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Integrated Coastal and Fisheries Governance Initiative

Integrated Coastal Management Toolkit

Hɛn Mpoano



This publication is available electronically on the Coastal Resources Center's website at <http://www.crc.uri.edu>.

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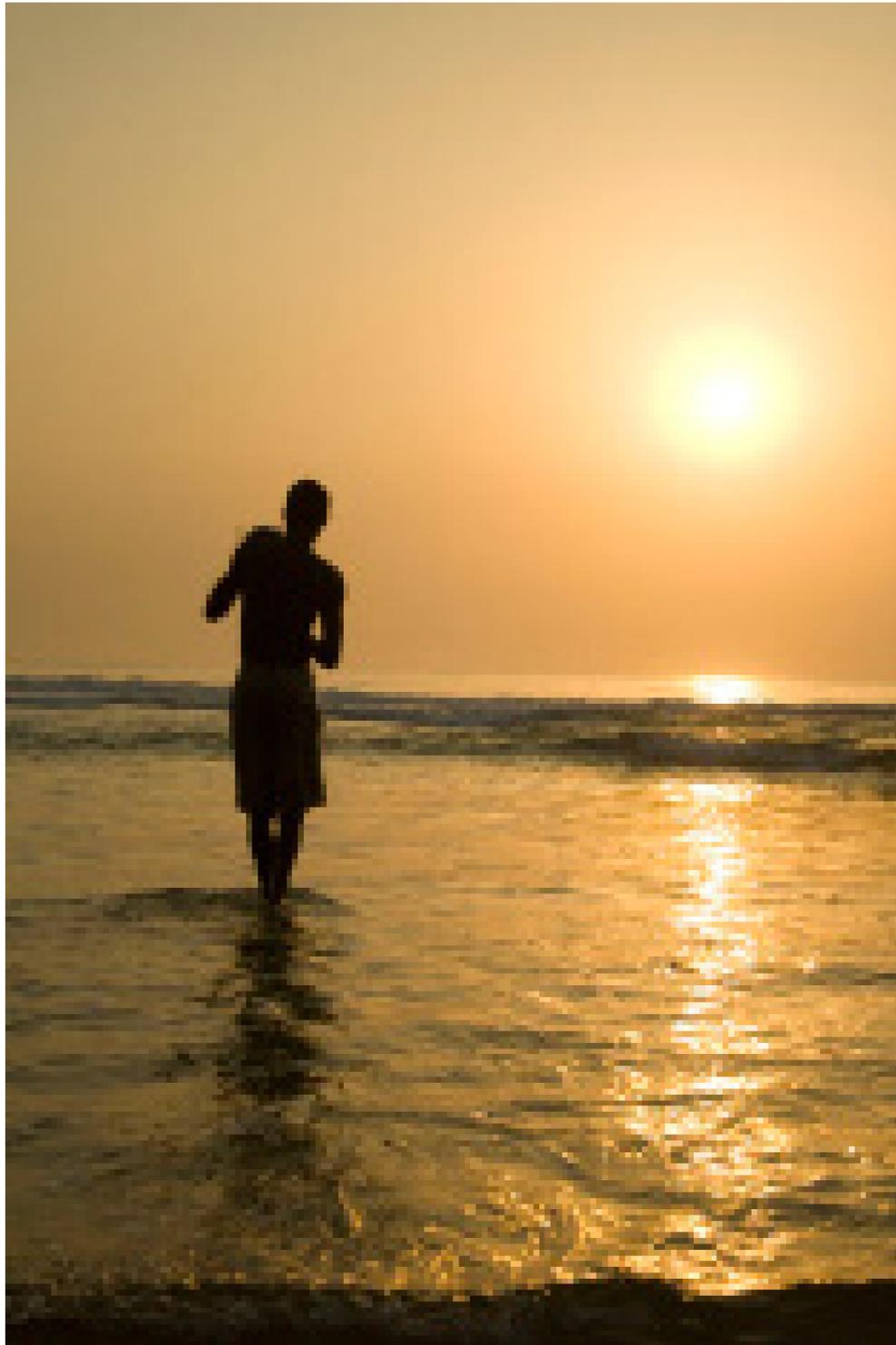
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Cover photo: Nzulezo, Jomoro District
Photo credit: Lucia Rybarova

Acknowledgements

With funding from the United States Agency for International Development (USAID), the Coastal Resources Center of the Graduate School of Oceanography at the University of Rhode Island have worked together with core partners including Friends of the Nation, Worldfish and Sustainamatrix to implement the Integrated Coastal and Fisheries Governance (ICFG) Initiative, locally known as Hen Mpoano. We are pleased to compile a compendium of Integrated Coastal Management (ICM) information and knowledge generated through this 4-year Initiative into a toolkit to inform district level planning and management of coastal and marine resources. Compilation of this material benefited from the contributions of a large number of colleagues and practitioners, including many members of the coastal communities of the Western Region of Ghana and beyond, who have assisted in information gathering, research and analysis. We sincerely acknowledge the contribution of the planning departments of the six coastal districts of the Western region in supporting the development of innovative processes that builds ICM into district planning processes and decision making procedures. We are also grateful to the following individuals for providing technical insights and guidance during the production of this material: Dr. Christopher Cripps (Spatial Solutions), Dr. Donald Robadue (Coastal Resources Center, University of Rhode Island, USA), Stephen Kankam (Hen Mpoano), Pamela Rubinoff (Coastal Resources Center, University of Rhode Island, USA), Hillary Stevens (Coastal Resources Center, University of Rhode Island, USA) and Kofi Agbogah (Hen Mpoano). The graphic designs and layouts as well as GIS mapping have been done through the hard work of Justice Camilus Mensah (Hen Mpoano) and Lucia Rybarova (Oil City Magazine).

Finally, we would like to acknowledge the fruitful collaboration developed with key officials and institutions, without which this toolkit will not have been possible. At the regional level the partnership developed with the Members, Chief Executives, Directors and Officers of the District Assemblies, Regional Coordinating Council and private companies is appreciated. At the national level, our collaboration with the National Development Planning Commission, Fisheries Commission, Town and Country Planning Department, Ministry of Environment, Science, Technology and Innovation is acknowledged. It is our hope that this toolkit and the legacy of the Hen Mpoano Initiative will inspire further work in coastal and marine management in Ghana.



Statement from Honourable Sylvester Daddieh, District Chief Executive of the Jomoro District Assembly

This toolkit is very unique and presents an opportunity for our district to have a foretaste of coastal management. I appreciate the efforts of Hen Mpoano for carefully putting together a resourceful tool like this as guidance for coastal planning and decision making in our district.

In its four years of operation, Coastal Resources Center and partners under the Hen Mpoano Initiative have assisted to build on our knowledge and views - as district planners and managers - of what the coastal zone is really about. The Initiative has assisted the district to identify major coastal zone challenges and given the people the requisite capability meant to advance conservation and sustainable development of the district's rich coastal resources.

This Toolkit has put together their findings and evidence gathered from 2009-2013, summarises the tools that have been developed during that time for all of us to tackle the problems and grasp the opportunities that exist. It tells us how to counter and avoid all the potentially destructive and harmful challenges which are being faced, and shows how the coast may become a place of pride, or harmony, of abundance based on the rich resources that have been enjoyed by its peoples for centuries past, while welcoming the incredible technologies of the 21st century which are now well among us.

I strongly recommend this toolkit to all who are living, working and investing in our coast.

CHIEF EXECUTIVE,
JOMORO DISTRICT ASSEMBLY

Definitions

Adaptive Capacity: capacity of a community to adapt itself to the threats and hazards such as climate change, coastal erosion, loss of livelihoods and inappropriate development.

Artisanal Fishing fleet: traditional canoe-based fishing vessels.

Barrier spit or beach: sandy beaches built up by ocean wave energy and backed by wetlands or river outflows. These systems are in constant movement in response to the energy of the surrounding system.

Built Areas Highly Exposed to Flood Damage: are settlements, businesses, residences and public buildings which are routinely submerged by flood waters, erosion or damage from high velocity stream and drainage flow.

Carbon Sequestration: the absorption of carbon dioxide (a "greenhouse gas" which is responsible for global warming) by vegetation.

Catchment Area The area receiving the waters feeding a part or the totality of a watercourse or watershed.

Climate Change: the changes in climate which are being experienced, including extremes of weather (storms,

flood and drought), causing sea levels also to rise.

Community Resourced Management Areas (CREMA): creates a win-win situation by creating a financial incentive for farmers to use and manage natural resources on sustainable basis by devolving management rights and responsibilities to them.

Development: is any man-made alteration to the landscape including grading, filling, dredging, extraction, storage, subdivision of land, or construction of structures, stormwater collection, drainage and discharge works, flood protection works.

Ecosystem: a complex set of relationships among the living resources, habitats and residents of an area. It includes plants, trees, animals, birds, fish, micro-organisms, water, soil and people. Everything that lives in an ecosystem is dependent on the other species and elements that are part of that ecological community.

Eco Tourism: is a form of tourism involving visiting fragile, pristine, and relatively undisturbed natural areas, intended as a low-impact and often small scale alternative to standard commercial (mass)

tourism. Its purpose may be to educate the traveler, to provide funds for ecological conservation, to directly benefit the economic development and political empowerment of local communities, or to foster respect for different cultures and for human rights.

Ecological goods and services: are the benefits provided by wetlands e.g., water purification, supplies of portable water, fishes, plants, building materials and water for livestock, outdoor recreation and education.

Environmental Assessment: is the process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being taken and commitments made.

Erosion: is the removal and transportation of soil particles by the action of water, wind, gravity or other geographical agents, whether naturally occurring or acting in conjunction with or promoted by man - made activities or effects.

Estuary: means a body of surface water a) that is part of a water course that permanently or periodically opens to the sea b) in which the salinity is measurably

higher as a result of the influence of the sea.

Flood: an overflow of rain water or other sources along the normal confines of a river, stream, drainage way or other water body that causes or threatens damage to property, infrastructure, people, or natural resources.

Flood proofing or protection: means any combination of structural and non-structural additions, changes, or adjustments to existing or new structures which reduce or eliminate flood damage to residential and non-residential buildings and their contents. These can include protective walls and drainage systems to redirect water away from existing buildings, rebuilding structures to make them more resistant to the intrusion of flood waters or the physical force of high velocity water. It also includes special design and construction techniques including piers and elevating the lowest usable floor of a building above the level of water experienced in events.

Floodplain: a level or nearly level land along a stream or river flooded only when the stream flow exceeds the water carrying capacity of the channel. flat or nearly flat land adjacent to a stream or river that

experiences occasional or periodic flooding.

Green Belt: an area which has been designated around a settlement for no development in order to provide access to green and open spaces and to encourage more dense urbanization.

High tide line: is the highest point on the shore that is covered by water at high tide. Ghana has two high tides and two low tides each day. The mean tidal range (distance between high and low tides) is 1 meter, and the spring tidal range (time of new or full moon) is 1.3m. For purposes of coastal development, this is the line which development is set back from.

Lagoon: closed or open, a shallow body of water separated from the ocean by a barrier island or spit. It may be open to the ocean occasionally during seasonal flooding or high seas.

Pair Trawling: the joining of nets to two boats in order to increase catches.

Pocket beach: a short sandy shoreline between rocky headlands that prevent long shore transport of sediment.

Restoration: is a broad process of reversing physical, economic and social decline in a coastal area.

Set back: is an area left free of any physical development or modification, commonly used to setback structures from a coastal feature, or from a road in an urban area.

Shoreline protection structures, or sea defense structures: include breakwaters, groins, bulkheads, jetties, and other structures, the purpose or effect of which is to control or prevent the erosion of coastal features.

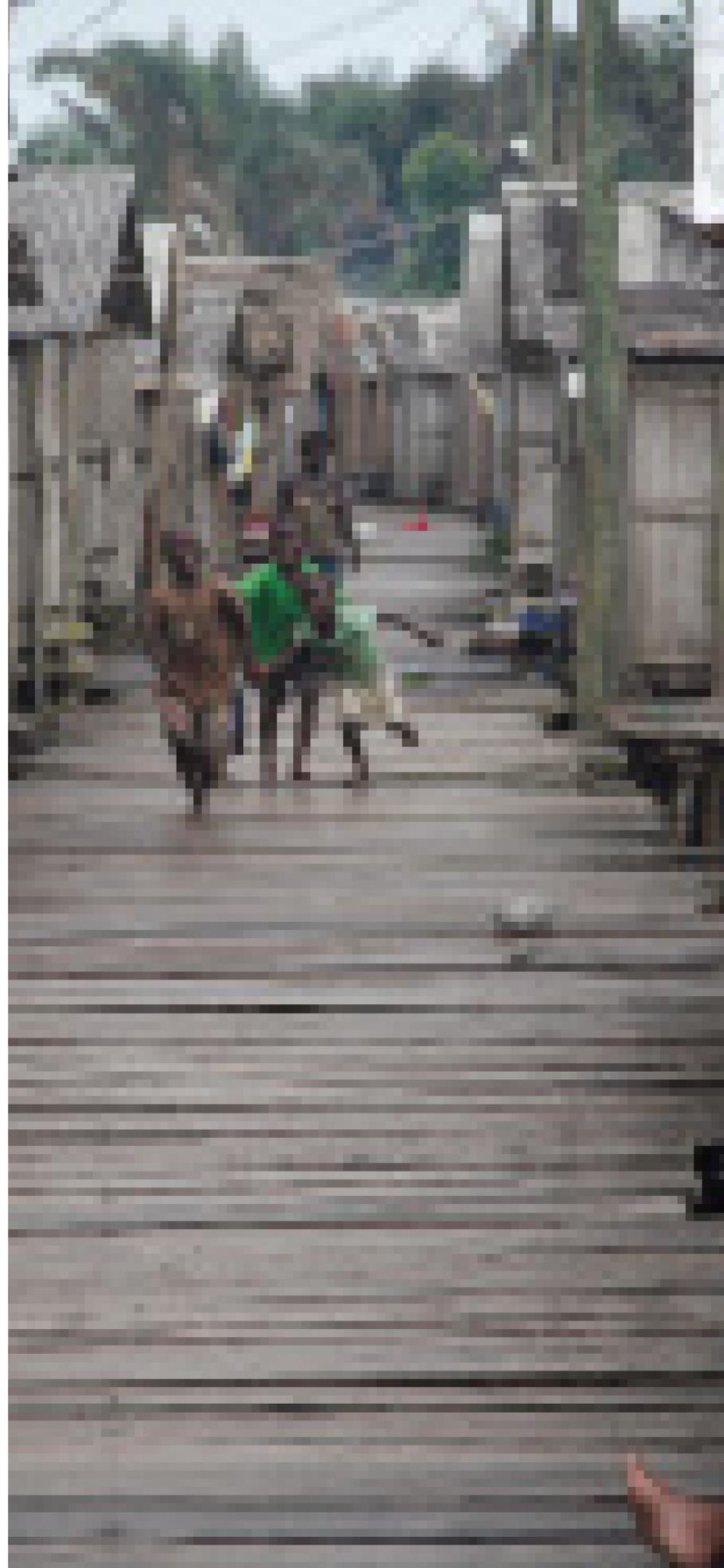
Traditional Authorities: the traditional governance system of chieftaincy in Ghana.

Watershed: area of land where all of the water that is under it or drains off of it goes into the same place, such as a river or a wetland.

Water dependent uses: are uses that can only be conducted on, in, over, or adjacent to the water; each involves, as an integral part of the use, direct access to and use of the water. These uses cannot physically function without direct access to the body of water along which it is

proposed. Examples of water dependent uses include: docks, piers, fish processing facilities, canoe/boat repairs, port activities requiring the loading and unloading of vessels. Water dependent uses exclude housing, hotels, motels, restaurants, warehouses, manufacturing facilities (except for those which receive and quickly process raw materials by ship) etc.

Wetland: means land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil. Functions within the natural ecosystem include flood attenuation and control, maintenance of underground and surface water supplies, sediment trapping, erosion control, pollution abatement and provision of habitats for flora and fauna.



INTRODUCTION

Hen Mpoano and Jomoro District Collaboration

This Toolkit is the final output, for Jomoro District, of the Integrated Coastal and Fisheries Governance (ICFG) initiative, which has become locally referred to as H&N MPOANO (Our Coast). It is a four-year project carried out by the University of Rhode Island Coastal Resources Centre and partners (see acknowledgments), and funded by the United States Agency for International Development (USAID).

The Overall Goal of the Hen Mpoano Initiative

Overall Goal: to support the Government of Ghana in achieving its development objectives of poverty reduction, food security, sustainable fisheries management and biodiversity conservation.

The initiative's vision is that:

Ghana's coastal and marine ecosystems are sustainably managed to provide goods and services that generate long term socio-economic benefits to communities while sustaining biodiversity.

The purpose of the Integrated Coastal Management Toolkit for Jomoro District and how to use it

- It is a catalogue which summarizes the marine and coastal information which has been gathered by Hen Mpoano. It is for use by all of those who are actively involved in carrying out Integrated Coastal Management.
- It provides easy-to-follow links to the source material, more detailed technical information.
- It suggests "Projects" for incorporating Integrated Coastal Management in the planning processes and practices of the District Assembly.

Contents of the Toolkit

Section

ONE: The Coastal Zone and Development Context

TWO: Integrated Coastal Management

THREE: Jomoro District Coastal Profile and Development Issues

FOUR: Integrated Coastal Management Institutions and Processes

FIVE: Bibliography of Documents and Maps produced by the Integrated Coastal and Fisheries Governance Programme

SIX: Best Management Practices

Section one:

The Coastal Zone and Development Context

 Bibliography listed in section five.

