THE BEST PRACTICE FOR COASTAL ADAPTION PLANNING: A SURVEYOR'S PERSPECTIVE

Publication of FIG Commission 8 Working Group 8.4
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1. The Purpose of the Publication

This publication does not only satisfy the core objectives of the Working Group 8.4, but also provides solutions to some of the key issues that were raised in the Costa Rica Declaration and the outcome of the roundtable discussion with Working Group 4.3. Through the Costa Rica Declaration, FIG acknowledged the pressure being placed upon Coastal Zones and the urgent need for adaptation and the support of best practice and programmes. This report compiles 15 sets of concise technical and analytical case studies worldwide, on a range of topics that centre on coastal adaptation Planning, climate change and associated sea level rise. It also touches on methodology on valuing un-price and heritage resources in the coastal zone. The case studies are highly focused on problems, methodologies, change processes, results and the lessons learned.

The purpose of these case studies is to provide examples of best practice in dealing with coastal adaptation, climate change impacts and related issues. The case studies in this report cover a range of related themes and therefore, serves as a "one stop shop" technical document for coastal managers, policy makers and other practitioners working in the coastal zone and SIDS addressing the 'land' challenges posed by rising sea levels and the complex issues in the coastal zone. Holistic and wider coverage documents such as this report are mostly handy to practitioners "as most of them are preoccupied with the responsibilities of their jobs and tend not to have the time or inclination to search for these information from different scientific sources" (Tribbia and Moser, 2008).

2. Background of the working Group 8.4

The Federation of International Surveyor's (FIG) Working Group 8.4 was set up in 2006 to investigate the emerging coastal habitat issues connected to rising sea levels as a result of climate change. The Working Group had two objectives: to identify the impacts of rising sea levels on habitats in coastal regions and to develop planning policy and implementation guidelines to assist sustainable coastal adaptation.

The Working Group perused a cross-commission engagement and collaboration with Working Group 4.3 (Administering Marine Spaces). A roundtable discussion between the two working groups was held during the FIG working week in Stockholm. The discussion highlighted the need for capacity building and the use of case studies as a tool for widened participation and sharing of best practice. It was identified that there was the need to develop a holistic policy framework for sea level rise adaptation planning, in coastal regions.

Since 2006, the Working Group 8.4 in collaboration with Working Group 4.3 has contributed cutting-edge technical papers on the subject in all FIG working weeks, general assembly and regional conferences. Most of these technical sections (outlined in Table 1) offered detailed insight into the impacts of sea level rise on coastal regions and Small Island Developing States (SIDS).

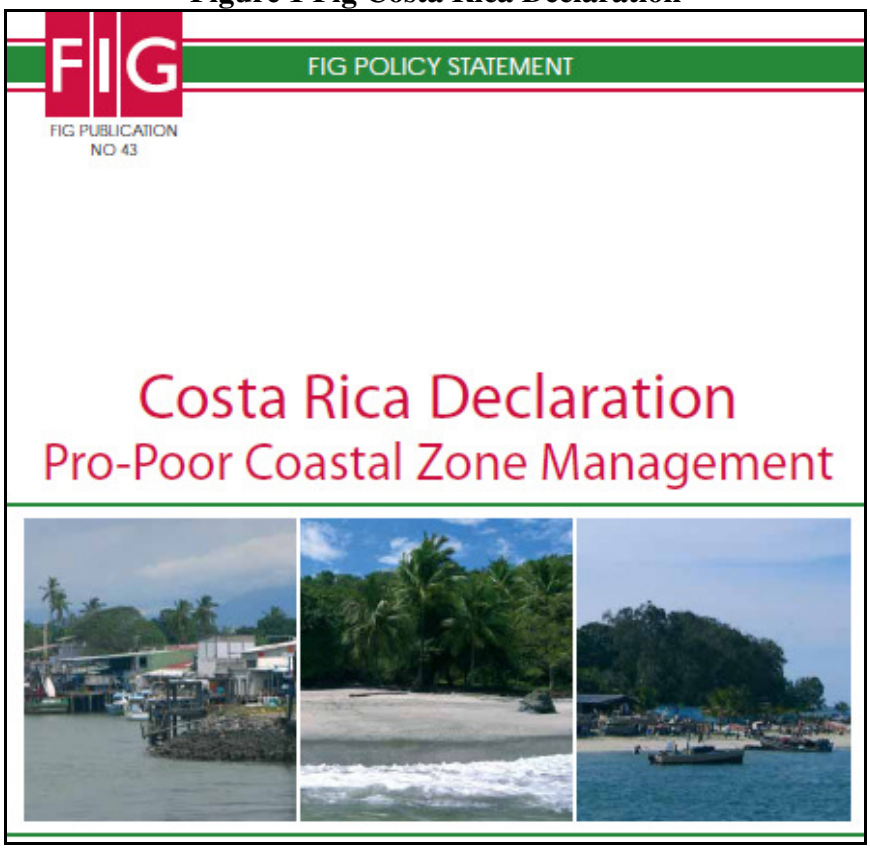
Table 1 Contribution of Working Group 8.4 since 2006

TYPE OF FIG ASSEMBLE	VENUE & YEAR	TECHNICAL SECTION	NUMBER OF PAPERS
XXX General Assembly & a Working Week	Hong Kong, 2007	TS 7B – Coastal Zone Management and Environmental Issues	4
6th FIG Regional Conference	San José, 2007	PS I – Coastal Zone Management TS 1 – Coastal Zone Management	3 2
Working Week	Stockholm, 2008	TS 3F - Coastal Zone Administration	7
Working Week	Eilat, 2009	TS 4E – Coastal Zone Management	5
7th FIG Regional Conference	Hanoi, 2009	TS 4D – Planning for Environmental Adaptations	3

These papers can be downloaded from http://www.fig.net/pub/proceedings/procindex.htm or from the FIG library.

