

REGIONAL STUDY FOR SHORELINE MONITORING AND DRAWING UP A MANAGEMENT SCHEME FOR THE WEST AFRICAN COASTAL AREA



**Towards a regional
coastal risk reduction plan**



**EXECUTIVE
SUMMARY**

REGIONAL STUDY FOR SHORELINE MONITORING AND DRAWING UP A DEVELOPMENT SCHEME FOR THE WEST AFRICAN COASTAL AREA (SDLAO)

Executive Summary

On 18 May 2011, in Dakar, a conference attended by the environment Ministers from the eleven Coastal States from Mauritania to Benin approved the results of the Regional study for shoreline monitoring and drawing up a development scheme for the West African coastal area¹.

This study, which involved more than 120 national, regional and international experts, paints a realistic and forward-looking picture of the current state of the 10,000 km of West African coastline and the main trends that characterise the way it changes.

General and detailed recommendations have been defined to reduce and control the coastal risks in these vulnerable areas which support the development of the Coastal States.

A SERIOUS CONCERN SHARED BY THE COASTAL STATES OF WEST AFRICA

1. The real consequences of coastal erosion, and more broadly, of the natural evolution of coastal areas, have been evident in West Africa for several decades. These impacts, already noted at a number of Pan African Ministerial conferences, are today increasing in intensity, and are all the more significant as the concentration of population and infrastructure in the coastal strip is also increasing rapidly.
2. The receding shoreline typically observed in West Africa is the result of various factors, in particular related to climate change, but also and especially to human activity. Shoreline hardening, the deterioration of natural formations (green infrastructure such as mangroves, lagoons and coastal dune rims), the extraction of building materials and the multiplication of dams deprive these fragile coastal areas of substantial sediment deposits. The situation is compounded by shortfalls in the coordination of coastal defence solutions, at local, national and inter-State levels. These different elements together aggravate the risk situations observed, as well as the threats weighing on public assets and human safety.



The study involved eleven countries in the region: Mauritania, Senegal, Gambia, Guinea-Bissau, Guinea, Sierra Leone, Liberia, Côte d'Ivoire, Ghana, Togo and Benin.

¹ The Dakar Declaration, originating from this regional meeting, is given in the appendix.

3. The prospective analysis carried out through the long term study (to 2020 and 2050) highlights the extent to which these coastal areas are strategically important for the future development of the coastal States, with an increasing concentration of the stakes in these particularly fragile and vulnerable environments.

4. The West African coast generally consists of more or less ancient sediment deposits, making it particularly vulnerable to various factors in the marine environment and atmosphere (waves, currents, winds and tides) that influence shoreline change. The role of inland waters in episodes of heavy rainfall and floods should also be taken into account.



Effondrement d'habitations et tentatives de protection individuelle.

5. This detailed regional study was commissioned by UEMOA and was conducted over a period of 18 months by IUCN, with contributions from a number of research centres, scientists and technicians from the Region and from Europe. The work gave rise to a set of recommendations that the individual States shall internalise and translate to the various sectors concerned by the management of coastal areas and their resources (environment, land planning, urbanism, fishing, agriculture, mining, maritime affairs, etc.).

6. **A structured process:** As the ultimate aim is for the eleven States involved to embrace and assimilate the results of this work, from the outset the process was structured in stages to enable the approval of intermediate products and to frame the study around a methodology that could be shared and analysed critically by the different partners. The regional workshops which took place from April 2009 led to the Dakar Declaration on 18 May which is presented in the appendix, validating the entire set of products and recommendations originating from the study.

The regional study for shoreline monitoring and drawing up a development scheme for the West African coastal area was launched by UEMOA as part of the regional programme to combat coastal erosion (PRLEC – UEMOA), the subject of Regulation 02/2007/CM/UEMOA, adopted on 6 April 2007. This decision also follows on from the recommendations from the Conference of Ministers in charge of the Environment dated 11 April 1997, in Cotonou. This programme was approved on 25 January 2007, at the meeting of Environment Ministers.