 Project proposed to be implemented. Refer to pages 42-43 for more information.

 Examples of Best Management Practices in coastal communities.

Legend

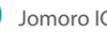
	Ecotourism		District boundary
	Fish landing site		Water body
	Fort/castle		River
	Lighthouse at Cape Three Points		Mangroves / Wetland
	Accommodation facility		1974 shoreline
	Sandy beaches		Natural vegetation
	Coastal lagoon inlet		Tidal influence (yet to be determined)
	Rocky shores		Coastal Zone
	N1/Highway		Town
	Major road		Community Resources Management Areas (CREMAs)
	Proposed roads		Coastal zone (1000 m buffer)
	Buffer		Birds
	Perception of shoreline 30 years ago		Crocodiles
	Perception of shoreline 60 years ago		Turtles / nursery
	Shoreline extend within community		
	Drains		
	100 year shoreline		
	Green belt		
	Gas pipeline		

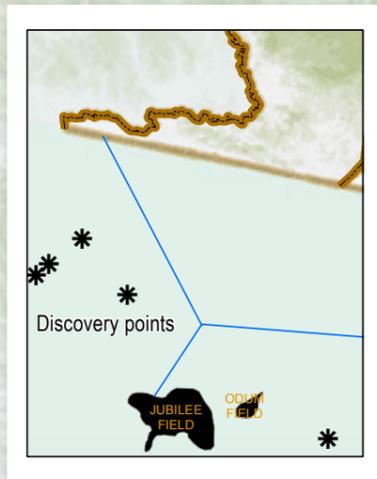


Figure 1: The Coastal Zone of Jomoro District
Source: CRC Ghana

1. What is the Coastal Zone?

The definition of the Coastal Zone.

- A. For planning purposes the coastal zone of Jomoro District is an area with a landward boundary 1km from the shore, or any development in the land area of coastal sub-basins draining seaward, or with a significant likely impact on coastal and marine resources.
- B. For economic purposes, the coastal zone also takes into account activities occurring out to 6 nautical miles seaward, or to a depth of 30m whichever is the greater (coinciding with the fishing grounds of the artisanal fishing fleet).



Ghana's oil reserves - Jubilee oil field

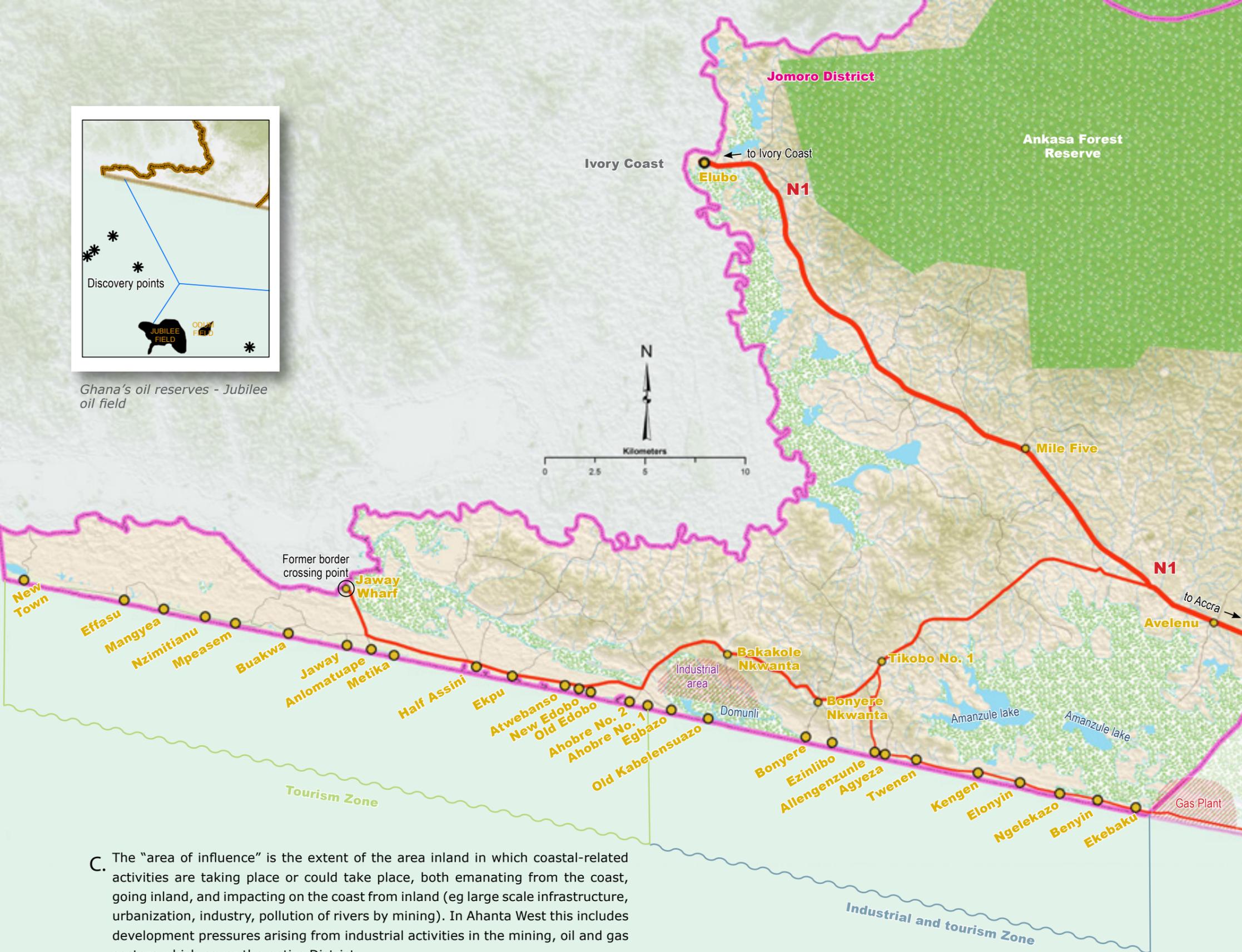


Figure 2: Regional and district maps showing factors in sphere of influence

1.2 Area of influence: socio-economic context

The context for development in Jomoro can be summarized as follows:

- The presence of the West African coastal highway runs through the district giving unique opportunities for international access; the long term effects of the change in the route from Jeway Wharf to Elubo are still being felt.
- The designation of the Domunli Lagoon site for major industrial development, fed by gas from Atuabo, creates a new growth pole which is an opportunity for Half Assini, Tikobo and Bonyere – but also a new challenge in achieving a successful balance between this and the maintenance of the very rich ecological goods and services in the coastal zone.
- The Amanzule wetlands are a highly unique feature of Jomoro which could benefit from being made highly accessible to visitors to gain support and resources for their protection.
- The wetlands and coastal zone constitute an extraordinarily vulnerable system which has for a long time subjected its inhabitants to severe hardships from flooding, loss of, and intense competition for land, not least by a very fast rising population. The competition is intensified by the presence of Ghana's two most productive oil and gas fields which are sited off the Jomoro coast.



C. The “area of influence” is the extent of the area inland in which coastal-related activities are taking place or could take place, both emanating from the coast, going inland, and impacting on the coast from inland (eg large scale infrastructure, urbanization, industry, pollution of rivers by mining). In Ahanta West this includes development pressures arising from industrial activities in the mining, oil and gas sectors which cover the entire District.

D. Coastal features include beaches, dunes, rivers, estuaries, salt marshes, lagoons, wetlands and mangroves as far as they are influenced tidally (1), so the coastal zone in some cases, extends beyond 1km from the outer edge of these coastal landscapes or ecosystem features (for detail see Figure 3).



Figure 3: Detail of coastal zone showing typical features
Source: CRC Ghana

Coastal features:

- Beaches, Dunes and Barrier Spits, Rocky Bluffs, Rock Outcrops and some Steep Slopes
- River Estuaries, Drainage Outflows, Mangroves, Wetlands Marshlands and Coastal Lagoons
- Vegetation, flora, tropical foliage forests, fauna, birds, small invertebrates, sea turtles

Dynamics:

Sandy shorelines are highly dynamic features that evolve in response to waves, currents, tides and wind. In many cases sandy beaches are built up by ocean wave energy and backed by wetlands or river outflows, and are referred to as barrier beaches. These systems are in constant movement in response to the energy of the surrounding system, and as a result are not advisable building sites.



Section
two:

Integrated Coastal Management - why, what and how?

Hen Mpoano, the Integrated Coastal and Fisheries Governance initiative, beginning in 2009, has worked with all stakeholders to get to this stage where the necessity of understanding, the “why”, the “what” and the “how” of Integrated Coastal Management can become clear.

2.1 Why?

The coast of Jomoro District surely represents one of its most distinctive features, which give it one of its greatest competitive advantages. But the development opportunities need to respect the right of communities, which have lived here for centuries past, to also continue to enjoy a prosperous and harmonious life. All will have to meet the ongoing socio-economic challenges exacerbated by climate change and coastal erosion. Those living inland, within the District, are also highly dependent on the health and well-being of the coast.



RI: Our Coast, Our Future: Western Region of Ghana

This is a major product of the Hen Mpoano initiative. It makes the case that a fresh approach to the governance of the coast and fisheries will take root only when it addresses issues that are perceived by the people of the place as important. It covers the major coastal and fisheries issues and concludes with a discussion of the actions that Hen Mpoano proposed to take over a three year period to establish and formalize a governance program for the Western Region that can serve as a model for the nation.

2.2 The Most Urgent Issues

The coastal zone of Jomoro District is undergoing rapid transformation due to activities of a fast growing oil and gas industry. A balance must be found between development and the flow of coastal ecological goods and services. There is a need to confine oil and gas-related development to certain “hot spots” (as identified, for example by the Western Regional Spatial Development Framework), to maintain sustainable livelihoods, protect the environment and the areas of high landscape value (“green belt areas”) which have been identified, while encouraging economic development.

The Rapid Assessment of Communities in Ahanta West (1) showed the following key points:

- Land Use pressures: the discovery of oil and gas has created a rush for land by prospective investors and speculators in industrial and other related development as well as pressure on the district’s 61km stretch of coastline for development of residential, leisure and hospitality. This, coupled with the huge area which is taken up by the wetlands creates strong competition for the space available, including that for fishing and for subsistence agriculture. These are generating concerns for more effective land use and spatial planning that addresses existing vulnerability.
- Fisheries decline: Bad fishing practices coupled with the regular incidence of algal bloom in the marine environment is resulting in dwindling fish catch and displacing fishery-based livelihoods and threatening food security. This problem is aggravated by the prevailing low agricultural productivity in the district.
- Coastal Eco-Systems threatened: Incidence of sand winning and sea erosion, destruction of mangroves, wetlands and drainage systems, sedimentation of major rivers.
- Other concerns: community perception of inadequate government representation and attention; low community participation in resource allocation decision-making, chieftaincy disputes; poor road access/ infrastructure; rising social problems; general lack of Primary and Junior High school education; availability of electricity, pipe-borne water, public toilets, health posts and refuse containers.

2.3 What? The Core Elements of Integrated Coastal Management

The response to pressures of development could in fact generate long term benefits for coastal ecosystems and their dependent communities. The following core elements of Integrated Coastal Management strategy could possibly be sanctioned by the district, by forming a Marine and Coastal Committee, as has been done at Ahanta West. Alternatively the remit of the Amanzule Working Group could be expanded to include implementation of such a strategy:

- Preservation and restoration of important coastal habitat and features that are critical to sustaining the fishing industry.
- Expanding Community Resource Management Areas (CREMAs) in existing conservation management clusters to cover other important coastal wetland areas and features.
- Creating Land Use and Environmental Policies that balance competing interests of industrial, tourism, food and livelihood security, leisure, commercial and residential activities while protecting the vital ecological functioning of the land and seascape.
- Supporting traditional and finding new livelihoods for coastal communities through agriculture, fisheries and aquaculture, as well as providing the access to fully partake in the new forms of development.
- Reducing vulnerability and building adaptive capacity of coastal communities to threats from hazards and climate change including extreme weather, rising sea levels and coastal erosion.
- Sustained stakeholder engagement and moves to build co-operation with neighboring districts through a Joint Coastal Development Planning Area; and creating effective links to the regional and national levels of government.

2.4 How? Systems for implementing Integrated Coastal Management

Integrated coastal management is a participatory process that engages communities, private sector, traditional authorities and civil society. The mechanisms for implementation at the district level are:

1. The District’s Medium Term Development Plan (MTDP), and Community Action Plans which address settlement growth, economic development and the provision of schools, clinics, other services, roads and infrastructure.
2. The District’s Spatial Development Framework (SDF), Structure Plans (SPs) and Local Plans (LPs), which show what can go where, and resolve potentially conflicting demands on land use in the coastal zone.
3. Strategic Environmental Assessment which ensure that the necessary environmental protection measures are taken.

The formation and activities of the Amanzule Working Group is a first step at ensuring that the greater Amanzule wetlands, which are shared between Jomoro and Ellembelle districts, attain formal conservation status and is recognized in the spatial plans of both districts. The establishment of a Marine and Coastal Committee as in Ahanta West district could also be a great step forward for implementing Integrated Coastal Management in Jomoro. It could provide a necessary forum for integration across sectors such as fisheries, offshore oil and gas activities, land use and fresh water supply. The Committee could support issue identification and assessment, suggest and shape policies, prioritize actions and evaluate outcomes as the Coastal Zone is developed.

At the regional and national scales, many of the objectives of coastal management may only be achieved through joint planning and implementation, involving adjoining coastal districts. For this reason, initiatives such as the Data Hub which has been established at

the Western Regional Coordinating Council by Hen Mpoano for technical support, the fledgling Joint Development Planning Area for the Coastal Districts of the Western Region, and Western Corridor Accelerated Development Authority must be supported by all.

This joint approach to planning and decision-making can involve;

- Adoption of region-wide policies for preventing and mitigating flood hazards.
- Information sharing on techniques for assessing hazards and adaptive capacity of coastal places (eg those used in vulnerability assessment and adaptive planning exercises at Dixcove and Akwidaa).
- Collaboration between agencies at regional and national levels on coastal issues.
- Effective mechanisms for conflict resolution and dialogue with parties affected by development decisions.
- Joint initiatives on protection/restoration of critical habitats, forests and wetlands of regional significance by programs such as Community Resourced Management Areas (CREMAs).
- Decision making on large facility siting and management of alterations of the coastal zone.

All of these will become more evident in coming years if detailed planning and decision-making can be done at community level and linked to regional and sub-regional co-ordination of national and international investments.



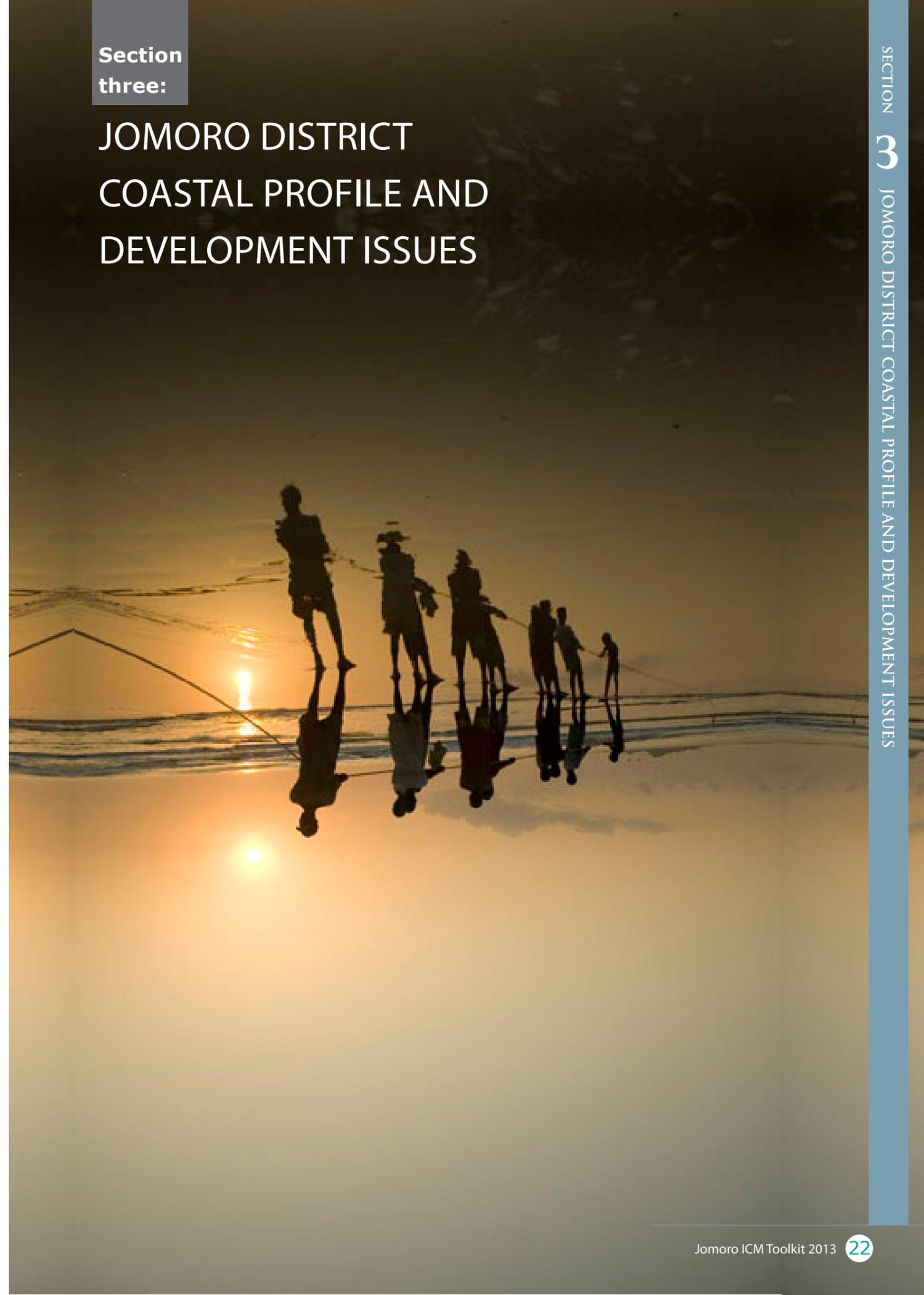
P1: Form Working Groups to deal with specific coastal issues, for example the Amanzule Working Group

2.4 Opportunities to Implement Integrated Coastal Management

Use of the above planning and decision making processes and environmental assessment provides the foundation for Integrated Coastal Management. District Assemblies suffer from chronic underfunding, but many development partners (governments of United States, Norway, France, Germany, Korea, Belgium, United Kingdom) and private sector such as the Jubilee Partners are funding projects which provide essential parts of the process, including community linkages. These need to be made sustainable in the long term by funding mechanisms such as Assembly's Internally Generated Funds (eg from property rate, betterment and value capture in new projects), Corporate Responsibility funds of major private investors such as in a Coastal Foundation, and national and international funds for infrastructure and investment.

