The Future Plan of Coastal Habitat Mapping by Satellite Remote Sensing in Cambodia

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Introduction to Cambodia’s Coastal

• This country has 435 km of coastline in length.

• Located in The Gulf of Thailand.

• Bordered between Thailand and Vietnam.

• This coastline area located in the Southeast of Cambodia.

• There are four City-Provinces that have coastline such as Kep City, Sihanouk Ville, Koh Kong and Kompot provinces.

• The coastline area including 69 islands are richest in biodiversity thanks to habitats such as coral reefs, seagrass and mangrove.
Marine Protected MPAs

1. Peam Krasop
   (23,750 ha)

2. Botum Sakor
   (171,250 ha)

3. Dong Peng
   (27,700 ha)

4. Preah Sihanouk (Ream)
   (21,000 ha)

Mangrove Forest in Cambodia

- 16 species were recorded in Cambodia (FAO, 2005)

Current threats to Mangrove Forest:
- Fuel wood
- Charcoal
- Shrimp Farming (FAO, 2005)

Seagrass/Seaweed Distribution

• Extensive seagrass area if found in Kampot Bay with other smaller beds around Kep and Kampong Som Bay
• 8 species were recorded
• there are two type of Seagrass Habitat:
  • extensive seagrass meadows along the mainland
  • Patches of seagrass intermingled with corals around the islands
• Sea grass beds are vulnerable from two main sources
  • Degradation of water quality and
  • Destructive fishing practices
• Seaweed culture in Cambodia started in 1999 with an introduction Eucheuma cottonii (lucrative cultivation)

(Source: FAO, 2005)
Seagrass/Seaweed Distribution

Estimated Sea Grass Area in the Coastal Waters by Province/Municipality (Source: MoE, 2005).

<table>
<thead>
<tr>
<th>Province/Municipality</th>
<th>Sea Grass Area in Hectares</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kampot</td>
<td>25,241</td>
</tr>
<tr>
<td>Koh Kong</td>
<td>3,993</td>
</tr>
<tr>
<td>Sihanoukville</td>
<td>164</td>
</tr>
<tr>
<td>Kep</td>
<td>3,096</td>
</tr>
</tbody>
</table>

Coral Reefs

• Play a very important role in marine ecosystem in Cambodia
• Reefs area accounted for 28.065 km$^2$ previous studies, including
  • 111 species of hard coral and 17 species of soft corals
  • 9 species belonged to seafans and seawhips.
• Average live coral reefs cover for the whole coastline accounted for 23 – 58 % (generally represented not good health corals).
• Main continuing treats to the coral reef habitats are:
  • over-fishing and use of dynamite
  • illegal fishing practices,
  • harvest of coral reefs for trade, and
  • degradation of water quality

(Source: MoE, 2005)
Coral Reefs Distribution

- Coral reefs are found in Kampot and Koh Kong Province.  
  *(Source: MoE, 2005)*

- However, actual mapping is uncertain and the quality of the corals at the different locations is difficult to ascertain.

Coastal Activities

The Population in the coastline area

- The Cambodia’s population was around 13,607,100 in 2005
- There is less population in the coastline area
- Most population growth in the Economical Area

The population of Coastal Area in Cambodia

<table>
<thead>
<tr>
<th>Population</th>
<th>Unit</th>
<th>Year 1998</th>
<th>Year 2001</th>
<th>Year 2006</th>
<th>Year 2011</th>
<th>Year 2016</th>
<th>Year 2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sihanouk Ville</td>
<td>person</td>
<td>67,440</td>
<td>81,265</td>
<td>100,061</td>
<td>120,515</td>
<td>141,624</td>
<td>164,283</td>
</tr>
<tr>
<td>Kompot</td>
<td></td>
<td>33,126</td>
<td>36,902</td>
<td>40,347</td>
<td>44,057</td>
<td>47,800</td>
<td>51,279</td>
</tr>
<tr>
<td>Koh Kong</td>
<td></td>
<td>29,329</td>
<td>36,544</td>
<td>46,691</td>
<td>57,572</td>
<td>69,126</td>
<td>81,153</td>
</tr>
</tbody>
</table>

Source: Ministry of Environment, December 2005, Cambodia
Marine Aquatic Culture

Source: Cambodia Shoreline Management Strategy, Ministry of Environment. 2006
Development in Coastal of Cambodia

Song Saa Private’s Island

Song Saa’s Private Resort
Cambodian Oil and Gas Distribution

Map of known oil and gas concessions

Onshore blocks
- Block XII: PT Medco - 52.5%, CNPA - 40%, JHL Petroleum - 7.5%
- Block X: ATI Petroleum (unconfirmed) and XV
- Other Blocks: Guangdong Chenguan Enterprise Investment Group (location unknown)

Offshore blocks
- Block A: Chevron - 55%, Moeco - 30%, GS Caltex 15%
- Block B: PTTEP - 33.3%, SPC - 33.3%, Resourceful Petroleum - 33.3%
- Block C: Polytec - 100%
- Block D: China Petrotech Holdings Limited (Cambodia) Co. - 100%
- Block E: Medco (PSC holder) - 41.3%, Kuwait Energy - 20.6%, JHL Petroleum - 4.1%, Lundin Petroleum - 34%
- Block F: Under negotiation with CNOOC (unconfirmed)

Change in forest cover influencing coastal waters

History of remote sensing studies in Cambodia

- Study on Cambodian Genocide Program by using Satellite Images of Cambodia, 1973-1992:
  - Composition Landsat Satellite image (Mass grave and prison site).
  - USGS Satellite images (Environmental Impact of Khmer Rouge Irrigation Project).
  - Most studies is inland geology
    - SAR (Specific Absorption Rate) base map: Flood hazard mapping in four province of Cambodia under the Mekong Basin (Hazarika et al., Unpubl).
    - Using RADASAT for Improving fisheries management and food security in the Mekong River watershed (Boivin et al., 2000).
# Mangrove Studied in Cambodia by Satellites

<table>
<thead>
<tr>
<th>Year</th>
<th>Area (ha)</th>
<th>Source</th>
<th>Trend</th>
<th>Methodology/Comments</th>
</tr>
</thead>
</table>
No studies on coastal habitats except mangroves
Future study on mapping of marine coastal habitats in Cambodia

• Ground/sea truth data for marine habitats by/with:
  - Acoustic Technology
  - Video imaging
  - Biological assessment
  - Geological survey

• Image analysis based on mainly ALOS (JAXA Satellite) and other satellite data
Thank You For Your Attention

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8th International Scientific Symposium
Ocean Climate and Marine Ecosystems in the Western Pacific