This study was conducted by the International Union for the Conservation of Nature (IUCN) under the responsibility of its Programme for Central and Western Africa (PACO), the coordination of which is based Ouagadougou, and under the general coordination of IUCN's Marine and Coastal Programme (MACO) for Central and Western Africa, the coordination of which is based in Nouakchott.

UEMOA is the contracting owner of the study, in this instance through PRLEC – UEMOA coordination of the UEMOA Commission. The work has been carried out under the supervision of:

- ▶ **The PRLEC-UEMOA Regional Steering Committee**, set up to improve the orientation of the different projects and oversee their diligent and efficient execution.
- ▶ **The PRLEC- UEMOA Regional Scientific Committee**, established with a view to assisting the UEMOA Commission in validating the technical and scientific contents of projects initiated within the framework of the implementation of PRLEC.

PRLEC comprises 4 components: 1-Research and development, 2-Management scheme, 3-Work realisation studies, 4-Planning and defence works. This study contributes to achieving the objectives of components 1 and 2 of the programme.

DES RECOMMANDATIONS PARTAGEES ET VALIDEES LORS DE LA CONFERENCE DE DAKAR

7. The recommendations originating from the study comply with the principle of subsidiarity and **are intended to be incorporated by the States** into their sectorial policies, and integrated into their land planning projects related to coastal territories. These recommendations are concrete provisions aimed at reducing coastal risks. They are a *de facto* part of the **adaptation to coastal climate change** approach for the coastal areas: four principles underpin these recommendations:

- ▶ **Act on all scales from local to regional**, having regard to all the stakeholders and all levels of governance. Changes in individual behaviour patterns, from those of the private sector operators (hotels, fishing, mining, etc.) faced with coastal risks should be taken into account in the same way as sector policies, institutional strategies and decision-making, including the instances of local governance of the coastal territories.
- ▶ **Place anticipation at the heart of decisions**: by founding all planning and management decisions on a forward-looking analysis of the situation of the coastal segments concerned, in terms of changes in hazards as well as vulnerability and changes in stakes.
- ▶ **Acknowledge the specific nature and identity of the coastal territories**, in particular by adopting legislative and regulatory provisions or methods of governance adapted to the specific nature and the multiple use designations of coastal territories.
- ▶ For the ecological services it renders, **natural infrastructure should be an integral part** of the design of land planning and spatial organisation projects in coastal development.

8. The management scheme covers the following topics:

- ▶ **Knowledge of hazards, stakes and risks** required for anticipation.
- ▶ **Preparation, networking and capacity building among coastal players** for coping with risks.
- ▶ **Land planning and attenuation of impacts**.
- ▶ **Governance of coastal risks**, in particular through national, regional and international cooperation mechanisms and the coordination of interventions.

9. The links between these different aspects comply with the principles of the Hyogo Framework for Action for disaster risk reduction.

10. The recommendations are made operational through a regional action programme organised around four direction-programmes

Part 1 - Watchkeeping and vigilance programme: provide the region and the partner States with a common, shared instrument for monitoring and anticipating coastal risks, in the form of a **West African Coastal Observatory (WACO)**. This instrument should contribute to the circulation of reliable, relevant information on changes in coastal issues, in particular related to risk reduction strategies, to all levels of decision-making. Its relevance will be a result of the products and services regularly made available to the States, including watchkeeping and monitoring services. WACO will also play a role in building the technical and scientific capacities of the countries in the region, by providing support to the research laboratories and favouring contacts with the appropriate international scientific and technical networks.