A key milestone achievement of the Working Group was its contribution to the Costa Rica Declaration on Pro-Poor Coastal Zone Management (FIG Publication No: 43,) in 2008. The Declaration recommended development in a number of areas including: adoption of a resilient approach to coastal zone strategies by recognising that long-term sustainability will occur only as a result of continuous adaptation (resilience) to changing conditions; and the provision of increased support for professional institutions, including capacity building and the development of best practice solutions.

Figure 1 Fig Costa Rica Declaration



3. The Content of the publication

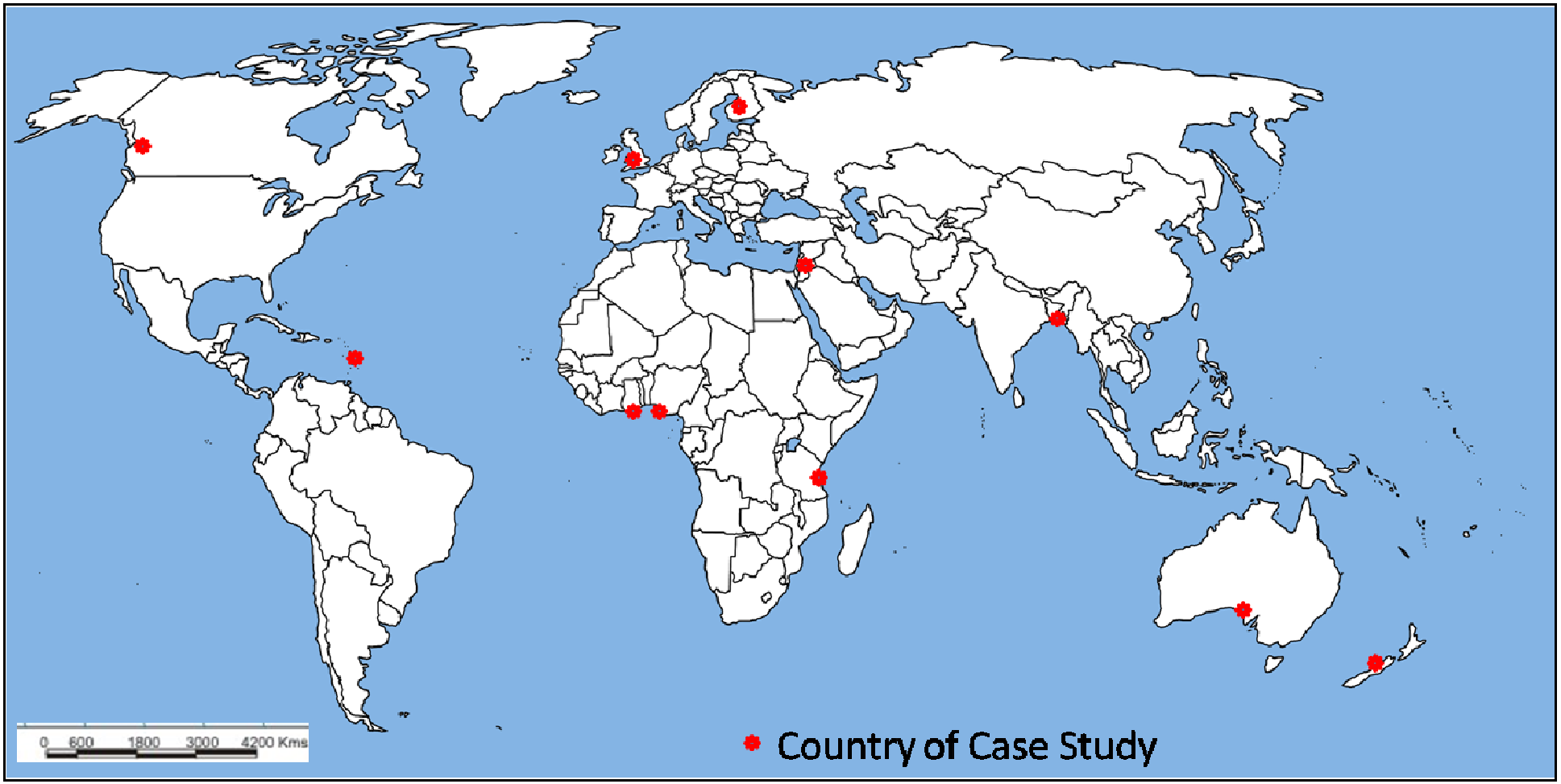
This publication has 15 case studies. Table 2 provides an outline of the titles of the case studies and the name of the authors. An overview of the countries where the case studies came from has been presented as Figure 2.

Table 2 An Outline of the Content of the Publication

No.	TITLE OF THE CASE STUDIES	AUTHOR/AUTHORS
1.	Dealing with the challenges of climate change and coastal adaptation planning: a framework for practitioners	Isaac Boateng, United Kingdom
2.	East Mediterranean Sea Level Change along the Israeli Coast during the Last Fifty years	Boris Shirman and Yossi Melzer, Israel
3.	The Victorian Coastal Vulnerability Assessment	Nathan Quadros, Jenni Rigby and Philip Collier, Australia
4.	The impacts of Sea level rise on coastal settlements and adaptation: A Case Study of Keta, Ghana	Isaac Boateng, United Kingdom
5.	The Niger Delta and the Challenges of Sea Level	Utang Pius B and Ogba Chima O, Nigeria
6.	Sustaining Management of Climatic Change and Sea Level Rise in the Niger Delta	Angela Kesiena Etuonovbe, Nigeria
7.	Shifting Sands: Coastal Erosion and Coastal Management at East Head spit, West Sussex	Brian Baily, United Kingdom
8.	Data Sources for Monitoring Inter-Tidal Environments: the Case of Langstone Harbour	Peter Collier, United Kingdom
9.	A note on the challenges of measuring the potential impacts of Climate Change in a small village in a SIDS: the case of Grand Riviere, Trinidad	David Neale and Michael Sutherland
10.	St. Margaret's Bay Marine Cadastre Prototype Case Study	Michael Sutherland and Susan Nichols, Canada
11.	An Analysis of Institutional Frameworks and its Significance for Sustainable Coastal Resources Management: Case Studies of *Tanguar Haor*, Bangladesh and Tanga, Tanzania	Isaac Boateng, United Kingdom
12.	Coastal Erosion and Property Rights – Judicial, Legislative and Policy Interventions	Mick Strack, New Zealand
13.	The Economic valuation of Coastal Ecosystems	Premachandra Wattage, United Kingdom
14.	Valuation of Coastal Heritage and Waterfront Properties	Tim Goodhead, England
15.	Profit sharing in coercive purchase of reliction area rising from the Baltic Sea	Juhana Hiironen and Kauko Viitanen, Finland

