



WIO- Mangroves and Carbon Assessment Regional Workshop

Maputo, October 29th -31st 2012

Organized by the
Western Indian Ocean Mangrove Network,
United States Forest Service

Implementation Organization
WWF Mozambique

Participants from
Tanzania, Kenya, Cameroon, Madagascar, USA, UK, Indonesia, Norway and Mozambique

Collaborating Private and Public Institutions

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Table of Contents

Background of Mangrove and Carbon Assessment Regional Workshop	1
Workshop Purpose and Participation	1
Workshop Objectives	2
Workshop Presentations and Discussion Points.....	3
Group Work	4
Carbon Finance/Markets	4
Methodological Harmonization	5
Communication/Sharing/Networking.....	6
Capacity Building.....	6
Science Gaps	7
National Mangrove Policy	8
Group Work Outputs – Action Item Participatory Exercise.....	9
Annex 1 – Workshop Programme	11
Annex 2 – Workshop Participants.....	14
Annex 3: Speech by Her Excellency, The Vice - Minister MICOA on the Opening of the Western Indian Ocean Mangroves and Carbon Workshop.....	16
Annex 4: Statement from the WIO Mangrove Network Coordinator	18
Annex 5: Statement by Mr. Frederico Prado (USAID Mozambique)	20

Background of Mangrove and Carbon Assessment Regional Workshop

Mangrove forests provide an array of ecosystem goods and services, which support the livelihoods of millions of people in the tropics and sub-tropics with total economic values (TEV) of up to US\$10 million ha⁻¹ per year depending on site productivity and concomitant management regimes. In the context of climate change, the global role of mangroves as carbon sinks has become more appreciated as they sequester about five times more carbon per unit area than any forest ecosystem.

However, the decline of these spatially limited ecosystems due to multiple global and local pressures is increasing thus rapidly altering the composition, structure and function of these ecosystems and their capacity to provide ecosystem goods and services. Ecosystems that can no longer provide their full ecosystem goods and services have a social and economic “cost” to humanity, which can be felt even in areas far away from the degraded ecosystem. Deforestation rates of between 1-2% per year have been reported thus precipitating a global loss of 30-50% of mangrove cover over the last half century majorly due to overharvesting and land conversion. Detailed spatial and temporal cover change analysis, may yield even higher rates of loss especially in peri-urban mangroves.

Deforestation and land-use currently account for 8-20% of global anthropogenic CO₂ emissions, second only to fossil fuel combustion. Mangrove loss alone contributes about 0.02-0.12 Pg carbon per year, which is about 10% of emissions from deforestation globally, thus making mangrove conservation especially in the context of carbon sequestration more critical than ever before. The relatively high rate of mangrove degradation while of great concern, provides a great opportunity too in turning the tide due to the requirement of additionality ingrained in Carbon Standards. ,

The role of mangroves as a significant carbon sink is now being demonstrated with data showing that they may contain five times the amount of carbon per unit area than other forest ecosystems due to long-term carbon burial in sediments. Recent UNFCCC led climate change agreements have made a case for Reduced Emissions from Deforestation and Degradation; and enhanced forest conservation (REDD+) as a key and relatively cost effective means of mitigating climate change. REDD+ and associated programs require rigorous monitoring of carbon pools and emissions, thus underscoring the importance of robust C storage estimates. This will require harmonization of methodologies to make assessments in different regions comparable.

With support from USAID, the Western Indian Ocean (WIO) Mangrove Network (WMN) and the United States Forest Service (USFS), in partnership with WWF Mozambique, Eduardo Mondlane University (EMU), Kenya Marine and Fisheries Research Institute (KMFRI) and Institute of Marine Sciences (IMS), University of Dar Es Salaam (UDSM) organized an Eastern Africa Mangroves and Carbon Assessment Workshop in Maputo, Mozambique to share regional and global experiences on this emerging topical issue.

Workshop Purpose and Participation

The meeting was held between 29th and 31st October 2012 at Girassol Bahia Hotel in Maputo. The meeting brought practitioners in mangrove carbon assessments comprising of scientists, civil society, community conservation groups, managers and policy makers to share regional and global experiences in carbon stock assessments and discuss a regional strategy on harmonizing methodologies to make data comparable across sites.