Part 2 – Capacity building programme for multiple stakeholders:

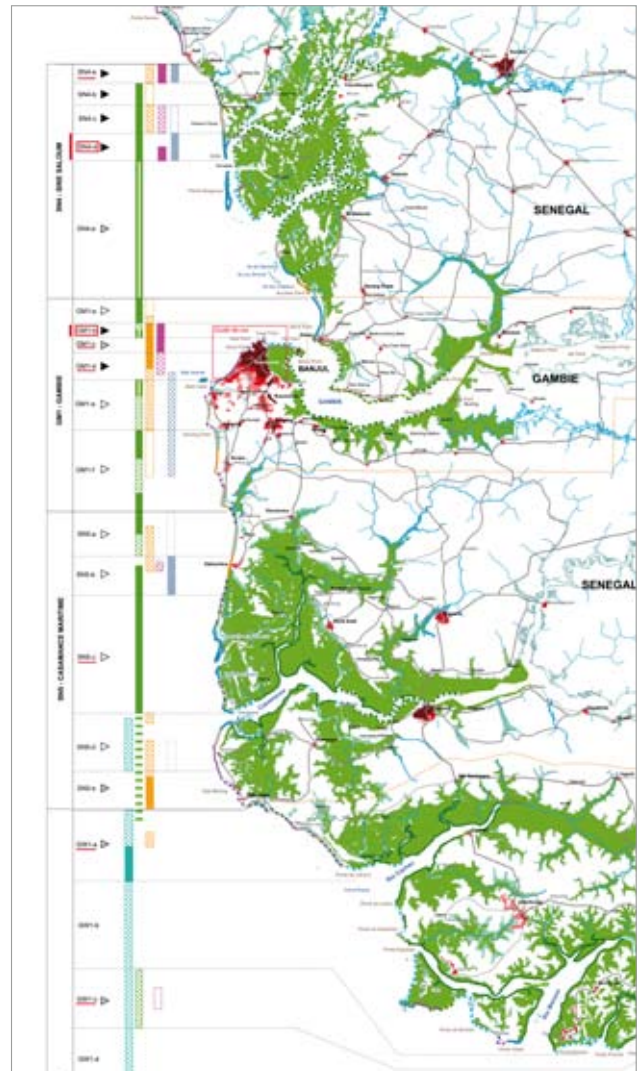
this programme will target various audiences: coastal population groups and local elected representatives, private sector stakeholders and corporations, State technical services.

Part 3 - Protection and impact reduction programme, which comprises three types of measures:

- Strategic measures applied through the building up of coastal land planning and development, in particular by the implementation of local sector schemes or master plan type approaches applied on the scale of the territories or the States, incorporating the protection of natural infrastructure and the definition of the various land use designations for coastal segments.
- Regulatory and legal measures which may be aimed at building and adapting coastal area impact studies, strategic environmental assessment, land planning norms, and the necessary regaining of control over land ownership in the public maritime domain.
- Priority and operational measures for coastal defence in the most at-risk sectors. These measures may be eligible under components 3 and 4 of UEMOA's PRLEC.

Part 4: The building of regional governance of coastal risks. The approach draws on 3 pillars:

- Networking and exchanges between the States, in order to encourage experience feedback and the exchange of best practices.
- The formal commitments of the States in the various existing Inter-State frameworks (Abidjan Convention, ECOWAS, UEMOA, GCLME and CCLME).
- Inter-State, and in particular, cross-border initiatives, and regional agency initiatives in favour of the coordination of coastal planning and management.



Excerpt from the mapping of the development scheme

11. General recommendations are also set for coastal planning along the following lines:

- ▶ Reducing the exposure of human settlements to disaster risks,
- ▶ Preserving the resilience and spontaneous response capacity of natural coastal systems and green infrastructure,
- ▶ Developing strategic spatial planning in support of land planning and including (i) the combined integration of marine weather hazards and river flooding; (ii) the role of natural infrastructure.

12. Two emerging stakes have been identified, relative to (i) the privatisation of public coastal space (one coast for all), and (ii) the strategic necessity of implementing maritime spatial planning approaches, to be designed in harmony with coastal land planning.

13. This general management scheme is supplemented by a detailed management scheme, for which the 10,000 km coastline has been divided into 179 coherent segments. Each of these sectors is characterised and prioritised, both from the point of view of planning and of the watchkeeping and monitoring measures that should be adopted.

