

# Indonesian Seaching for It's Continental Shelf Outer Limits

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## Abstract

With reference to the provisions within Article 76 of the UN Law of the Sea Convention, coastal States intends to delineate the outer limits of the continental shelf beyond 200 nautical miles is required to submit particulars of such limits along with the supporting scientific and technical data.

Since 2003, Bakosurtanal scientiests have carried out Desktop Study using the following data: (i) bathymetric data derived from 1996-1999 digital marine mapping project, (ii) global sea bottom topographic data from ETOPO2, and (iii) sediment thickness data from NGDC/NOAA. The advantages of carrying out desktop study were twofold, i.e. it is important to have an organized approach, and it has been able to get the work done within a limited budged to start.

A preliminary result of the study shows that in some certain areas Indonesia has a prospect to claim its continental shelf limits potentially extends beyond 200 nautical miles in 3 distinct areas. These area located to the West of Sumatera, to the North of Papua and to the South of Sumba island. This desktop study need further research especially using seismic data derived from new survey. This paper will describe the desktop study that has been carried out, the available data beeing used, as well as the future work needed to prepare Indonesian submission claim for its continental shelf beyond 200 nM..

## Introduction

As defined in article 76 of the United Nations Convention on the Law of the Sea (UNCLOS), the Continental Shelf is the area of the seabed and subsoil that extends to a distance of 200 nautical miles beyond the territorial sea from the territorial sea baseline and beyond that distance to the outer edge of the continental margin.

The Law of the Sea is arguably the most comprehensive and complex law treaty in the history of international law. To date, the United Nations Convention on the Law of the Sea has been signed by over 130 States. Indonesian government ratifies the convention by establishing the Law No. 17 (UU

No. 17), 1985 and it is effective since 16 November 1994.

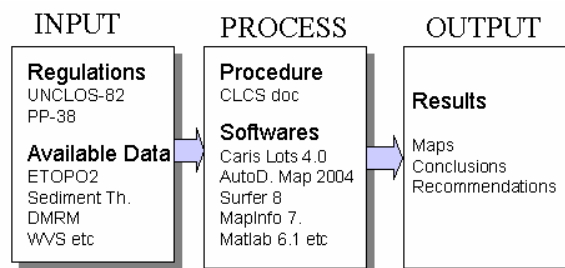


Figure 1. Outline scheme for delimitation of the Outer Limits of Continental Shelf

The ratified treaty is not just a set of principles but is law. Signatory States have ten years to plan and prepare a legal claim to the United Nations that draws two critical sovereignty lines:

- The boundary that marks 200 nautical miles from their baseline, and
- The boundary that will extend the ownership of their continental shelf beyond 200 nautical miles. This study will be focused for this case.

Based on the available material, this paper is reconstructed the delimitation process as shown in figure 1. The next sections outline the inputs (which regulations are used and which data are available), the process (Delimitation procedure and Available/developed Softwares) and the outputs (It will be described in the forms of maps, conclusions and recommendations).

### Delimitations Procedure

The procedure of delimitation of the outer limits of continental shelf follows the Final Scientific and Technical Guidelines of the Commission on the Limits of the Continental Shelf (CLCS). The procedure is also described in the Caris Lots 4.0 User's Guide, see figure 2. The step-by-step procedure is as follows:

- Step 1: Determination of Baseline

The territorial seas baseline determines the location of all the outer limits. The baseline is an approximate model of the coastline and is a combination of normal and straight baseline. The Indonesian baseline is defined in the Governmental Regulation Nr. 38, 2002.

- Step 2: Determination of Legal Limits

Indonesian maritime boundary can be constructed base on:

- ❖ ZEE-lines; it is projection of Indonesian baseline 200 nm seaward.
- ❖ Boundary agreement between Indonesia and his neighboring countries. It should be noted that this study is not focused on this case. Temporary boundary agreement should be taken from existing Indonesian ZEE-charts.

