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Background document

Addressing climate change through disaster risk reduction and coastal zone management: GCCA experience

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Addressing climate change through disaster risk reduction and coastal zone management: GCCA experience

1. Background, scope and objective

The EU is taking decisive action on addressing climate change and making it an integral part of EU development aid. In 2007, it established the Global Climate Change Alliance (GCCA), its flagship initiative to strengthen dialogue, exchange of experiences and cooperation on climate change with developing countries most vulnerable to climate change, in particular the Least Developed Countries and the Small Island Developing States.

Since its inception, EU GCCA funding has been used to formulate and implement programmes aimed at addressing climate change in a range of different countries and contexts. As part of knowledge management efforts, the GCCA has prepared a series of five papers ("background documents") intended to inform the Global Learning Event to take place in Brussels in September 2012.

The objective of the background documents is primarily to identify key insights, emerging lessons and challenges arising from GCCA experience in the formulation and implementation of interventions. Observations are presented and discussed, with occasional references to international knowledge and experience to support the collection of additional or more detailed insights and to inform better practice; they do not constitute and should not be interpreted as an evaluation.

The papers have been prepared using available information on GCCA-supported interventions. This includes documents prepared during project formulation, updates provided by EU Delegations, from a small number of visits to GCCA-supported interventions undertaken by members of the GCCA Global Support Facility (GSF), and during specific side events held during the series of regional workshops on "Mainstreaming climate change into national development planning and budgeting" in the Pacific, Africa, Asia and the Caribbean. It is acknowledged that these approaches to information collection are not comprehensive, and that as such, the compiled descriptions and analysis of GCCA-supported interventions, on which these papers are based, may contain errors and/or omissions. As such, the papers are presented as a basis and framework to collect information, experience and knowledge from those most directly involved in GCCA-supported interventions across the initiative. The information, experience and knowledge collected at the Global Learning Event will then directly provide the material to prepare the forthcoming publication "GCCA achievements and lessons learned" that will be presented at the Qatar Conference of the Parties (CoP) of the United Nations Framework Convention on Climate Change (UNFCCC) in November 2012.

This paper addresses disaster risk reduction (DRR), one of the GCCA's five priority areas. Because a number of GCCA interventions jointly address these topics, it also covers coastal zone management, as a specific aspect of disaster risk reduction (and/or adaptation).

In view of the convergence of adaptation and disaster risk reduction (see Section 3.3), it is recommended to complement the reading of this paper with the reading of the background document on Adaptation.

2. Overview of GCCA DRR- and coastal zone management-related interventions

The GCCA currently supports and/or is in the process of identification / formulation of programmes with a focus on disaster risk reduction and/or coastal zone management in 9 countries and 2 regions,

namely the Caribbean and the Pacific.[1] For each of these, a summary of activities and expected results, as well as some key insights and emerging lessons, is provided in Table 1.[2]

Table 1 – Summary of GCCA DRR- and/or coastal zone management-related programmes

Country or region Duration GCCA budget Sector(s) concerned	Main activities and/or expected results	Key insights and/or emerging lessons
Bangladesh 2011-2015 €8.5 million Overall development / poverty reduction; agriculture; coastal zone management; infrastructure; land management; natural resources	• Support for implementation of the Bangladesh Climate Change Strategy and Action Plan via a contribution to the multi-donor Bangladesh Climate Resilience Fund • Support, among other topics, for disaster risk management and the building of climate-resilient infrastructure • In this context, construction of cyclone shelters	• Early warning systems are needed to support timely disaster preparedness and response • Community involvement in building disaster response capacities and maintaining key infrastructure is an important aspect of DRR • Infrastructure-based options, among others, are useful to reduce vulnerabilities and increase disaster response capacities
Benin 2012-2016 €8.0 million Forests	• To reduce flood impacts in downstream areas: promotion of the conservation and sustainable use of gallery forests in the lower valley of the Ouémé river • Support for the acquisition of new GIS data and new topographic maps covering the whole national territory, for various purposes including improved capacity in the field of territorial planning and DRR	• Territorial mapping and early warning systems are useful to improve disaster response capacities • Improved forest management supports flood risk reduction • In this context, involving communities, and promoting local forest management and sustainable forest-based livelihoods, are key for sustainable forest management
Caribbean 2011-2014 €8.0 million Agriculture; education and research; energy; fisheries; forests; health; tourism; water and sanitation	• Strengthening of climate monitoring systems • Climate modelling at downscaled resolutions • Vulnerability and risk assessment to inform future land use planning, zoning and development planning • Implementation of pilot adaptation projects	• Strong climate monitoring systems, as well as downscaled climate modelling, are needed to underpin DRR efforts • Vulnerability and risk assessment also supports these efforts
Guyana 2009-2014 4.17 million Coastal zone management	Support for implementation of the National Mangrove Management Action Plan, incl.: • Rehabilitation of mangrove fields • Mangrove protection and monitoring • Mangrove mapping • Mangrove-related research • Formulation of a code of practice for mangrove management • Public awareness campaigns and training	• Mangrove protection and rehabilitation supports coastal protection • Involving communities, building their capacities through outreach and education, and promoting sustainable mangrove-based livelihoods, are key for the sustainability of this effort • Good intersectoral coordination is also required

[1] In the Pacific, two GCCA regional programmes are under way. One, identified as 'Pacific' in Table 1, is managed by the University of the South Pacific (USP). The other one, identified as 'South Pacific', is managed by the Secretariat of the Pacific Community (SPC).