14. The full set of results has been summarised in three mapping systems rendered at 1:500,000 (9 X A1 format sheets for each topic) covering coastal geodynamics, the human stakes and the management scheme respectively.



Harbour infrastructure is responsible for significant alterations in shoreline changes. Nouakchott harbour: siltation to the north and erosion to the south.

KEY ASPECTS OF THE DIAGNOSTICS

15. The management scheme draws on detailed diagnostics carried out on a regional scale, and through national diagnostic studies. These are supplemented by a set of case studies of the most at-risk sectors, conducted by teams from universities in the region. Here are some of the highlights from the diagnostics:

WEST AFRICAN COASTAL AREA: THE CAUSES OF THE FRAGILITY

16. The West African coastal area is typically vulnerable, composed of loose, erodible sediment formations. Rocky headlands constitute less than 3% of the coastline, and are composed of fractured and weathered formations that are also subject to erosion.

17. Sediment supply is relatively limited and partially trapped by the backwaters of large dams, of which there are approximately 150 in West Africa.

18. CThis sediment supply is redistributed along the West Atlantic sea fronts and the Gulf of Guinea by the system of coastal currents and ocean waves (coastal drift), which, when interrupted or disturbed by developments such as harbours, inevitably causes erosion and accretion phenomena that alter the stability of the shoreline.

NATURAL ECOSYSTEMS AT THE SERVICE OF COASTAL DEFENCE

19. All along the ten thousand kilometres of the West African coastline are natural environments – some of which are damaged – including mangroves (covering approximately 14,000 sq km), a string of small estuaries from Sierra Leone to Benin, the system of lagoons and coastal marshes from Côte d'Ivoire to Ghana and all types of sediment accumulation (banks, rims) **that constitute strategic sediment reserves** which, when remobilised, contribute to the coastal sediment balance.

20. These environments provide significant ecological services to the coastal societies, in particular by limiting erosion and its impacts. Their conservation is already largely justified through the commitments of the States to maintain biological diversity, and makes a direct contribution to reducing the risks related to shoreline mobility and to strategies for adapting to climate change. The concept of natural infrastructure already mentioned at the CBD's CoP 10, and again at the recent global platform on risk reduction, leads to a renewal of the approaches to land planning, particularly in the coastal area.



Fadiouth lies at the heart of a complex patchwork of coastal swamps and mangroves.

FACING THE FUTURE

21. The rapid increase in the social and economic stakes in coastal areas today endows coastal land planning schemes and choices with strategic importance.



Extraction of sand to the north of the Cape Verde peninsula (Senegal)

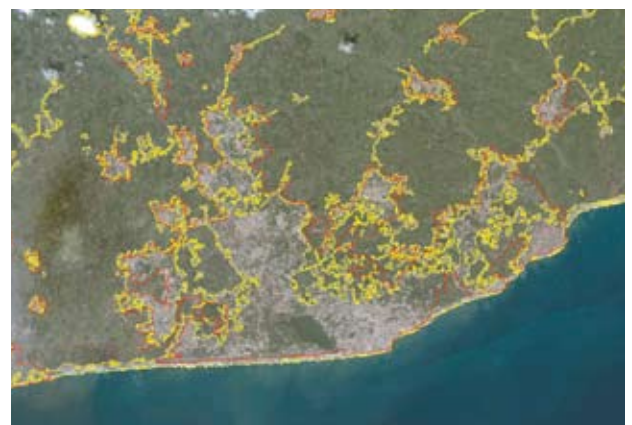
22. The current human land use footprint on the West African coast is dominated by the concentration of population and economic stakes, which is expressed through:

- ▶ Urban development and its forerunners (road connections, electrification, recent changes in small-scale fishing strategies, etc.).
- ▶ Rapid development of tourism and residential areas, often on the periphery of urban agglomerations.

23. These developments are combined with the extraction of building materials in the coastal area which accelerates the erosion phenomena observed.

24. Note also the increasing number of developments situated on low-lying areas that are filled in and which cut off water courses, increasing the risks of flooding from rivers or rainwater.