Section three:

JOMORO DISTRICT COASTAL PROFILE AND DEVELOPMENT ISSUES



3.1 Characteristics of the Coastal Zone: overview

The Jomoro District shoreline is relatively rural with a mix of land and water uses which underpin local cultures and livelihoods. It is characterized by a long stretch of relatively flat sandy beaches and dune systems with elevation below 10 metres. The majority of the district's population live in dense fishing settlements with fish landing and processing areas on the first dune. This population is hemmed between the sea and the vast Amanzule wetlands. Few hills of rocky outcrops protrude between the sandy beaches and sometimes extend into the sea forming rocky sea beds. The shoreline from the western boundary of Ghana to Ahobre is part of a narrow, 7-10km wide strip of land which bounds the Abby lagoon which is mostly in La Cote D'Ivoire. Until recently, this was the main international route across the border to Abidjan by ferry, with the District Capital, Half Assini, as its heart, also the centre for a thriving coconut industry. The route dips back from the coast at Ahobre to circumvent the Domunli Lagoon, which has the town of Bonyere at its eastern side. From Bonyere to Beyin is a further long stretch of coast with coconut groves separating fishing villages. Beyin is the location of a paramount chieftaincy of the Nzema people, and a growing tourist resort with the Nzulezu stilt village inland on the Amanzule Lake, as its star attraction.

The coast line is linked to, rivers, estuaries and the greater part of the vast ecologically significant Amanzule wetland complex that provides habitats for diverse flora and fauna. In the uplands there are forests and rich agricultural lands.



R2: Adaptive Capacity for Resilient Coastal Communities: Climate Change and Natural Hazards Issues in Coastal Districts of Ghana's Western Region

In 2011 and 2012, Hen Mpoano assessed 77 Western Region coastal communities in the Districts of Jomoro, Elembelle, Nzema East and Ahanta West to gain an understanding of their concerns and capacity. The findings indicated that adaptive capacity is limited in coastal communities. Some locations are faring better than others, but overall, coastal communities have weak ability to respond to emergencies generated by natural hazards, they suffer social and economic development challenges that are worsening, and they have a relatively low ability to manage coastal resources in a way that will ensure sustained productivity and environmental quality.

3.2 Characteristics of Coastal Zone: off-shore marine areas and fisheries

The off-shore areas of the coastal zone are actively used by the artisanal (traditional) fishing fleets. Fishing is also the province of larger, Ghana-based semi-industrial fishing vessels and industrial, intercontinental vessels. There are locally breeding fish, those inhabiting the Guinean current across West Africa and those that migrate across larger distances (such as blue whales). Surveys have been carried out to determine the location and type of marine



R3: Nearshore Rocky Reefs of Western Ghana, West Africa: Baseline ecological research surveys. Atweberhan, M., Gough, C., Fennelly L. and Frejaviile, Y. I.

Ecological information on the near shore rocky reef habitats (NSRH) of Ghana is very limited. The present study fills this knowledge gap, by investigating the general status of the NSRH and fisheries of western Ghana, and providing baseline information on the fish, invertebrate and benthic communities.

R4: Assessment of Fishing Grounds in the Nzema East and the Ahanta West Districts

A rapid appraisal conducted in nine (9) main landing sites in the Nzema East and Ahanta West districts between 14th and 21st September 2010. The communities visited were, Ankobra (Sanwoma), Apewosika (suburb of Axim), Miamia, Princess Akatakyi, Cape Three Points, Akwidaa, Dixcove, Busua and Butre. The purpose of this assessment was to ascertain primary information of the spawning and fishing grounds among others. The research team was made up of two persons; a staff of the Western Regional branch of the Ghana Canoe Fishermen Association and a staff of the Friends of the Nation. Data was collected through focus group discussions, participatory mapping, direct observations and key informants interviews.

R5: Determining The Origin And Ecology Of A Macroalgae (Ulva clathrata) Bloom Along The Coast Of Western Ghana And Cote d'Ivoire.

The Ghanaian Ministry of the Environment worked with The Integrated Coastal and Fisheries Governance (ICFG) and CRC-Ghana to form a Task Force of collaborating institutions to extend a survey into Cote D'Ivoire in order to more fully describe the ecology of the "green green" bloom and its underlying nutrient source(s).

life including juvenile fish and their breeding, and Marine Protected Areas are being proposed to protect fisheries and improve food security.

Marine areas experience many other uses such as for a local, national and international highway, for leisure, cables, pipelines, oil and gas exploitation. The Marine areas are subject to increasing kinds of pollution from the wastes of marine and non-marine activities (dumping of waste). As capacity for coastal management increases, spatial planning for the seascape will be necessary to ensure harmony between traditional uses of the sea for fishing and oil and gas production activities. Marine Spatial Plans are now being used throughout the world to cope with the increasing pressures.



P2: Prepare Marine Spatial Plan P3: Continue with research on Algae Bloom leading to proposals for its management.

-  Sandy beaches
-  Coastal lagoon inlet
-  Rocky shores

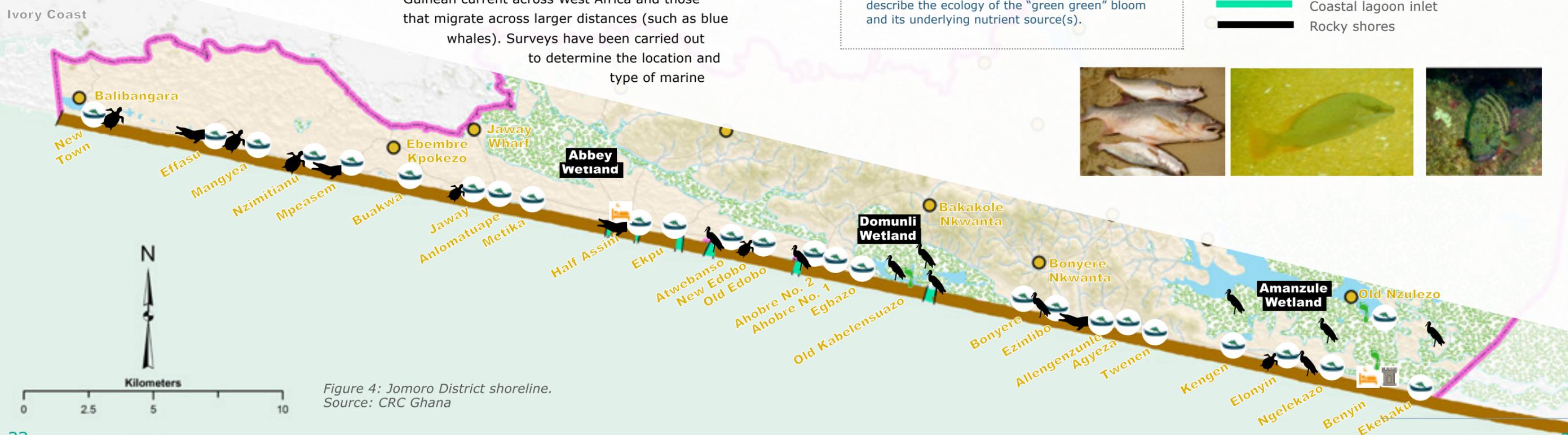


Figure 4: Jomoro District shoreline.
Source: CRC Ghana

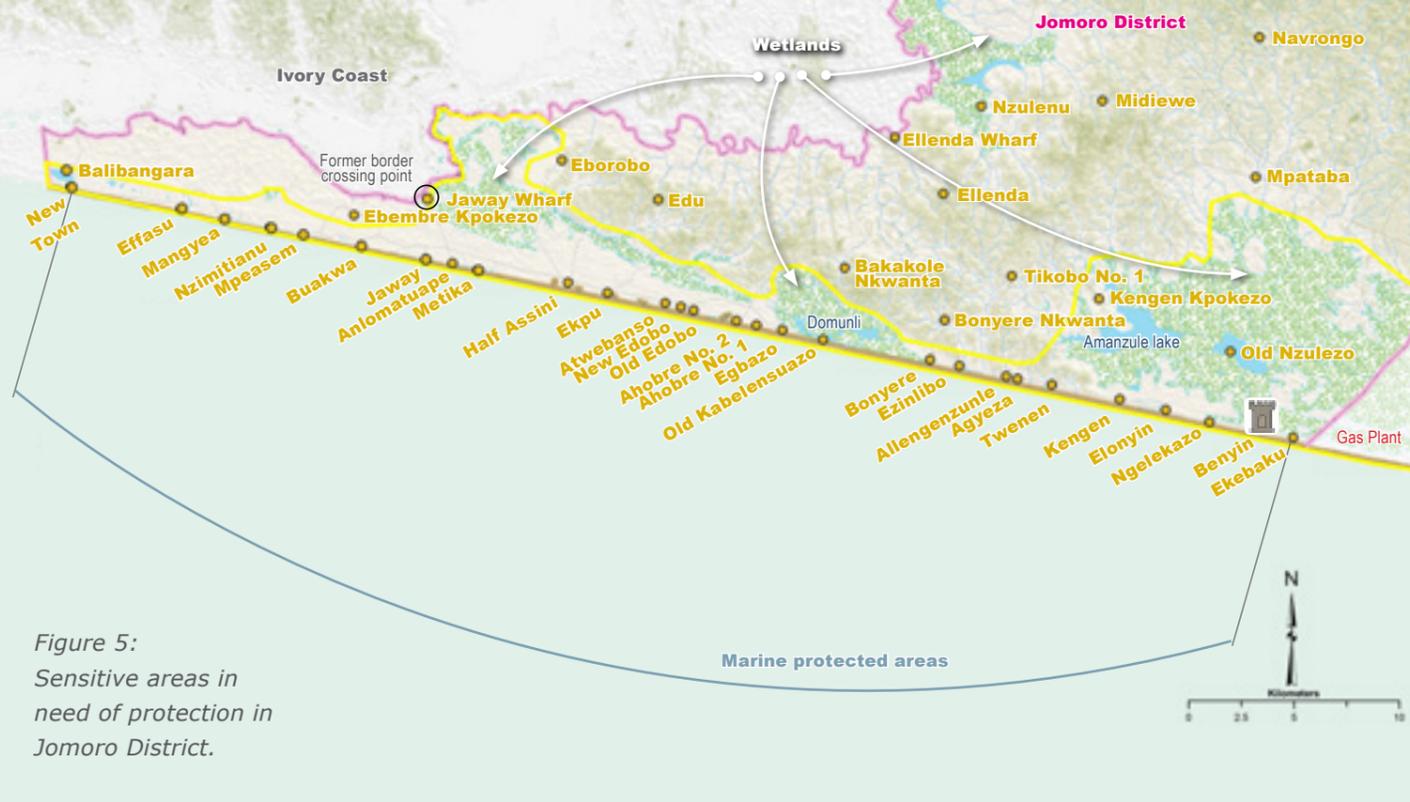


Figure 5:
Sensitive areas in
need of protection in
Jomoro District.

3.3 Characteristics of the Coastal Zone: areas of restoration and preservation

The coastal zone of Jomoro is associated with wetlands, mangroves, lagoons, rivers and estuaries. These provide essential ecosystem services and are also critical for maintaining a healthy fishery (see section 3.4.2 below). These ecosystems are a priority for conservation. Some of these ecosystems are already officially recognized and those that are of more local significance should also be differentiated. Ultimately this could include the marine part of the coastal zone with protected areas such as Marine Conservation Areas and Sanctuaries, Fishery Conservation and Closure Areas, and Essential Fish Habitats.



Project

P4: Undertake public education on the benefits of conservation of coastal ecosystems.
P5: work with Marine Protected Areas Inter ministerial Committee over designation of marine protected areas.

3.4. Relief, Drainage and Climate: Coastal Dynamics, Human Uses and Implications

3.4.1 Shoreline Beaches, Dunes and Barrier Spits: human and natural hazards

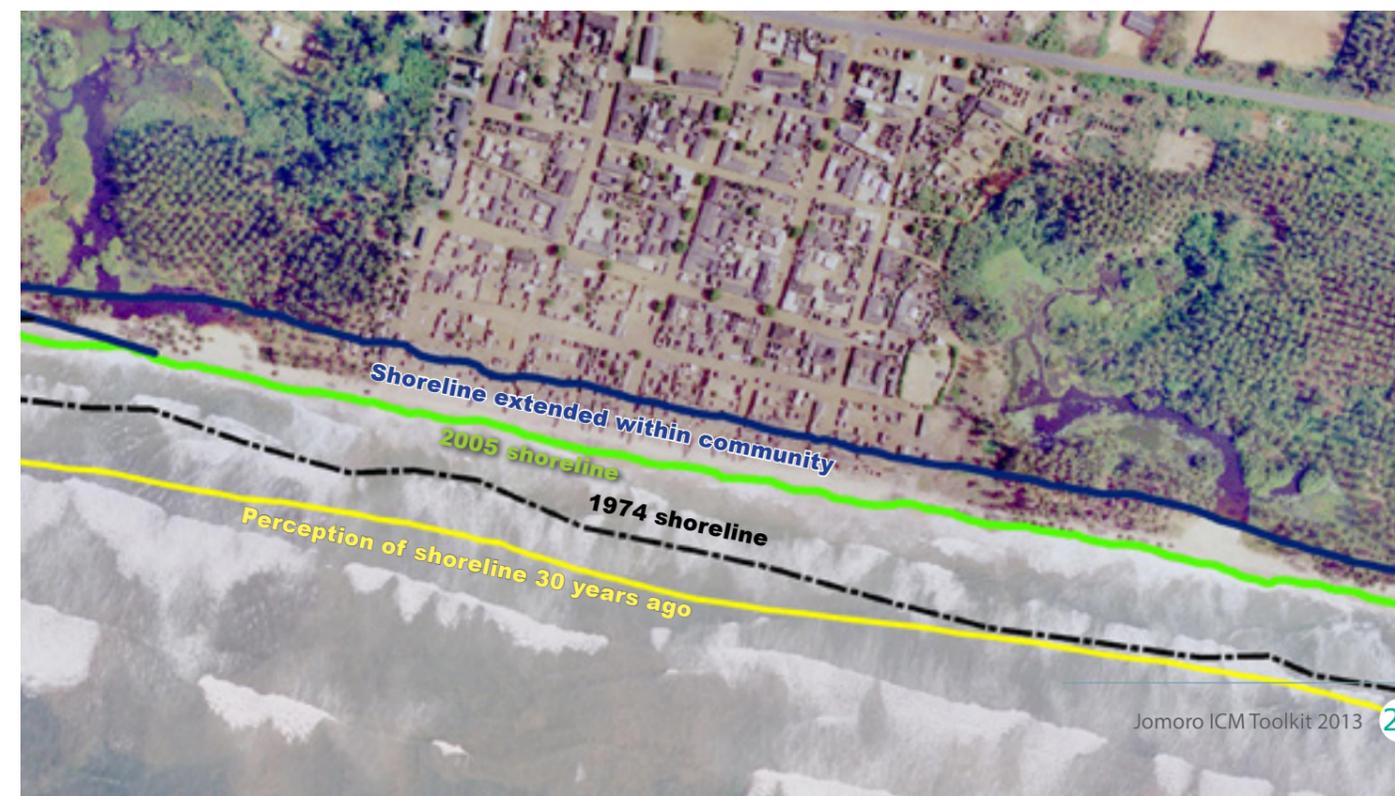
Due to the action of wind, waves, current and rising sea level in recent decades, most barrier beaches in Ghana are retreating at a rate of about 1m per year and in the Western region, are estimated to be retreating at 2m per year on the average (2). Erosion, sea level rise, and sand winning from the beach can all result in land loss and the inland movement of the shoreline.

While the rate of erosion slightly varies from one coastal community to the other, sections of the shoreline in the district are noted to have eroded by approximately 50 meters over the past 2 decades, causing the disappearance of buildings, farm lands and other properties. This phenomenon still continues due to high sea wave energy and evolving sea level rise due to climate change. And it has initiated a difficult process of relocation. For instance, most people who lived in Old Kabenlansuazo moved to resettle at New Kabenlansuazo about 50 years ago. Other communities facing greater impact of coastal erosion include Metika and Twenen.

Most stakeholders in the coastal communities accept the fact sand winning contributes immensely to coastal erosion. But their perception is that small scale sand winning, for household use such as building and its rehabilitation does not significantly add up to the problem.