The experts for the workshop were by invitation only (to organizations and individuals) and were limited to a maximum of 50 participants. Where appropriate, more than one expert from an organization was invited to participate.

The participants in the workshop worked in plenary sessions and working groups (see below) to develop their recommendations and outputs. The expert workshop programme is provided in Annex 1.

A total of 45 invited experts participated in the workshop. A list of participants, their organizational and contacts is provided in Annex 2.

Workshop Objectives

- Discuss commonalities and differences in findings from mangrove carbon projects in the WIO and other regions, as a basis for identifying methodological gaps and suggest novel approaches to address them.
- Demonstrate the merit of USFS/CIFOR mangrove carbon stock assessment protocols used in other regions and discuss the applicability in WIO as a common assessment platform.
- Brainstorm on mechanisms for collaboration, coordination, and harmonization of mangrove programs in the WIO region and beyond.

All participants were asked to identify their goals and expectations for the workshop and to express opinions.



The Deputy Minister of MICOA, Mozambique Hon. Ana Paula Chichava opening the Workshop

The meeting was officially opened by the Deputy Minister for the Ministry of the Coordination of the Environment (MICOA) of Mozambique, the Hon. Ana Paula Chichava. The Vice Minister on her own behalf and that of the Ministry for Coordination of Environmental Affairs (MICOA) welcomed the participants to Mozambique. She noted the importance of mangroves in supporting livelihoods of local communities and national economies besides providing global ecosystem goods and services. Being in Mozambique for this first ever mangrove carbon workshop was a great opportunity since Mozambique has the highest mangrove cover in the region. The Minister however noted that mangroves face various management challenges, which has seen a reduction of cover and thus loss of inherent ecosystem goods and services. She noted the recent appreciation of mangroves as very significant carbon sinks and the associated opportunities under the UNFCCC REDD+ schemes. The Minister further challenged the scientists and managers to urgently undertake feasibility studies on the science and marketing of potential carbon credits from regional mangroves so as to enhance their conservation.

The Minister's statement was followed by remarks from the Western Indian Ocean Mangrove Network Coordinator, Jared Bosire who underscored the need for regional cooperation in the science and management of mangroves and appreciated the support from USAID and all partners in making the workshop a reality (full statement in Annex 4). Frederico Prado from USAID Mozambique on behalf of the main workshop sponsor noted that deforestation currently is responsible for up to 17% of global greenhouse gas emissions, yet when conserved, restored, and managed sustainably, forests provide one of the best ways to remove and store carbon from the atmosphere. He emphasized on the United States' commitment to working with partners around the globe to meet the climate change challenge, through the protection and restoration of the world's forests among other programs (full statement in Annex 5).

Workshop Presentations and Discussion Points

Within the framework of the above objectives, the workshop agenda was organized to proceed with presentations and discussion in the following areas:

- A.** Orientation, perspectives and policy-relevance: Presentations were made about the general importance of mangrove ecosystems to nations and communities and mangrove ecosystem's vulnerability to climate change.
- B.** Overview of mangrove and carbon assessment: Presentations were made on the relative importance of mangroves within the REDD+ frameworks and global carbon stocks, as well as challenges with measuring carbon pools in mangroves and predominating methodologies used.
- C.** Mangroves and REDD – country assessment (Madagascar, Kenya, Tanzania and Mozambique). WIO countries presented the ongoing initiatives, programs, projects, and challenges in their respective countries regarding mangrove conservation and management. Special focus was made on activities surrounding mangrove stratification and carbon measurement. Continued mangrove degradation was noted and this provides opportunities for additionality incase carbon projects may be developed
- D.** Experiences and Lessons from non-WIO Mangrove Programs. Additional programs from UNEP, USAID/USFS, CIFOR Indonesia, and Central Africa (CWCS/UNEP) were presented to expose the workshop participants to the experiences outside the region. Very high carbon stocks were reported from some C. Africa sites with as high as 2,500 tonC/ha. This is the highest that has been reported in mangroves as yet.

- E. WIO – Regional Issues, Gaps and Opportunities. Given the presentations to date, the participants were asked to break into small groups to analyze and discuss priority issues and challenges facing the WIO region in the area of Mangrove Carbon, and identify potential opportunities to address these challenges. The group work is summarized below.
- F. Synthesis and Recommendations for a Regional WIO Initiative. Following report outs and discussions around the topics of the group work a prioritization activity was undertaken to allow participants to voice their opinions on the way forward for programs and projects that were interested in supporting the WIO region in the area of REDD+ and Mangrove Carbon. For every theme identified following the presentations and interactions during the workshop, various questions were posed to guide the discussions at the various groups as below.