25. Access to water in dry areas remains a key organisational factor in the distribution and growth of human settlements.



Corridorisation and extension of urban spread (Cape Coast – Ghana)

26. A few observations:

- ▶ The coastal zone (which here is taken as a 25 km wide strip) today concentrates 31% of the total population and more than 50% of the urban population of the coastal States.
- ▶ **The total urban population of the coastal area in the 11 countries may well double, from 18 to 36 million between 2000 and 2020**, while the rural population is expected to grow by half.
- ▶ **From 2020 to 2050, the urban population of the coast could increase from 36 to over 80 million under the business-as-usual scenario and to 74 million under the moderate «controlling disparities» scenario.**
- ▶ Almost all the administrative and/or economic capitals are situated there.
- ▶ The level of urbanisation on the coast is twice as high as in the hinterland.
- ▶ The current average population density is 260 per km², with maxima of 1,000 per km² in Togo and Benin and zones with less than 10 per km² in Liberia or Guinea Bissau. Some zones are still practically uninhabited. In the future, these densities could largely exceed 2,000 people per km² in certain countries in the Gulf of Guinea, such as Benin, for example.
- ▶ The coastal fringe today accounts for approximately 56% of the GDP of the coastal countries.
- ▶ The horizontal spread of urban areas is a common trend: the built-up area per inhabitant in West African towns is 150 m² compared to an average of 125 for the developing countries. The urbanised area per inhabitant exceeds 200 m².



Future developments will not affect the coastal strip in a uniform manner.

In grey: highly localised developments, the population densities are and will remain low due to the constraints of the milieu (mangroves, and the availability of water in the North of Senegal)

In yellow: Important but localised developments

In red: Saturation of the coastal fringe



27. The prospective study that was carried out also includes a probable acceleration of economic growth in West Africa at rates exceeding 5% over the long term. This growth **will support the pace of urbanisation throughout the region, which will see a reinforcement of the concentration of economic activity along the coast, with the building of heavy industrial plant and the development of agro-industrial production. Market pressure on commodities is also already expressed through various projects to build ore ports related to the increased activity of the sector.**
28. **In this favourable growth context in the sub-region, most African ports have already begun to undertake work to extend their capacity, or will do so in the near future. The increasing penetration of the private sector in the management and even building of ports (for ore ports) should act as an incentive to the States to be vigilant in taking into account the environmental, coastal and even social impacts of these new facilities.**

FACING UNCERTAINTIES:

CLIMATE CHANGE AND RISING SEA LEVEL

29. Climate simulations today are predominantly characterised by uncertainty. There are some elements that appear highly probable concerning temperature rise, but the models diverge widely regarding precipitations. However, we may consider probable an increase in the intensity of rainfall events and a **reduction in the return periods of certain extreme events** which could cause flooding in coastal zones and aggravate erosion phenomena (which could also, in certain specific cases, lead to increased siltation).
30. It is believed that an expected global reduction in rainfall in the course of the 21st century would cause a decrease in the flow rates of the major rivers such as the Senegal and the Volta, which would be accompanied by a sediment deficit and an acceleration in coastal erosion.
31. **Rise in sea level:** The fact that sea level is rising has been largely confirmed. The historical tide gauges show a rise in the average level of the sea of 20 cm over the past 100 years. Current estimates for the end of this century are between 20 and 60 cm. Much more dramatic hypotheses evoke a rise of more than 3 metres - as a conservative estimate - should the West Antarctic glaciers disintegrate completely. In West Africa, although this rise cannot be estimated accurately, a rise greater than the global average is expected².