- Step 3: Determination of Constraint (cut-off) Line

According to Article 76, paragraph 5 of UNCLOS 1982, the constraint (cut off) line is defined as a line a line either shall not exceed 350 nm from the Indonesian baselines or shall not exceed 100 nautical miles from the 2,500 m isobaths. The combination of the most seaward components of these two of lines should be the cut-off line. Determination of cut-off line can be carried out using

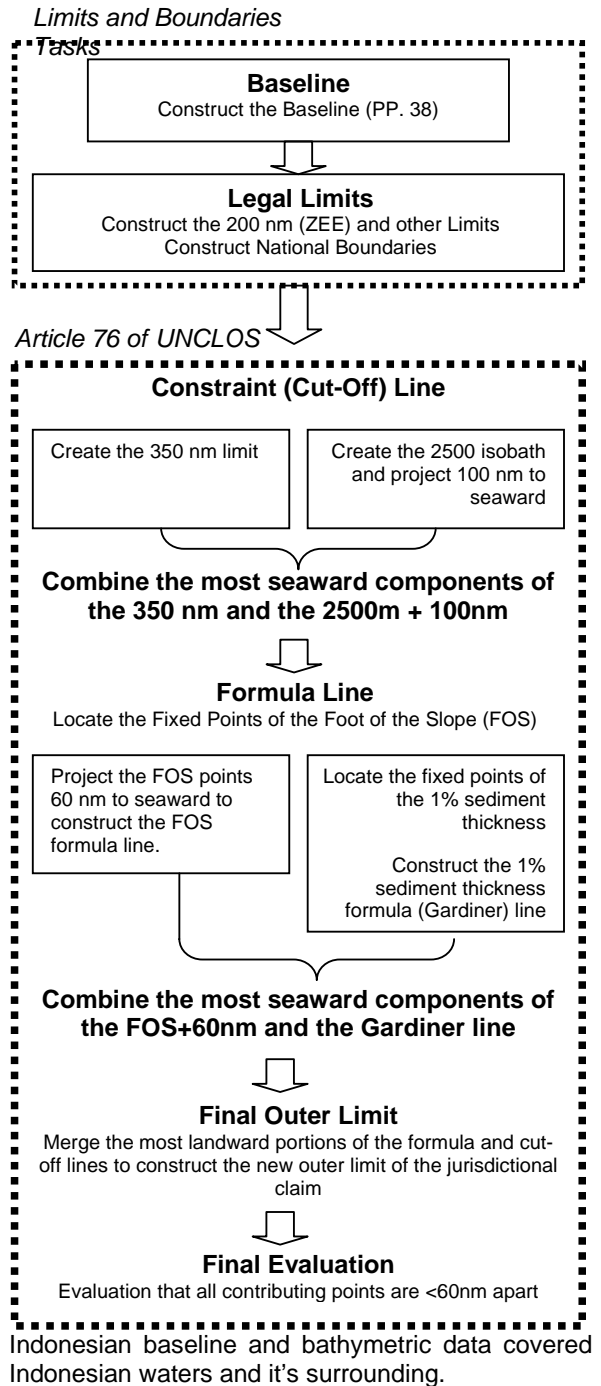


Figure 2. Principle Procedure of delimitation of the Outer Limits of continental shelf, adapted from Caris Lots 4.0 User's Guide.

- Step 4: Applying Formula Line

Delimitation of the Outer Limits of Continental Shelf must be based on the determination of the Foot of the Slope (FOS), see figure 3. It is defined as the point of maximum change of gradient in the sea floor. The delimitation can be done using one or both of the following methods:

- ❖ Distance formula: FOS plus 60 nm.
- ❖ Gardiner formula: 1% sediment thickness

The 200nm limit and the cut-off line define the "corridor of interest"<sup>1</sup> for extended claims. The Combination of the most seaward components of the FOS+60nm and the Gardiner line should be candidate line for the Outer Limits.