All presentations given (see agenda - annex 1) are all available for download (until at minimum December 31st of 2012) at <http://ge.tt/20y9ayq>.

Group Work

After the presentations, the workshop participants self-divided themselves into six thematic groups to discuss priority topics within the mangrove carbon arena. The goals of the groups were to identify primary challenges within each topic and priority opportunities to address the challenges. The groups were given some orienting questions to stimulate discussion, asked to focus specifically on the WIO region (Kenya, Tanzania and Mozambique), and subsequently presented the results of their discussions. The thematic topics and group results were as follows:

1. Carbon Finance/Markets
2. Methodological Harmonization
3. Communication/Sharing/Networking
4. Capacity Building
5. Science Gaps
6. National Mangrove Policy

The below summarizes the discussion questions presented to the groups and their resulting presentations (arising out of the respective group discussions) made to the plenary.

Carbon Finance/Markets

- **Questions:**
 - What are the priority issues in community engagement and benefit sharing?
 - What information is needed to move mangrove carbon into markers (international or voluntary)?
 - Cost-benefit analysis
 - Are there any opportunities to incorporate ecosystem services into/with carbon markets?
 - Are there institutional constraints?
- **Group Presentation:**
 - Issues:
 - Carbon ownership rights for communities
 - Legal instruments and precedence exist that allow communities to gain carbon rights
 - % tax – 30-40%?

- Undefined - realistic working agreements needed
- Feasibility studies and business plans (cash flow) needed
- Work with existing (REDD+) forest frameworks to develop projects transparently (RPP)
- Benefit sharing ensures communities opportunity cost is offset
- Sustainable management needed to meet start-up costs
- Attention to local socio-economic dynamics (future generations)
- PES, biodiversity offsets, additionality, biodiversity banking should be examined as well
- Approved VCS methodologies for calculating change rates in mangroves needed (soil and mangrove dynamic sequestration especially!)
- Market transparency
- Enormous start-up costs!
- Strong government support- context in which project can deliver
- Opportunities
 - Methodological
 - Set practical precedents – ownership, taxes, benefits
 - Work with government transparently
 - Business planning – market, feasibility , business plan, start-up finance

Methodological Harmonization

- **Questions:**
 - Which mangrove sub-classification system is best for carbon markets?
 - How can data collection be harmonized?
 - How do we define disturbance?
- **Group Presentation**
 - Priority Issues
 - Strata/sub-divisions of mangroves – many different approaches!
 - Geo-morphology
 - Level of degradation
 - Species assemblages
 - Canopy cover
 - Also non-mangrove (areas that were or could become)
 - Opportunity
 - Follow up workshop needed
 - Protocol for plots – sq vs circle?
 - Advantages to both, depending on mangrove structure
 - Tailored to particular mangrove
 - Variability assessed in advance
 - Opportunity
 - Follow up workshop needed
 - Calculation/determination of carbon stocks
 - Allometrics
 - Species specific vs generic
 - Lab analysis
 - Opportunity

- Refining of local species specific allometrics needed
- Creation of regional analysis laboratory (soil)
 - National labs also needed
- Database
 - Knowledge/information exchange
 - Opportunity
 - Create database! – eg African wood density
 - Coordinating institution/organization in each country

Communication/Sharing/Networking

- **Questions:**
 - Data and data analysis sharing
 - How can the WIO Mangrove Network enhance communication between scientists/academia?
 - Which potential opportunities exist that can enhance communication with different stakeholders?
- **Group Presentation**
 - Issues
 - Data
 - Online portal/blog/database needed
 - Regional center for soil carbon analysis
 - Short training courses on data analysis
 - Challenges – disparities in information – aspects, institutions involved, methods applied
 - Communication between scientists/academia
 - Brochures
 - Workshops
 - Annual reports
 - Marine science courses and curricula
 - Joint research projects
 - Form a secretariat for communication/center
 - Part-time lectures/exchange programs
 - Potential opportunities to enhance communication between different stakeholders
 - Regional Symposium (WIOMSA) in Oct 2013
 - Meetings
 - International level policy meetings (UNEP and NBO convention)
 - Country level – permanent secretaries and directors of institutions
 - Annual meetings to put out policy briefs to inform managers and policy makers
 - Awareness material for different stakeholders in local languages
 - Work with Community based organizations