The full case studies can be downloaded from the commission 8 website
http://www.fig.net/commission8/index.htm

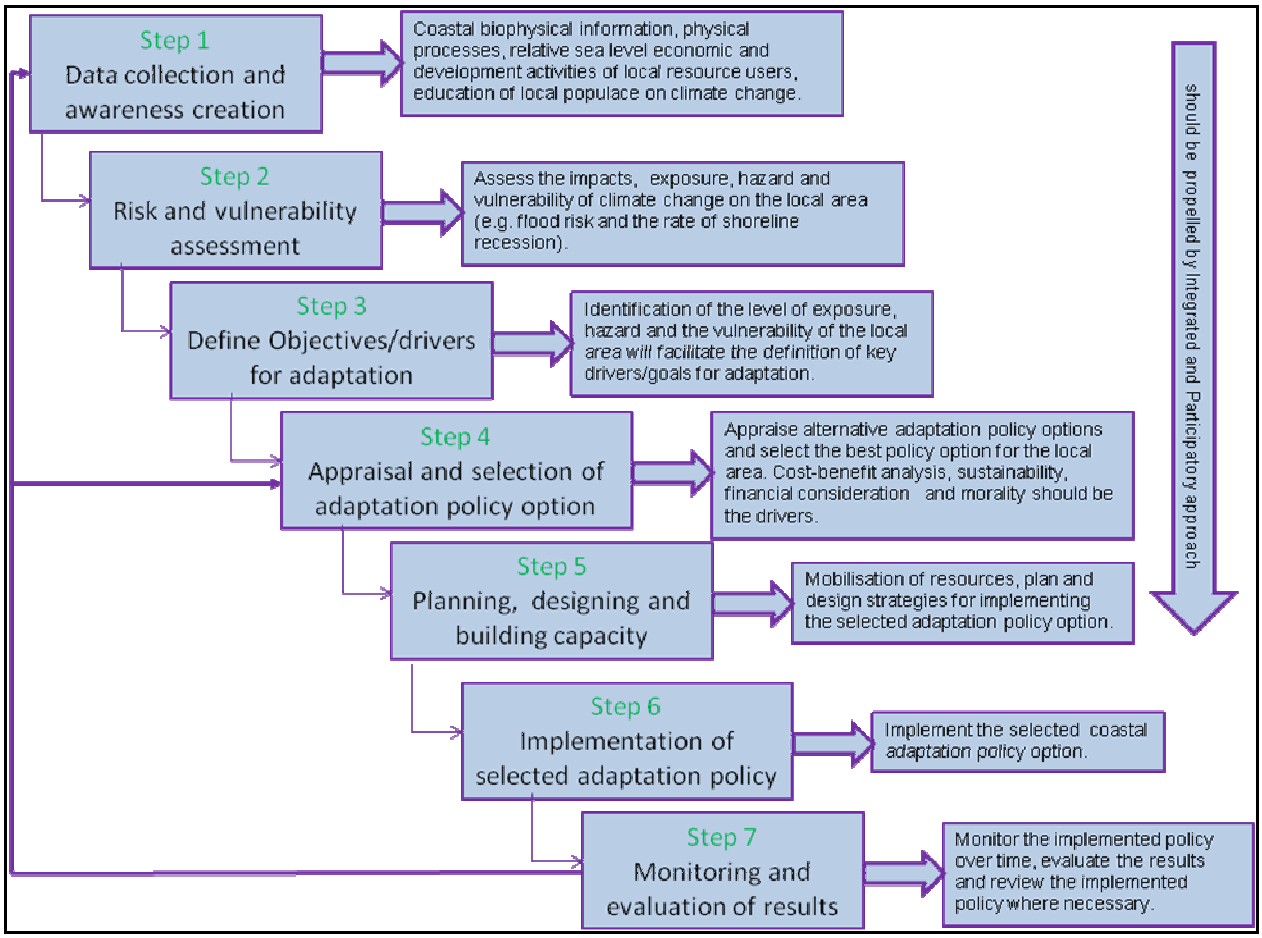
Figure 2 World Map Showing Case Study Countries



4. Technical Outline of the Case Studies

The case study one presents an overview of the impacts of climate change on the coastal zone and SIDS. Based on the review of coastal adaptation policies and methodologies for adapting to the impacts of climate change, the study develops an integrated coastal adaptation framework for practitioners (Figure 3).

