coral bleaching on coral reef fish, fisheries, and ecosystems. Conservation Biology Volume 21, No. 5, 1291–1300.

Hallegatte, S. and P. Dumas (2009). Adaptation to climate change: soft vs. hard adaptation. Centre International de Recherche sur l'Environnement et le Développement (CIRED).

Hesselink, F., W. Goldstein, P. P. van Kempen, T. Garnett and J. Dela (2007). Communication, Education and Public Awareness (CEPA) A Toolkit for National Focal Points and NBSAP Coordinators (Secretariat of the Convention on Biological Diversity and IUCN: Montreal, Canada) 2007.

Hoegh-Guldberg, O., P.J. Mumby, A.J. Hooten, R.S. Steneck, P. Greenfield, E. Gomez, C.D. Harvell, P.F. Sale, A.J. Edwards, K. Caldeira, N. Knowlton, C.M. Eakin, R. Iglesias-Prieto, N. Muthiga, R.H. Bradbury, A. Dubi and M.E. Hatziolo (2007). Coral Reefs Under Rapid Climate Change

and Ocean Acidification. DOI: 10.1126/science.1152509.

Jones, L. (2010). Overcoming social barriers to adaptation. Background Note. July 2010. Overseas Development Institute (ODI).

Karani, I., S. Anderson and N. Kariuki (2014). Institutionalising adaptation monitoring and evaluation frameworks: Kenya. IIED Briefing. Issue August, 2014

Kingdon, J. W. (1995). Agendas, Alternatives, and Public Policies (2nd ed.). New York: Longman.

Klein, R.J.T., S. Huq, F. Denton, T.E. Downing, R.G. Richels, J.B. Robinson and F.L. Toth (2007). Inter-relationships between adaptation and mitigation. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson (Eds.). Cambridge University Press, Cambridge, United Kingdom, 745-777

Klein, R.T.J., R.J. Nicholls and N. Mimura (1999). Coastal adaptation to climate change: Can the IPCC technical guidelines be applied? Mitigation and Adaptation Strategies for Global Change 4: pp. 239–252, 1999

Levine, S. (2014). Assessing Resilience: why quantification misses the point. Humanitarian Policy Group (ODI) Working Paper, July 2014.

Local Governments in Eastern Africa, CLGF UNCDF UNDP 2011.

Manning, M., M. Petit, D. Easterling, J. Murphy, A. Patwardhan, H-H. Rogner, R. Swart and G. Yhoe (eds.) (2004). IPCC Workshop on Describing Scientific Uncertainties in Climate Change to Support Analysis of Risk and of Options. Workshop Report. National University of Ireland, Maynooth, Co. Kildare, Ireland, 11–13 May, 2004.

Marshall, G. (2014). After the floods: Communicating climate change around extreme weather events. Climate Outreach and Information Network.

McClanahan, T.R., S.D. Donner, J.A. Maynard, M.A. MacNeil, N.A.J. Graham et al. (2012). Prioritizing key resilience indicators to support coral reef management in a changing climate. PLoS ONE 7(8): e42884. doi:10.1371/journal.pone.0042884.

Meidinger, E.E. (2000). Organizational and Legal Challenges for Ecosystem Management. www.law.buffalo.edu/homepage/eemeid/scholarship/orglegchal.htm. Accessed November 2011

Michaels, S. (2009) Matching knowledge brokering strategies to environmental policy problems and settings. Environmental Science and Policy (2009), doi:10.1016/j.envsci.2009.05.002.

Mimura, N., R.S. Pulwarty, D.M. Duc, I. Elshinnawy, M.H. Redsteer, H.Q. Huang, J.N. Nkem and R.A. Sanchez Rodriguez (2014) Adaptation planning and implementation. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom.

Morgan, L. (2014). Protect Diverse marine habitats. Nature, Volume: 515, pp. 28–31, 6 November 2014.

Moser, S. (2009). Making a difference on the ground: the challenge of demonstrating the effectiveness of decision support. Climate Change 95(1): pp.11–21.

Moser, S., and J.A. Ekstrom (2010). A framework to diagnose barriers to climate change adaptation. PNAS 107(51): pp. 22026–22031.

Munang, R., I. Thiaw, K. Alverson, M. Mumba, J. Liu and M. Rivington (2013). Climate change and ecosystem-based adaptation: a new pragmatic approach to buffering climate change impacts. Current Opinion in Environmental Sustainability 2013, 5.

Nairobi Convention (in prep.) Action Strategy. Nairobi Convention Secretariat, Nairobi, Kenya.

Naumann, S, G. Anzaldua, P. Berry, S. Burch, M. Davis, A. Frelih-Larsen, H. Gerdes and M. Sanders (2011). Assessment of the potential of ecosystem-based approaches to climate change adaptation and mitigation in Europe. Final report to the European Commission, DG Environment, Contract no. 070307/2010/580412/SER/B2, Environmental Change Institute, Oxford University Centre for the Environment.

Nellemann, C., E. Corcoran, C.M. Duarte, L. Valdés, C. De Young, L. Fonseca, and G. Grimsditch (eds.) (2009). Blue Carbon: A Rapid Response Assessment. United Nations Environment Programme, GRID-Arendal.

Newig, J. and O. Fritsch (2009). Environmental governance: participatory, multi-level – and effective? Environmental Policy and Governance 19, pp. 197–214 (2009).

Newig, J. (2007). Symbolic environmental legislation and societal self-deception. Environmental Politics, Volume 16, Issue 2, 2007.

Niang, I., O.C. Ruppel, M.A. Abdrabo, A. Essel, C. Lennard, J. Padgham and P. Urquhart (2014). Africa. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Barros, V.R., C.B. Field, D.J. Dokken, M.D. Mastrandrea, K.J. Mach, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom, and New York, United States, pp. 1199–1265.