Capacity Building

- **Questions**
 - What are the gaps/needs in:
 - Academics – Universities and training centers

- Government (field managers and ministries)
- Research institutions
- Technical infrastructure (laboratories etc)
- Communities
- **Group Presentation**
 - Priority/Challenges
 - Access to published scientific papers on mangroves
 - Inadequate funding & training
 - Lack of capacity @ govt level – mangrove carbon programs
 - Lack of equipment at research stations and labs
 - Forestry programs rarely include mangrove courses
 - Inaccessibility to mangrove areas (Moz)
 - Lack of communication among stakeholders
 - Question – what skills to mangrove stakeholders (govt managers esp) need to support a successful mangrove carbon project?
 - Opportunities
 - USAID PEER program (and other equipment training grants)
 - Research funds/scholarships
 - Linking poverty reduction and mangrove conservation (studies briefs/presentations)
 - Raise awareness (students, communities)
 - Provide alternative sources of livelihood
 - Public orientation talks by universities at local/regional communities/towns/cities enroute to research sites

Science Gaps

- **Questions**
 - What technologies or science is needed still to quantify/characterize/commercialize mangrove carbon?
 - Which factors will influence sedimentary carbon?
 - What are the regional limitations?
- **Group presentation**
 - Technology/science
 - LIDAR – use to validate ground truthing
 - Carbon dynamics (where from/to, how much, what rate) – stable carbon isotopes
 - Create controlled disturbance to compare before and after
 - Evaluate the contribution of other organisms to mangrove carbon (phytoplankton, algae, etc)
 - Sedimentary carbon
 - Mangrove clearing: biochemical activity, physical disturbance, redirecting and abstraction of rivers, mechanism binding the carbon to the sediments
 - Regeneration ecology study needed
 - Existing Limitations of region
 - Funding, experts, laboratory, networking capability, science forums, rigorous testing of methodologies and toolkits
 - Opportunities
 - Establish a regional carbon lab

- Pilot projects – Zambezi, Rufiji, Lareu, Guvero
- Capacity building in GIS, LIDAR, remote sensing, physical oceanography, biogeochemistry (grad students, and exchange programs)
- Long-term monitoring sites in mangrove areas
- Establish LMR sites

National Mangrove Policy

- **Questions:**
 - What is the current status of national policy for mangroves in your country?
 - What are the limitations of the current policy?
 - How can we more effectively present information so that it effectively inform management and policy?
- **Group presentation**
 - Current Status
 - Tanzania: No specific policy on mangroves but some aspects touching on mangrove management are embedded in statements on coastal forest management under the forest policy
 - Kenya: No specific policy on mangroves but policy concerns are embedded in forest policy under conservation of indigenous forests.
 - Mozambique: No specific policy on mangroves, but some policy concerns are within the forest policy.
 - Limitations of Policy
 - Tanzania: Policy provides no focus on management of mangrove forest in spite of mangroves uniqueness
 - Kenya: Not adequate in informing management of mangroves
 - Mozambique: Do not provide specific attention that is needed for proper management of mangroves
 - Key Challenges:

Tanzania	Kenya	Mozambique
Inadequate information on values of mangrove	Inadequate framework for participatory policy development	Lack of information on mangroves
Enabling environment for policy development inadequate	Intense competition for access to mangrove resources	Poor linkages between scientists and policy makers
Inadequate scientific information	Insufficient communication/linkages between researchers and managers and policy makers	Institutional weakness
Uncertain funding levels depending on bilateral aid	Mainstreaming funding into national economic dev .plans.	Inadequate public awareness on mangrove conservation

o Opportunities

Tanzania	Kenya	Mozambique
On going national forest resource assessment will likely inform mangrove mgt	On going policy reforms to align to the constitution and fit provisions of decentralized governance system	Use of existing networks I.e WMN
Existence of regional networks i.e WMN will address policy concerns and information gaps	Take advantage of increased prominence of civil societies (CSO) organizations/movements	On going review of existing policies
Existence of research regional funds i.e WIOMSA	Strengthen existing research liaison forums	Shifting of conservation area management to Ministry of tourism
Continuation of bilateral funding		
Nairobi Policy forum; ICZM etc	=do=	=do=