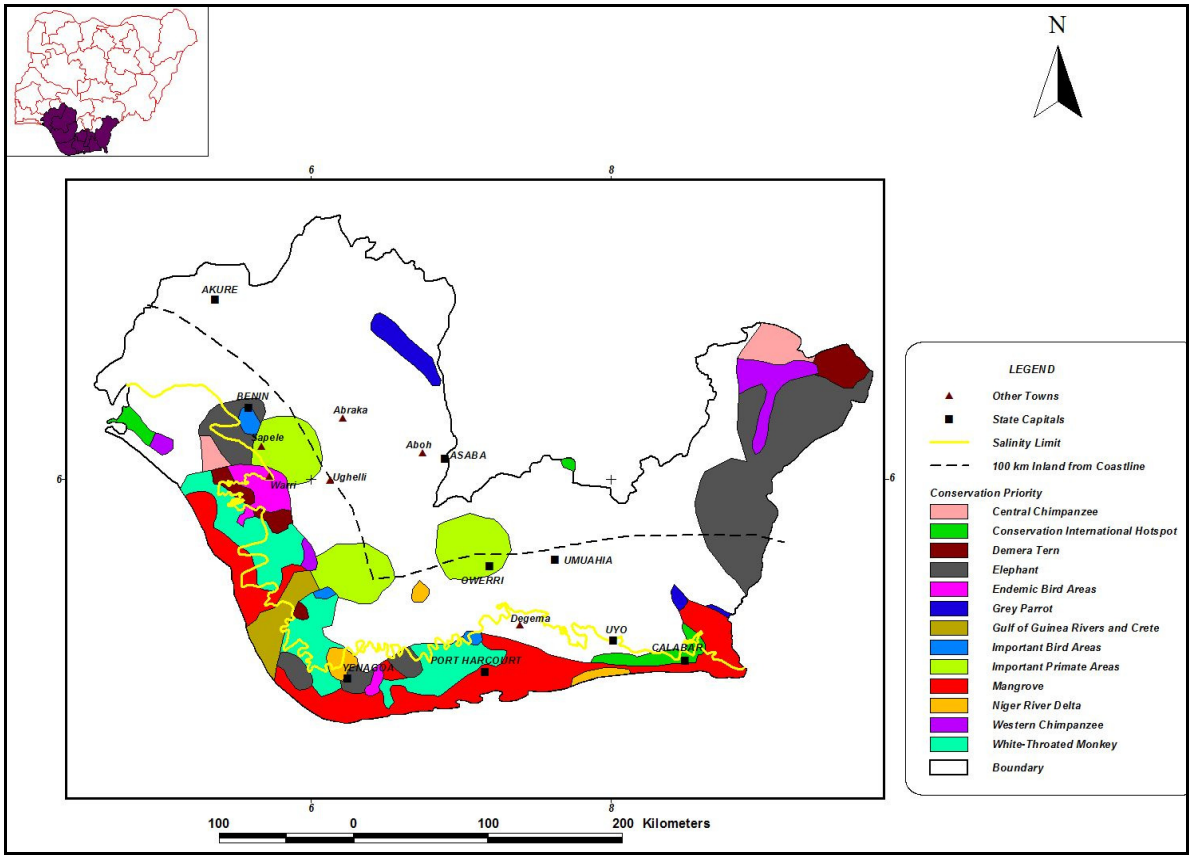
Figure 3 A Framework for Sea-Level Rise Adaptation into Planning



Case studies two and three present detailed methodologies for assessing relative sea-level rise, coastal recession and coastal vulnerability. Local sea-level rise, rate of coastal erosion and vulnerability to flooding are some of the key data required for coastal adaptation planning. It is therefore essential for practitioners to be aware of the methodologies of assessing these important variables.

Case studies four, five and six presents the effects of sea level rise on deltas, and estuaries coastal systems, which serve as the world's most productive and valuable coastal areas. The case studies also discuss how to adapt these vulnerable but productive coastal areas to the impacts of the rising sea level. The importance of these case studies is based upon the fact that most of the world large cities, which serve as economic centres (London, Sydney, Washington DC, New York, Tokyo, Hanoi, Lagos, etc) are located in deltas and around estuaries.

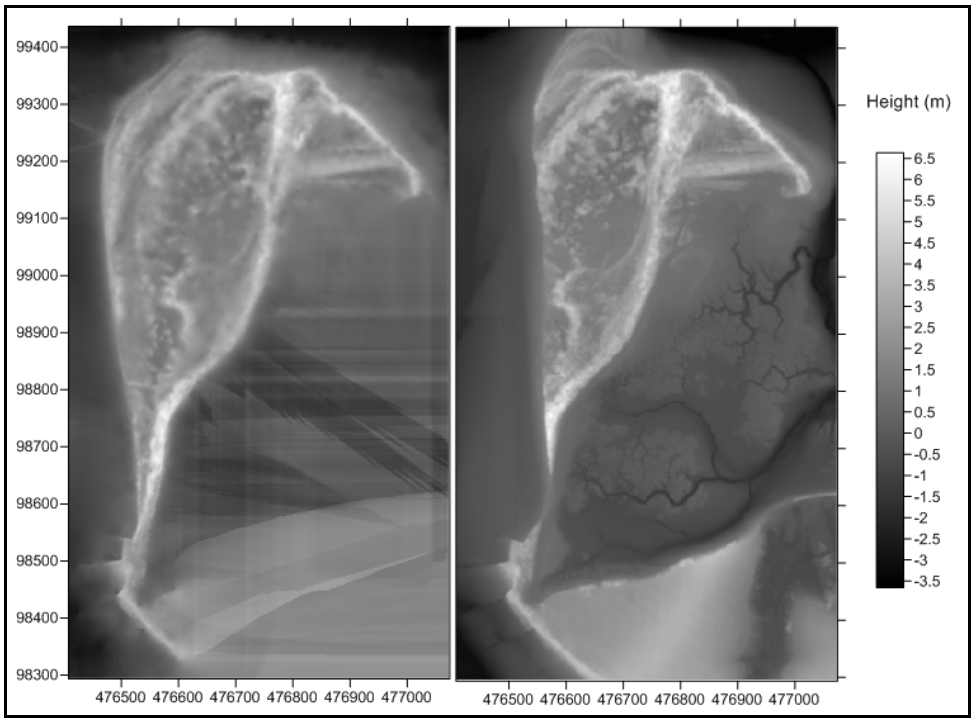
Figure 4 Biodiversity and Conservation Sites under Threat from Inundation in the Niger Delta



The challenges of measuring and monitoring the impacts of climate change and associated sea level rise are discussed in case studies seven, eight and nine. These three case studies present concise but holistic approach for overcoming the challenges of data acquisition, measuring and monitoring physical and environmental changes in the coastal zone.