In almost all the coastal communities, there are traces of coastal erosion. In most communities, properties and activities that prevailed at the beach in the past such as play grounds, coconuts, cemeteries, roads and houses have been destroyed. For instance, in Twenen, community members noted that their current residence marked their third settlement. Their last place was called Twenwo, and they predict that they might have to move again in the next 20 years. Similarly, in Ellonyi, a coastal community located near the River Ellonyi; a vehicular road and coconut trees located near the beach about 35 years ago have been destroyed by erosion. Likewise in Ngelekazo, inhabitants noted that there has been increasing coastal erosion dated 70 years ago and has destroyed key recreational areas and coconut plantations. The situation and destruction of property is not different from Old Kabenlansuazo, Agyeza, Allengenzule, Ezinlibo and Egbazo. Particularly in Egbazo, residents described how their borehole that had been destroyed by erosion.

Figure 6: Community perception of coastal erosion.



Case study

Good Management Practices
Support Urbanization, Sanitation and Wastewater Management in the Coastal Zone:
Dixcove Case Study



Project

P6: Increase collaboration with the Ministry of Water Resources, Works and Housing for regulating private development and installing publicly funded defenses.

P7: Where acceptance of land loss is agreed as the best option long term, plan re-settlement schemes and incorporate as objective in Structure Plans.

P8: Develop a public education programme on coastal hazards and climate change

P9: End destructive sand winning practices by use of bye laws and community sensitisation

P10: Prepare coherent shoreline management plans to regulate coastal land use.



Reference

R6: Report on Characterization of coastal communities and shoreline environments in the Western Region of Ghana.

This report provides information on the conditions and environmental, social and economic issues faced by 89 coastal communities in the six coastal districts of Ghana's Western Region. Rapid appraisals of coastal communities, district level validation workshops and secondary literature review were undertaken to provide additional information that will ultimately contribute to assembling the baseline. While rapid appraisals gleaned community scale information, it also provided the opportunity to socialize the initiative among coastal communities visited. The purpose of district scale workshops was to solicit inputs from local people as well as reactions to findings of the rapid appraisals and to incorporate local perceptions of changes into a district level synthesis of coastal and fisheries governance issues.

3.4.2 River estuaries, Drainage Outflows, Mangroves, Wetlands, Marshlands and Coastal Lagoons

Wetlands and coastal water resources serve vital functions in the environment. They provide habitat for many plants and animals, including migratory birds and many types of fish. Mangrove areas, in particular, are important to the overall health of the marine fisheries, because they provide habitats for shellfish as well as nursery grounds to juvenile fish. Mangrove wood is harvested for a variety of purposes, but this practice should be limited due to the damage to wetlands that overharvesting causes.

From a hydrologic perspective, wetlands serve to dampen the effects of changing water levels, thereby providing protection from flooding. In the process of slowing floodwaters, wetlands trap and store sediments, limiting erosion and in some cases actually building up soil. Through this

process, they protect coastal waters from excessive runoff and sedimentation. Coastal communities often rely on these areas for their drinking supply, so maintaining the flow levels and cleanliness of the water is vital to community health.

Wetlands are easy targets for dumping of waste and infilling because they lack existing users or owners. They are also under threat from indiscriminate cutting of mangroves for fire wood for cooking and fish smoking. The practice is very common, partly due to low level of awareness of their ecological functions and services.

In most coastal communities in the Jomoro district, there is intense cutting of mangroves around the lagoon as well as building of houses near wetlands.



Good Management Practices
Reduce Impacts from Flooding and Erosion:
Akwidaa Case Study



R7: Rapid assessment of mangrove status and conditions for use to assess potential for marine payment for ecosystem services in Amanzule and surrounding areas in the western coastal region of Ghana, West Africa

Ghana's mangrove ecosystems are tremendously valuable, providing ecosystem services like carbon sequestration, protection from storms, floods, and erosion, provision of timber and non-timber forest products, processing of waste and nutrient pollution, aquaculture and agriculture support, and habitat for aquatic and terrestrial species. Yet, as in many other parts of the world, short-term development needs are undermining long-term mangrove health and survival. Fortunately, economic mechanisms have the potential to tip the balance toward restoration, maintenance, and protection of mangrove forests. The need for proper valuation of mangrove ecosystem services underpins such mechanisms towards the establishment of any realistic payment for ecosystem services scheme in any given mangrove or wetland habitat.

R8: Coastal Hazards and Flooding Risk in Ghana's Western Region

This issue brief highlights the key issues facing Ghana's Western Region in terms of coastal flooding in low-lying areas as well as shoreline erosion, and recommends policy options to improve public safety and reduce environmental impacts.

R11: Biodiversity Threats Assessment for the Western Region of Ghana.

This review of biodiversity threats in the coastal zone of

the Western Region of Ghana covers both terrestrial and marine systems and includes maps and descriptions of important wetlands and habitats.

R12: Rapid Biodiversity Assessment on the Essei and Butuah Lagoons and the Whin River Estuary in the Sekondi-Takoradi metropolis of the Western Region of Ghana

This rapid Biodiversity Assessment on the Essei and Butuah Lagoons and the Whin River Estuary in the Sekondi-Takoradi metropolis of the Western Region of Ghana concludes that deplorable management, ignorance or conflict of interest on the part of users has led the wetlands onto a path of potentially irreversible destruction. A new type of coastal management thinking and practice are needed that takes into account Ghanaian economic, socio-cultural and environmental perspectives.

R13: Approved byelaws for wetland conservation in 4 areas (Butre, Busua, Akwidaa, and Princes town)

Cape Three Points – Princes' Town CREMA Constitution and Resource Management Bye-law was amended to include provisions that call for the development of management plans for CREMA wetlands. The revised bye-law was approved by the Assembly.

R14: Model Bye-laws for Coastal Management in Ghana: Experiences from Shama District

Through Hen Mpoano-facilitated technical assessments, stakeholder engagements and participatory mapping exercises, model bye-laws and policy statements for flood hazard mitigation, shoreline and wetland management were formulated and approved by the district assembly.



3.5 Vegetation, Flora, Tropical Foliage Forests, Wildlife

3.5.1 Coastal Vegetation, farming, forest reserves.

The current majority land use in Jomoro District is by the wetlands, subsistence farms, trees and forest. Of greatest significance in terms of carbon sequestration, freshwater supply, fish habitat and flood control is the Amanzule wetland which straddles Jomoro, Ellembele and Nzema East and extends to the border with neighboring Côte d' Ivoire. Even with its close proximity to the coast, this wetland is largely a freshwater system except along its southeastern terminus where the outlet parallels the coast before finally emptying into the sea near Azulenoanu. This ecosystem is composed of several wetland categories including swamp and mangrove forests and holds Ghana's only known peat swamp forest and the country's largest intact swamp forest. A baseline land cover for the Amanzule area (see fig 7) has been defined to assist in change detection and analysis going forward.

The Ankasa Forest Reserve is the major Forest Reserve in the District, and is one of the largest designated for 'protection' rather than 'production' in Ghana. The park recognized for its guided nature walk by most tourist remains of high significance due to its high plant diversity, indigenous forest birds, monkeys especially chimpanzee and forest elephants.

Coastal communities combine farming and fishing for their livelihoods, with a mixture of cash and

subsistence food crops. Their farming has suffered from the severe decline of the formerly prosperous coconut crop through Cape St Paul Wilt disease which slowly spread throughout the coast from 1932. This led to lucrative pig farming and coconut oil production. Rather than replant expensive and slower growing disease-resistant coconut hybrids, farmers have switched to less profitable oil palm. This has added to the pressure on livelihoods from declining fish stocks. Subsistence food crop areas suffer from over exploitation and subdivision among increasing number of family members.

The balance between income from cash crops and land available for food, is a key factor in sustaining livelihoods and food security. The mapping of rural land uses will enable decisions to be made about the most efficient balance of uses. This designation of land for agriculture, added to protected areas/corridors for wildlife will enable the best decisions to be taken about which areas are suitable for urbanisation, tourism, leisure and industrial development.



P14: Map and plan rural land uses areas. Develop strategy for balance of agricultural land uses and set buffers for food crop production as well as conserve ecosystem functions and services.

P15: Develop the eco-tourism potential of Greater Amanzule Wetlands.

P16: Establish green networks in District Spatial Development Framework and to protect wildlife, agricultural and forest areas. Include green corridors in Structure Plans and Local Plans.

Figure 7:
Land cover classification for Amanzule wetland.

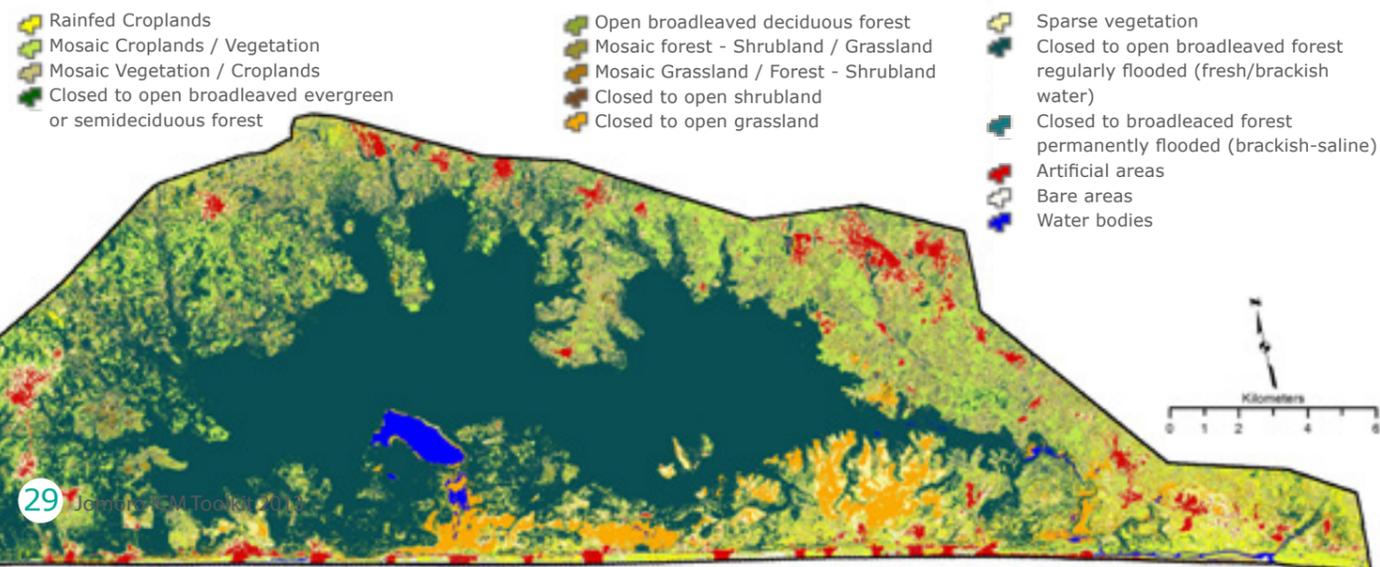


Figure 8:
Satellite image of western part of Region, showing capacity of land cover to sequester carbon.

Source: University of Rhode Island



R16: Land Cover Mapping of the Greater Cape Three Points Area Using Landsat Remote Sensing Data Map Book

This is the companion book of maps for the land cover study. The land use and land cover map products created in this study are the first available data for the coastal region of Ghana. The maps represent an important step in the management of its natural resources. Land use and land cover maps allow land managers, policy and decision makers, and local communities to make informed decisions about the future of their natural, cultural and economic resources. This set of maps can also provide a window into how the landscape has changed as the baseline data for possible future work. With the baseline data ready, the next step of change analysis will be possible. The choice to use the U.N. Land Cover Classification System also provided the flexibility to meet classification needs in the future while still maintaining continuity with past work.

R17: Report from Community Conservation on Primates in the Western Region.

Field notes from Horwich's site visit and recommendations for improved management of the forest reserves and alternative livelihoods for the

adjacent communities. Horwich made two additional visits in 2012 which are also included in this report.

R18: Land Cover Mapping of the Greater Cape Three Points Area Using Landsat Remote Sensing Data

The land use and land cover map products created in this study are the first available data for the coastal region of Ghana. The maps represent an important step in the management of its natural resources. Land use and land cover maps allow land managers, policy and decision makers, and local communities to make informed decisions about the future of their natural, cultural and economic resources. This set of maps can also provide a window into how the landscape has changed as the baseline data for possible future work. With the baseline data ready, the next step of change analysis will be possible. The choice to use the U.N. Land Cover Classification System also provided the flexibility to meet classification needs in the future while still maintaining continuity with past work.



3.6 Settlements, Spatial Analysis, and Siting of Infrastructure,

3.6.1 Growth of the Coastal and Fishing Settlements

The population of the Jomoro district has increased over the years from 37,685 in 1970 to current population of 150,107. The initial increase in population between 1970 to 2000 was partly attributed to the completion of the international highway linking Ghana to La Cote d'Ivoire which led to increases in commercial activities and resulted in the influx of people to the district. However, the recent increases in population as gleaned from community interactions during the rapid assessments were influenced largely by high immigration of fisher folks especially from the Central Region, uncontrolled births, teenage pregnancy resulting and its associated high school drop-out rate. Planned oil and gas facilities in the area and provision of auxiliary services for the petroleum industry were also cited as potential contributing factors to the increasing population.

3.6.2 Cultural context and traditions in Coastal Communities

Artesanal fishing communities represent a unique and distinct culture which arises from the activity. Fishermen are at sea in canoes for three to four days at a stretch, while others are mending and making boats, nets and fishing gear. Women prepare, smoke and sell the fish. The district is seen as homogenous in terms of ethnicity but with Nzemas constituting 65.4% of the total population and Nzema as the main language spoken. Migration is a common practice in the fishing industry. This is rife between July and September (the high fishing seasons) when coastal communities in the district experience massive influx of fishermen.

Prominent religious practices in the district are Christianity with Traditional and Islam. However, the majority of the people in the district are traditionalists. Traditional authority in the district

is vested in the Western Nzema Traditional Council with the Omanhene (Paramount Chief) as its President. All the Chiefs in the district owe allegiance to the Omanhene who is also the Paramount Chief of Jomoro and has his seat of authority in Beyin. The district has four divisional Chiefs with their seats located at Nuba, Mpim, Half-Assini and New Town.

By far the main festival in Jomoro is Kundum (locally called Abisa). The festival, mostly celebrated between August and November, lasts at least seven days and rotates between communities. It features prominent traditional dance and drumming. In communities where the Kundum festival is celebrated, rituals are performed to pacify and honour the gods of the wetlands and other gods. The festival is also a key unifying force as it brings together families and people from in and outside the District. It is however crucial to emphasize that chieftaincy disputes are prominent in coastal communities like Bonyere and Newtown. This source of dis-unity and disorganization has impacted in information flow, social well-being, peace and security in the communities.



P33: Support local festivals and educate/promote on retention of cultural identity of coastal and fishing communities.



R19: 'Faith In Action' Faith Based Action For Creation Care In Coastal Communities Of Western Region.

This report details engagement with religious leaders in six coastal districts in the Western Region of Ghana from the 12th of December 2011 to the 9th of February 2012. In all, over 123 religious leaders were trained in reference theology on environmental stewardship and creation care. The programme led to the establishments of six interfaith eco-networks in six coastal districts in the western region of Ghana. The programme was a big success and both participants and organisers benefitted immensely from the exchanges and experiences shared. The main recommendations for keeping the fire burning is ensuring that the eco-networks which have been established live beyond the lifespan of the initiative to perform the functions of mobilising religious organisations and advocating for responsible coastal resource use.

3.6.3 Land ownership

Traditionally, land was in the "customary ownership" of chiefs, who dispensed and allocated it on behalf of their people. Subsequently the colonial authorities negotiated treaties under Romano-British law which lead to individual land titles and leases being granted, and substantial land being taken into government ownership. Where most land is not registered, there are frequent conflicts over its ownership. Families who have subsisted on the land for generations are summarily evicted without compensation, and incoming investors are caught up in land disputes so that nothing materializes. In areas around Bonyere, for example, farmers (coconut plantation owners) are agitating for adequate compensation for fruit trees destroyed by authorities to make way for gas pipeline laying.

All of this requires that the land agencies should work more closely with local communities; that land transfers by chiefs should be transparent; and that adequate compensation systems are in place where families are dispossessed of their land by development. The land agencies currently operate in a very separate institution. By resolving this element, the implementation of Integrated Coastal Management will become easier.



P34: Work with Lands Commission at local level on land security and compensation

3.6.4 Spatial Analysis: Coastal Settlements in Jomoro

There are 29 communities on the coast of the Jomoro District. The most populated areas in the District are the district capital-Half Assini, Elubo, Bonyere and Tikobo No 1, with three major market centres in the district located at Jeway Wharf, Tikobo No. 1 and Ellubo.

The principle coastal settlements are, from west to east: Avolenu (New Town), Efasu, Mangyea, Enzimitianu, Mpeasem, Buakwaw, Number 4,

Alomatoape, Jaway. Metika, Half Assini, Ekpu, Old Edobo, New Edobo, Atwebanso, Ahobre No.1, Ahobre No.2, Egbazo, Old Kabelasuazo, Bonyere, Ezinlibo, Allengenzule, Agyeza, Twenene, Kengen, Eloyin and Ngelekazo, Benyin and Ekabaku.

The road network for the coastal settlements is generally poor, but it should be recognized that the oil-related development will drive its improvement. In this regard, the coastal road from Atuabo in Ellebelle (site of the gas plant) to Bonyere is already being improved. The development of the very substantial industrial/petrochemical site at Domunli Lagoon provides an opportunity to upgrade infrastructure and provide connectivity from Bonyere, through Tikobo to Half Assini.