Nicholls, R. J., S. Hanson, C. Herweijer, N. Patmore, S. Hallegatte, J. Corfee-Morlot, J. Chateau and R. Muir-Wood (2008). Ranking port cities with high exposure and vulnerability to climate extremes: exposure estimates, OECD Environment Working Papers, No. 1, OECD Publishing, http://dx.doi.org/10.1787/011766488208.

Nilsson, A, and A. G. Swartling (2009). Social learning about climate adaptation: Global and local perspectives. Stockholm Environment Institute, Working Paper.

NOAA (2010) Adapting to Climate Change: A Planning Guide for State Coastal Managers. National Oceanic and Atmospheric Administration (NOAA) Office of Ocean and Coastal Resource Management, http://coastalmanagement.noaa.gov/climate/adaptation.html

Noble, I.R., S. Huq, Y.A. Anokhin, J. Carmin, D. Goudou, F.P. Lansigan, B. Osman-Elasha, and A. Villamizar (2014). Adaptation needs and options. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B.

Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom, and New York, United States, pp. 833–868.

Possingham, H. (2014). Representative ecosystems. Nature, vol. 515, pp. 28–31, 6 November 2014.

Pralle, S.B. (2009). Agenda-setting and climate change. Environmental Politics, 18:5, pp. 781–799, DOI: 10.1080/09644010903157115

Preston, B., R.M. Westaway and E.J. Yuen (2010). Climate adaptation planning in practice: an evaluation of adaptation plans from three developed nations. Mitigation and Adaptation Strategies for Global Change 2010, published online, 28 October 2010.

Pringle, P. (2011). AdaptME Toolkit for Monitoring and Evaluation of Adaptation Activities, Manual. United Kingdom Climate Impacts Programme (UKCIP).

Ranger, N. and S-L. Garbett-Shiels (2011). How can decision-makers in developing countries incorporate uncertainty about future climate risks into existing planning and policy-making processes? Policy paper March 2011. Centre for Climate Change Economics and Policy Grantham Research Institute on Climate Change and the Environment.

Rapley, C. G., K. de Meyer, J. Carney, R. Clarke, C. Howarth, N. Smith, J. Stilgoe, S. Youngs, C. Brierley, A. Haugvaldstad, B. Lotto, S. Michie, M. Shipworth and D. Tuckett (2014). Time for change? Climate science reconsidered. Report of the UCL Policy Commission on Communicating Climate Science.

Reisinger, A., R.L. Kitching, F. Chiew, L. Hughes, P.C.D. Newton, S.S. Schuster, A. Tait and P. Whetton (2014). Australasia. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Barros, V.R., C.B. Field, D.J. Dokken, M.D. Mastrandrea, K.J. Mach, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom, and New York, United States, pp. 1371–1438.

Ribeiro, M., C. Losenno, T. Dworak, E. Massey, R. Swart, M. Benzie and C. Laaser (2009). Design of guidelines for the elaboration of regional climate change adaptation strategies. Study for European Commission, DG Environment, Tender DG ENV. G.1/ETU/2008/0093r. Ecologic Institute, Vienna.

Rowson, J. and A. Corner (2015). The seven dimensions of climate change. Introducing a new way to think, talk and act. Action and Research Centre (RSA) and Climate Outreach and Information Network (COIN).

Royal Society (2014). Resilience to Extreme Weather. The Royal Society Science Policy Centre report 02/14 Issued: November 2014 DES3400. ISBN: 978-1-78252-113-6.

Sayer, J., U. Chokkalingam and J. Poulsen (2004). The restoration of forest biodiversity and ecological values. Forest Ecology and Management 201 (2004) pp. 3–11.

Smit, B. and J. Wandel (2006). Adaptation, adaptive capacity and vulnerability. Global Environmental Change 16 (2006), pp. 282–292.

Smit, B., I. Burton, R.J.T. Klein and J. Wandel (2000). An anatomy of adaptation to climate change and variability. Climate Change 45: pp. 223–251, 2000.

Smithers R, C. Cowan, M.J. Harley and others (2008). England Biodiversity Strategy – Climate Change Adaptation Principles: Conserving Biodiversity in a Changing Climate. 16pp.

Stern, N. (2009). A Blueprint for a Safer Planet: How to Manage Climate Change and Create a New Era of Progress and Prosperity. Bodley Head, London, United Kingdom.

Stockholm Resilience Centre (n.d.). Applying resilience thinking: Seven principles for building resilience in social-ecological systems. Stockholm Resilience Centre. Stockholm University.

Tompkins, E.L and W.N. Adger (2003). Defining response capacity to enhance climate change policy. Tyndall Centre Working Paper No. 39.

Tribbia, J. and S.C. Moser (2008). More than information: what coastal managers need to plan for climate change. Environmental Science and Policy. Volume 11, Issue 4, June 2008.

UNDP (2007). Monitoring and Evaluation Framework for Adaptation to Climate Change. Draft. United Nations Development Programme (UNDP).

UNEP (2012). Report of the Seventh Conference of Parties to the Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Western Indian Ocean (Nairobi Convention). UNEP (DEPI)/EAF/CP.7/.

UNFCCC (2010). Synthesis report on efforts undertaken to monitor and evaluate the implementation of adaptation projects, policies and programmes and the costs and effectiveness of completed projects, policies and programmes, and views on lessons learned, good practices, gaps and needs. FCCC/SBSTA/2010/5.

Walker, W.E., P. Harremoës, J. Rotmans, J.P. Van Der Sluijs, M.B.A. Van Asselt, P. Janssen and M.P. Krayer Von Krauss (2003). Defining uncertainty. A conceptual basis for uncertainty management in model-based decision support. Integrated Assessment 2003, Vol. 4, No. 1, pp. 5–17.

White, L. (2014). Manage parks professionally. Nature, vol. 515, pp. 28–31, 6 November 2014.

WIOMSA (2011a). Climate Change Impacts, Adaptation and Mitigation in the WIO region: Solutions to the Crisis.