[2] The information presented in Table 1 is extracted from a more detailed Annex to the background documents, developed on the basis of documents prepared during project formulation, updates provided by EU Delegations, from a small number of visits to GCCA-supported interventions undertaken by members of the GCCA Global Support Facility (GSF), and during specific side events held during the series of regional workshops on "Mainstreaming climate change into national development planning and budgeting" in the Pacific, Africa, Asia and the Caribbean. The complete Annex for this paper will be available in hardcopy at the Global Learning Event, while each individual entry will be shared in advance of the Global Learning Event with the appropriate national / (sub) regional delegate(s) for their review and comment.

Country or region Duration GCCA budget Sector(s) concerned	Main activities and/or expected results	Key insights and/or emerging lessons
		• Field activities support learning processes
Jamaica 2011-2013 €4.13 million Coastal zone management; forests; natural resource management	• Rehabilitation (through replanting) and improved management of selected watersheds, to reduce downstream run-off • Restoration and protection of coastal ecosystems, including mangroves, to enhance natural buffers and increase resilience	• Watershed rehabilitation through replanting supports slope stabilisation and flood risk reduction, while the protection and rehabilitation of coastal ecosystems such as mangroves supports coastal protection • Involving communities, and promoting local forest management, are key for sustainable forest management • Field activities support learning processes
Pacific (USP) 2011-2014 €8.0 million Education and research; technological development	• Capacity building on CC-related topics, through both formal and informal training • Formulation and implementation of replicable community-based CC adaptation activities • Applied research, with a focus on developing tools for assessing vulnerability and developing adaptation plans • Setting up of a CC Knowledge Centre at the University of the South Pacific	• Research and knowledge management at regional level support DRR and coastal zone management • Formal as well as informal training can contribute to building capacities in these areas • Pilot projects based on a robust process of participatory community engagement must both draw on training and research initiatives, and provide inputs into them
Samoa 2012-2015 €3.0 million Water and sanitation	• Rehabilitation of the drainage infrastructure of the Greater Apia area • Rebuilding and upgrading of priority drainage infrastructure for stormwater flows in Apia • Setting up of an effective drainage infrastructure management system, and implementation of a maintenance plan	• Adaptation and DRR can be addressed simultaneously in the water sector • Infrastructure-based options to DRR are valuable, especially if implemented in the context of a wider approach such as integrated water resources management
Senegal 2010-2015 €4.0 million Coastal zone management	• Establishment of an Integrated Coastal Zone Management (ICZM) system aimed at coastal protection • Collection of data on coastal hydrodynamics • Implementation of concrete adaptation and DRR measures in designated vulnerable areas • Awareness raising on ICZM and erosion control • Investigation of alternatives to sand extraction from beaches	• Resettlement of the most vulnerable coastal communities is an option to be envisaged • ICZM is needed to address simultaneously all the components that drive coastal erosion • ICZM involves significant data requirements, notably in terms of coastal hydrodynamics • Coordination between ICZM and CC management needs strengthening • Field activities can support learning processes in the context of ICZM
Solomon Islands 2011-2014 €2.8 million Overall development / poverty reduction	• Mainstreaming of CC and DRR priorities into the national development strategy and the transport sector plan • Recurrent allocation of a budget to key institutions carrying out CC and DRR activities, notably to implement NAPA priorities and resettlement activities • Building of capacities of the Ministry of Environment and National Disaster Management Office in the field of CC and DRR	• Resettlement of the most vulnerable coastal communities is an option to be envisaged • The integration of CC adaptation and DRR supports more effective responses in both areas • So does capacity development for all organisations involved in DRR and CC adaptation
South Pacific (SPC) 2011-2015 €11.4 million Overall development	• Production of 'adaptation roadmaps' providing for the mainstreaming of CC adaptation into development policies and budgets • Pilot implementation of some activities	• Combining 'top-down' and 'bottom-up' approaches to adaptation provides the best chance of improving adaptive capacity • Field activities, in the form of pilot projects,

