Earth observations in support of fisheries management in West Africa

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Session 5: Services and Information for Healthy Ecosystems and Food Security
• **Outline**
  
  – Introduction of the MESA ECOWAS Marine Thema
  – Description of MESA Marine Services
  – Benefits of the use marine EO data for the management of fisheries in West Africa
    • Mapping potential fishing zones
    • Early warning of ocean conditions
    • Fishing vessel traffic
  – Near term needs in the region
    • Improved monitoring including the activities of small fishing vessels
MESA (Marine) in ECOWAS Region

• **Theme**
  – Earth observation services for coastal and marine resources management in ECOWAS

• **Objective**
  – To increase the information management, decision-making & planning for coastal and marine resources management, by enhancing access to and exploitation of Earth Observation data.
MESA Regional Thematic Actions

**ECOWAS**
1. Benin
2. Cape Verde
3. Cote d'Ivoire
4. Gambia
5. Ghana
6. Guinea
7. Guinea Bissau
8. Liberia
9. Nigeria
10. Senegal
11. Sierra Leone
12. Togo
13. Mauritania
14. Sao Tome & Principe

**CEMAC**
- Cameroon
- Equatorial Guinea
- Gabon
- R. Congo
- DR Congo
Fisheries Challenges in Gulf of Guinea

- 3 million: People directly or indirectly employed in fishing industry
- 20 kg: Avg. annual per capita consumption of fish protein for the region (World: 18 kg: Avg)
- 1.6 Million tons of catch per year (about $3 billion)
- $1.5 Billion: Value of lost fishing revenue due to IUU
- 10% of GDP in Guinea-Bissau and Sierra Leone from fishing industry
- >30% of export revenues in fish (Mauritania & Senegal)

Source: Illegal Fishing Plunders and Strains West Africa (http://www.reuters.com/article/2012/03/15/us-westafrica-fishing-idUSBRE82E0HD20120315); Governance in West African Fisheries. Experiences from the West African Regional Fisheries Program (http://www.lib.noaa.gov/about/news/Virdin_07112012.pdf)
MESA (Marine) in ECOWAS Region

• Establishment of Regional Centre
  – ECOWAS Coastal & Marine Resources Management Centre (located at University of Ghana)

• Designation of National Focal Points
  – Benin, Cape Verde, Cote d’Ivoire, Gambia, Ghana, Guinea, Guinea Bissau, Liberia, Nigeria, Senegal, Sierra Leone, Togo, Mauritania, Sao Tome and Principe

• Partnership with National Research centres and universities
  – Nigerian Institute for Oceanographic and Marine Research (NIOMR)
  – Ghana Meteorological Agency (G-MET)
  – Centre de Recherches Océanographiques de Dakar (CRODT)
  – Institut National de Développement des Pêches (INDP)
  – University Félix Houphouët-Boigny (Cocody), Cote D'Ivoire
  – University of Abomey-Calavi, Benin Oceanologic and Fisheries Research Institute (IRHOB) Benin
  – University of Sierra Leone, Fourah Bay, Sierra Leone
5 Result Areas of MESA

1. Provide Access to EO data

21 MESA Stations are to be installed in participating institutions
5 Result Areas of MESA

2. Develop EO Services

Monitoring potential fishing zones in western Africa

Monthly Environmental Bulletins

Safety of artisanal fishermen at sea
3. Building Capacity in EO data analyses

- Regional training
- National training
- Open & targeted fellowships
- Internships
- Trainer of Trainers programmes (Continental level)
5 Result Areas of MESA

4. Utilize EO data to support decision / policy formulation

- Regional Fisheries Directors Forum
  - harmonization of legal framework for monitoring small fishing vessels

- Regional Working Committees
  - guidance on prioritizing key services required for the sustainable management of fisheries resources
5 Result Areas of MESA

5. Building synergies with organizations within and outside MESA

Collaboration with:
MOI, AGRHYMET, AWA, PRCM, CICOS, BDMS USAID/UCC

Participating in crossfertilization and continental activities
Marine Products and Services

SERVICE 1:
Forecast of Potential Fishing Zone (PFZ) charts and Monitoring of Fishing Vessel Traffic

SERVICE 2:
Forecast of Ocean conditions and dissemination as SMS alerts
Supporting fisheries management using EO data

*Service 1 – Mapping potential fishing zones (PFZ)*
# EO for fisheries management

**PFZ maps + Automatic Identification System (AIS)**

<table>
<thead>
<tr>
<th>Service 1 - Fisheries management support</th>
<th>Description</th>
<th>Targeted users</th>
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</table>
| **Service 1.1: Maps of potential fishing zones** | • Regional Fisheries Bodies  
• National focal persons (NFPs) in the 14 countries participating in the ECOWAS Marine Thema  
• Universities, Research and Academic institutions  
• Community Fishing Groups  
• Agencies in charge of Monitoring, Control and Surveillance | |
| **Service 1.2: Overlay PFZ map with fishing vessel traffic information** | Data: MODIS OC/SST products, Mercator forecast products [SST, SSH, u-v, SSS], Automatic Identification System [vessel traffic data] | |
EO for fisheries management

PFZ maps + Automatic Identification System (AIS)

Data acquisition

Service 1.1
MESA Station

Geospatial data
- Sea surface temperature
- Ocean colour
- SST fronts

Processing
- SST & Chl-a maps
- Edge detection techniques to generate SST fronts
- Integration of Chl-a & SST fonts

Potential fishing zone maps

Service 1.2
AIS ftp portal

Fishing vessel traffic information
- Voyage information
- Navigation information
- Vessel information

Processing
- Fishing vessel type & distribution analysis
- Automatic detection of fishing activities

Fishing Vessel Traffic Information

Reports of fishing pressure (fleet capacity, fishing effort and frequency)
Service 1 – Mapping potential fishing zones

Monthly Environmental Bulletins

Maps of biological indicators
Service 1 – Mapping potential fishing zones

- This service targets only national institutions involved in monitoring and surveillance of fishing activities of INDUSTRIAL FISHING FLEETS.