The scale of urbanization which is typical of coastal settlements in the western region quickly became apparent when Hen Mpoano was working with the community at Dixcove. From aerial imagery it is clear that the area of displacement and resettlement that is being considered by the existing fishing and farming community was only a small part of the area which is becoming earmarked for development. Dixcove and Busua are likely to become merged with Butre in the foreseeable future in one large conurbation.

This type of expansion which is evident all along the coast, can happen in a way which creates orderly, modern towns in which the existing community and incomers both benefit from a high quality environment. Investment in social amenities, water, power, connecting roads, water courses needs to be made for the larger urban area which includes the existing area. A pre-requisite for this is the preparation of Structure Plans for the above mentioned key settlements (Half Assini, Tikobo, Bonyere), to be identified in the Spatial Development Framework which should itself be aligned with the Medium Term Development Plan.

Once the plans have been prepared, implementation should be able to be financed by new investors if the planning and permitting process aims for high quality, high values and negotiates sharing of improved land values.

Some coastal communities are less likely to receive capital investment until their infrastructure is improved, but measures can be taken to improve services and capacity for resilience (see the Case Study of Akwidaa). The development around the Beyin area is an exemplary form of eco-tourism; the question arises as to how to negotiate more substantial levels of leisure development. The proposals for Princes Town in Ahanta West District provide a useful example involving a high quality hotel, residential and golf course development around the lagoon and adjacent to the historic fort and fishing community. The issues arising from this are typical of any regeneration/investment project on this scale in the coastal zone (see also the Case Study of Princes Town).



P17: Prepare Community Action Plans to address vulnerability and improve resilience for all coastal communities
P18: Apply good coastal management practice in major leisure developments



Good Management Practices to Support Manage Large-Scale Leisure Development to Benefit the Community, the Private Investor and the Ecosystem: Princes Town Case Study

3.6.5 Siting of Infrastructure/Settlements

It is essential that water dependent and water enhanced uses with resulting value returns are used to maximize value in areas of the coastal zone, and that their siting prevents erosion and further damage to the coast. To achieve this it will be necessary that the ground rules for shoreline development are included in the Structure Plan, Local Plans and through Assembly Bye-Laws.

However, certain critical questions need to be answered in the siting of infrastructure and settlements. These include but not limited to:

- What are the accumulative social and environmental impacts?
- What is the role of the Districts in making siting decisions?
- By what mechanisms are impacts on affected people addressed?

- What steps should be taken now to ensure positive outcome 5 to 10 years from now?

3.6.6 Social issues, water, waste, and sanitation

Falling standard of education and poor parenting is one of the major issues in the coastal communities. Three of the coastal communities visited during the vulnerability survey in the District recorded zero percent (0%) pass in the 2010 B.E.C.E results. A combination of poor access to educational infrastructure and lack of trained teaching personnel at the basic education level is resulting in high school drop-out rate, poor pupil performance and spurring entry of prospective students into the already over-stretched fishery in the Jomoro district. When there is huge fish catch, some schools do not function because no child goes to the classrooms.

Most communities visited during the survey complained of low teacher population at the basic schools, due to inadequate social infrastructural amenities. Even where there are a few professional teachers, their attitude and that of other public authorities leave much to be desired. It is not uncommon to find most classrooms empty even though the school has teachers on the government payroll. There is insufficient supervision by the circuit supervisors.

The depreciation of livelihoods therefore accompanies a decrease in social self-support and neglect of services. Standards have measurably declined in recent years. This decline emphasizes the gap between existing communities of long standing and any newcomers who are enjoying the benefits of new development and investment. While the coast is still a place which welcomes incomers, these serious problems could degenerate into uncomfortable levels of resentment and insecurity.

Water

Wetlands filter and clean water; streams and small rivers which serve many communities are the traditional sources of water for drinking and domestic use. As these become polluted and demands on them increase, the need for investment in protection and new supplies arises. Most communities also rely on boreholes and hand-dug wells for their water, but as the coast becomes eroded, or otherwise

developed for water based activities, these become salinated. Therefore water supply policies which respect the erosion pattern are needed. Added to community needs are those of the major industrial and tourism and leisure projects. These consume water on a much larger scale, yet the Water Resources planning for the region indicates the likelihood of a growing crisis gap between supply and demand.

Sanitation and Waste

Likewise sanitation, and waste for which traditionally the shore and open lands used to be used, are now reaching very poor levels. Both of these cause increasingly bad health. In Adjoa, the Nana Adjoa lagoon which use to produce "big fishes" for the community has now been degraded and silted; because of persistent refuse dumping and mangrove cutting. The day-to-day sanitation on the coastlines is being managed by ZOIL, a subsidiary of the Zoomlion Company Limited. There are only few toilet facilities within the coastal communities; a situation that encourages inhabitants to go everywhere to ease themselves except the beach because the practice had been prohibited by the team from the eco-brigade.

Poor sanitation and industrial wastes pollute shores and wetlands; most lagoons, rivers and other water sources enter the sea in the district. These estuaries, especially those that are in the communities, had been turned into refuse dumps due to lack of properly demarcated sites for the dumping of refuse.



P19: Map critical watersheds shared by adjoining districts and subject to collaborative management
P20: Continue and extend coastal and shoreline waste management schemes
P21: Reinstatement of wells and boreholes to be conditions of new developments and take account of salination threats



R22: Opportunities for integrating family planning, health and nutrition interventions into coastal-fisheries governance agendas in Western Region, Ghana

Opportunities for integrating family planning, health and nutrition interventions into coastal-fisheries governance agendas are identified for the coastal districts of Ghana's Western Region.

R23: Facilitating Integrated Population Health and Environment in Five Communities in the Shama District and Two Communities in the Ahanta West District: Achievements and Lessons Learned

This report outlines the accomplishments and lessons learned through the implementation of integrated Population, Health and Environment (PHE) initiatives by the Central and Western Fishmongers Improvement Association (CEWEFIA) in seven coastal communities in Ghana's Western Region. The report elaborates on the socio-environmental context in the communities before the piloted interventions and the relevance of PHE as an approach for addressing the issues faced by the target communities and associated ecosystems. The way forward for improving PHE programmes in such communities is suggested to inform similar actions in other parts of the country and elsewhere in the world.

R24: Freshwater supply and distribution: a developing crisis in the Western Region

This issue brief highlights the key issues facing Ghana's Western Region in terms of fresh water supply and distribution and recommends policy options to protect water resources and insure equity in their use and distribution.

R25: Improving Livelihoods through Plastic Waste Management in Coastal Communities of the Western Region of Ghana: Achievements and Lessons Learned

This report outlines the accomplishments and lessons learned through piloting integrated sanitation and livelihood improvement interventions in four coastal communities in the Western Region of Ghana by Daasgift Quality Foundation. It highlights the issues of plastic waste management in coastal communities and describes the business model applied to facilitate household income generation through plastic waste management in the target communities. The way forward for improving plastic waste management in coastal communities is suggested to inform similar and future initiatives in other parts of the country.

3.7 Economy and Livelihoods

3.7.1 Overview

Agriculture accounts for 65% of the economic activities in the District. This includes crop farming, fishing (artisanal fishing), livestock and agro-processing. The rest of the population are in the buying and selling business and also in the public sector. Since the discovery of oil and gas and subsequent production, other elements of the economy such as tourism, hospitality and auxiliary services are increasing. Declining community livelihoods have been a major issue over the years, contributing to slow economic growth and rising poverty. Human Resource capacity development through improving the educational system as well as adult training for coastal communities will be essential if they are to diversify into new occupations and not to become more marginalized slums. Out migration of the youth for menial jobs in bigger towns like Abidjan, Takoradi, Sekondi, Tarkwa and others, which weakens communities in the long term, is on the increase.



R26: Livelihoods and poverty reduction in coastal communities in the Western Region of Ghana: analysis of livelihoods baseline data the ICFG program

This report is the result of the livelihoods baseline survey as part of the USAID-funded Integrated Coastal and Fisheries Governance (ICFG) Program for the Western Region of Ghana (Hen Mpoano). The survey aims to provide a baseline for interventions to be implemented as part of the Hen Mpoano by:

1. Establishing a baseline of the status of livelihoods of households in target communities (assess income levels and sources, seasonality issues, assets, vulnerability)
2. Establishing a simplified nutritional baseline of households in target communities and fish species consumed
3. Identifying opportunities for livelihood diversification in the target opportunities

Income diversification is a means to cope with risks and seasonality related to agriculture and fisheries. Poverty is multi-dimensional as it not only relates to income and consumption levels, but also to a lack of basic needs (access to shelter, health, and sanitation) and the ability to cope with shocks. Understanding poverty therefore requires the analysis to go beyond measuring income, to include factors such as education levels, health status, ownership and control over capital, financial and natural assets and access to social networks. The livelihoods survey conducted for the Hen Mpoano project aimed to encompass all these dimensions.

R27: Livelihood Diversification and fishing communities in Ghana's Western Region

Livelihood diversification in the fishing communities in Ghana's Western Region requires a focused effort to develop oil or tourism in a way that creates local employment and encourage people to exit fishing, leaving a less-crowded sector, more amenable to gradual change, with a more educated younger generation shifting into other sectors and places.



P23: Create links between local communities, tertiary/ vocational education and incoming developments in oil and gas, supply industries, tourism and hospitality, new residential developments, and construction.

3.7.2 Agriculture

Fishing and farming livelihoods are interlinked. In the farming season (raining seasons) income from fishing is used to purchase farming inputs whilst investments shift back to fishing during the fishing seasons. Farming consists of subsistence, cash crops and plantations. Coconut was one of the main cash crops until the Cape Saint Paul Wilt disease gradually destroyed most of them from the 1930s onwards. As large acres of land have been used for coconut plantation, the remaining land which is relatively little is over-cultivated and has lost the relevant nutrients in the soil. Again, the poor fertility of the soil and its sandy nature does not allow for the cultivation of many crops. The intensity of this problem is much witnessed in coastal communities towards west of Half-Assini;

thus from Jaway through Mpeasem to Avolenu/New Town. In such areas, greater quantity of food crops especially cassava and plantain come from Ivory Coast.



P14: Map and plan rural land uses areas. Develop strategy for balance of agricultural land uses and set buffers for food crop production as well as conserve ecosystem functions and services.
P25: Create land banks or reserves for agriculture for local food production

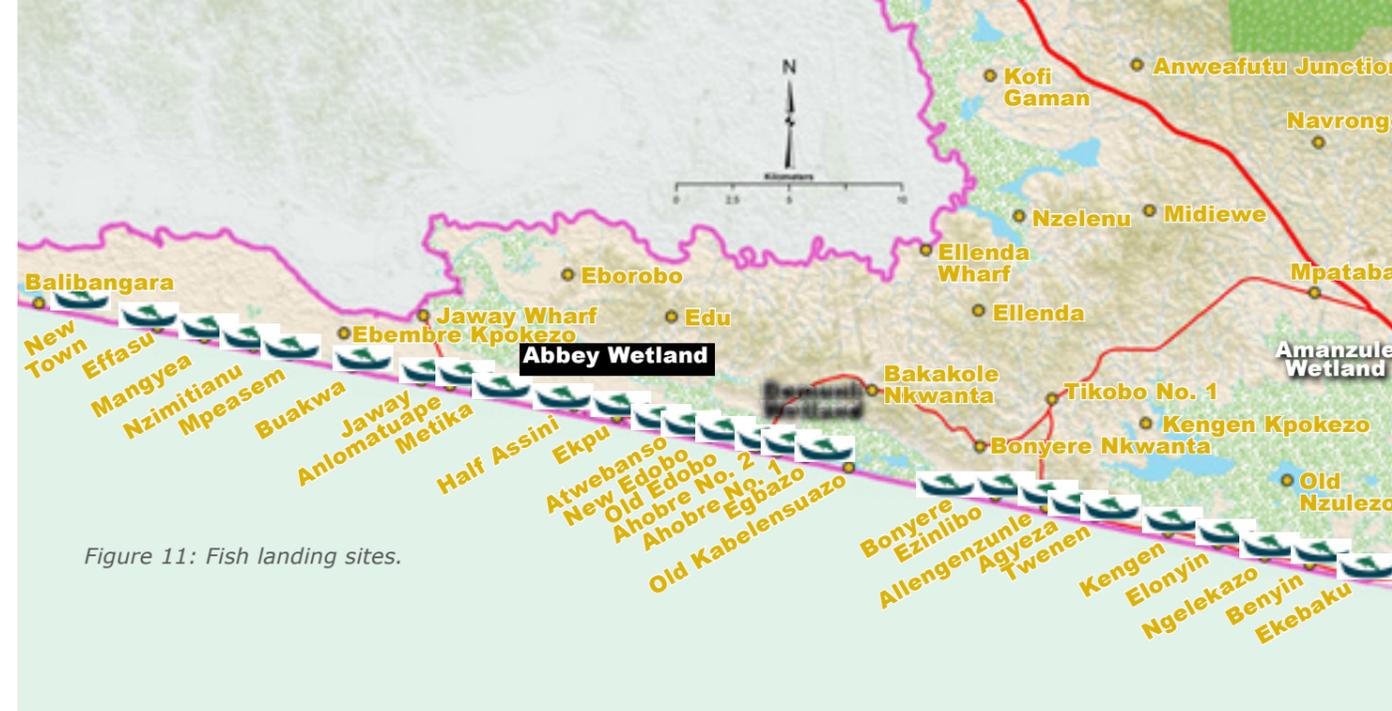


Figure 11: Fish landing sites.

3.7.3 Fishing

Active fishing activities occur in about 28 fish landing sites dotting the coast of Jomoro district. Fish landings have declined over the last 15-20 years, attributable in the first instance to simple increase in population leading to over-fishing. But more damaging methods have been used to catch up, such as light fishing, use of monofilament nets, dynamite, carbide, pair trawling and fishing with obnoxious substances. Illegal practices result in poor fish quality, with fishmongers and processors in particular expressing greater worry about the short shelf-life of processed fish. Added to this is the arrival of algae bloom which adversely affects artisanal marine fishing. Since 1993, marine algal blooms caused by the filamentous green alga *Enteromorpha flexuosa* - known locally as green-green - have been occurring every year (December-February) from Newtown to Cape Three Points. It has also been reported in the rivers and wetlands of the Amanzule at Bakanta and Ankobra at Sanwoma respectively. The dramatic decline in fisheries can be reversed through significant reductions in fishing effort, best decided by co-management institutions including community-based. Management of pelagic, demersal and those small scale fish stocks found in estuaries, lagoons, rivers, lakes and near-shore marine areas will require different co-management approaches with expressions at the national, regional and community scales respectively.



R28: Smoked marine fish from Western Region, Ghana: a value chain assessment

The assessment of the smoked marine fish value chain assessment in the Western Region, Ghana concludes that there does not seem to be any significant market at present for a premium smoked product. It discusses possible risks with any change to the status quo and makes suggestions for pilot scale interventions.

R29: Ghana Coastal Fisheries Governance Dialogue.

The second national Fisheries Governance Dialogue aimed to help stakeholders in the fisheries sector generate a shared understanding of critical lessons and pathways for fisheries co-management success in Ghana. The dialogue was held in direct response to the call from both fisheries communities and the government of Ghana for a radical change from the way fisheries resources are currently being managed.

R30: Ghana Coastal Fisheries Governance Dialogue: Developing Options for a Legal Framework for Fisheries Co-management in Ghana

The Dialogue was a direct follow up on the Second Dialogue held in Elmina in April 2012. The two-day meeting was attended by 79 fisheries stakeholders representing government, donor agencies, research institutes, fisher folks, non-governmental organisations and civil society organizations. It was generally agreed that there was need for three key structures:

1. National-level management for pelagic fisheries. Laws will be developed to manage pelagic fish at the national level since they are highly migratory and cross regional and national boundaries. Management will also need to involve enforcement agencies (e.g. Marine Police and Navy).
2. Regional-level management of near shore demersal species and the Volta Lake. Management authority should be devolved to the regions with

full authority to approve management plans for fisheries resources in their areas.

- Local management of lagoons and estuaries and small freshwater lakes. Management and rule making powers devolved to local communities – and the rules made to be passed as by-laws by district assemblies.

R31: Marine Police Training Workshop Proceedings, September 25 – October 4. Fresh Approaches for promoting compliance and enforcement.

The Hen Mpoano Initiative discussed with the Fisheries Commission and the Ghana Police Service (GPS) on ways to support aspects of the training of the newly assembled officers of the MPU on the ecological justifications of the Fisheries Regulations. Approval was sought from USAID to organize short training modules for the unit. A curriculum for the training was approved by the GPS, FC and USAID which paved the way for the training workshop. It consisted of series of lectures, group assignments, presentations and discussions, role plays, and field visits to fish landing sites and fishing communities. The visits were important for the Marine Police Officers (MPOs) as that inducted them into the communities.

R32: Joining Forces to Collaboratively Manage Ghana's Fisheries Resources: the role of a Fisheries Working Group

In order to sustain the socio-economic benefits from coastal resources and biodiversity, there was the need for a collaborative approach to management rather than leaving the Fisheries Commission to single-handedly manage the fisheries and coastal resources. A Fisheries Working Group (FWG) was therefore catalyzed by the ICFG Initiative. Its members were carefully selected to comprise representatives of Fishers and State Regulators of the fishing industry, to play an advisory role among others to the Fisheries Commission relative to policy and management issues. In addition to this, the FWG sought to address ineffective communications among fishers and stakeholders including the Petroleum industry.