Country or region Duration GCCA budget Sector(s) concerned	Main activities and/or expected results	Key insights and/or emerging lessons
/ poverty reduction; coastal zone management; health; infrastructure; water and sanitation	included in these roadmaps (possible themes include coastal zone management and urban planning)	thus contribute to informing DRR, coastal zone management and other adaptation responses
The Gambia 2012-2016 €3.86 million Overall development / poverty reduction; coastal zone management	• Establishment of a participatory and self-sustainable integrated coastal zone management (ICZM) process • Acquisition and management of data in support of evidence-based ICZM and adaptation • Identification of priority coastal zone adaptation measures • Demonstration and research projects focused on ecosystem and livelihood resilience and coastal zone ecosystem rehabilitation	• ICZM is needed to address simultaneously all the components that drive coastal erosion • Acquiring and managing data in support of evidence-based ICZM is an important aspect this approach • A strengthened institutional framework, supportive of intersectoral coordination and notably coordination between ICZM and CC management, is required • Field activities can support learning processes in the context of ICZM
Vanuatu 2012-2016 €3.2 million Overall development / poverty reduction; agriculture; natural resources; water and sanitation	• Mainstreaming of climate resilience and DRR into key sectors • Provision of technical assistance to foster the integration of CC vulnerability into development plans and budgets • Implementation of concrete activities to increase resilience to climate risks (through improvement of farming practices, watershed management, ecosystem restoration, the development of early warning and monitoring systems for floods)	• Investing in data collection and knowledge management, including early warning systems, supports evidence-based DRR • The integration of CC adaptation and DRR supports more effective responses in both areas • Ecosystem-based approaches are an integral part of DRR

3. GCCA insights and emerging lessons

In this section, the individual country and regional experiences presented in Table 1 are clustered under broad themes and general findings.

3.1 Reducing vulnerability to disaster-related effects of climate change

Vulnerability to natural disasters and climate change is a function of exposure, sensitivity and adaptive capacity (IPCC, 2001; IPCC, 2012). Vulnerability reduction in the context of disaster risk reduction involves seeking opportunities to reduce exposure, reduce sensitivity and increase adaptive capacity.

Exposure to climate change is to a large extent determined by geographical location. The most obvious way of reducing exposure to climate-related disasters is to avoid promoting settlements and economic development in identified high-risk areas (e.g. very low-lying coastal areas, areas prone to floods and landslides or particularly exposed to wind damage) – and in some cases, to retreat from such areas through relocation of infrastructure and population resettlement. In practice, these options may be politically difficult to promote, especially the latter. Despite the challenges, two

GCCA programmes are or consider addressing coastal zone vulnerability through resettlement, as presented in Box 1.

Box 1: GCCA experience – Reducing exposure to risks through resettlement

In **Solomon Islands**, the GCCA budget support programme explicitly encourages consideration of resettlement of the most vulnerable communities as an adaptation and disaster risk reduction option. The disbursement criteria request the allocation of a budget to this and other NAPA priorities, and another criterion refers to the costing of relocation options and preparation of guidelines for human resettlement projects, including safeguard standards, to minimize risks of conflicts due to resettlement.

In **Senegal**, following a decision to drop the construction of a breakwater (see Box 7), the selection of alternative projects to be financed by the GCCA is under way. Final choices still have to be confirmed, but interest now seems to have moved to support for the resettlement of coastal communities established in particularly vulnerable areas to safer places.

Infrastructure- and ecosystem-based options are also available to reduce exposure. In coastal areas, in particular, artificial sea defences can offer protection against coastal floods linked to sea surges, while the rehabilitation of natural ones such as mangroves can both reduce coastal flooding and absorb part of the energy of tropical storms, thus reducing their impact on land. These options are further discussed in Section 3.5.

Addressing *sensitivity* to climate change might be less straightforward than addressing either exposure or adaptive capacity. However, support for the development of alternatives to beach sand extraction, as in **Senegal** and **The Gambia**, might be an example of such an approach: for a given level of exposure to storm surges and sea level rise, a coastline from which no sand has been extracted will be less sensitive to erosion than a coastline subjected to sand mining.

More frequently, interventions in the field of disaster risk reduction and coastal zone management address vulnerability through *enhancement of adaptive capacity*, which may encompass many aspects including activities in the field of education, livelihoods, access to essential services, access to information and technology, infrastructure building, ecosystem and natural resource management, and institutional building. Various approaches are used by GCCA interventions, including public outreach and education activities (e.g. in **Guyana** and the **Pacific**); livelihood diversification and income generation (e.g. in **Bangladesh** and **Guyana**); the development of early warning systems (e.g. in **Bangladesh**, **Benin** and **Vanuatu**); risk mapping and other knowledge management and decision-support tools and systems (e.g. in **Benin**, the **Caribbean** and **Vanuatu**); the building of physical infrastructure such as cyclone shelters (e.g. in **Bangladesh**) and drainage systems (e.g. in **Samoa**); improved management of ecosystems (e.g. in **Guyana**, **Jamaica** and **Vanuatu**); and institutional and capacity strengthening (e.g. in **Jamaica**, **Senegal**, **Solomon Islands** and **The Gambia**). Examples of GCCA interventions in these areas are further developed in other sub-sections under Section 3 of this document.