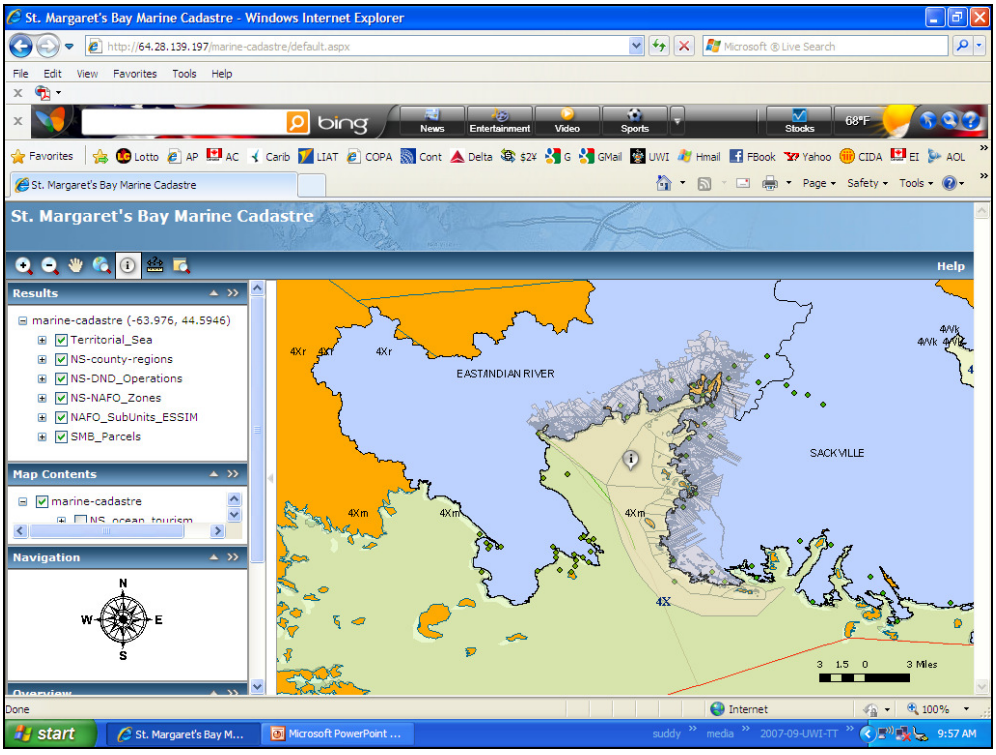
Figure 4 Residents Observe a Leatherback Turtle on the Trinidad North Coast

Figure 5 Surface Image Models of Data Collected using Lidar (2005) and Photogrammetry 1997: The Erosion to the Front of the Spit (Left) Can Clearly Be Seen



The case study ten presents an updates of FIG publication 36, Administering Marine Spaces: International Issues, 2006. This case study outline the progress made in the area of marine spatial planning and present a prototype for a possible replication elsewhere.

Figure 6 COINAtlantic Marine Cadastre Prototype (Showing General Results)



Case studies eleven and twelve review institutional framework required for sustainable coastal and marine resources. The two case studies identified integrated, formal and codified institutions that are developed through participation as the type of institutional framework that is likely to advance the frontiers of sustainable coastal and marine resources management.

Figure 7 Fishermen Supporting the Collaborative Wetland Management in Tanguar Haor

In most case, the economic and social value of coastal and marine resources determines the effort and the driver for sustainable management of such resources. Case studies thirteen and fourteen present the methodologies for valuing non-market coastal resources and heritage properties.

Finally, the case study fifteen which is the last case study deals with an emerging problem of coastal reliction lands in the Polar Regions. Global warming is causing most of the ice in the Polar Regions to melt, which in turn give way to isostatic rebound and new land. This case study discusses the issue of right and ownership of such new lands which have emerged as a result of the melting of the ice on areas which was previously covered with glacier.

5. Summary of the Case Studies.

A summary of each case study is provide below to give a brief insight to each title and to direct readers to the one which may be of interest to follow up to the FIG website and download the full case study.

Case study: 1

This case study offers a general review of the impacts of climate change in coastal regions and assesses adaptation planning policies in order to develop a holistic, efficient and generic framework for the development of sustainable coastal adaptation planning by practitioners. Since prevention, they say is always better than cure, the paper advocates for pro-active adaption rather than re-active adaption policies to deal with the impacts of climate change in the coastal regions. The paper concludes that due to recent climate related devastations in the coastal zones, a range of adaptive management and planning policies that could potentially offset some of the worst climate related problems need to be developed and implemented in advance within an organised framework that includes elements of community involvement, monitoring, maintenance, evaluation and capacity building. However, the case study indicates that for such policies to be effective, they need to be matched carefully to local economic strength and environmental conditions as well as the coastal characteristics.

Case study: 2

This case study analyse the methodology for detecting sea level rise and coastal retreat. The analysis was based on the Survey of Israel (SOI) on the Mediterranean Sea for more than fifty years and tide gauge measurements along the Eastern Mediterranean coast, established in the 1920s by the British. The study identified that the main objective for such analysis are marine mapping, shoreline management and coastal engineering purpose. The study reveals that mean sea level of the case study area rose by 10-15cm between 1958 and 1978. Sea level experienced a rise of about 10mm/year between 1990 and 2001. However, the rise ended in the year 2001. In recent years, the study observed stability or even decrease in sea level along the Mediterranean coast of Israel.