R33: Region Fisheries Sector Review

This report concludes that any attempt to promote fisheries development and fisheries management reform in Ghana's Western Region must address a wide range of issues, including an understanding of the dynamics of the fishery, solutions for improved management, promoting pro-poor livelihood opportunities, and building a stronger constituency to tackle these issues in transparent and equitable ways.



P26: Develop co-management committees and management plans for small scale fish stocks in Cape Three Points and adjacent nearshore marine areas

3.7.4 Industry and related services

As the coastal district adjacent to the active offshore oil and gas industry of Ghana, the potential for industrial and other related development has intensified. The Jubilee Field is in operation, and a further USD\$4.8bn is being raised to develop Tweneboa, Enyenra and Ntomme (TEN) field for production 2016 which is even further west, and also immediately south of Jomoro. In most of the coastal communities, particularly east of the District capital, portions of the shoreline and coconut plantations in areas such as Bonyere and Ndumsuazo have been acquired for oil-and-gas related infrastructure and hospitality business. This has increased the price of land and also resulted in the acquisition of farmlands for industrial purposes. No major industrial investments have as yet actually materialized in the coastal zone, but the gas pipeline is being laid to Domunli Lagoon from Atuabo, and some major developments are being planned for there, the largest being the proposed VRA power station.

There is therefore the urgent need to prevent 'haphazard development' and consider services that the ecosystems in which the lands are situated provide in terms of livelihoods and food security, and the implications on availability of fish landing sites in the future. The Assembly must prepare spatial plans to ensure orderly development and incorporate them into Medium-Term Development Plans.

- Relationship to existing communities: connectivity to existing road and infrastructure networks; security, pollution (noise, air, land and water-based).
- Relationship to existing coastal and marine eco-systems: preventing damage to water resources, below ground aquifers, drainage, coastal and marine systems and bio-diversity as noted above. Care in understanding impacts of any incursions into coastal features and remedial measures to solve any existing long term problems and counter any new damage which might be a consequence of the new facility.
- Use during construction phase and operating phases of already overstretched services, health, education, water, power etc.

- Provision of properly planned and constructed settlements for the above as opposed to allowing temporary structures which evolve long term into slums.
- Respect for existing cultures and lifestyles and measures to effect good relationships between incomers and existing populations.
- Planning a process in which existing settlements, livelihoods, landscapes and eco-systems come out as improved as opposed to damaged or destroyed by new facilities.

All of the above will be considered in an Environmental Impact Assessment for any major project, such as that which is being undertaken for the VRA Power Plant. It is necessary to use the Integrated Coastal Management mechanisms to ensure that this is full, comprehensive and understood and supported by local communities.

It should be noted that as soon as any major new facility comes into being, there is a major impact on surrounding areas in the form of those wanting to take advantage of supply chain opportunities – housing, shops, commercial services, warehousing, industrial services. The mechanism for ensuring that these unfold in an orderly manner is the Structure Plan and Local Plan. But in the case of very large projects such as the Gas Plant, Oil Refinery or proposed Oil and Gas Specialist Harbour, the impact can only be fully understood and planned for at a sub-regional and even regional level, hence the need for joint planning across districts such as has been mentioned above.



P24: Prepare Structure Plans and Local Plans for areas west of Takoradi up to Butre estuary and Agona; also Butre/Busia/Dixcove area.
P27: Ensure local monitoring/input to Environmental Impact Assessment process by the Coastal and Marine Committee

3.7.5 Tourism and Leisure

Jomoro has a wealth of places to attract visitors, and indeed by bringing visitors, the cry for conservation of its rich natural resources can be amplified. Most wetlands in the district especially the Amanzule, Domunli, Abby and Balibangari are relatively in their pristine state with intact mangrove forests and animals, turtle, birds, crocodiles etc. There are wetlands full of crocodiles in Nzemintianu, Mangyee, Half-Assini, Old Kabenlasuazo, Allengenzule etc. The Domunli estuary in Old Kabelasuazo, the Suhone estuary in Ezinlibo and the Elonyi estuary between Elonyoi and Ngelekazo are potentially a bird watchers paradise as transit points for migratory birds flying seasonally between Europe and its sister cold climes in the southern hemisphere. These must be both promoted and made accessible by boating and interpretation, while being protected and conserved.

The 50 km stretch of pristine white sands beaches spanning the whole of Jomoro offer good opportunities for beach lovers, beach soccer and water sports practitioners to indulge in their favorite past-time.

Other tourism activities and potentials that should be upheld and nurtured respectively include the cultural heritage which it can offer when packaged well: the 500 years old Stilt Village (Nzulezo); the annual Kundum festival; weekly market trading activities in Jaway Wharf (where many people travel from near and far, to engage in all levels of commercial activities); medium scale fish landing activities in Half-Assini, Effasu, and New Town; historical sites at Fort Appolonia at Beyin, Miegyinla community, Captain William's Tomb in Half Assini and the Mystery site in Kengen.

It is also crucial to not just identify but support and promote initiatives that are helping in the conservation of such areas. As most coastal areas of the district are recognized for dolphin and whale watching, the Assembly must collaborate with Ghana West Coast and others institutions and aggressively promote it to become a major tourist attraction, along with Amanzule and Domunli estuaries.

Section
four:INTEGRATED COASTAL
MANAGEMENT INSTITUTIONS AND
PROCESSES: Development Goals,
Projects and Priorities

These opportunities are yet to be taken up on any scale by holiday visitors, and the majority use of facilities is still for business and development projects. To get onto the mass/global tourism market requires a regional/sub-regional initiative to provide access and infrastructure on a scale which could be an objective of sub-regional or sub-national bodies such as the proposed Joint Coastal Development Planning Area and the Western Corridor Accelerated Development Authority.

Many of the measures which have been described in above sections and other measures recommended in a recent report on Tourism (3) are pre-requisites for the tourism industry to take off and to become a desirable use of the coast in balance with other activities.



P14: support local festivals and educate/promote on retention of cultural identity of coastal and fishing communities
P28: Continue and extend waste management schemes to keep beaches clean to more remote beaches, and expand to include security measures for visitors
P29: Tourism supply chain: involve local communities in the delivery of the product such as local food, fish/fishing and other products
P30: Promote tourism and leisure investment through establishment of investors forums.
P31: Work with Ghana Museums and Monuments Board, Ghana Wildlife Society and others to extend the tourism product range – eg Historic Forts, Cape Three Points, whale watching, wildlife conservation - and develop a sustainable eco-tourism development plan for the coastal zone



R34: A Fresh Approach to the Governance of the Western Region's Coastal Zone

The fundamental purpose of designating the six coastal districts of the Western Region as a Joint Development Planning Area is to provide for sustained planning and management that addresses the issues that affect the Western Region's coastal zone as a whole and cannot be effectively addressed by the coastal districts individually. It provides the districts with an explicit high-level mandate and an additional source of funding to work collaboratively on specified issues posed by development in the Western region's coastal zone. The joint development planning and management process is to manage, preserve, protect, develop, and where possible restore, for this and succeeding generations, the resources of the coastal zone of the Western Region. This would be accomplished through comprehensive and coordinated long range planning and management designed to produce the maximum long-term benefit for society. The sustainable use of socio-ecological systems would be the primary guiding principle upon which alterations and new uses in the coastal zone would be measured, judged and regulated.

R35: A nested coastal and marine governance system

This brief puts forward options for a nested coastal governance system. These ideas will be refined and augmented by ideas introduced by other papers in the series. The papers focus on coastal and fisheries issues in the western region to identify their causes, social, economic and environmental implications and how they might be addressed by a strengthened governance system. These briefs draw upon Hen Mpoano's "learning by doing" process as it works with communities, districts, governmental agencies and other stakeholders to practically address problems and specific opportunities along the coast and within the fishery. The process and proposal is supported by the advisory council of the Hen Mpoano initiative.

R36: Managing our coastal wetlands: lessons from the Western Region

Though the government of Ghana has made clear commitments for wetlands management and protection, there remain significant challenges in the implementation of conservation strategies and encroachment and degradation continues to evolve. The Western Region is home to some of the richest and most diverse coastal wetlands areas in Ghana and yet there are no formal mechanisms for their management and protection. These wetlands provide a host of critical functions and services but they are increasingly under threat for accelerated development resulting from the rapidly evolving oil and gas sector and record high commodity prices for a host of products exported from the region. This paper proposes a "way forward" that calls not only for commitment within agencies of government but also the active involvement of civil society and a change in the attitude of the traditional authorities and private sector interests that are fueling, directly or indirectly, the threats to the coastal wetlands of the Western Region. It also suggests mechanisms for managing and protecting vital wetlands resources in the western region.

4.1 Governance: management institutions and processes

Institutional frameworks for effective implementation of ICM are yet to be fully developed at all levels - district, regional and national. To be successful, such mechanisms should recognize and institutionalize the roles of private sector, civil society and traditional authorities in addition to government. In Ahanta West District, a pilot institutional mechanism was developed under the collaborative program with Hen Mpoano through the formation of, and the general assembly's endorsement of a special committee of the assembly known as the Marine and Coastal Management Committee (MCMC). This Committee has representation of civil society, traditional authorities, the private sector, and coastal communities. The committee is a good example of how Jomoro could link and integrate issues at the coastal community scale with planning and decision making processes at the district level.

On the other hand, coastal issues that find expression at the sub-regional and regional levels (alteration of the coastal zone, coastal erosion, conflicts arising from siting large scale infrastructure) will require mechanisms that allow for negotiation, coordination and better communication between national and regional level institutions since the district level mechanisms for planning and decision making will not provide the most effective responses to these bigger scale



Figure 12: Tourism Map

issues. The Legal Instrument (LI) for Joint Development Planning Area and associated Executive Instrument provides adequate institutional and legal framework for addressing specific challenges which faces two or more coastal districts as a whole and for which each individual district will be unable to tackle.

The table below illustrates the current system of governance as applied to the coastal zone. It shows that the system is working in part, but there are serious deficiencies, not least those arising from lack of resources. Listing these from the bottom up:

Table 1: Current system of coastal governance and its limitations.

Institution	Description	Linkages and effectiveness
Unit Committees and Area Councils	Unit Committees exist at Settlement level and can prepare Community Action Plans which should be incorporated in District level planning. They report to the Area Councils into which the District is sub-divided, which in turn report to the District Assembly.	<p>There is a community level perception of inadequate government representation and attention. They complain of a big gap between the community and the District Assembly. Even communities with Assembly Members who reside in the communities claim they hardly pay visits and only see them during general elections.</p> <p>Unit Committees which are supposed to fulfill this function lack the resources to effectively represent communities or carry out Community Action Plans. Such Plans (for examples see Akwidaa and Dixcove) could promote community resilience, improve wellbeing and livelihoods. Representation can be thwarted by chieftaincy disputes.</p>
District Assemblies	District Assembly is the main institution of decentralized government. Assembly members are elected while District Chief Executives and Presiding Members are appointed by the President. Integrated Coastal Management can be applied through the Development Planning and Physical Planning systems. The Assembly could create a Marine and Coastal Management Committee with representation by Civil Society, Traditional Authorities, the Private Sector, and Coastal Communities. This can be the vehicle for driving a strategy which can implement many of the proposals contained in this toolkit	<p>The Development Planning system suffers from weak finance for implementation and frequent over-riding from the centre. There is also a lack of integration of Physical Plans with Development Plans. A Coastal and Marine Committee could be inaugurated but require ongoing support to become effective.</p> <p>The Projects that have been identified which fit within the remit of this committee are noted in Table 2 below</p>
Joint Coastal Development Planning Area	The LI for Joint Development Planning Area and Executive Instrument for designating areas as such, enables adjoining Districts to act jointly on projects which run across their boundaries. Certain aspects of Integrated Coastal Management fall into this category and steps are being taken to set up such a body for the six coastal districts of the Western region	<p>The Joint Development Planning Area is at a formative stage and negotiations are underway to pilot such a mechanism in the six coastal districts of the Western region.</p> <p>The Projects that have been identified which fit within the remit of this are noted in Table 2 below.</p> <p>In addition working across districts will assist with maintaining consistent policies for coastal management.</p>
The Regional Co-ordinating Council	The Regional Coordinating Council has been set up to co-ordinate and harmonise district level planning within the region. Apart from harmonization of Development Plans, it has also recently prepared and approved a Regional Spatial Development Framework. The Physical Planning Department also houses a Geographical Information System (GIS) training and development hub which has trained physical planning officers in five of the six coastal districts.	Monitoring of projects in development plans is the main role at present. The physical planning hub has been active and may play an ongoing role in servicing any Joint Coastal Management Planning Area

4.2 Projects for the Medium Term Development Plan and the National Medium Term Development Framework

The Projects which have been identified in SECTION 3 above are here listed and numbered as under the main relevant section of the Government of Ghana's forthcoming Medium Term Development Framework 2014-17. Most of them fall under Sub theme: Sustainable natural resources management (which includes marine and coastal resources).

Table 2: Projects listed under National Development Planning Guidelines.

Sustainable natural resources management	MTDP	JDPA
1.1 Sustainable use of coastal forests and wetlands		
P4: Undertake public education on the benefits of conservation of coastal ecosystems	X	X
P9: End destructive sand winning practices by use of bye laws and community sensitisation	X	X
P11: Establish new and support existing Community Resource Management Areas (CREMAs) to protect and enhance wetlands	X	
P12: Designate both on shore, including wetlands and mangroves, and maritime preservation areas in Structure Plans and Local Plans	X	
P13: Incorporate policies in plans and bye laws to reduce impact of dams, creation of impervious surfaces in development and blockage of water courses	X	
P14: Map and plan rural land uses areas. Develop strategy for balance of agricultural land uses and set buffers for food crop production as well as conserve ecosystem functions and services.	X	X
P15: Develop the eco-tourism potential of Greater Amanzule Wetland.	X	
P16: Establish green networks in District Spatial Development Framework and to protect wildlife, agricultural and forest areas. Include green corridors in Structure Plans and Local Plans.	X	
2.1 Develop a co-management framework for fisheries with explicit mandate for MMDAs and communities		
P26: Develop co-management committees and management plans for small scale fish stocks and adjacent nearshore marine areas	X	X
2.2 Promote fisheries development for food and livelihood security		
P2: Prepare Marine Spatial Plan	X	X
P5: Work with Marine Protected Areas Inter ministerial Committee over designation of marine protected areas.	X	X
P3: Continue with research on Algae Bloom leading to proposals for its eradication.		X
2.3 Improve access to coastal land for food crop farming		
P14: Map and plan rural land uses areas. Develop strategy for balance of agricultural land uses and set buffers for food crop production as well as conserve ecosystem functions and services. This could include further work with GREL to continue the policy for set-aside of land in plantations for subsistence.	X	
P25: Create land banks or reserves for agriculture for local food production.	X	X
P29: Tourism supply chain: involve local communities in the delivery of the product such as local food, fish/fishing and other products.	X	X
2.4 Create opportunities for generating wealth, jobs and diversified livelihoods from the oil and gas sector		
P23: Create links between local communities, tertiary/ vocational education and incoming developments in oil and gas, supply industries, tourism and hospitality, new residential developments, and construction.	X	X

Sustainable natural resources management	MTDP	JDPA
3.1 Designate areas for large facility siting in the coastal zone		
P24: Prepare Structure Plans and Local Plans for Half Assini, Tikobo and Bonyere areas.	X	
P27: Ensure local monitoring/input to Environmental Impact Assessment process.	X	X
3.2 Develop tourism and leisure potential of coastal areas		
P33: Support local festivals and educate/promote on retention of cultural identity of coastal and fishing communities.	X	
P15: Develop the eco-tourism potential of Greater Amanzule Wetlands.	X	X
P28: Continue and extend scheme to keep beaches clean to more remote beaches, and expand to include security measures for visitors.	X	
P29: Tourism supply chain: involve local communities in the delivery of the product such as local food, fish/fishing and other products.	X	X
P30: Promote tourism and leisure investment through establishment of investors' forums.	X	X
P31: Work with Ghana Museums and Monuments Board, Ghana Wildlife Society and others to extend the tourism product range – eg Historic Forts, Cape Three Points, whale watching, wildlife conservation and develop a sustainable eco-tourism development plan for the coastal zone	X	X
4.1 Develop partnerships for waste management involving shorefront communities.		
P20: Continue and extend coastal and shoreline waste management schemes	X	
4.2 Improve access to water and sanitation facilities		
P19: Map critical watersheds shared by adjoining districts and subject to collaborative management		X
P21: Reinstatement of wells and boreholes to be conditions of new developments and take account of salination threats.	X	
5.1 Reduce vulnerability of people, property and infrastructure to coastal hazards		
P6: Increase collaboration with the Ministry of Water Resources, Works and Housing for regulating private development and installing publicly funded defenses.	X	X
P7: Where acceptance of land loss is agreed as the best option long term, plan re-settlement schemes and incorporate as objective in Structure Plans.	X	
P8: Develop a public education programme on coastal hazards and climate change.	X	
P32: Undertake public education on values and importance of wetland ecosystems.	X	
P10: Prepare coherent shoreline management plans to regulate coastal land use.	X	X
P16: Prepare Structure Plans and Local Plans for Half Assini, Tikobo and Bonyere areas.	X	
P17: Prepare Community Action Plans to address vulnerability and improve resilience for all coastal communities by building on Dixcove and Akwidaa vulnerability assessments.	X	
P18: Apply good coastal management practice in any major leisure developments.	X	
Other Sections of the MTDF		
P1: Form Working Groups to deal with specific coastal issues, for example the Greater Amanzule Working Group.	X	X
P14: Support local festivals and educate/promote retention of cultural identity of coastal and fishing communities.	X	
P34: Work with Lands Commission at local level on land security and compensation.		X

4.3 Regulation

The district's permitting and regulating decision making processes are crucial for implementing certain aspects of coastal planning and management. These processes can rely on best management practices for addressing urbanization and shoreline sanitation issues (example Dixcove), flood hazard management (example Akwidaa) and large scale tourism facility siting (Princes Town). The district also has the power to formulate bye-laws to regulate different activities in its coastal zone. Example is the Community Resourced Management Areas bye-laws that has been adopted and provided for expansion of these areas to include coastal wetlands. Jomoro can also draw on examples from Shama District to formulate bye-laws for floodplain and shorefront management.