Group Work Outputs – Action Item Participatory Exercise

To facilitate prioritization of actionable proposals for the region arising out of the group discussions, participants were asked to identify priorities by using stickers so that eventual ranking could be done based on number of stickers per action as below

- Hold regular liaison forums to strengthen research linkages and inform managers and policymakers (19 votes)
 - o Eg: MZ: Shifting of conservation management to Min Tourism; ICZM – integrated coastal zone management strategy and action-plan
 - o Policy briefs relating mangroves to food security and livelihood development
- Explore how to combine carbon with other PES systems with mangrove carbon (17)
 - o Protocols & Methodologies developed for other PES system integration (5)
- Promote research funds, fellowships, and scholarships for mangrove graduate degrees (Msc + phd) – GIS, LIDAR, remote sensing, physical oceanography, biogeochemistry, etc) (17 votes)
- Regional Database/Blog/Portal development (17)
- Establish regular communication tools between scientists and academics in region (brochures, annual reports, meetings, etc) (16)
- Training communities (village and regional) on mangrove benefits (16)
- Develop regional research laboratory (Many – forgot to include but highly supported)
- Support feasibility studies and business plans in pilot projects (13)
- Define community carbon rights, building on existing legal instruments and precedence (11)
- Establishment of long term mangrove research sites in each country (10)
- Workshop/trainings on data analysis (10)
- Develop joint regional research projects (9)
- Link forestry degree curriculum to mangrove education classes (8)
- Promote research in targeted mangrove areas (8)
 - o E.g.: Carbon dynamics; Controlled degradation/change monitoring; Evaluate contribution of organisms to mangrove carbon – phytoplankton, etc; Evaluate relative carbon

contributions of different mangrove species; Testing of methodologies / tool boxes to determine most appropriate for region

- Promote mangrove carbon issues at International Marine Symposium (Oct 2013) – side event (7)
- Verify VCS methodologies (esp soil and mangrove dynamic sequestration) (7)
- Support WIOMN to inform policy gaps and do regional research (6)
- Trainings to current forest managers & policy makers on mangroves (6)
- Mainstreaming ICZM policies (5)
- Part-time lecture/regional exchange program for scientists and students (regional and international) (5)
- Pilot/demonstration projects (LIDAR, etc) (5)
- Link with grant programs (equipment/training) – USAID PEER Program (5)
- Pilot various different carbon funding arrangements (standing stocks and env trust funds) (4)
- Follow up workshop on stratification development for mangroves (2)
- Follow up workshop on plot protocol discussion (1)
- Further curriculum development at Universities (1)
- Strengthen linkages and engagement of CSO in mangrove arena (1)
- Species specific allometric development
- Develop coordinated community outreach material

While the priority issues may be many, it was proposed that some of these can be addressed through national, regional and/or international collaborations/initiatives.

Annex 1 – Workshop Programme

Sunday 28 October: Arrival

Monday, 29 October 2012

Morning Session I: Orientation, perspectives and policy-relevance

0900 - 0920h: Registration

0920 h: **Opening**

- Introduction to Workshop objectives: Session (Moderator: Célia Macamo – Eduardo Mondlane University, Mozambique).

0930 h: **Welcome Address**

- Welcoming by Honorable Ana Paula Chichava Vice Deputy Minister (MICOA)

0945-1045h: **Presentations (10 min/each)**

- **1. Regional Mangroves Consortium** (Jared Bosire – WMN Coordinator)
- **2. International Relevance of Mangrove Sustainability** (Frederico Prado – USAID, Maputo).
- **3. Mangroves and the terrestrial C pool** (P.V. Sundareshwar – USAID).
- Discussions

1045-1115h: Coffee-break / Group-photo

Morning Session II: Overview of Mangrove C Assessment

1115 – 1245h: **Presentations**

- **4. Issues in measuring mangrove C pools** (Carl Trettin – US Forest Service) - Discussions
- **5. Use of remote sensing in mangrove assessments** (José Rafael – Department of Geography – UEM) - Discussions
- **6. Applying radar technology in determining C stocks in mangroves of the region** (Rachel Cohen - Edinburgh University, UK) - Discussions