Case study: 3

This case study presents an overview of the Victorian coastal vulnerability assessment which aimed to provide broader information on the physical vulnerability of Victoria's coast to inundation and erosion from sea level rise and storm events. The coastal vulnerability assessment is a 'second pass' assessment, which guide the selection of local or regional coastal areas for more localised and detailed coastal hazard assessments. A core component of this vulnerability assessment has been the acquisition of a high-resolution coastal Digital Elevation Model (DEM). In addition to the coastal elevation, there were three other components of the state-wide vulnerability assessment, which includes the coastal landform, and geomorphology classification, sea-level rise scenarios and storm tide modelling. All these input data were combined to produce zones of instability (erosion) and inundation (flooding) extents for the whole Victorian state, Australia. The study concluded that the Future Coasts Program is a leading example of coastal climate change adaptation in Australia and indicated that the high resolution DEM has been instrumental in broadening the

application of coastal vulnerability assessments to a range of coastal planning and management tasks.

Case study: 4

This case study examines the sustainable management approach towards a vulnerable coast such as Keta, Ghana. The coast of Keta is highly vulnerable due to the soft geology and extremely low-lying nature of the coastline. The study presents a detailed assessment of erosion and flood risks affecting the present land use at the backshore of Keta coast and future vulnerability base on the predicted sea level rise. It identifies that even "one metre" sea level rise could submerge large areas at the backshore and affect communities, land use and environmental quality. The study develops an adaptation policy framework to reduce the risks to people and development in a sustainable manner. The study recommends the development of storm warning systems, emergency evacuation planning and building of elevated storm surge shelters among others as key measures that should be implemented to manage the flood risk of Keta. Such measures are especially important for the coastal settlers around the Volta delta where the hinterland is so extensive and low-lying that extremely large areas could be flooded in future, leaving few safe havens to which the population could retreat.

Case study: 5

This paper assesses the impacts sea-level rise on Niger Delta and potential responses of on a local and regional scale. It outlined the methodologies used for the assessment and summarises some of the impacts, highlights the nature of vulnerability and explores possible adjustments to climate-induced sea level rise. It identifies that planned adaptation measures are currently lacking, though their provision is imperative to reduce the impact. The paper recommends that economic implication of implementing adaptation measures might be very high, but that should not deter government and corporate intervention as the long-term benefits far outweighed the cost of implication.

Case study: 6

This case study highlights the need for Integrated Coastal Management in the Niger Delta due to its fragile coastal ecosystems, multiple stakeholders and simultaneously attacked by chemical pollution and the degradation of natural resources in the Delta. It identifies that coastal zones are vulnerable areas in different parts of the world, but in developing countries like Nigeria, the impacts of degradation can be worse than other countries. The reveals that several decades of oil production, industrialisation and infrastructural developments in the Niger Delta, had lead to tremendous environmental degradation, which exert profound adverse effects on local livelihoods and social well-being. The study concluded that Planning plays a major role in the protection of natural resources, habitats and biodiversity. Hence, the Federal and State Governments should pay closer attention on detailed research, proactive environmental planning, impact assessment and management. The study recommends that development agencies such as the World Bank, UN and others should work more closely

with grassroots organisation in the area rather than the government agencies because they have good knowledge of the communities.

Case study: 7

This case studies assesses the historical changes of the East Head spit which offers a challenge for those involved in coastal management and protection of how to achieve a balance between a sustainable coastal form, whilst preserving the dynamic nature of the spit and minimising potential threats instigated by its decline. The study identified that since the late 1990s, the landward end and the seaward facing side of the spit has suffered from accelerated rates of erosion culminating in the overwashing of a section of the spit and subsequent remedial works in 2005 and 2009. The study summarises mapping and monitoring of past change and discusses more recent change and management decisions. It uses various data sources and techniques to describe the changes which have occurred and shows how the combination of these techniques can lead to a better informed understanding and management policy. The study shows the importance of an affordable well structured monitoring programme, which should be part of any coastal management strategy.

Case study: 8

This case study discusses a number of different data sources that have been used by the University of Portsmouth to monitor the health of Langstone Harbour, which lies immediately to the east of the city of Portsmouth. These data sources include historic maps and charts, which have been used to assess physical changes in the harbor, and imagery which has been used to make measurements and to monitor changes in the vegetation composition and health. The study highlights the importance of inter-tidal environments, which severs as ecological resources, nursery areas for some fish species, breeding and feeding areas for birds and barriers which absorb the erosive power of the sea. It concludes that monitoring the health of inter-tidal environments provides particular difficulties for scientists. Access may be difficult, or even dangerous, and being inter-tidal the time available to collect data may be restricted hence innovative techniques such as those discuss in this study should be adopted.

Case study: 9

This paper review the challenges posed by Climate Change to coastal towns and cities in Small Island Developing States (SIDS). It identifies the growing concern to a wide variety of built environments and communities in the coastal zone including those of small towns and villages in SIDS. The study indicated that any assessment of potential Climate Change impact requires a good understanding of the relationship between built infrastructure and sea surface elevation. Similarly, it requires knowledge of the relationship between community socio-economics on one hand and coastal infrastructure on the other. The study highlighted the specific case of Grand Riviere, which is a small coastal community located on the Trinidad North Coast along the Caribbean Sea. The town is low-lying and accessed by a poorly maintained, single-lane, coastal road. The assessment of Grand Riviere draws attention to the challenges faced by researchers studying small coastal communities in search of answers to

research questions about critical coastal relationships; the answers to which are important in decision-making associated with potential Climate Change impact.