WIOMSA (2011b). Regional Conference on Climate Change Impacts, Adaptation and Mitigation in the WIO Region: Solutions to the Crisis. Balaclava, Mauritius, 21–23 March 2011. Summary Report. April, 2011.

World Bank (1996). Guidelines for integrated coastal zone management. DOI: 10.1596/0-8213-3735-1.

Annex I Paris Agreement

United Nations 2015

The Parties to this Agreement,

Being Parties to the United Nations Framework Convention on Climate Change, hereinafter referred to as "the Convention",

Pursuant to the Durban Platform for Enhanced Action established by decision 1/CP.17 of the Conference of the Parties to the Convention at its seventeenth session,

In pursuit of the objective of the Convention, and being guided by its principles, including the principle of equity and common but differentiated responsibilities and respective capabilities, in the light of different national circumstances,

Recognizing the need for an effective and progressive response to the urgent threat of climate change on the basis of the best available scientific knowledge,

Also recognizing the specific needs and special circumstances of developing country Parties, especially those that are particularly vulnerable to the adverse effects of climate change, as provided for in the Convention,

Taking full account of the specific needs and special situations of the least developed countries with regard to funding and transfer of technology,
Recognizing that Parties may be affected not only by climate change, but also by the impacts of the measures taken in response to it,

Emphasizing the intrinsic relationship that climate change actions, responses and impacts have with equitable access to sustainable development and eradication of poverty,

Recognizing the fundamental priority of safeguarding food security and ending hunger, and the particular vulnerabilities of food production systems to the adverse impacts of climate change,

Taking into account the imperatives of a just transition of the workforce and the creation of decent work and quality jobs in accordance with nationally defined development priorities,

Acknowledging that climate change is a common concern of humankind, Parties should, when taking action to address climate change, respect, promote and consider their respective obligawtions on human rights, the right to health, the rights of indigenous peoples, local communities, migrants, children, persons with disabilities and people in vulnerable situations and the right to development, as well as gender equality, empowerment of women and intergenerational equity,

Recognizing the importance of the conservation and enhancement, as appropriate, of sinks and reservoirs of the greenhouse gases referred to in the Convention,

Noting the importance of ensuring the integrity of all ecosystems, including oceans, and the protection of biodiversity, recognized by some cultures as

Mother Earth, and noting the importance for some of the concept of "climate justice", when taking action to address climate change,

Affirming the importance of education, training, public awareness, public participation, public access to information and cooperation at all levels on the matters addressed in this Agreement,

Recognizing the importance of the engagements of all levels of government and various actors, in accordance with respective national legislations of Parties, in addressing climate change,

Also recognizing that sustainable lifestyles and sustainable patterns of consumption and production, with developed country Parties taking the lead, play an important role in addressing climate change,

Have agreed as follows:

ARTICLE 1

For the purpose of this Agreement, the definitions contained in Article 1 of the Convention shall apply. In addition:

1. "Convention" means the United Nations Framework Convention on Climate Change, adopted in New York on 9 May 1992.

2. "Conference of the Parties" means the Conference of the Parties to the Convention.

3. "Party" means a Party to this Agreement.

ARTICLE 2

1. This Agreement, in enhancing the implementation of the Convention, including its objective, aims to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty, including by:

(a) Holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change;

(b) Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production;

(c) Making finance flows consistent with a pathway towards low greenhouse gas emissions and climate- resilient development.

2. This Agreement will be implemented to reflect equity and the principle of common but differentiated responsibilities and respective capabilities, in the light of different national circumstances.

ARTICLE 3

As nationally determined contributions to the global response to climate change, all Parties are to undertake and communicate ambitious efforts as defined in Articles 4, 7, 9, 10, 11 and 13 with the view to achieving the purpose of this Agreement as set out in Article 2. The efforts of all Parties will represent a progression over time, while recognizing the need to support developing country Parties for the effective implementation of this Agreement.

ARTICLE 4

1. In order to achieve the long-term temperature goal set out in Article 2, Parties aim to reach global peaking of greenhouse gas emissions as soon as possible, recognizing that peaking will take longer for developing country Parties, and to undertake rapid reductions thereafter in accordance with best available science, so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century, on the basis of equity, and in the context of sustainable development and efforts to eradicate poverty.

2. Each Party shall prepare, communicate and maintain successive nationally determined contributions that it intends to achieve. Parties shall pursue domestic mitigation measures, with the aim of achieving the objectives of such contributions.

3. Each Party's successive nationally determined contribution will represent a progression beyond the Party's then current nationally determined contribution and reflect its highest possible ambition, reflecting its common but differentiated responsibilities and respective capabilities, in the light of different national circumstances.

4. Developed country Parties should continue taking the lead by undertaking economy-wide absolute emission reduction targets. Developing country Parties should continue enhancing their mitigation efforts, and are encouraged to move over time towards economy-wide emission reduction or limitation targets in the light of different national circumstances.

5. Support shall be provided to developing country Parties for the implementation of this Article, in accordance with Articles 9, 10 and 11, recognizing that enhanced support for developing country Parties will allow for higher ambition in their actions.

6. The least developed countries and small island developing States may prepare and communicate strategies, plans and actions for low greenhouse gas emissions development reflecting their special circumstances.

7. Mitigation co-benefits resulting from Parties' adaptation actions and/or economic diversification plans can contribute to mitigation outcomes under this Article.

8. In communicating their nationally determined contributions, all Parties shall provide the information necessary for clarity, transparency and understanding in accordance with decision 1/CP.21 and any relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement.

9. Each Party shall communicate a nationally determined contribution every five years in accordance with decision 1/CP.21 and any relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement and be informed by the outcomes of the global stocktake referred to in Article 14.

10. The Conference of the Parties serving as the meeting of the Parties to the Paris Agreement shall consider common time frames for nationally determined contributions at its first session.