1300-1400h: Lunch

Afternoon session I: Mangroves and REDD – Country Assessments

1400-1530h: **Presentations**

- **7. Mangroves and REDD+** (Trevor G. Jons Coordinator, Blue Ventures, Madagascar) - Discussion

- **8. Kenyan experience in carbon stock assessment: opportunities and challenges on REDD pilot projects** (Jared Bosire, Assistant Director for Marine and Coastal Research, Kenyan Marine Fisheries Research Institute)-Discussion
- **9. Mikoko Pamoja, a mangrove REDD+ Pilot Project: Lessons learnt** (James Kairo, Coordinator. Mikoko Pamoja Project, Kenyan Marine Fisheries Research Institute) - Discussion

1545-1615h: Coffee-break

Afternoon session II: Mangroves and REDD – Country Assessments

1615-1700h: **Presentation**

- **10. Zambezi Delta Mangrove Classification and C Inventory Project** (Celia Macamo, UEM) - Discussion
- **11. Mangrove Assessments in Indonesia** (Joko Purbopuspito, Center for International Forestry Research of Indonesia) - Discussion

1700-1730h: Adjourn

Tuesday, 30 October 2012 (900-1055h)

Morning Session I: Experiences and Lessons from Non-WIO Mangrove Programs

0930-0945h: Review of previous day (Moderator: Salomão Bandeira)

0945-1040h: **Presentations:**

- **12. UNEP Central Africa Mangrove Program** (Gordon Ajonina, Cameroon Wildlife Society) - Discussion
- **13. Mangrove Assessments in Tanzania: strategy, policy, planning, opportunities and challenges on REDD preparedness** (Imacullate Semesi, Institute of Marine Sciences, University of Dar Es Salaam, Tanzania) - Discussion

1055-1125h: Coffee break

Morning Session II: Experiences and Lessons from Non-WIO Mangrove Programs

1125-1220h: **Presentations**

- **14. Global UNEP Mangrove Program** (Gabriel Grimsditch, UNEP Mangrove Program Coordinator) - Discussion
- **15. USAID TWINCAM/SWAMP Project** (Jason Ko) - Discussion

1300-1400h: Lunch

Afternoon Session I: WIO Regional Issues, Gaps, Opportunities

1400-1530h:

- Review morning session & charge for group discussions.
- Regional work group:
Identify studies or considerations needed to improve mangrove assessments;
Identify existing synergies that should be further exploited;
Identify areas where regional harmonization will be challenging.
- Discussions

1530-1615h:

- Groups Report.
- Discussions.

1700h: Adjourn.

Wednesday, 31 October 2012 (900-1300h)

Morning session I: Synthesis & Recommendations for a Regional WIO Initiative

0900-10:30h:

- Group reports and Synthesis of regional group discussions;
- Finalisation of working group reports and recommendations.

1030-1100h: Coffee break

1100-1230h: Closing Remarks;

- Workshop Synthesis – questions and answers;
- Recommendations & prioritizations for collaboration, coordination, and studies – group discussions.

1300-1400h:

- Close Workshop, final remarks.
- Lunch.

Annex 2 – Workshop Participants

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Annex 3: Speech by Her Excellency, The Vice - Minister MICOA on the Opening of the Western Indian Ocean Mangroves and Carbon Workshop

Dear Scientists and researchers;
Dear Cooperation Partners;

Dear Representatives of institutions
Distinguished guests,
Ladies and Gentlemen;

Allow me to begin my speech on behalf of the Ministry for Coordination of Environmental Affairs and in my name, by welcoming everyone here to the Workshop on "Carbon in mangrove forests in Western Indian Ocean" to share experiences on the regional and global assessment of carbon in mangroves and discuss regional strategies for harmonization of methodologies and comparison of data from various regions.

We also honour the presence of our cooperation partners, WWF, representatives of research institutions of higher education in the country and abroad and USAID, for their efforts in materializing this event, which will focus on the exchange of ideas among scientists, researchers, managers and students who work with the assessment of carbon stocks in mangroves, and hopefully will produce proposals of solutions to the issues raised.

Ladies and gentlemen

Let me emphasize that the discussion of the theme of this workshop leads us also to reflect on the ways and mechanisms of REDD+ implementation, especially with regard to the definition of the legal framework, given its lack and little experience in regional countries in this matter.