3.2 Investing in data collection and management

Reliable data are needed to support climate change adaptation, disaster risk reduction and coastal zone management. Data needs may notably concern short- and medium-term weather forecasts to feed into early warning systems, coastal hydrodynamics (e.g. sediment transport and budget, sea

currents, tidal force, bathymetry), risk area mapping, but also socioeconomic aspects such as livelihoods, the relative wealth of settlements, or the value of coastal infrastructure. Examples of GCCA-supported interventions that invest in data collection and management in support of evidence-based decision making for disaster risk reduction and coastal zone management are presented in Box 2.

Box 2: GCCA experience – Collecting and managing data for DRR and coastal zone management

The **Bangladesh** Climate Change Resilience Fund supported by the GCCA notably promotes the strengthening of early warning systems for cyclones, storm surges and floods. This will enable more accurate short-, medium- and long-term forecasts, in support of timely disaster preparedness and response.

In **Benin**, the acquisition of cartographic tools, and the strengthening of capacities of the National Geographical Institute and structures in charge of producing maps, will support the mapping of the entire national territory, necessary for enhanced disaster risk management, especially through improved land use planning. The new equipment and the updating of maps of the national territory will for instance help identify risk areas where settlements should not be allowed. Another expected result of the programme is the establishment of an early warning system for floods, which will improve disaster response capacity at the level of institutions and the population.

In the **Caribbean**, climate monitoring, climate modelling, and vulnerability and risk assessment to inform future land use planning, zoning and development planning, are being supported in the context of a regional programme. These activities contribute to disaster risk reduction as well as adaptation in general.

In the **Pacific**, applied research will be undertaken with a focus on better understanding the degree and nature of the vulnerability of the communities of various sizes (cities, towns, villages) which occupy particularly vulnerable locations (e.g. atolls and river deltas), and on developing tools needed for assessing vulnerability and developing adaptation plans. The programme also supports the development of a Climate Change Knowledge Centre at the University of the South Pacific. These activities notably support disaster risk reduction and improved coastal management.

In **Senegal**, data on coastal hydrodynamics will be collected and integrated in a database of coastal areas, in support of integrated coastal zone management (ICZM).

In **The Gambia**, data on climate change and coastal management are scattered, often held outside the country and not available to decision makers. As a result, studies often fail to capitalise on earlier data collection efforts, and agencies do not have ready access to information such as historical coastal change. To help address these problems, the GCCA will support the establishment of an information management system at the National Environment Agency, including a geographical information system, to allow analysis of historical and new data relevant to ICZM and adaptation. Feasibility studies, vulnerability assessments and economic analysis will also be undertaken to enhance the body of evidence on which to base strategic choices and planning decisions.

In **Vanuatu**, support is provided for the development of early warning and monitoring systems that help build the ability of farmers to cope with critical situations, such as flooding. The mapping of high-risk areas is also promoted as an input to evidence-based land use planning (e.g. to avoid expanding settlements into flood-prone areas).

3.3 Strengthening institutions for disaster risk reduction and coastal zone management

In the fields of disaster risk reduction and coastal zone management, as in all other sectors, strong institutions are central in providing effective design and implementation of climate-related policies, and also contribute to favourable conditions for the development of a sound legal and regulatory framework. Given their cross-sectoral nature, the institutional framework for addressing both issues is frequently complex, and lack of effective coordination between key organisations may hinder progress in implementing projects or wider reforms. In **Guyana**, for example, the Ministry of Public Works is in charge of the budget for coastal zone protection structures including sea walls, while the Ministry of Agriculture supervises the GCCA-funded Mangrove Management Action Plan. Strengthened collaboration is need to support the effective, coordinated implementation of works, notably the building of hard structures that in some places are needed to protect natural mangrove regeneration. Box 3 provides examples of institutional strengthening efforts undertaken in the context of GCCA-supported programmes.

Box 3: GCCA experience – Strengthening institutions for DRR and coastal zone management

In **Bangladesh**, GCCA support to the Climate Change Resilience Fund contributes to the setting up of a functional institutional framework and mechanisms to support natural disaster management, including appropriate policies, laws and regulations.