11. A Party may at any time adjust its existing na-

tionally determined contribution with a view to enhancing its level of ambition, in accordance with guidance adopted by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement.

12. Nationally determined contributions communicated by Parties shall be recorded in a public registry maintained by the secretariat.

13. Parties shall account for their nationally determined contributions. In accounting for anthropogenic emissions and removals corresponding to their nationally determined contributions, Parties shall promote environmental integrity, transparency, accuracy, completeness, comparability and consistency, and ensure the avoidance of double counting, in accordance with guidance adopted by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement.

14. In the context of their nationally determined contributions, when recognizing and implementing mitigation actions with respect to anthropogenic emissions and removals, Parties should take into account, as appropriate, existing methods and guidance under the Convention, in the light of the provisions of paragraph 13 of this Article.

15. Parties shall take into consideration in the implementation of this Agreement the concerns of Parties with economies most affected by the impacts of response measures, particularly developing country Parties.

16. Parties, including regional economic integration organizations and their member States, that have reached an agreement to act jointly under paragraph 2 of this Article shall notify the secretariat of the terms of that agreement, including the emission level allocated to each Party within the relevant time period, when they communicate their nationally determined contributions. The secretariat shall in turn inform the Parties and signatories to the Convention of the terms of that agreement.

17. Each party to such an agreement shall be responsible for its emission level as set out in the agreement referred to in paragraph 16 above in accordance with paragraphs 13 and 14 of this Article and Articles 13 and 15.

18. If Parties acting jointly do so in the framework of, and together with, a regional economic integration organization which is itself a Party to this Agreement, each member State of that regional economic integration organization individually, and together with the regional economic integration organization, shall be responsible for its emission level as set out in the agreement communicated under paragraph 16 of this Article in accordance with paragraphs 13 and 14 of this Article and Articles 13 and 15.

19. All Parties should strive to formulate and communicate long-term low greenhouse gas emission development strategies, mindful of Article 2 taking into account their common but differentiated responsibilities and respective capabilities, in the light of different national circumstances.

ARTICLE 5

1. Parties should take action to conserve and enhance, as appropriate, sinks and reservoirs of greenhouse gases as referred to in Article 4, paragraph 1(d), of the Convention, including forests.

2. Parties are encouraged to take action to implement and support, including through results-based payments, the existing framework as set out in related guidance and decisions already agreed under the Convention for: policy approaches and positive incentives for activities relating to reducing emissions from deforestation and forest degradation, and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries; and alternative policy approaches, such as joint mitigation and adaptation approaches for the integral and sustainable management of forests, while reaffirming the importance of incentivizing, as appropriate, non-carbon benefits associated with such approaches.

ARTICLE 6

1. Parties recognize that some Parties choose to pursue voluntary cooperation in the implementation of their nationally determined contributions to allow for higher ambition in their mitigation and adaptation actions and to promote sustainable development and environmental integrity.

2. Parties shall, where engaging on a voluntary basis in cooperative approaches that involve the use of internationally transferred mitigation outcomes towards nationally determined contributions, promote sustainable development and ensure environmental integrity and transparency, including in governance, and shall apply robust accounting to ensure, inter alia, the avoidance of double counting, consistent with guidance adopted by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement.

3. The use of internationally transferred mitigation outcomes to achieve nationally determined contributions under this Agreement shall be voluntary and authorized by participating Parties.

4. A mechanism to contribute to the mitigation of greenhouse gas emissions and support sustainable development is hereby established under the authority and guidance of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement for use by Parties on a voluntary basis. It shall be supervised by a body designated by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement, and shall aim:

(a) To promote the mitigation of greenhouse gas emissions while fostering sustainable development;

(b) To incentivize and facilitate participation in the mitigation of greenhouse gas emissions by public and private entities authorized by a Party;

(c) To contribute to the reduction of emission levels in the host Party, which will benefit from mitigation activities resulting in emission reductions that can also be used by another Party to fulfil its nationally determined contribution; and

(d) To deliver an overall mitigation in global emissions.

5. Emission reductions resulting from the mechanism referred to in paragraph 4 of this Article shall not be used to demonstrate achievement of the host Party's nationally determined contribution if used by another Party to demonstrate achievement of its nationally determined contribution.

6. The Conference of the Parties serving as the

meeting of the Parties to the Paris Agreement shall ensure that a share of the proceeds from activities under the mechanism referred to in paragraph 4 of this Article is used to cover administrative expenses as well as to assist developing country Parties that are particularly vulnerable to the adverse effects of climate change to meet the costs of adaptation.

7. The Conference of the Parties serving as the meeting of the Parties to the Paris Agreement shall adopt rules, modalities and procedures for the mechanism referred to in paragraph 4 of this Article at its first session.

8. Parties recognize the importance of integrated, holistic and balanced non-market approaches being available to Parties to assist in the implementation of their nationally determined contributions, in the context of sustainable development and poverty eradication, in a coordinated and effective manner, including through, inter alia, mitigation, adaptation, finance, technology transfer and capacity-building, as appropriate. These approaches shall aim to:

(a) Promote mitigation and adaptation ambition;

(b) Enhance public and private sector participation in the implementation of nationally determined contributions; and

(c) Enable opportunities for coordination across instruments and relevant institutional arrangements.

9. A framework for non-market approaches to sustainable development is hereby defined to promote the non- market approaches referred to in paragraph 8 of this Article.

ARTICLE 7

1. Parties hereby establish the global goal on adaptation of enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change, with a view to contributing to sustainable development and ensuring an adequate adaptation response in the context of the temperature goal referred to in Article 2.

2. Parties recognize that adaptation is a global challenge faced by all with local, subnational, national, regional and international dimensions, and that it is a key component of and makes a contribution to the long-term global response to climate change to protect people, livelihoods and ecosystems, taking into account the urgent and immediate needs of those developing country Parties that are particularly vulnerable to the adverse effects of climate change.