The data that are presented to us today indicate that Africa has about 431.1 million ha in mangroves, corresponding to 21% coverage of mangroves worldwide. Mozambique is one of the countries with the highest mangrove cover in East Africa due to its geographical location and long coastal line, with an estimate of between 291,146 and 396,080 ha, and the provinces of Zambezia and Sofala, being the regions of greatest occurrence. However, despite this privilege, most of this natural resource is declining substantially, particularly in the delta of the Zambezi River where there was a reduction in mangrove area from 1600 to 811 km².

Worthy participants

There is recognition in relation to the high economic, ecological and environmental value mangroves play to the local communities, particularly its potential to act as nutrient reservoir, and nursery habitat for various animals (fish, crustaceans, arthropods, mammals, fungi and algae), reducing the greenhouse effect and the important role in coastal protection against erosion, cyclones, floods, sea level rise, salt water intrusion and control of tidal cycles. Still on mangrove services, I must say that they play an important role in nutrient cycling, and carbon sequestration, and act as a carbon sink.

However, these coastal ecosystems, apart from being most vulnerable to climate change, are threatened due to human activities, rising sea level, frequency and intensity of tropical cyclones, ocean acidification and changing freshwater flows.

Dear participants;

Our presence here testifies the commitment of our government with the environmental causes, particularly in relation to the effort that we have undertaken in order to materialize the government's five year program ending soon, which seeks, among other objectives to reduce the high levels of poverty and promote improved quality of life for citizens.

The challenges that are imposed today on environmental issues transcend our sector; to be more specific, the environmental sector (MICOA). Today, we are all called to assume a leadership role in addressing the issues related to the environment and finding solutions to the various issues. However, we are aware that much remains to be done, without failing to recognize that some work is being done because large areas of mangroves are protected by conservation areas of Mozambique, including the Bazaruto Archipelago, Inhaca Island, Maputo Special Reserve Marromeu Reserve, RG Pomene and Quirimbas National Park.

Ladies and gentlemen

Today there is talk of the emergence of so-called "blue" and "wet" carbon. We believe that this initiative also with carbon markets may offer a new way to protect and restore mangroves. However, more extensive feasibility studies are required to assess whether carbon projects in conservation areas are technically feasible and financially sustainable, and if there is the necessary technical assistance to develop project concepts and design documents, and bring mangrove forest carbon credits to the market.

I will not stretch over my speech, but allow me to finish, wish everyone a pleasant stay, and wish you a very successful work and, to finish, I declare open the "Western Indian Ocean Mangrove Carbon workshop" open.

Thank you very much.

Annex 4: Statement from the WIO Mangrove Network Coordinator

Your Honor, Honourable Ana Paula Chichava, the Deputy Minister for the Ministry of Coordination of the Environment, Mozambique,

USAID Representative

USFS Representative

All Partners who have worked to arrange for this Workshop, the first of its kind in the Region,

And colleagues from various national, regional and international organizations,

I am delighted that we are gathered here today to elevate the agenda of mangrove conservation in the region. Mangroves support the livelihoods of millions of our people in the region, although they continue to be degraded in unprecedented rates.

While climate change has put more pressure on mangrove ecosystems, amid the challenges we can also take advantage of the associated opportunities.

The role of mangroves in serving as carbon sinks is getting more appreciated, although not much has been done in the African Continent in C stock assessment and attracting of funds under PES Schemes for instance REDD+.

During a Regional workshop on vulnerability assessment of mangroves to climate change and associated anthropogenic pressures in Mombasa, Kenya, last year, the mangrove experts in attendance:

Recognizing the important role that mangroves play by providing many critical ecosystem goods and services to millions of people in the region;

Appreciating that these ecosystems face a myriad of similar management challenges across the region ranging from overexploitation, conversion, pollution and more recently climate change related impacts

Acknowledging that there has not been a regional forum which brings together regional mangrove scientists, managers and policy makers;

Proposed and approved the formation of a WIO Regional Mangrove Network as a Forum which will *inter alia* facilitate:

- *Expertise sharing/capacity development in mangrove research and management across the region*
- *Standardization of methodologies in conducting assessments and management practices*
- *Production of regional publications and policy briefs on mangrove research and management and ensuring dissemination of such outputs*
- *Raising the profile of mangroves as a critically important ecosystem supporting many livelihoods in the region*
- *Development and delivery of community based training programs on sustainable mangrove management and conservation*