- 32.** There could be dramatic consequences in several places, such as around Nouakchott, where there are large built areas below sea level. Other major urban agglomerations will also be threatened, all the more so as this rise in sea level will be accompanied by an increase in the frequency of storm surges and their submersion potential, in particular in river deltas. This situation also poses a threat to the mangrove rice-growing systems, which have already been affected. There will be more frequent intrusions of saline waters which will affect water resources for consumption and agriculture (the advancement of the salt-water wedge and especially the alteration of coastal freshwater lenses).
- 33. Changes in coastal systems:** Coastal systems are not in fact passive with regard to the rise in sea level, and there are numerous threshold effects, for these systems also react and adapt to the new configurations. For example, coastal plant formations can increase sediment trapping, and river flow rates can be modified by the variability of continental precipitations. Lagoon or estuary outlet streams can be partially closed by the advance of sand spits, etc. When these elements are taken into consideration, any evaluation of the impacts of the rise in sea level or the submersion hazard should therefore remain cautious and avoid simplistic or reductionist calculations or representations.



Mangrove rice cultivation systems are at risk, even under the hypothesis of a moderate rise in sea level.

² On a global scale, the rise in sea level does not take place at a uniform rate.

- 34. These different elements of climate forecast must still be balanced by the recognition of the non-linear and chaotic nature of these phenomena, and the threshold effects that will characterise the different manifestations of climate change.**
- 35. The combination of permanent shoreline monitoring with the monitoring of changes in climate conditions should enable the production of scenarios to be updated regularly, in order to reduce the extreme uncertainty that today besets any forecasting in terms of climate in West Africa.**

WEST AFRICAN COASTAL OBSERVATORY: MERGE AND SHARE TECHNICAL RESOURCES ON A REGIONAL SCALE

- 36.** One of the principal recommendations contained in the Dakar Declaration concerns the setting up of a West African Coastal Observatory (WACO). The observatory should be able to provide the States and the various high-level decision-making bodies in the sub-region with quality information relevant to the needs of spatial planning, land planning, coastal defence and adaptation to climate change.
- 37.** The setting up of WACO is a prolongation of the SDLAO study, enabling the exploitation of its achievements, data, protocols, cartography and above all the network of research scientists and technicians which has today become established in the sub-region and possesses relays on an international scale... This initiative is therefore built on serious foundations that it is important to develop and consolidate. The main missions of WACO can be summarised as follows:

Quality information...

- ▶ **Constitution, management, maintenance and updating of a Geographic Reference Base of the West African Coastal Area**, the initial principal items in which may be the regional mapping from the SDLAO and the case studies, which characterise the reference situations on several at-risk sites in the West African Coastal Area.
- ▶ **The sharing and integration of data and knowledge about the West African coastal area**; standardisation of data collection protocols enabling the long-term interoperability of the data collected on a national scale and their regional consolidation.
- ▶ **Contribution to building the regional and international coordination of research activities** on the coastal zone, with a view to ensuring that they are exploited, and providing them with visibility, credibility and increased recognition. The maintaining of a regional database on research projects and activities concerning the dynamics of change in the West African coastal area will also be part of the Observatory's remit.

...Translated and interpreted...

- ▶ **Contribute to presentation, explanation and awareness-raising** for decision makers regarding the natural and anthropic phenomena that affect the state of the coastal zone and how it changes.
- ▶ **Production of a prospective study** analysing and anticipating the changes and trends in the coastal systems, positioned as a decision-making tool for local, national and regional decision-makers.

...placed at the disposal of all the coastal stakeholders

- ▶ **Deliver the available information** and knowledge to the decision-makers, stakeholders and users of the West African coastal areas in a frequency and format appropriate to their level of use.
- ▶ **Provide action-oriented products and services** to inform the decisions and arbitration on public action in terms of coastal protection, land planning and management.
- ▶ **Networking of coastal stakeholders**, in particular to encourage the emergence of a common vision of the coastal area and of the prerogatives and responsibilities of the various players involved, as well as the sharing of experience in terms of coastal governance, conservation, management and development.
- ▶ **Distribute and deliver the available information and up-to-date knowledge about the coast** to the different stakeholders in coastal management, both governmental and non governmental. In particular, the observatory will place at the disposal of the coastal players and experts conducting studies all of the documentation and relevant data available, in a useable form. An appropriate method and frequency of information circulation may be established depending on the identified target public and users of this coastal information.