- Maps and reports from this service are disseminated via email, ftp and MESA stations.

PFZ maps overlaid with fishing vessel trajectories to understand fishing behaviour

Fishing density maps
Service 1 – Mapping potential fishing zones

• This service targets **only national institutions involved in monitoring and surveillance** of fishing activities.

• Maps and reports from this service are disseminated via **email, ftp and MESA stations**
Service 1 – Mapping potential fishing zones

Monitoring illegal unregulated and unreported fishing

- **Daily fishing activity reports** are disseminated daily to institutions with the mandate for monitoring and surveillance of fisheries resources.
- **On request reports** to support AIS data analyses and investigate potential IUU fishing activities.

Video of fishing vessel trajectory – evidence of potential IUU fishing
Semi-industrial vessels

They are licensed; 400 operational: exclusively permitted to fish in the Inshore Economic Zone (30m depth); operate from 6 landing sites
ABSEA transponder

Identifier

Charger

Vessel bracket and fixings
Artisanal vessels

- Open Access; Registered; Not licensed; 9,000 canoes exclusively permitted to the Inshore Economic Zone (30m depth); operate from 308 landing sites
MESA driving policy in West Africa

Demo Project in Ghana with support from ECOWAS Coastal & Marine Res. Mgt. Center collaborated with the Ministry of Fisheries and Aquaculture Development (MFAD) 20 inshore fishing vessels were installed with transponders.

- In Ghana, MFAD has began electronic monitoring of small fishing vessels, about 200 – 400 vessels will be fitted with transponders.

Density map – small fishing vessels monitoring, Ghana

Small vessels fitted with transponder
Supporting fisheries management using EO data

Service 2 – Forecasting and monitoring ocean conditions
Artisanal fishermen in West Africa

- Use small dug-out canoes
- Numbers about 10,000 canoes in Ghana only and about 120,000 in West Africa
- Mainly rely on traditional knowledge to
  - Navigate
  - Locate fish
  - Detect the weather at sea
- Need for an Early Warning System (EWS)
## Service 2 – Monitoring and forecasting ocean conditions

<table>
<thead>
<tr>
<th>Service 2</th>
<th>Title</th>
<th>Goals</th>
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<tbody>
<tr>
<td>Service 2.1</td>
<td>Monitor and forecast ocean conditions</td>
<td>Produce charts of sea surface currents, sea surface height, sea surface temperature and salinity, sea surface winds and significant wave heights for safety at sea.</td>
</tr>
<tr>
<td>Service 2.2</td>
<td>Disseminate forecast products via SMS</td>
<td>Make forecast products readily available to users through SMS text messaging.</td>
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**Data:**
- Wave products, Mercator forecast products [SST, SSH, u-v, SSS]
Target Users
• Artisanal Fishers
• Semi-industrial and Industrial Fishing Fleet
• Marine Operators
• Navies and Coast Guards
• Fisheries Ministries
• Disaster Management Organizations

SMS messages interpreted with different flags at fishing communities to indicate conditions at sea

SMS alert of Ocean conditions received by artisanal fishermen

Using satellite technology to obtain data on ocean conditions

Processing of data and forecasting ocean conditions at sea
Service 2 – Monitoring and forecasting ocean conditions

Contents
1. Significant Wave Height  
2. Sea Surface Winds  
3. About this Bulletin  
4. Annex  

Highlights
- Significant wave height distribution was generally low along the coastal areas of the West African sub-region.
- The south-western section is expected to record peak levels of high wave heights during the latter part of the month of August.
- Average wind speeds are expected to reach its minimum for this year during the month of August 2016 while beginning an increase at the latter part of the month for the north-western section (Mauritania, Cape Verde, Senegal).

Faits marquants
- La distribution de la hauteur significative des houles était généralement faible le long des zones côtières de la sous-région ouest-africaine.
- La section sud-ouest devrait enregistrer des hauteurs maximales de houles à la fin du mois d'Août.
- La moyenne des vitesses de vent devrait atteindre son minimum pour l'année en cours durant le mois d'Août 2016 tout en commençant à augmenter à la fin du mois pour la partie nord-ouest (Mauritanie, Cape Verde, Sénégal).

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Service 2 – Monitoring and forecasting ocean conditions

Using flags to complement ocean condition dissemination service
GMES-Africa (Future Activities)

FOCUS AREAS:
• Component 1: Monitoring and Forecasting of Oceanography Variables
  – Monitoring and forecasting of physical and biological oceanography variables (consolidation of MESA application)
  – Potential Fishing Zones Management (consolidation of MESA)
• Component: Coastal Area Monitoring
  – Coastal Ecosystems Mapping and Monitoring (new application)
  – Coastal Vulnerability (consolidation of MESA)
• Component: Ship Traffic and Pollution Monitoring
  – Ship Traffic Monitoring (new application)
  – Pollution Monitoring and Warning (new application)
• Component: Marine Weather Forecast
  – Marine Weather Forecast (consolidation of MESA)
Summary

• Fisheries managers have come to appreciate the huge benefits from using geospatial information in the day-to-day management of fisheries resources

• MESA services are being used in decision-making
  – providing information to artisanal fishermen to ensure safety at sea
  – protecting fishing grounds

• Potential for regional monitoring of smaller fishing vessels
  – Harmonization of legal framework in coastal countries in West Africa.
UG-MESA — protecting fishing grounds and life at sea