3. The adaptation efforts of developing country Parties shall be recognized, in accordance with the modalities to be adopted by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement at its first session.

4. Parties recognize that the current need for adaptation is significant and that greater levels of mitigation can reduce the need for additional adaptation efforts, and that greater adaptation needs can involve greater adaptation costs.

5. Parties acknowledge that adaptation action should follow a country-driven, gender-responsive, participatory and fully transparent approach, taking into consideration vulnerable groups, communities and ecosystems, and should be based on

and guided by the best available science and, as appropriate, traditional knowledge, knowledge of indigenous peoples and local knowledge systems, with a view to integrating adaptation into relevant socioeconomic and environmental policies and actions, where appropriate.

6. Parties recognize the importance of support for and international cooperation on adaptation efforts and the importance of taking into account the needs of developing country Parties, especially those that are particularly vulnerable to the adverse effects of climate change.

7. Parties should strengthen their cooperation on enhancing action on adaptation, taking into account the Cancun Adaptation Framework, including with regard to:

(a) Sharing information, good practices, experiences and lessons learned, including, as appropriate, as these relate to science, planning, policies and implementation in relation to adaptation actions;

(b) Strengthening institutional arrangements, including those under the Convention that serve this Agreement, to support the synthesis of relevant information and knowledge, and the provision of technical support and guidance to Parties;

(c) Strengthening scientific knowledge on climate, including research, systematic observation of the climate system and early warning systems, in a manner that informs climate services and supports decision- making;

(d) Assisting developing country Parties in identifying effective adaptation practices, adaptation needs, priorities, support provided and received for adaptation actions and efforts, and challenges and gaps, in a manner consistent with encouraging good practices;

(e) Improving the effectiveness and durability of adaptation actions.

8. United Nations specialized organizations and agencies are encouraged to support the efforts of Parties to implement the actions referred to in paragraph 7 of this Article, taking into account the provisions of paragraph 5 of this Article.

9. Each Party shall, as appropriate, engage in adaptation planning processes and the implementation of actions, including the development or enhancement of relevant plans, policies and/or contributions, which may include:

(a) The implementation of adaptation actions, undertakings and/or efforts;

(b) The process to formulate and implement national adaptation plans;

(c) The assessment of climate change impacts and vulnerability, with a view to formulating nationally determined prioritized actions, taking into account vulnerable people, places and ecosystems;

(d) Monitoring and evaluating and learning from adaptation plans, policies, programmes and actions; and

(e) Building the resilience of socioeconomic and ecological systems, including through economic diversification and sustainable management of natural resources.

10. Each Party should, as appropriate, submit and update periodically an adaptation communication, which may include its priorities, implementation and support needs, plans and actions, without creating any additional burden for developing country Parties.

11. The adaptation communication referred to in paragraph 10 of this Article shall be, as appropriate, submitted and updated periodically, as a component of or in conjunction with other communications or documents, including a national adaptation plan, a nationally determined contribution as referred to in Article 4, paragraph 2, and/or a national communication.

12. The adaptation communications referred to in paragraph 10 of this Article shall be recorded in a public registry maintained by the secretariat.

13. Continuous and enhanced international support shall be provided to developing country Parties for the implementation of paragraphs 7, 9, 10 and 11 of this Article, in accordance with the provisions of Articles 9, 10 and 11.

14. The global stocktake referred to in Article 14 shall, inter alia:

(a) Recognize adaptation efforts of developing country Parties;

(b) Enhance the implementation of adaptation action taking into account the adaptation communication referred to in paragraph 10 of this Article;

(c) Review the adequacy and effectiveness of adaptation and support provided for adaptation; and

(d) Review the overall progress made in achieving the global goal on adaptation referred to in paragraph 1 of this Article.

ARTICLE 8

1. Parties recognize the importance of averting, minimizing and addressing loss and damage associated with the adverse effects of climate change, including extreme weather events and slow onset events, and the role of sustainable development in reducing the risk of loss and damage.

2. The Warsaw International Mechanism for Loss and Damage associated with Climate Change Impacts shall be subject to the authority and guidance of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement and may be enhanced and strengthened, as determined by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement.

3. Parties should enhance understanding, action and support, including through the Warsaw International Mechanism, as appropriate, on a cooperative and facilitative basis with respect to loss and damage associated with the adverse effects of climate change.

4. Accordingly, areas of cooperation and facilitation to enhance understanding, action and support may include:

(a) Early warning systems;

(b) Emergency preparedness;

(c) Slow onset events;

(d) Events that may involve irreversible and permanent loss and damage;

(e) Comprehensive risk assessment and management;

(f) Risk insurance facilities, climate risk pooling and other insurance solutions;

(g) Non-economic losses;

(h) Resilience of communities, livelihoods and ecosystems.

5. The Warsaw International Mechanism shall collaborate with existing bodies and expert groups under the Agreement, as well as relevant organizations and expert bodies outside the Agreement.

ARTICLE 9

1. Developed country Parties shall provide financial resources to assist developing country Parties with respect to both mitigation and adaptation in continuation of their existing obligations under the Convention.

2. Other Parties are encouraged to provide or continue to provide such support voluntarily.

3. As part of a global effort, developed country Parties should continue to take the lead in mobilizing climate finance from a wide variety of sources, instruments and channels, noting the significant role of public funds, through a variety of actions, including supporting country-driven strategies, and taking into account the needs and priorities of developing country Parties. Such mobilization of climate finance should represent a progression beyond previous efforts.

4. The provision of scaled-up financial resources should aim to achieve a balance between adaptation and mitigation, taking into account country-driven strategies, and the priorities and needs of developing country Parties, especially those that are particularly vulnerable to the adverse effects of climate change and have significant capacity constraints, such as the least developed countries and small island developing States, considering the need for public and grant-based resources for adaptation.