In **Senegal**, inter-institutional coordination around integrated coastal zone management (ICZM) has started to develop, at the initiative of the GCCA and other interventions (including the preparation of a World Bank assessment study on the economic value of the impact of climate change on the Senegalese coastal zone). The GCCA is contributing to this process; for example, in March 2011, it brought together all actors involved in the ten coastal zone projects currently active in Senegal, emphasising the need for nationally led coordination. The link between institutions in charge of climate change coordination and coastal zone management remains weak, however, and needs strengthening. Better coordination and alignment of the coastal protection and climate change agendas may notably support progress towards a more integrated, less infrastructure-focused response to coastal erosion.

In **The Gambia**, the Department of Water Resources, the Ministry of Forestry and Environment and the National Environment Agency (NEA) all have responsibilities with regard to climate change, but coordination (assigned to NEA) is hindered by the absence of an overarching framework and by overlapping institutional mandates. The GCCA programme will bring stakeholders together to define coordination roles and functions with regard to both ICZM and climate change, and to develop bridges between ICZM and climate change coordination.

Whilst there has been growing recognition of the need to address climate change adaptation and disaster risk reduction in an integrated manner (see for instance ISDR, 2005; IPCC, 2012), there is still a gap between the institutional, legal and policy frameworks at the international, national and local level. This is an obstacle for the development and implementation of integrated approaches to reduce vulnerability and enhance risk resilience. There is thus a need to better mainstream climate change into policies and institutions related to disaster risk reduction, and *vice versa*. Some GCCA interventions pay specific attention to this aspect, as illustrated in Box 4.

Box 4: GCCA experience – Promoting an integrated approach to adaptation and DRR

In **Samoa**, disaster risk reduction and adaptation are addressed simultaneously in the water sector. Drainage is an essential component of the Water for Life sector plan, considering its contribution to flood mitigation. The GCCA intervention supports the rehabilitation and upgrading of the drainage infrastructure in the flood-prone central business area of Apia, contributing to disaster risk reduction efforts. Technical specifications will be defined taking account of the latest climate change projections for the country, supporting adaptation to future climatic conditions.

In **Solomon Islands**, the government has brought both the Climate Change Office and National Disaster Management Office under the Ministry of Environment, Conservation and Meteorology, in view of rationalising and strengthening coherence in the design and implementation of adaptation and disaster risk reduction policies. The National Disaster Risk Management Plan explicitly integrates climate change and reflects some NAPA priorities. GCCA budget support helps strengthen the institutions in charge of implementing this plan, and also emphasises the need to mainstream climate change adaptation and disaster risk reduction into national and sector strategies, starting with the Medium-Term Development Strategy and the National Transport Plan, and into the national budget. The disbursement criteria chosen for the budget support programme encourage steps in this direction.

In **Vanuatu**, support is provided to the National Advisory Board (NAB) for Disaster Risk Management and Climate Change, a newly created body integrating the functions of two pre-existing bodies, the multi-sectoral National Advisory Committee on Climate Change (NACCC) and National Task Force for Disaster Risk Reduction and Disaster Management. The NAB Secretariat, under the Vanuatu Meteorological and Geohazards Department, is being reinforced, with the help of external expertise, to address simultaneously disaster risk reduction and climate change adaptation and support the mainstreaming of both topics into key sectors.

In the **Pacific** region in general, a consensus on the need to better integrate adaptation and disaster risk reduction was one of the highlights of the EU-Pacific high-level policy dialogue organised under GCCA auspices in March 2011, in Vanuatu.

Developing capacities is an important aspect of institutional strengthening. Capacity development for disaster risk reduction and coastal zone management requires working with a wide range of stakeholders, including policy makers; national, sectoral and municipal officials; various types of non-governmental organisations; and local communities. Some of the skills to be developed may be quite specialised (e.g. coastal hydrodynamic studies, use of mapping and GIS tools, interpretation of satellite images, forecasting for early warning systems, hazard and risk mapping, mangrove seedling production, design of infrastructure- and ecosystem-based approaches to adaptation and risk reduction); others may be more generic (e.g. data management, planning skills, monitoring and evaluation skills and communication skills). Examples of GCCA-supported interventions that address these needs are presented in Box 5.

Box 5: GCCA experience – Building capacities for DRR and coastal zone management

In **Bangladesh**, it is recognised that capacities for natural disaster management need to be widespread and address all levels and stakeholders. GCCA funding contributes to the strengthening of capacities to manage natural disasters in government, civil society and communities.

In **Solomon Islands**, technical staff of the Ministry of Environment, the National Disaster Management Office, the Ministry of Development Planning and Aid Coordination and the Ministry of Lands have been encouraged to attend training on climate change and/or disaster risk reduction; participation in such training has been made one of the 'triggers' for disbursement of the variable tranche of budget support.

In **Guyana**, education and outreach initiatives targeting coastal communities are an integral part of the GCCA-supported Mangrove Management Action Plan. Five village mangrove action committees have been set up to promote mangrove awareness and protection at the community level. A campaign explaining the multiple benefits of mangroves have been shown on national television. A documentary on mangroves entitled 'Holding Back the Sea', aired by the Guyana Learning Channel, has been well received by its audience of primary schools. A teacher's resource manual on mangroves, endorsed by the Ministry of Education, is now also part of the secondary school curriculum.