4.4 Priorities and Actions

The above projects emerge from the participative working with coastal communities and other stakeholders, the evidence that has been gathered and analyzed. The list does not take account of priorities or the capacity of stakeholders to carry out the projects. Some will align with Government of Ghana national priorities, others may fit well within the objectives of foreign aid or corporate responsibility. The Coastal and Marine Management Committee will be a point of discussing and setting priorities, which will be reflected in the Medium Term Development Plan and Spatial Plans, and coordinating joint action by stakeholders.

Priorities that are highlighted here include the urgent approval of bye laws, designation of protected areas, along with continuing to develop community resourced management of them. Public education initiatives in the list of projects are a pre-cursor to action. Some of the projects listed should be routine functions of the District Assembly, but it is proposed that they become "projectised" as a way of ensuring that they maintain a high priority in local administration and action with stakeholders. The table also indicates which projects are purely within the province of the Assembly, and those which need to be shared in a Joint Planning Area.

4.5 Funding

The Medium Term Development Plan is the document which ties together local needs, national policies, projects and action plans with funding sources. Yet the funding systems remain weak compared to the task. In order to achieve the objective of "goods and services that generate long term socio-economic benefits to communities while sustaining biodiversity" multiple funding streams will need to be co-ordinated. These will have to include central government and donor support, internally generated funds, especially from a share of the increased land values that are being created (betterment and land value capture) which has to be negotiated on each development proposal; from local property taxes which if well established can be used to underpin bond issues for funding infrastructure; and from CSR policies of major investors, including setting up of a Coastal Foundation.



Notes to text

(1) See also Ghana's Riparian Buffer Zone Policy for Managing Freshwater Bodies in Ghana, 2011. Ministry of Water Resources, Works and Housing. Government of Ghana. The following are relevant detailed definitions:

Flood Hazard Boundary Map is a map upon which the boundaries of the flood hazard zone has been delineated. It is periodically updated as new information becomes available.

Flood Hazard Zones: Zone B is the additional land and wetlands which lie within and form part of the boundaries of the flood zone as illustrated in the Flood Hazard Boundary Map. This area has a probability of 1 in 5 or 20% in a given year to be covered by floodwater during a period of intense rainfall, as well as have temporary extensive areas of standing water, and also includes permanent and seasonal wetlands and normal river flow. **Flood Hazard Zone C** is an expanse of relatively flat land that spans from the main stem of a river or stream, possessing wet soils that include sediment carried and dropped by the stream, and is susceptible to being inundated by periodic flood waters from any source with a probability of 1 in 25 in a given year. This zone incorporates the river buffer zone A and the high flood hazard zone B.

Floodplain Is a level or nearly level land along a stream or river flooded only when the streamflow exceeds the water carrying capacity of the channel. flat or nearly flat land adjacent to a stream or river that experiences occasional or periodic flooding.

Riparian Buffer Zone is A riparian buffer zone strictly defined, comprises only the vegetation in a stream channel and along riverbanks; However, the term has recently been used more broadly to include adjacent landscape that exerts direct influence on a water bodies and associated aquatic ecosystems. It generally encompasses undisturbed native strip of vegetation either original or established that borders streams and rivers, ponds, lakes and wetlands and is therefore the interface between terrestrial and

aquatic ecosystems. It may include trees, shrubs, herbaceous plants and grasses extending from the defined edge of a stream, river or shoreline. To conserve these resources requires that buffer zones are designated to the maximum extent practicable and include best management practices that will ensure the maintenance and integrity of the waterway, biota, and habitats and reduce pollution that would result in water quality improvement and fresh water supply at low cost from well conserved water bodies.

River Buffer Zone A is a land area on or contiguous to the main river channel or wetland that shall be retained in its natural or undisturbed condition. This includes vegetation, wet soils, slopes and vegetative cover within. Buffer width varies for major rivers/streams (10 - 60m), minor streams (10 - 20m), and seasonal streams (10 - 15m). See Riparian Buffer.

(2) Based on Boateng Isaac (2012) An Application of GIS and coastal geomorphology for large scale assessment of coastal erosion and management: a case study of Ghana.

(3) The key points which have been identified for this are:

- Constructions at beach destinations should be behind the tree line and lower than the tree height so that from the beach the view is dominated by the trees and the building are hidden. This means repair existing/stopping new undesirable structures from being built.
- Add tourism investment to the justification for infrastructure investment in coastal communities, and seek partnership with tourism facility investors in providing them (electricity water, sanitation, waste).
- Support to farming should seek to link locally sourced food with tourism development.
- Protect and secure beaches: prevent further erosion and damage sand and stone winning. Keep beaches and the sea clean. Ban driving beach buggies or motor bikes on popular beaches, publicise the dangers of being in fish

landing areas, establish life guards and security.

- Involve local communities in the delivery of the product: increasingly poor local communities are well aware of the opportunities which tourists provide, but there are many ways in which these linkages could be developed as a source of business. For example, fishermen who could introduce and show visitors their industry, tours of settlements, cultural tours, farm visits, supplies of food and fish among others. All of these happen informally but could be scaled up if training and other essentials could be provided.
- As a strong complementary asset to beach tourism, other sites must be strengthened further developed. The Marine and Coastal Committee can work with the relevant authorities such as the Ghana Museums and Monuments Board, the Wildlife Division, Ghana Wildlife Society amongst others to:
 1. Improve access to ecotourism areas as well as signage and facilities.
 2. Develop new attractions, for example sites like Cape Three Points Lighthouse should be developed as prime whale watching sites.
 3. Support and promote initiatives that are helping conservation and protection of marine and shore-based wildlife such as the efforts of certain beach resorts to offer turtle volunteer opportunities.
 4. Maintain and develop historic and cultural sites: there is huge scope for extending the current offer.

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R22: D'Agnes, L and Johnson, K. (2010). Opportunities for integrating family planning, health and nutrition interventions into coastal-fisheries governance agendas in Western Region, Ghana (2010) Trip report.

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R24: Freshwater supply and distribution: a developing crisis in the Western Region This issue brief highlights the key issues facing Ghana's Western Region in terms of fresh water supply and distribution and recommends policy options to protect water resources and insure equity in their use and distribution.

R25: Asmah, G.B., Owusu, A., Kankam, S. (2013). Improving Livelihoods through Cleanliness in the Coastal Communities of the Western Region of Ghana: Achievements and Lessons Learned.

SECTION 3.7.1

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R27: Gordon, A., Pulis, A. (2010) "Livelihood Diversification and fishing communities in Ghana's Western Region", WorldFish Center. USAID Integrated Coastal and Fisheries Governance Initiative for the Western Region, Ghana. 69pp.

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5.2 List of data files

Theme	Feature	Description	Object	Source	Year
Coastal Resources	Beach Seine	Location of beach seine activities	Point	EPA	2004
Coastal Resources	Birds	Bird diversity along the coastal stretch of Jomoro District	Point	EPA	2004
Coastal Resources	Coast Type	Representation of the district's coastline classified into sandy beaches, rocky shores and mouth at lagoon	Line	EPA	2004
Coastal Resources	Ecological Ranking	Sensitivity of Coastal ecosystems to potential oil spills.	Line	EPA	2004
Coastal Resources	Fish and Shrimp	Distribution of nursery and spawning sites of fish species.	Point	EPA	2004
Coastal Resources	Reptiles and Lizards	Distribution of crocodiles, turtles and lizards along the coast	Point	EPA	2004
Coastal Resources	Fish Landing Sites	The location of fish landing sites, the number of beach seine activities, number of fishermen and the number of canoes.	Point	EPA	2004
Coastal Resources	Human Use Ranking	Classification of human use along the coast.	Line	EPA	2004
Boundary	Jomoro District boundary	The boundary of Jomoro district including the coastline.	Polygon	ICFG	2012
Boundary	Jomoro District boundary (TCPD)	The boundary of Jomoro district including the coastline.	Polygon	TCPD	2013
Boundary	Coastal Zone (1000m)	1000 meter buffer of the coastline which defines the landward boundary of the coastal zone.	Line	ICFG	2012
Boundary	Coastal Zone (30 meter Bathymetry)	30 meter bathymetry line indicating the seaward boundary of the coastal zone.	Line	ICFG	2012
Boundary	Coastal Zone (6 Nautical miles)	6 Nautical mile buffer of the coastline indicating the seaward boundary of the coastal zone.	Line	ICFG	2012
Boundary	Coastal Zone(Landscape and Seascape)	The coastal zone of Jomoro district.	Polygon	ICFG	2013
Focal Area Zone	Amanzule Focal Area	Boundary of the Amanzule focal area.	Polygon	ICFG	2012
Hydrography	Coastal Wetlands	Water bodies, wetlands and adjoining ecosystems	Polygon	EPA	2004
Hydrography	Water bodies	District-wide coastal water resource inventory.	Polygon	EPA	2004
Hydrography	Coastal Wetlands	Water bodies, wetlands and adjoining ecosystems that promote aquatic life along the coastline of the district	Polygon	EPA	2004
Hydrography	Rivers	River systems.	Line	ICFG	2012
Industrial	Industrial Development	Various industrial developments in the district.	Point	EPA	2004
Industrial	Mineral Deposits	Location of the different types of mineral exploration activities.	Point	ICFG	2013
Industrial	Tourism	Tourism destinations in the district.	Point	ICFG	2013
Roads	Jomoro Roads	Street center lines for the major transportation highways, roads, and streets.	Line	ICFG	2012
Settlement	Jomoro Towns	Administrative names and the location of all the major settlements.	Point	ICFG	2012
Settlement	Jomoro Coastal Towns	Names and locations of some selected coastal towns/communities in the district that fall within the Amanzule focal area	Point	ICFG	2012
Vegetation	Forest Reserve	Forest Reserve.	Polygon	Forestry dpt.	
Vulnerability Assessment	Boreholes	Active and inactive sources for dugout water access	Point	ICFG	2013
Vulnerability Assessment	Flood Zones	Flood zones or areas that were constantly flooded.	Polygon	ICFG	2013
Vulnerability Assessment	Bridge	Location of bridges	Point	ICFG	2013
Vulnerability Assessment	Previous Shoreline	The previous shoreline extent as mapped by community members.	Line	ICFG	2013
Vulnerability Assessment	Virtual Shoreline	The farthest extent of wave action as mapped by community members.	Line	ICFG	2013
Vulnerability Assessment	Community Assessment	Vulnerability assessment including socio-economic ranking and specific indicator values of all coastal communities.	Point	ICFG	2013
Land use / Land cover	Land use / Land cover	Land use / land cover from 2002 Landsat data	Raster	ICFG	2011
Imagery	Orthophotos	Digital orthophotos of the coastal stretch of the district.	Raster	Survey dpt.	2005
Imagery	Toposheets	Scanned topographic sheets of the district.	Raster	Survey dpt.	1986
Elevation/Bathymetry	Contour (20 meters)	20 meter interval contour lines.	Line	ICFG	2011
Elevation/Bathymetry	Elevation and Bathymetry (20 meters)	20 meter interval elevation and bathymetry (sea depth).	Line	ICFG	2011
Elevation/Bathymetry	Aster 30meter Bathymetry	30 meter resolution Aster bathymetry (sea depth).	Raster	ICFG	2002
Elevation/Bathymetry	Aster 30meter Elevation	District-wide 30-meter resolution DEM	Raster	ICFG	2011
Imagery	Landsat	30 meter resolution Landsat ETM data acquired from 2001 to 2002	Raster	ICFG	2002
Imagery	RapidEye	5 meter resolution RapidEye data captured in 2012-2013	Raster	ICFG	2013



Relocate vulnerable families to New Town, encouraged through providing homes, utilities and services

Upgrade and maintain concrete storm drain channels to accommodate heavy rains and floods

Establish a "no-build" buffer adjacent to lagoon, rivers and wetlands

Exclude permanent structures on undeveloped barrier beaches

Elevate and set back structures to reduce impacts of flooding and erosion

Minimize impacts to fishing businesses and assets

Develop programs to inform health, agriculture, and fisheries sectors on the impacts of climate change

Monitor beach and wetlands to understand changes and the implications for future

Map existing and future floodplains

Establish early warning system and disaster preparedness plans

Sea defenses should be the last option in dynamic beaches and inlet



Good Management Practices

Reduce Impacts from Flooding and Erosion: Akwidaa Case Study



Good Management Practices

Reduce impacts from flooding and erosion.

Akwidaa Case Study



Objective 1 - Citizens, leaders and sectors are fully aware of vulnerabilities from natural flood hazards and options to reduce risk today and in the future.

1. Develop programs to inform health, agriculture, and fisheries sectors on the impacts of climate change.

Changes in precipitation, temperature and weather patterns affect the health and wealth of the community. Work with government and non-government organizations and academia to share up-to-date information on impacts and actions that can be taken by different sectors of society to be more resilient.

2. Establish early warning system and disaster preparedness plans.

Community-based programs should include participatory mapping of risk evacuation routes, drills to practice warning and evacuation, and information exchange. Early warning can include informing the community of extreme high tides, heavy rains, and wave activity. SMS and community networks have been successful at getting the word out.

3. Monitor beach and wetlands to understand changes and the implications for future.

Work with NGO and university to establish a program to track changes, such as beach erosion and levels of flooding. Additionally, wetlands that provide habitat for

fisheries will likely change as sea level rise results in higher salinity further upstream. Monitoring can be performed by members of the Community Resource Management Areas (CREMA) or students together with wetland curriculum that could support increased awareness.

4. Map existing and future floodplains utilizing best available data, models, and results from vulnerability assessments.

The flood hazards map can become an overlay to the physical plan, showing river channels, watercourses, approximate extent of the flood waters, and expected flood elevations. Estimate historical flood elevations using local knowledge and other data and consider future changes in rain fall intensity.

Objective 2 – Changes are made to existing development that accepts the long-term impact of erosion and flooding in high hazard areas

5. Relocate vulnerable families to New Town,

encouraged through providing homes, utilities and services. Relocate structures at high risk of flood, or those damaged by disaster. Pre-planned urban development with houses and associated services will provide an incentive for families to relocate.

6. Elevate and set back structures to reduce impacts of flooding and erosion.

Consider the levels of historic storms, tides and anticipated sea level rise when elevating structures or moving them back from the shoreline.

7. Minimize impacts to fishing businesses and assets.

Boats, gear, landing facilities depend on being waterside and should be set back or elevated to prevent future storm damage. Prepare long term plans for locating other associated activities, such as market, fisherman houses, and gear that do not require a waterfront location away from the shore and not in harm's way.

8. Upgrade and maintain concrete storm drain channels to accommodate heavy rains and floods.

Use national design standards to reduce flooding of adjacent urban areas

Objective 3: New development is located safely away from high hazard areas

9. Exclude permanent structures on undeveloped barrier beaches.

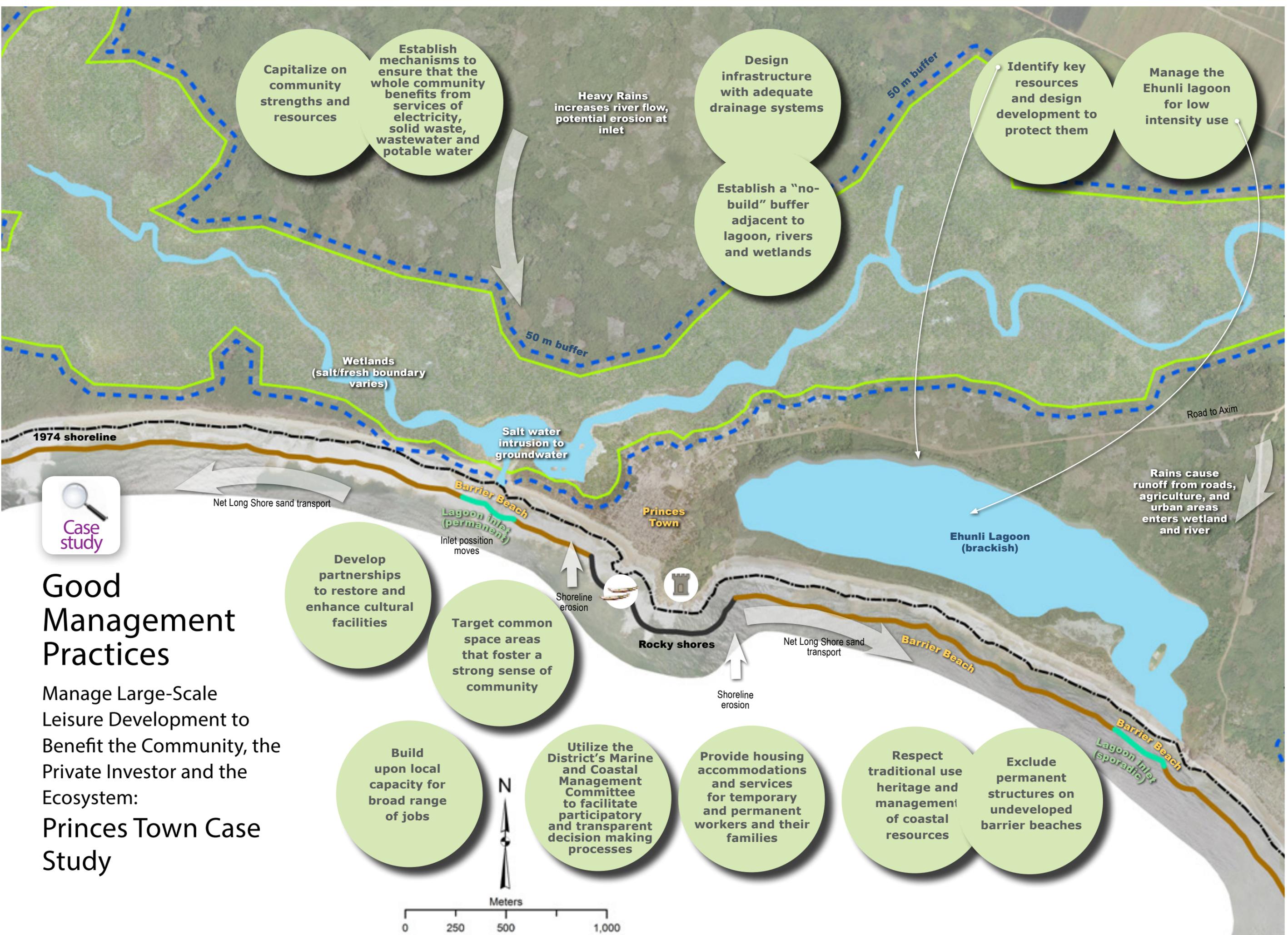
The dynamic processes of erosion and wave overwash keep the beach healthy. Temporary, low impact structures may be acceptable, but should be elevated to allow for beach movement. Sea defenses should be prohibited in these areas.