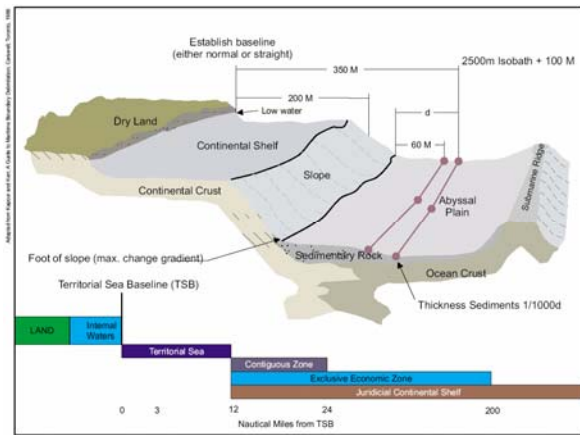


Figure 3. Three dimensional character of an offshore boundary

□ Step 5: Final Outer Limits and Evaluation

The final outer limit must be submitted to the United Nations as a set of coordinates points which are no greater than 60 nautical miles apart. The to be claimed area is defined by straight lines drawn between these points. In this case, we have to select the most advantageous points from the outer limits.

**Available Data**

To delimitate the outer limits of continental shelf, the bathymetric-, sediment thickness-, and basepoints data are needed. The available data<sup>2</sup> are:

*PP-38*

The Governmental Regulation (PP-38/2002) contains a list of coordinates of 183 base points to construct Indonesian baselines.

*World Vector Shoreline (WVS)*

WVS is a digital 1:250,000 scale NIMA (National Imagery and Mapping Agency) product in ASCII coded Standard Linear Format (SLF) that has been in existence since the late 1980's. It contains shorelines derived from Digital Landmass Blanking (DLMB) data and supplemented by Operational

Navigation Charts (ONCs) and Tactical Pilotage Charts (TPCs). It also contains international boundaries and country names derived from paper products including ONCs, TPCs, and Joint Operation Graphics (JOGs).

*Bathymetric Data derived from DMRM-project*

During the Digital Marine Resource Mapping (DMRM)-project 1996-1999, the bathymetric survey has been carried out using SIMRAD EM12D Multibeam Echosounder. The spatial distance between the line tracks are about 100 km and cover minimal 200 nm seaward from the baseline. The aim of this survey is to determine the limits of the Exclusive Economic Zone (EEZ) and to provide reconnaissance surveys for the continental shelf study. Figure 4 represent the location of bathymetric data derived from DMRM-project.

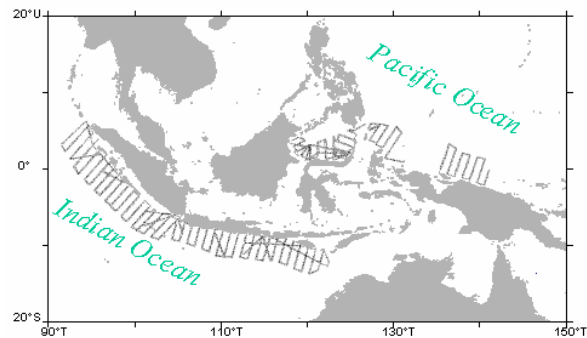


Figure 4: Locations of bathymetric data derived from DMRM-Project

*Global Bathymetric Data: ETOPO2*

ETOPO2 is a gridded database of bathymetry and land topography covering the entire surface of the earth. Grid cell spacing is 2 arc-minutes, see figure 5. The grids on the GEODAS ETOPO2 CD set are in the GEODAS Gridded Data Format - GRD98. The GEODAS Software can be used to create custom grids. The ETOPO2 is modeled based on the Major Sources of Data as follows:

- The seafloor data between latitudes 70° North and 72° South are from the work of Smith and Sandwell (1997). These data were derived from satellite altimetry observations combined with carefully, quality-assured shipboard echosounding measurements, by Dr. Walter H.F. Smith, of the NOAA Laboratory for Satellite Altimetry and Dr. David T. Sandwell, of the Institute of Geophysics and Planetary Physics at the University of California, San Diego.
- Seafloor data southward of 72° South are from the US Naval Oceanographic Office's (NAVOCEANO) Digital Bathymetric Data Base 5-minute (DBDB5). Seafloor data northward from 70° North are from the new International Bathymetric Chart of the Arctic Ocean (IBCAO).
- Land topography is from the GLOBE Project, an internationally designed, developed, and

<sup>1</sup> If the points of possible FOS fall seaward of the corridor of interest, refer to the CLCS Guidelines to judge whether we should pick one closer to land (as described in User's Guide of Caris Lots 4.0). If it falls landward of the corridor of interest, it may be use after using the distance and Gardiner formulas.