In the **Pacific**, with GCCA support, the University of the South Pacific has developed training modules and scholarship programmes on various topics related to climate change and disaster risk reduction. It will soon start delivering formal training (through post-graduate, master and PhD-level courses and the provision of scholarships for action research) and informal training (through workshops and information sessions).

3.4 Involving local communities

Local stakeholders can play an important role in the prevention of disasters as well as the implementation of adequate responses when they occur. On the prevention side, for example, ecosystems that play an important role in mitigating climate-related risks are vulnerable to damage if their importance is not fully appreciated by local communities (e.g. destruction of mangrove forests for the short-lived benefits of shrimp farming, collection of sea shells to the detriment of beach formation dynamics, forest degradation from slash-and-burn agricultural practices to the detriment of soil and water conservation). Community-based awareness raising, combined with the demonstration of more sustainable approaches (as in **Benin** and **Guyana**, for instance) or the provision of alternatives (in particular with regard to settlements in high-risk areas), is an effective way of reducing disaster risks.

Generally speaking, programmes clearly benefit when all key stakeholders, including vulnerable communities and possibly private sector actors (as in **Guyana**), are effectively represented in decision-making processes. With a participatory approach, measures aimed at disaster risk reduction, notably in the field of coastal zone management, take better account of the needs of local communities. It is even better if they are seen to generate some direct benefits for them. Examples of community involvement in GCCA-supported programmes are presented in Box 6.

Box 6: GCCA experience – Involving communities in DRR and coastal zone management

In **Bangladesh**, community involvement in building disaster response capacities is widely promoted, and 10% of the amount available for the GCCA-supported Climate Change Resilience Fund is to be disbursed in the form of grants to community-based adaptation projects, on the basis of calls for proposals. Community participation is also promoted to ensure effective operation and maintenance of infrastructure aimed at eliminating or reducing hazards (e.g. coastal embankments, river embankments and drainage systems, urban drainage systems) and infrastructure aimed at enhancing the emergency response (e.g. cyclone and flood shelters).

In **Benin**, the GCCA supports the conservation and sustainable use of gallery forests in the lower valley of the Ouémé river to reduce flood risks in downstream areas. It is acknowledged that forest protection cannot be successful without efforts to develop sustainable livelihoods for forest-dependent communities. The design of new forest management structures and the development of sustainable management plans are to be undertaken with the involvement of local communities and traditional authorities, using participatory processes and with a focus on identifying the incentives needed for adopting sustainable practices. Support will be provided to local communities for the development of alternative livelihoods such as sustainable production of non-timber forest products and medicinal plants, and ecotourism.

In **Guyana**, coastal communities are involved in the production of seedlings for mangrove rehabilitation works, and a mangrove reserve women's producers group has been established to promote alternative livelihoods, based in particular on the sale of non-timber forest products, honey from beekeeping and other produce from the mangrove. An interesting feature of the project is the involvement of a private sector champion with experience in promoting a range of organic food and beauty products produced by Amerindian communities; this has been instrumental in the success of the programme with regard to the development of sustainable mangrove-based livelihoods.

In **Jamaica**, local communities are fully engaged to sustain the rehabilitation of watersheds through slope stabilisation measures such as reforestation of degraded hillsides. This is done by establishing or, where they exist, strengthening local forest management committees.

In **Senegal**, coastal communities concerned by (still to be identified) field projects will be involved in sensitisation actions on coastal zone management and in the restoration of coastal ecosystems. The aim is to train champions of sustainable coastal zone management in different communities, who will then further promote good practices.

In **The Gambia**, the engagement of local stakeholders including non-state actors is promoted through the financing of demonstration and research projects (see Box 8).

3.5 Combining 'soft' and 'hard' options

The recent IPCC report on managing the risks of extreme events and disasters to advance climate change adaptation stresses that 'successful strategies include a combination of hard infrastructure-based responses and soft solutions such as institutional capacity building and ecosystem-based responses' (IPCC, 2012: 17). GCCA interventions in the field of disaster risk reduction and coastal zone management support both infrastructure-based options (e.g. in **Bangladesh** and **Samoa**) and ecosystem-based options (e.g. in **Benin**, **Guyana**, **Jamaica**, **Vanuatu**). Some of them also promote integrated approaches, which bring together all the main stakeholders in a given issue to identify balanced approaches that take their various needs into account. The GCCA supports integrated coastal zone management (ICZM) in **Senegal** and **The Gambia**, and contributes to the

implementation of integrated water resources management (IWRM) in **Samoa**. Integrated approaches typically lead to the implementation of a mix of hard and soft options.