WEST AFRICAN ECONOMIC AND MONETARY UNION

The Commission

ESTABLISHING A WEST AFRICAN COASTLINE OBSERVATORY FOR THE REDUCTION OF COASTAL RISKS AND THE IMPACTS OF COASTAL EROSION

Dakar Declaration

- Considering the importance of coastal areas in West African countries, home to most of the political and economic capital cities of our states and more than half of their population,
- Taking into account the concentration of vital economic activities of our countries along the coasts, such as fishing, international shipping and tourism,
- Recognizing that the rapidly increasing coastal population coupled with the amplification of pressure by different economic sectors, result into accelerated degradation of coastal ecosystems, a rush to ownership of the last available land resources, and conflicts for the use of resources,
- Concerned about the erosion observed, often causing severe social and economic impacts, forcing residential areas to be moved and rendering obsolete investments essential to the functioning of our economies,
- Taking into account the plausible increase of coastal hazards in the years and decades to come, resulting from increased social and economic stakes on the one hand and from the effects of climate change on the other hand, including the rising sea-level and the increased pace of extreme weather events,
- Recognizing the limited capacity for coastline monitoring and sharing of scientific information needed to establish coastal management and protection decisions to be made by our the governments of our countries
- Noting the fragility of coastal ecosystems, their importance in the provision of environmental goods and services essential to the development of our societies and the role of natural systems such as mangroves and coastal lagoons in fixing the coastline and in reducing risks of natural disasters,
- Recognizing the need for forward-looking work to anticipate constraints and future risks and provide the means to respond in a coherent approach to space planning, taking account of coastal ecosystems in an integrated regional approach to the development of the West African coastal area,
- Having cognizance of the regional study commissioned by the UEMOA and implemented by IUCN on the shoreline monitoring and the development of a master plan

for the West African coastline, and taking into account the recommendations of experts appointed by our countries, gathered in Dakar on Monday 16 and Tuesday 17 of May 2011 to review and validate the results of this work,

We, Ministers in charge of Environment and Coastal Erosion, representing the Governments of the Islamic Republic of Mauritania, Senegal, The Gambia, Guinea Bissau, the Republic of Guinea, Sierra Leone, Liberia, the Republic of Côte d'Ivoire, Ghana, Togo and Benin, gathered at Méridien President Hotel in Dakar on Wednesday May 18, 2011

1. Thank and congratulate the UEMOA for the quality of the work done, and for taking the initiative to conduct a regional study involving six non-member states alongside its five coastal Member States in order to get a broad and inclusive regional vision of coastal dynamics,
2. Approve all the work done, their results and the different mapping deliverables derived from them, recommend their wide dissemination into the public domain and that their presentation be made in particular to political authorities and scientists of each countries to promote their ownership and their transcription into national policies,
3. Make ours the proposal to establish as soon as possible the Observatory of the West African coastline to monitor the evolution of our coastal areas and guide decisions in terms of planning and coastal risk reduction,
4. Appreciate the proposal by Senegal to host the Observatory of the West African coastline within the Ecological Monitoring Centre in Dakar, and are committed to facilitate in our countries the production and sharing of information from a network of scientific and technical experts, including the academia,
5. Are requesting the UEMOA in unison to keep on its integration efforts, and requesting regional organizations and development partners involved in West Africa to give their technical and financial support for the implementation of the West African coastline development master plan.

Made in Dakar, on May 18, 2011

Ministers responsible for Environment of the UEMOA member states and guest States (The Islamic Republic of Mauritania, The Gambia, Guinea, Sierra Leone, Liberia, Ghana)

For the Secretary State for Sustainable Development, Guinea Bissau



Mme Maria Odete Rosa,
Chargée d'Affaires, Guinea Bissau Embassy, Dakar

REGIONAL STUDY FOR SHORELINE MONITORING AND DRAWING UP A MANAGEMENT SCHEME FOR THE WEST AFRICAN COASTAL AREA