Case study: 10

Through the research efforts of scholars and professionals from countries such as Canada, Australia, and the United States of America (among others) the value of marine information management systems or marine cadastres to coastal zone management has become internationally recognised. These systems help to manage rights, restrictions, and responsibilities within coastal and marine spaces. This case study presents marine cadastre prototype component which has been developed jointly by the University of New Brunswick, Canada and the University of the West Indies, Trinidad and Tobago. This study outlines the development of this application, and the lessons learned during the process.

Case study: 11

This case study reviews theoretical and empirical literature on institutional frameworks and resource management. It analyses the results of the review using two case studies: integrated management of wetland in Bangladesh and Collaborative management of mangrove in Tanzania. The study explains why different institutional approaches are needed in different contexts to achieve sustainable coastal zone management. It identifies that effective management of any kind of natural resources, require clear understanding of available institutional frameworks and their effects in enhancing or detracting management of that resource. It concludes that Integrated and community participatory decision-making process and better stakeholder interaction mechanisms is the best framework that can be adopted in managing coastal resources.

Case study: 12

This case study reflects on the conflict being played out in many coastal communities, and identifies that such conflict has not been satisfactorily resolved. Ownership and management of the coastal margin are contested. Case law, legislation and central and local government policy in New Zealand support the general concepts of promoting the natural character of coastal land, recognising that land is not permanent and that the sea may take land, avoiding attempts to build structures against the sea, and preventing inappropriate development. However, demand for coastal property and the value attaching to that property suggest that these concepts are contrary to the expectations of land owners. The study concludes that coastal margins of our land; mark a significant zone of conflict, where not just the land and the sea clash, but environmental, social, economic, legal and engineering issues also are at odds. It recommended that judicial, legislative and policy suggestions to the contrary will require careful negotiation.

Case study: 13

This case study discusses the methodology for valuing un-price coastal recourses and reveals problem associated in coastal ecosystem valuation using Contingent Valuation Method (CVM) in Asia. Coastal ecosystem is essential to life on our planet as well as to support the livelihood of people living and dependent on the coastal resources. The abundance of

resources in good quality is fundamental to all marine biological processes, for maintenance of biodiversity and for primary and secondary production functions that supports human needs. Value of provisioning services such as food, mangrove, fibre, and water are generally straightforward due to existing price structure. Regulating services such as the regulation of climate, coastal erosion, coral bleaching, pollution, disease; and supporting services such as nutrient cycling and photosynthesis are difficult to value as there is no prices for these resources.

Case study: 14

This case study looks at issues associated with valuing coastal heritage property on historic waterfronts. It provids a review of the complex pressures on waterfront property values created by historic curiosity, conservation, restoration and preservation. The waterfront around Portsmouth Harbour is used as case study and through this a review of the impact of development on the City of Portsmouth is conducted. The study illustrates why the surveyor will have to use a number of different valuation techniques when looking at waterfront development. The tension created by using techniques that have been designed for short property lifecycles for historic property that have long life cycles is assessed in the context of World Heritage designation.

Case study: 15

A fair value is usually considered to be equal to the market value of the compulsory purchased property unit. In some cases, however, there are no markets for properties like the compulsory purchased and thereby no comparable sales for which the valuation could be built upon. When the determination of market value fails the fair value needs to be derived by other means. This study discusses fair value of a property, which has no functioning property markets. It analyse this problem by utilising profit sharing theory in a case of coercive purchase of reliction area. The case study shows that in certain situations the profit should be shared between the purchaser and the conveyor and should not be appointed to either party alone. It indicates that reliction areas have been available in Finland due to global warming and isostatic rebound which occurs after the melting of the local glacial.

5. Summary and Policy Direction for Practitioners.

A major challenge facing our planet and its resource in the 21st century is the changing climate; its impacts on our life sustaining resources and our ability to adapt to the change. There is a general consensus among scientist that the climates change and its effects on our planet is already occurring and the effects are likely to increase in the next century. The most pressing issue now is to develop a proactive and sustainable adaptation plans and policies to deal with the present and future impacts of climate change.

Knowledge from the case studies have revealed that processes of adaptation to climate change and sea level rise in both human and natural systems are very complex and dynamic, and often involves numerous assessments depending on existing conditions. The success of any adaptation policy depends on the ability to address the natural resilient to the change,

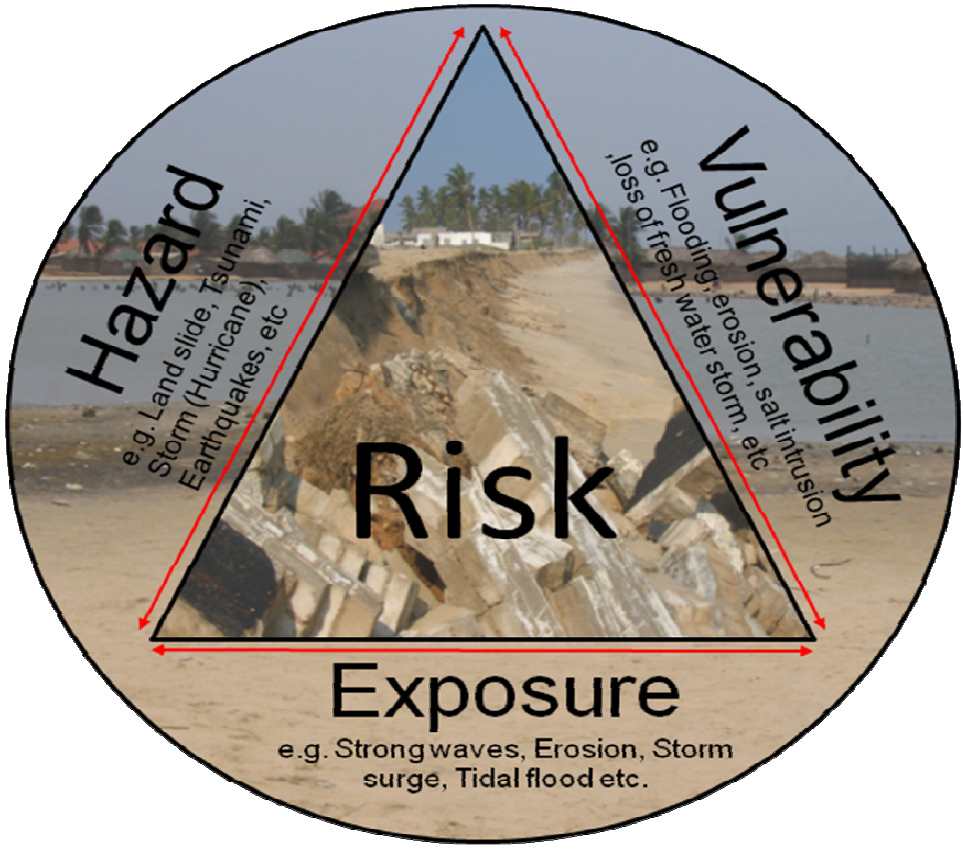
financial considerations, the local capacity to deal with the effects of the change, effective planning policies, which depends on data and informed decisions.