Box 7 provides examples of infrastructure-based, ecosystem-based and integrated approaches to disaster risk reduction and coastal zone management implemented in the context of GCCA-supported programmes.

Box 7: GCCA experience – Supporting 'hard', 'soft' and integrated approaches

In **Bangladesh**, it is recognised that disaster risk reduction requires, among other things, investment in infrastructure to reduce vulnerabilities and increase disaster response capacities. The Bangladesh Climate Change Resilience Fund can thus support the building or rehabilitation of protective infrastructure such as coastal and river embankments, urban drainage systems, river erosion control works, cyclone and flood shelters. The construction of cyclone shelters is getting particular attention at the moment, with the ongoing construction of a multipurpose cyclone shelter, and plans to construct 56 additional ones and rehabilitate another 50.

In **Samoa**, the GCCA supports the rehabilitation, reconstruction and upgrading of drainage infrastructure in support of flood risk reduction, as well as the setting up of an effective asset management system and the implementation of a maintenance plan for drainage infrastructure. This latter aspect is important: drainage infrastructure quickly ceases to be functional if it is not regularly maintained. These infrastructure-based flood mitigation efforts are part and parcel of a wider IWRM planning process, in which the upgrading of drainage infrastructure is complemented by the regulation of development activities in the upper watersheds and the rehabilitation (replanting) of the Apia watershed.

In **Vanuatu**, watershed management to control flooding (notably with the introduction of agroforestry) and other ecosystem-based approaches (e.g. wetland restoration, replanting of coastal vegetation and forests, and use of indigenous afforestation methods to reduce flooding, coastal erosion and the impact of storm surges) are among activities to be supported.

Other countries in which the GCCA supports ecosystem-based approaches to risk reduction include **Benin** (flood risk mitigation through improvement forest management, see Box 6), **Guyana** (coastal zone protection through mangrove restoration and protection) and **Jamaica** (reforestation of degraded hillsides for slope stabilisation and flood risk mitigation, and coastal zone protection through the rehabilitation and improved management of natural sea defences such as coral reefs, seagrass beds and mangrove forests).

In **Senegal**, the GCCA promotes the establishment of an ICZM system, as a way of addressing all the components that have an influence on coastal dynamics, for which inter-sectoral coordination is required. This notably involves the development of an appropriate institutional and legal framework for managing coastal zones. The programme operates in an environment of apparent preference of some government services for infrastructure-based coastal protection measures over 'softer' approaches, which needs to be overcome if ICZM is really to take hold.

As far as concrete projects are concerned, the initial plan of supporting the construction of a breakwater in the Rufisque area had to be dropped after a study revealed a high level of financial and technical risk, and insufficient funding capacity under the GCCA programme. In replacement, interest now seems to have moved to support for the resettlement of vulnerable coastal communities (see Box 1). Once projects have been identified, the concerned coastal communities will be involved in sensitisation actions on coastal zone management and in the restoration of coastal ecosystems.

(...)

Box 7 (continued) – Supporting 'hard', 'soft' and integrated approaches

In **The Gambia**, it is also recognised that coastal protection requires an integrated approach to coastal management, involving all stakeholders and sectors that have an incidence in the management of the coastal area. This poses a challenge in terms of ensuring inter-sectoral coordination. ICZM is quite a wide-encompassing approach and one which would, in the context of The Gambia, cover a large part of the country, as it would normally include also the estuarine coast. Due to the complexity of implementing full-fledged ICZM and the limited resources available under the GCCA, the project aims to start making use of ICZM best practices in a limited number of vulnerable coastal areas.

In terms of support for concrete coastal protection measures, options remain open. Coastal protection structures are one element that could be used to reduce the severe coastal erosion that is affecting Gambia's tourism industry and coastal livelihoods. However, it is recognised that the selection of the best alternative for coastal protection has to be derived from a detailed feasibility study, which has to consider social as well technical feasibility and could point to other alternatives (e.g. enhancing natural defences, retreat, beach nourishment). The costing of coastal protection infrastructure is not possible until the feasibility study has been completed, and a decision on the precise measures to be supported will depend on its outcomes.

One of the advantages of ecosystem-based approaches is their capacity to enhance the resilience of ecosystems and thus maintain ecosystem services on a sustained basis in spite of potentially disrupting short-term variation and long-term changes in climate. Preserving and restoring habitats for marine, coastal and forest biodiversity, for example, may support the diversity and resilience of livelihood opportunities (e.g. in relation to tourism, fishing, or the exploitation of non-timber forest products). Options based on maintaining and restoring natural ecosystems can go a long way in reducing the vulnerability of both natural systems and human populations to climate-related risks and disasters, while also providing benefits in terms of mitigation, given their significant potential as carbon reservoirs (Trumper et al, 2009; World Bank, 2010).