5. Developed country Parties shall biennially communicate indicative quantitative and qualitative information related to paragraphs 1 and 3 of this Article, as applicable, including, as available, projected levels of public financial resources to be provided to developing country Parties. Other Parties providing resources are encouraged to communicate biennially such information on a voluntary basis.

6. The global stocktake referred to in Article 14 shall take into account the relevant information provided by developed country Parties and/or Agreement bodies on efforts related to climate finance.

7. Developed country Parties shall provide transparent and consistent information on support for developing country Parties provided and mobilized through public interventions biennially in accordance with the modalities, procedures and guidelines to be adopted by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement, at its first session, as stipulated in Article 13, paragraph 13. Other Parties are encouraged to do so.

8. The Financial Mechanism of the Convention, including its operating entities, shall serve as the

financial mechanism of this Agreement.

9. The institutions serving this Agreement, including the operating entities of the Financial Mechanism of the Convention, shall aim to ensure efficient access to financial resources through simplified approval procedures and enhanced readiness support for developing country Parties, in particular for the least developed countries and small island developing States, in the context of their national climate strategies and plans.

ARTICLE 10

1. Parties share a long-term vision on the importance of fully realizing technology development and transfer in order to improve resilience to climate change and to reduce greenhouse gas emissions.

2. Parties, noting the importance of technology for the implementation of mitigation and adaptation actions under this Agreement and recognizing existing technology deployment and dissemination efforts, shall strengthen cooperative action on technology development and transfer.

3. The Technology Mechanism established under the Convention shall serve this Agreement.

4. A technology framework is hereby established to provide overarching guidance to the work of the Technology Mechanism in promoting and facilitating enhanced action on technology development and transfer in order to support the implementation of this Agreement, in pursuit of the long-term vision referred to in paragraph 1 of this Article.

5. Accelerating, encouraging and enabling innovation is critical for an effective, long-term global response to climate change and promoting economic growth and sustainable development. Such effort shall be, as appropriate, supported, including by the Technology Mechanism and, through financial means, by the Financial Mechanism of the Convention, for collaborative approaches to research and development, and facilitating access to technology, in particular for early stages of the technology cycle, to developing country Parties.

6. Support, including financial support, shall be provided to developing country Parties for the implementation of this Article, including for strengthening cooperative action on technology development and transfer at different stages of the technology cycle, with a view to achieving a balance between support for mitigation and adaptation. The global stocktake referred to in Article 14 shall take into account available information on efforts related to support on technology development and transfer for developing country Parties.

ARTICLE 11

1. Capacity-building under this Agreement should enhance the capacity and ability of developing country Parties, in particular countries with the least capacity, such as the least developed countries, and those that are particularly vulnerable to the adverse effects of climate change, such as small island developing States, to take effective climate change action, including, inter alia, to implement adaptation and mitigation actions, and should facilitate technology development, dissemination and deployment, access to climate finance, relevant aspects of education, training and public awareness, and the transparent, timely and

accurate communication of information.

2. Capacity-building should be country-driven, based on and responsive to national needs, and foster country ownership of Parties, in particular, for developing country Parties, including at the national, subnational and local levels. Capacity-building should be guided by lessons learned, including those from capacity-building activities under the Convention, and should be an effective, iterative process that is participatory, cross-cutting and gender-responsive.

3. All Parties should cooperate to enhance the capacity of developing country Parties to implement this Agreement. Developed country Parties should enhance support for capacity-building actions in developing country Parties.

4. All Parties enhancing the capacity of developing country Parties to implement this Agreement, including through regional, bilateral and multilateral approaches, shall regularly communicate on these actions or measures on capacity-building. Developing country Parties should regularly communicate progress made on implementing capacity-building plans, policies, actions or measures to implement this Agreement.

5. Capacity-building activities shall be enhanced through appropriate institutional arrangements to support the implementation of this Agreement, including the appropriate institutional arrangements established under the Convention that serve this Agreement. The Conference of the Parties serving as the meeting of the Parties to the Paris Agreement shall, at its first session, consider and adopt a decision on the initial institutional arrangements for capacity-building.

ARTICLE 12

Parties shall cooperate in taking measures, as appropriate, to enhance climate change education, training, public awareness, public participation and public access to information, recognizing the importance of these steps with respect to enhancing actions under this Agreement.

ARTICLE 13

1. In order to build mutual trust and confidence and to promote effective implementation, an enhanced transparency framework for action and support, with built-in flexibility which takes into account Parties' different capacities and builds upon collective experience is hereby established.

2. The transparency framework shall provide flexibility in the implementation of the provisions of this Article to those developing country Parties that need it in the light of their capacities. The modalities, procedures and guidelines referred to in paragraph 13 of this Article shall reflect such flexibility.

3. The transparency framework shall build on and enhance the transparency arrangements under the Convention, recognizing the special circumstances of the least developed countries and small island developing States, and be implemented in a facilitative, non-intrusive, non-punitive manner, respectful of national sovereignty, and avoid placing undue burden on Parties.

4. The transparency arrangements under the Convention, including national communications, biennial reports and biennial update reports, international assessment and review and international consultation and analysis, shall form part of the experience drawn upon for the development

of the modalities, procedures and guidelines under paragraph 13 of this Article.

5. The purpose of the framework for transparency of action is to provide a clear understanding of climate change action in the light of the objective of the Convention as set out in its Article 2, including clarity and tracking of progress towards achieving Parties' individual nationally determined contributions under Article 4, and Parties' adaptation actions under Article 7, including good practices, priorities, needs and gaps, to inform the global stocktake under Article 14.

6. The purpose of the framework for transparency of support is to provide clarity on support provided and received by relevant individual Parties in the context of climate change actions under Articles 4, 7, 9, 10 and 11, and, to the extent possible, to provide a full overview of aggregate financial support provided, to inform the global stocktake under Article 14.