10. Sea defenses should be the last option in dynamic beaches and inlet.

With the dynamic inlet to the Ehunli Lagoon, erosion control structures, seawalls and jetties will likely impact adjacent areas and increase erosion. Erosion control must be carefully designed to meet engineering standards for expected waves and river flow and precautions taken to reduce erosion potential adjacent to these structures.

11. Establish a "no-build" buffer adjacent to lagoon, rivers and wetlands.

A vegetated and undisturbed strip of land will reduce pollution, erosion, flooding and habitat destruction. Maintain a "no-net loss" practice for wetlands. If there must be a wetlands alteration, mitigation actions are recommended to accommodate flood storage needs. This mitigation shall take place nearby so that flooding impacts downstream will not increase.



Capitalize on community strengths and resources

Establish mechanisms to ensure that the whole community benefits from services of electricity, solid waste, wastewater and potable water

Heavy Rains increases river flow, potential erosion at inlet

Design infrastructure with adequate drainage systems

Establish a "no-build" buffer adjacent to lagoon, rivers and wetlands

Identify key resources and design development to protect them

Manage the Ehunli lagoon for low intensity use

Develop partnerships to restore and enhance cultural facilities

Target common space areas that foster a strong sense of community

Build upon local capacity for broad range of jobs

Utilize the District's Marine and Coastal Management Committee to facilitate participatory and transparent decision making processes

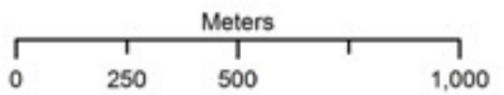
Provide housing accommodations and services for temporary and permanent workers and their families

Respect traditional use heritage and management of coastal resources

Exclude permanent structures on undeveloped barrier beaches

Good Management Practices

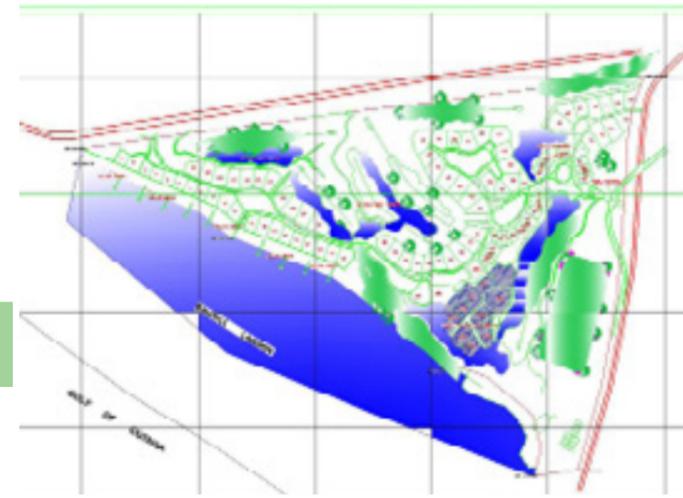
Manage Large-Scale Leisure Development to Benefit the Community, the Private Investor and the Ecosystem:
Princes Town Case Study



Good Management Practices

Manage Large-Scale Leisure Development to Benefit the Community, the Private Investor and the Ecosystem:

Princes Town Case Study



Objective 1 - Development is harmonized with conservation, increasing quality of life by designing with nature

1. **Respect traditional use, heritage and management of coastal resources.** Traditional knowledge for managing occasional opening of the Ehunli lagoon to the ocean helps maintain salinity for fisheries and reduce flooding of elevated lagoon water levels. Protecting mangroves are critical for bird and monkey habitat and respects local culture, where hurting monkeys is taboo. Maintaining existing public access to lagoon, forest, and coast is important for economic and cultural uses.
2. **Exclude permanent structures on undeveloped barrier beaches.** The dynamic processes of erosion and wave overwash keep the beach healthy. Temporary, low impact structures are allowable, but should be elevated to allow for beach movement. Sea defenses should be prohibited.
3. **Establish a "no-build" buffer adjacent to lagoon, rivers and wetlands.** A vegetated and undisturbed strip of land will reduce pollution, erosion, flooding, and habitat destruction. Wetlands should not be

filled, however, if there is over-riding public benefit for filling wetlands or waterway (i.e. a road access), consider other alternatives including relocation, bridge, or adequate culvert to reduce impacts and flooding. Maintain vegetated buffers for rivers, streams and lagoons (10 – 60m).

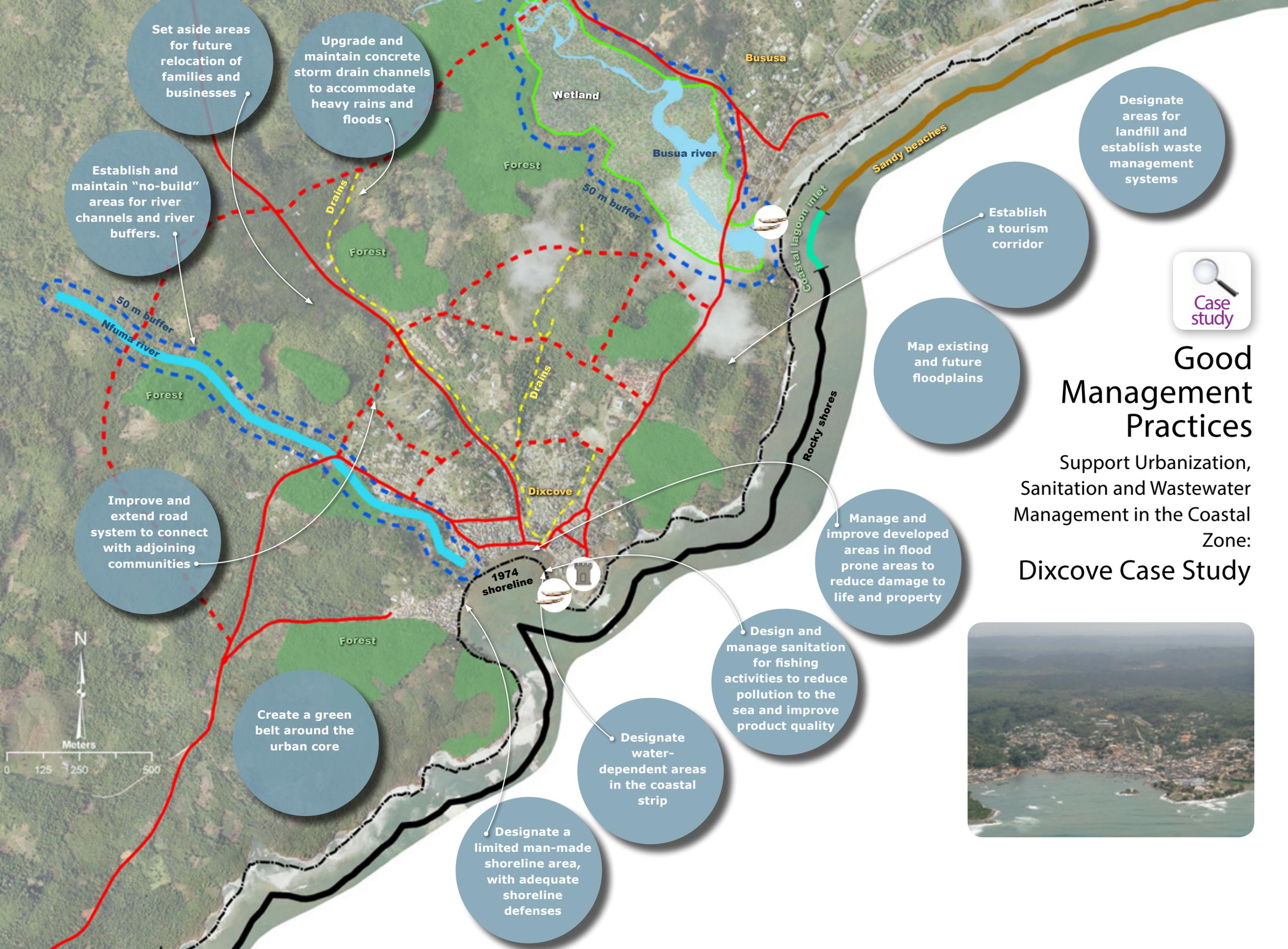
4. **Manage the Ehunli lagoon for low intensity use.** Identify areas for both traditional use and non-damaging new uses. Limit boating to vessels without motors. Minimize the number of piers and promote shared use of the water area to reduce disturbance of habitat.
5. **Identify key resources and design development to protect them.** Map areas of high value habitat and resource value as a first step in locating new development. Undeveloped green spaces (forest, mangrove, wetlands) can be used for passive recreation and tourism. Connecting these areas provides a habitat corridor for wildlife. Grouping/clustering buildings away from key resources will minimize destruction of valuable habitat.

Objective 2 - Services and infrastructure are in place that improve the standard of living for existing and future residents and visitors

6. **Design infrastructure with adequate drainage systems.** Roads should include drains or vegetated buffers to reduce flooding and pollution to rivers and wetlands during rainfall. Building designs and grading should reduce impacts to nearby properties and waterbodies. Where feasible, include cisterns for rain water harvesting and storing drinking water.
7. **Establish mechanisms to ensure that the whole community benefits from services of electricity, solid waste, wastewater and potable water.** Identify approaches such as co-financing, co-management, partnership agreements or service contracts. Locate facilities for solid waste and sewage disposal in safe areas not prone to flooding and ensure proper design.
8. **Provide housing accommodations and services for temporary and permanent workers and their families.** Large tourist developments require additional workforce housing during construction and for continued operation of the expanded community.
9. **Develop partnerships to restore and enhance cultural facilities.** Build upon efforts to restore the facilities, such as Fort Gross Friedrichsburg and partner with Ghana West Coast Destination Management Organization to promote a cultural tourism corridor in Ahanta West.

Objective 3 - Sustained engagement among District, community and development sectors provides mutual benefits

10. **Utilize the District's Marine and Coastal Management Committee to facilitate participatory and transparent decision making processes.** The committee will help develop and implement formal mechanisms for decision making, negotiation, conflict resolution, and participation by stakeholders.
11. **Target common space areas that foster a strong sense of community.** Design spaces to support engagement between existing and new community members. Markets, parks, or buildings can provide opportunities to share experiences, including cultural exchange, outdoor activities and special events.
12. **Build upon local capacity for broad range of jobs.** Work with local and regional leaders, educators and businesses to build capacity of local residents to support new jobs in construction, management, tourism, and services. Business concepts can emerge from initial joint projects between the leisure operator and the community.
13. **Capitalize on community strengths and resources.** Identify ways for enhancing the value of resorts by including local fish and agriculture products, cultural amenities and other eco-tourism approaches as part of the package.



Set aside areas for future relocation of families and businesses

Upgrade and maintain concrete storm drain channels to accommodate heavy rains and floods

Establish and maintain "no-build" areas for river channels and river buffers.

Designate areas for landfill and establish waste management systems

Establish a tourism corridor



Map existing and future floodplains

Good Management Practices

Support Urbanization, Sanitation and Wastewater Management in the Coastal Zone:

Dixcove Case Study

Improve and extend road system to connect with adjoining communities

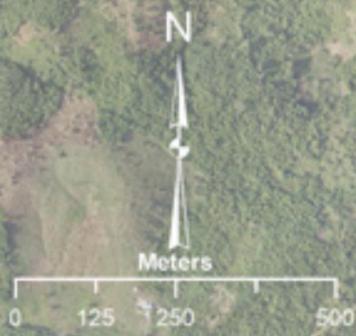
Manage and improve developed areas in flood prone areas to reduce damage to life and property

Design and manage sanitation for fishing activities to reduce pollution to the sea and improve product quality

Create a green belt around the urban core

Designate water-dependent areas in the coastal strip

Designate a limited man-made shoreline area, with adequate shoreline defenses



Good Management Practices

Support Urbanization, Sanitation and Wastewater Management in the Coastal Zone:

Dixcove Case Study

Objective 1.
Planned and well-maintained urban areas that increase quality of life of the community

- 1. Establish and maintain “no-build” areas for river channels and river buffers.** Enforce a no-build area adjacent to the river channel or watercourse. If there is over-riding public benefit (i.e. a road that cannot be located elsewhere) for developing or filling in the watercourse, ensure that flooding will not increase (i.e. raise height of road or install culverts of adequate size). Maintain vegetated buffers that support natural functions for rivers/streams (10 - 60m), minor streams (10 – 20m), seasonal streams (10 – 15m).*
- 2. Create a green belt around the urban core.** Protect and manage healthy forests and wetlands in order to capture rainwater, reduce flooding, and support groundwater drinking supplies, while supporting sustainable livelihoods. Connected forests will provide a corridor for wildlife, defines a transition from urban to rural areas and benefits recreation and tourism.
- 3. Map existing and future floodplains utilizing best available data, models, and results from vulnerability assessments.** The flood hazards map can become an overlay to the physical plan, showing river channels, watercourses, approximate extent of the flood waters, and expected flood elevations. Estimate historical flood elevations using local

- knowledge and other data and consider future changes in rain fall intensity and increased development of urban areas.
- 4. Set aside areas for future relocation of families and businesses.** Relocate structures at high risk of flood, or those damaged by disaster. Pre-planned and pre-built urban development with houses and associated services provide an incentive for families to relocate.
 - 5. Establish a tourism corridor** to provide uniform promotion, signage and maintenance of communities, landscapes, cultural and heritage sites that have tourism value. Prepare plans for development and support services that support District goals to promote the tourism industry. Train local residents to work as guides for tourists, ensuring some local income and promoting interest in natural and cultural assets.
 - 6. Improve and extend road system to connect with adjoining communities.** The “ring road” approach would mark a clear transition from urban to rural where services, densities and land uses are different. Design adequate storm water drainage adjacent to the roads to reduce flooding.



Objective 2 - Shoreline protection that supports long term safety and security of waterfront activities

- 7. Designate a limited man-made shoreline area, with adequate shoreline defenses.** Assess condition of current shoreline and defense systems to determine their level of effectiveness to reduce flooding and long term shoreline recession. Upgraded or new structures shall be designed and constructed with engineering standards; consider the need to maintain access for water dependent uses; and reduce impact (erosion, wave damage) to adjacent beaches and properties.
- 8. Designate water-dependent areas in the coastal strip.** Prioritize and promote uses that must rely on the sea (water dependent uses) for the water front. These include fishing, swimming, and boat repair. Design of these areas ensures safety to humans and property and respects flood hazards from the land and the sea and long term shoreline erosion.
- 9. Manage and improve developed areas in flood prone areas to reduce damage to life and property.** Upgrade or reconstruct structures so they are elevated above flood water levels. Safe heights can be established from local knowledge or maps. If existing structures are highly damaged by flood, encourage residents to relocate away from floodplain.

Objective 3 – Wastewater management and shoreline sanitation improvements that enhance health of residents and ecosystems

- 10. Upgrade and maintain concrete storm drain channels to accommodate heavy rains and floods.** Use national design standards to construct drainage and reduce flooding of adjacent urban areas. Plan for maintenance of these channels, including programs to keep them free of solid waste. This could include sensitization of residents on how to identify and use other areas for solid waste disposal and household wastewater.
- 11. Designate areas for landfill and establish waste management systems.** Locate disposal sites outside of areas which are vulnerable to floods, with a minimum 90 m buffer to water and streams.* Where feasible, locate outside the coastal zone. Support income generating programs for plastic recycling and collection.
- 12. Design and manage sanitation for fishing activities** to reduce pollution to the sea and improve product quality. Identify and carry out programs to ensure that fish handling area and cleaning stations are sanitary. Identify options for clean potable water including piping in or installing water tanks (filled by rain water or tank truck). Explore fish waste disposal opportunities that benefit others, such as composting waste for fertilizer or using it as feed for animals.

* see National Riparian Buffer policy for more information