Recommended that this Network be anchored at a Regional Body whose vision engenders **the Protection, Management and Development of the Marine and Coastal Environment (and associated resources) of the Eastern Africa Region**; to take advantage of the such a Body's established and proven engagement with

different stakeholders especially regional governments so as to encourage these governments to recognize the importance of mangroves as critically important national resources by:

- *Supporting inclusion of mangrove forests specifically when conducting reviews of Forest/Sector legislations in the different countries and ensure provision of comprehensive community involvement and participation in mangrove management*
- *Appointing Officers at Senior Management levels within the Ministries responsible for forest management whose sole mandate will be to spear-head mangrove management as well as ensure decentralization and devolution of this management*
- *Developing national programs to address the current widespread mangrove degradation and support sustainable mangrove conservation and management and*
- *Supporting project level carbon assessment and financing initiatives (e.g. REDD+ and PES in general) as climate change adaptation and mitigation options whose proceeds can provide much needed resources to enhance mangrove conservation*

The Network experts will shortly finalize a manuscript on vulnerability of regional mangrove to climate change and associated pressures; has submitted a proposal to produce a book on mangrove management in the region based on country case studies; and has successfully presented an agenda to the COP 7 of the UNEP Nairobi Convention to be held here from 10th to 14th Dec 2012.

I sincerely thank USAID for support towards this workshop and other mangrove related activities in the region, WWF Moz and UEM colleagues for managing the logistics and all other partners for the great teamwork to make this workshop a reality.

Honourable Minister, I am very grateful for your passion, commitment and leadership in the conservation of marine resources in the region especially during the time Mozambique has been the Chair of the Bureau of the Nairobi Convention. I can say with confidence that in you we have a friend at policy level to help us champion the agenda on mangrove conservation in the region.

It is my hope that we are going to have a very interactive and productive workshop.

Thank you.

Annex 5: Statement by Mr. Frederico Prado (USAID Mozambique)

1. The role / importance of mangroves as a carbon reservoir
 - a. Donato *et. al.*'s data in a 2011 paper indicate that mangroves are among the most carbon-rich forests in the tropics, containing on average 1,023 Mg carbon per hectare
 - b. Organic-rich soils ranged from 0.5 m to more than 3 m in depth and accounted for 49–98% of carbon storage in these systems
 - c. They estimate that mangrove deforestation generates around 10% of global emissions from deforestation, despite the fact that they account for just 0.7% of tropical forest area

2. Paucity of work in Africa, which is exacerbated by a relatively shallow knowledge base from other regions, and there is a need for information on African mangroves if countries are going to be able to engage the REDD+ processes
 - a. From 1950 to 2000, 265 papers were published focusing on mangrove research in East Africa, 92 per cent of which centered on Kenya
 - b. Few were experimental or comparative with 80 per cent descriptive in approach
 - c. The mangrove ecosystems of eastern Africa are well studied, but even the baseline information needed for environmental impact assessments and management plans is still not available
 - d. A major problem is that available information is often not disseminated. Numerous different national languages further hinder dissemination as findings are often confined to their countries of origin.

3. Why is USAID interested in carbon in general and mangroves specifically?
 - a. The United States is committed to working with partners around the globe to meet the climate change challenge, and to achieve this goal we simply must protect and restore the world's forests.
 - b. Deforestation is responsible for up to 17% of global greenhouse gas emissions, yet when conserved, restored, and managed sustainably, forests provide one of the best ways to remove and store carbon from the atmosphere.
 - c. Moreover, healthy forests are essential to the livelihoods and welfare of millions of people in both developed and developing countries, they are home to some of the planet's most significant biodiversity, and they help to maintain healthy ecosystems.
 - d. At the Copenhagen climate summit in December 2009, the Obama Administration made a historic announcement to dedicate \$1 billion to help countries to slow, halt, and eventually reverse deforestation.
 - e. Reducing these emissions by avoiding deforestation and improving forest management is a key approach for cost-effective climate change mitigation, in addition to generating important biodiversity conservation and livelihood benefits as well.
 - f. Finance and Carbon Markets, Low Emission Development Strategies (LEDS), Greenhouse gas inventories and monitoring, reporting, and verification (MRV)
 - g. Mangroves are characterized by enormous below ground carbon pools