7. Each Party shall regularly provide the following information:

(a) A national inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases, prepared using good practice methodologies accepted by the Intergovernmental Panel on Climate Change and agreed upon by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement;

(b) Information necessary to track progress made in implementing and achieving its nationally determined contribution under Article 4.

8. Each Party should also provide information related to climate change impacts and adaptation under Article 7, as appropriate.

9. Developed country Parties shall, and other Parties that provide support should, provide information on financial, technology transfer and capacity-building support provided to developing country Parties under Article 9, 10 and 11.

10. Developing country Parties should provide information on financial, technology transfer and capacity-building support needed and received under Articles 9, 10 and 11.

11. Information submitted by each Party under paragraphs 7 and 9 of this Article shall undergo a technical expert review, in accordance with decision 1/CP.21. For those developing country Parties that need it in the light of their capacities, the review process shall include assistance in identifying capacity-building needs. In addition, each Party shall participate in a facilitative, multilateral consideration of progress with respect to efforts under Article 9, and its respective implementation and achievement of its nationally determined contribution.

12. The technical expert review under this paragraph shall consist of a consideration of the Party's support provided, as relevant, and its implementation and achievement of its nationally determined contribution. The review shall also identify areas of improvement for the Party, and include a review of the consistency of the information with the modalities, procedures and guidelines referred to in paragraph 13 of this Article, taking into account the flexibility accorded to the Party under paragraph 2 of this Article. The review shall pay particular attention to the respective nation-

al capabilities and circumstances of developing country Parties.

13. The Conference of the Parties serving as the meeting of the Parties to the Paris Agreement shall, at its first session, building on experience from the arrangements related to transparency under the Convention, and elaborating on the provisions in this Article, adopt common modalities, procedures and guidelines, as appropriate, for the transparency of action and support.

14. Support shall be provided to developing countries for the implementation of this Article.
15. Support shall also be provided for the building of transparency-related capacity of developing country Parties on a continuous basis.

ARTICLE 14

1. The Conference of the Parties serving as the meeting of the Parties to the Paris Agreement shall periodically take stock of the implementation of this Agreement to assess the collective progress towards achieving the purpose of this Agreement and its long-term goals (referred to as the "global stocktake"). It shall do so in a comprehensive and facilitative manner, considering mitigation, adaptation and the means of implementation and support, and in the light of equity and the best available science.

2. The Conference of the Parties serving as the meeting of the Parties to the Paris Agreement shall undertake its first global stocktake in 2023 and every five years thereafter unless otherwise decided by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement.

3. The outcome of the global stocktake shall inform Parties in updating and enhancing, in a nationally determined manner, their actions and support in accordance with the relevant provisions of this Agreement, as well as in enhancing international cooperation for climate action.

ARTICLE 15

1. A mechanism to facilitate implementation of and promote compliance with the provisions of this Agreement is hereby established.

2. The mechanism referred to in paragraph 1 of this Article shall consist of a committee that shall be expert-based and facilitative in nature and function in a manner that is transparent, non-adversarial and non-punitive. The committee shall pay particular attention to the respective national capabilities and circumstances of Parties.

3. The committee shall operate under the modalities and procedures adopted by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement at its first session and report annually to the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement.

ARTICLE 16

1. The Conference of the Parties, the supreme body of the Convention, shall serve as the meeting of the Parties to this Agreement.

2. Parties to the Convention that are not Parties to this Agreement may participate as observers in the proceedings of any session of the Conference of the Parties serving as the meeting of the Parties to this Agreement. When the Conference of the Parties serves as the meeting of the Parties to this Agreement, decisions under this Agreement

shall be taken only by those that are Parties to this Agreement.

3. When the Conference of the Parties serves as the meeting of the Parties to this Agreement, any member of the Bureau of the Conference of the Parties representing a Party to the Convention but, at that time, not a Party to this Agreement, shall be replaced by an additional member to be elected by and from amongst the Parties to this Agreement.

4. The Conference of the Parties serving as the meeting of the Parties to the Paris Agreement shall keep under regular review the implementation of this Agreement and shall make, within its mandate, the decisions necessary to promote its effective implementation. It shall perform the functions assigned to it by this Agreement and shall:

(a) Establish such subsidiary bodies as deemed necessary for the implementation of this Agreement; and

(b) Exercise such other functions as may be required for the implementation of this Agreement.

5. The rules of procedure of the Conference of the Parties and the financial procedures applied under the Convention shall be applied mutatis mutandis under this Agreement, except as may be otherwise decided by consensus by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement.

6. The first session of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement shall be convened by the secretariat in conjunction with the first session of the Conference of the Parties that is scheduled after the date of entry into force of this Agreement. Subsequent ordinary sessions of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement shall be held in conjunction with ordinary sessions of the Conference of the Parties, unless otherwise decided by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement.

7. Extraordinary sessions of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement shall be held at such other times as may be deemed necessary by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement or at the written request of any Party, provided that, within six months of the request being communicated to the Parties by the secretariat, it is supported by at least one third of the Parties.

8. The United Nations and its specialized agencies and the International Atomic Energy Agency, as well as any State member thereof or observers thereto not party to the Convention, may be represented at sessions of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement as observers. Any body or agency, whether national or international, governmental or non-governmental, which is qualified in matters covered by this Agreement and which has informed the secretariat of its wish to be represented at a session of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement as an observer, may be so admitted unless at least one third of the Parties present object. The admission and participation of observers shall be subject to the rules of pro-

cedure referred to in paragraph 5 of this Article.

ARTICLE 17

1. The secretariat established by Article 8 of the Convention shall serve as the secretariat of this Agreement.

2. Article 8, paragraph 2, of the Convention on the functions of the secretariat, and Article 8, paragraph 3, of the Convention, on the arrangements made for the functioning of the secretariat, shall apply mutatis mutandis to this Agreement. The secretariat shall, in addition, exercise the functions assigned to it under this Agreement and by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement.