For programmes with activities in very specific, highly technical areas such as coastal management, highly specialised expertise is required. Feedback from the field indicates that the setting up of mechanisms to facilitate access to the large pool of expertise that exists in the EU on ICZM would be most useful.

3.6 Learning from field activities

Organisations may have experience in the use of certain types of infrastructural solutions, or a feasibility study completed for a given type of solution may predispose a certain course of action. Some approaches (typically those based on infrastructure building) may also be politically perceived as more 'serious'. Ultimately however, the best approach is the one that addresses a specific issue in the most effective and efficient manner, taking account of technical, social, environmental and economic aspects. Effective, locally acceptable disaster risk reduction and coastal adaptation options may be identified by implementing pilot or demonstration projects, supporting knowledge building in real-life conditions. Several GCCA interventions support demonstration projects or field activities that can play a similar role, as illustrated in Box 8.

Box 8: GCCA experience – Learning from field activities in DRR and coastal zone management

In **Guyana**, mangrove restoration work undertaken under the National Mangrove Management Action Plan is implemented gradually, starting with identified priority locations. This allows building experience over time.

In **Jamaica**, the establishment or strengthening of Local Forest Management Committees, and the implementation of reforestation, agroforestry and other watershed management activities in selected watersheds , can provide a foundation for similar undertakings in other parts of the country. Similarly, the restoration of coastal ecosystems and implementation of other coastal protection measures in selected areas can also lead to replication on a wider scale, on the basis of the experience acquired in the context of the GCCA programme.

In **Senegal**, the implementation of 'concrete activities' in the field of coastal zone management was deemed an indispensable complement to the institutional and technical work undertaken in relation to the setting up of ICZM. Following a decision to abandon the initially envisaged infrastructure project (see Box 7), a number of smaller-scale projects involving coastal communities in vulnerable areas of the coastline will be implemented. This will provide an opportunity to test disaster risk reduction and coastal adaptation measures, and train champions of sustainable coastal zone management in different communities, who could then further promote good practices on the basis of their practical experience.

In **The Gambia**, demonstration and research projects will be supported, based on a call for proposals (under way at the time of writing this background document), with a view to enhancing local-level capacity to adapt to climate change. Projects will focus on enhancing ecosystem and livelihood resilience to climate change, on coastal zone ecosystem rehabilitation, and on developing viable alternatives to sand mining in coastal areas.

In the **Pacific**, low-input, replicable community climate change adaptation projects, accompanied by a robust process of best practice promotion, will be implemented. These projects are expected to draw on the programme's training and research components, but also to contribute inputs into them. Project sites are in the process of being chosen, and should represent different types of islands and problems common in the Pacific, building synergies with ongoing work carried out under major adaptation projects in the region. Projects sites are expected to be predominantly in outer (peripheral) and more vulnerable islands, where self-sufficiency issues are more acute.

In the **South Pacific**, experience shows that a system embracing both 'top-down' and 'bottom-up' approaches to the adaptation process has the best chance of improving adaptive capacity. For this reason, strategic planning of adaptation (in the form of the preparation of national 'adaptation roadmaps') is combined with the implementation of field projects from which practical experience can be acquired and shared. These field projects may concern various adaptation- and DRR-relevant sectors, including coastal zone management and urban planning.

The GCCA regional programme for the **Caribbean** will also support the implementation of a limited number of adaptation projects; it is not known as this stage whether they will involve activities in relation to disaster risk reduction or coastal zone management.

4. Topics for further discussion at the GCCA Global Learning Event

How are disaster risk reduction and coastal zone management being addressed in your GCCA programme? How are things being done? What are the challenges, and how are they being tackled? What are the lessons learned to date? Do you have practical examples (e.g. studies, policies or plans) or stories to share? More specifically:

1. Does the GCCA programme in your country promote an integrated approach to adaptation and disaster risk reduction? What about integrated approaches such as ICZM or IWRM? How are these being implemented?
2. Does the GCCA programme in your country support applied research (e.g. risk mapping), data collection and management? If so, how does this aspect of the work complement other areas of work, and which ones?
3. Does the GCCA programme in your country include pilot or demonstration projects? Which issues do they address? What has been or will be put into place to support learning and dissemination? Can you already share some materials?
4. What approaches have been most effective in engaging stakeholders and in particular the most vulnerable? What about the private sector?
5. Does the GCCA programme in your country support infrastructure-based measures, and/or ecosystem-based measures, in support of disaster risk reduction or coastal zone management? If so, how were these measures selected? How did the political dimension come in?
6. How are you ensuring that the GCCA programme is supporting long-term institutional strengthening and capacity building? Which activities or approaches have proven most successful in strengthening capacities and institutions (e.g. in-country technical assistance, training, south-south exchange, etc.)? Can you explain?

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