The coastal adaptation framework (Figure 3) provides holistic and step by step processes to develop sustainable coastal adaptation policy which is based on participation and reliable data on the climate change variables. The seven steps outlined in the framework are:

Step 1. Data collection and awareness creation
It is important to note that data collection and awareness creation aspect of the framework helps to identify the true extent of the change and vulnerability. The information collection process would also require input from local people and that begins the local participation, which in the long run creates local awareness.

Step 2. Risk and vulnerability assessment
The risk and vulnerability assessment centred on the use of the data collected to develop the understanding of potential impact of climate change on coastal communities and both natural and man-made life sustaining systems such as natural resources, and the built environment. This assessment is mostly done on three dimentions (Figure 8).

Figure 8 Climate Change Risk Assessment Triangle



Step 3. Define Objectives/drivers for adaptation
Once the risk and the vulnerability of an area are identified, it will be possible to set goals or define objectives for adaptation. In most case the major drivers for adaption should be based on the following:

- To protect life and properties
- To reduce exposure and vulnerability to settlements
- To pursue participatory approach in the development of adaptation strategy
- To ensure a healthy ecosystems
- To allow natural processes to operate whenever possible and to avoid unnecessary artificial interventions as nature is likely to win in the long-term.
- To develop accommodative strategies that will allow vulnerable areas to be used until the time for eventual retreat. This should be plan in a way that reduces risks to human health and safety.

Step 4. Appraisal and selection of adaptation policy option
Alternative adaptation policies should be considered and the best option for the local area should be selected for implementation. The appraisal should base upon cost-benefit analysis, effectiveness of the adaptive approach or technology and the moral judgement base on the life, natural resources and properties at risk. The appraisal should select the best policy option for implementation. The adaptation policy options discussed in this publication are: **Accommodation, Protection** and **Retreat** (IPCC, 2007) or **Hold the line, Advance the line, Managed Realignment and No active Intervention** (DEFRA, 2006). These policies have been explained in detail in case study one.

Step 5. Planning, designing and build capacity for adaptation
Once the preferred and appropriate policy option is selected, planning designing and capacity building for the implementation of the selected policy can begin. Planning and design should involve all stakeholders (government and none governmental organisation). All issues including any opposition to the selected policy option should be address through education, trade-offs and consensus building. Technical skills, funding and any resources need for successful implementation of the selected policy should be developed at this stage.

Step 6. Implementation of selected adaptation policy
Implementation of the policy should be done within the appropriate institutional framework and with the necessary technical skills. The required political and financial support for the implementation of the policy should be sustained to ensure that the policy implementation is successfully completed. Any implementation challenges that may arise should be dealt with in the established institutional arrangements.

Step 7. Monitoring and evaluation of results
This aspect of the framework facilitates the assessment the performance and the effectiveness of the implemented policy. It enables corrective measures to be taken in due course and where necessary a revision of the entire policy.

6. Conclusion
The issue of climate change and impacts are already affecting coastal regions and SIDS of FIG member countries. The impacts are likely to intensify in the next decade. There is the need to plan for adaptation now so as to reduce some of the negative future effects of climate change in the coastal zone. The best adaptation practices presented in this publication may be

applicable elsewhere with minor modification, probably to adapt it to the local rules and regulations.

It is worth noting that the problems of climate change are not restricted to the coastal zone as discussed in this publication. The problems are diverse and cut-across many dimensions and faculties of the surveyors' professions. It is therefore, suggested that FIG should set a cross-commission task-force to develop a holistic but concise guidance notes on climate change adaptation policies for members. Such a guide could be the foundation or the bases upon which member states/institutions could develop their local climate change adaptation guide. We could do this better because of the nature of our work and the issues (climate change adaptation) under consideration. If we do not do this, sooner or letter, such a guide will be develop by politicians or other professionals without due considerations to surveyors perspective and we may be asked to apply such a guide irrespective of how narrow or ineffective it may be because we do not have any holistic roadmap on the issues.

7. References

Department for Environment Food and Rural Affairs. (2006). *Shoreline management plan guidance. Volume 2: procedures.* Retrieved January 10, 2008, from http://www.defra.gov.uk/environ/fcd/guidance/smpguid/volume2.pdf

International Federation of Surveyors (2008). Costa Rica Declaration on Pro-Poor Coastal Zone Management. FIG PUBLICATION NO. 43

Intergovernmental Panel on Climate Change. (2007). *Climate change 2007: impacts, adaptation and vulnerability: contribution of working group II to the fourth assessment report of the IPCC*. Cambridge: Cambridge University Press.

Tribbia, J. & Moser, S. C. (2008). More than information: what coastal managers need to plan for climate change? *Journal of Environmental Science and policy,*11(4), 315-328

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