ARTICLE 18

1. The Subsidiary Body for Scientific and Technological Advice and the Subsidiary Body for Implementation established by Articles 9 and 10 of the Convention shall serve, respectively, as the Subsidiary Body for Scientific and Technological Advice and the Subsidiary Body for Implementation of this Agreement. The provisions of the Convention relating to the functioning of these two bodies shall apply mutatis mutandis to this Agreement. Sessions of the meetings of the Subsidiary Body for Scientific and Technological Advice and the Subsidiary Body for Implementation of this Agreement shall be held in conjunction with the meetings of, respectively, the Subsidiary Body for Scientific and Technological Advice and the Subsidiary Body for Implementation of the Convention.

2. Parties to the Convention that are not Parties to this Agreement may participate as observers in the proceedings of any session of the subsidiary bodies. When the subsidiary bodies serve as the subsidiary bodies of this Agreement, decisions under this Agreement shall be taken only by those that are Parties to this Agreement.

3. When the subsidiary bodies established by Articles 9 and 10 of the Convention exercise their functions with regard to matters concerning this Agreement, any member of the bureaux of those subsidiary bodies representing a Party to the Convention but, at that time, not a Party to this Agreement, shall be replaced by an additional member to be elected by and from amongst the Parties to this Agreement.

ARTICLE 19

1. Subsidiary bodies or other institutional arrangements established by or under the Convention, other than those referred to in this Agreement, shall serve this Agreement upon a decision of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement. The Conference of the Parties serving as the meeting of the Parties to the Paris Agreement shall specify the functions to be exercised by such subsidiary bodies or arrangements.

2. The Conference of the Parties serving as the meeting of the Parties to the Paris Agreement may provide further guidance to such subsidiary bodies and institutional arrangements.

ARTICLE 20

1. This Agreement shall be open for signature and subject to ratification, acceptance or approval by States and regional economic integration organizations that are Parties to the Convention. It shall be open for signature at the United Nations Headquarters in New York from 22 April 2016 to 21 April

2017. Thereafter, this Agreement shall be open for accession from the day following the date on which it is closed for signature. Instruments of ratification, acceptance, approval or accession shall be deposited with the Depositary.

2. Any regional economic integration organization that becomes a Party to this Agreement without any of its member States being a Party shall be bound by all the obligations under this Agreement. In the case of regional economic integration organizations with one or more member States that are Parties to this Agreement, the organization and its member States shall decide on their respective responsibilities for the performance of their obligations under this Agreement. In such cases, the organization and the member States shall not be entitled to exercise rights under this Agreement concurrently.

3. In their instruments of ratification, acceptance, approval or accession, regional economic integration organizations shall declare the extent of their competence with respect to the matters governed by this Agreement. These organizations shall also inform the Depositary, who shall in turn inform the Parties, of any substantial modification in the extent of their competence.

ARTICLE 21

1. This Agreement shall enter into force on the thirtieth day after the date on which at least 55 Parties to the Convention accounting in total for at least an estimated 55 percent of the total global greenhouse gas emissions have deposited their instruments of ratification, acceptance, approval or accession.

2. Solely for the limited purpose of paragraph 1 of this Article, "total global greenhouse gas emissions" means the most up-to-date amount communicated on or before the date of adoption of this Agreement by the Parties to the Convention.

3. For each State or regional economic integration organization that ratifies, accepts or approves this Agreement or accedes thereto after the conditions set out in paragraph 1 of this Article for entry into force have been fulfilled, this Agreement shall enter into force on the thirtieth day after the date of deposit by such State or regional economic integration organization of its instrument of ratification, acceptance, approval or accession.

4. For the purposes of paragraph 1 of this Article, any instrument deposited by a regional economic integration organization shall not be counted as additional to those deposited by its member States.

ARTICLE 22

The provisions of Article 15 of the Convention on the adoption of amendments to the Convention shall apply mutatis mutandis to this Agreement.

ARTICLE 23

1. The provisions of Article 16 of the Convention on the adoption and amendment of annexes to the Convention shall apply mutatis mutandis to this Agreement.

2. Annexes to this Agreement shall form an integral part thereof and, unless otherwise expressly provided for, a reference to this Agreement constitutes at the same time a reference to any annexes thereto. Such annexes shall be restricted to lists, forms and any other material of a descriptive nature that is of a scientific, technical, procedural

or administrative character.

ARTICLE 24

The provisions of Article 14 of the Convention on settlement of disputes shall apply mutatis mutandis to this Agreement.

ARTICLE 25

1. Each Party shall have one vote, except as provided for paragraph 2 of this Article.

2. Regional economic integration organizations, in matters within their competence, shall exercise their right to vote with a number of votes equal to the number of their member States that are Parties to this Agreement. Such an organization shall not exercise its right to vote if any of its member States exercises its right, and vice versa.

ARTICLE 26

The Secretary-General of the United Nations shall be the Depositary of this Agreement.

ARTICLE 27

No reservations may be made to this Agreement.

ARTICLE 28

1. At any time after three years from the date on which this Agreement has entered into force for a Party, that Party may withdraw from this Agreement by giving written notification to the Depositary.

2. Any such withdrawal shall take effect upon expiry of one year from the date of receipt by the Depositary of the notification of withdrawal, or on such later date as may be specified in the notification of withdrawal.

3. Any Party that withdraws from the Convention shall be considered as also having withdrawn from this Agreement.

ARTICLE 29

The original of this Agreement, of which the Arabic, Chinese, English, French, Russian and Spanish texts are equally authentic, shall be deposited with the Secretary-General of the United Nations.

DONE at Paris this twelfth day of December two thousand and fifteen.

IN WITNESS WHEREOF, the undersigned, being duly authorized to that effect, have signed this Agreement.