<sup>2</sup> It should be noted that bathymetric and sediment thickness data available for this study are global data with restricted accuracy. The bathymetric data derived from DMRM-project is more accurate but with restricted resolutions.

independently peer-reviewed global digital elevation model (DEM), at a latitude-longitude grid spacing of 30 arc-seconds (30"). The GLOBE Task Team was established by the Committee on Earth Observation Satellites (CEOS). It is part of Focus I of the International Geosphere-Biosphere Programme - Data and Information System.

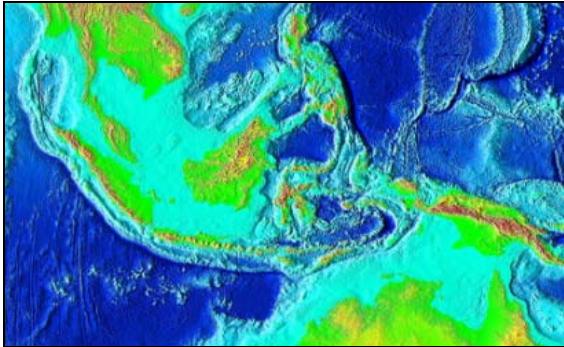


Figure 5. The bathymetry and land topography derived from ETOPO2 in the study area.

### Sediment Thickness

The National Geophysical Data Center (NGDC) has compiled compiling the digital sediment thickness database for the world's oceans and marginal seas. The data is presented with a grid spacing of 5 arc-minutes by 5 arc-minutes. Sediment thickness data were compiled from three principle sources: previously published isopach maps; ocean drilling results, both from Ocean Drilling Program (ODP) and the Deep Sea Drilling Project (DSDP); and seismic reflection profiles archived at NGDC as well as seismic data and isopach maps available as part of the IOC's Geological/Geophysical Atlas of the Pacific (GPAPA) Project.

Figure 6. shows the sediment thickness data in the Indonesian waters and its surroundings. The data is downloaded from the NGDC's homepage:

<http://ngdc.noaa.gov/mgg/sedthick/data>

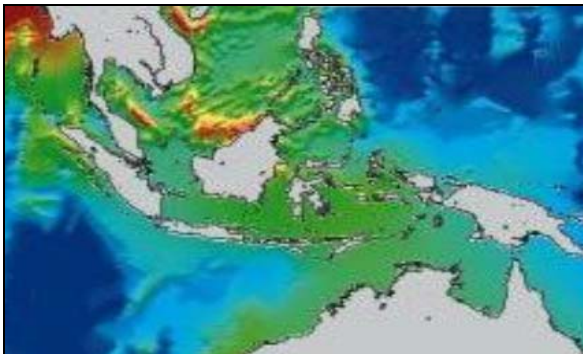


Figure 6. Total Sediment thickness from NGDC/NOAA

## Softwares

The following softwares are used in this study to process the available data, i.e.: *Caris Lots 4.0*, *Autodesk Map 2004*, *Surfer version 8*, *MapInfo version 7.0*, *Matlab version 6.1*.

## The Results

The delimitation procedure described above is implemented on the available data using the processing Softwares. In this section, the results will be presented and described.

### Baseline and it's buffering lines

As described in the procedure of delimitation, the coordinates of basepoints derived from governmental regulation Nr. 38 are used to reconstruct Indonesia baselines<sup>3</sup>. The 200 nm and 350 nm limit is developed by the projection from the baseline using procedure called envelope of arcs or buffering object. The process can be done using AutoDesk Map, MapInfo or Caris Lots 4.0, and the result is presented in the figure 7.

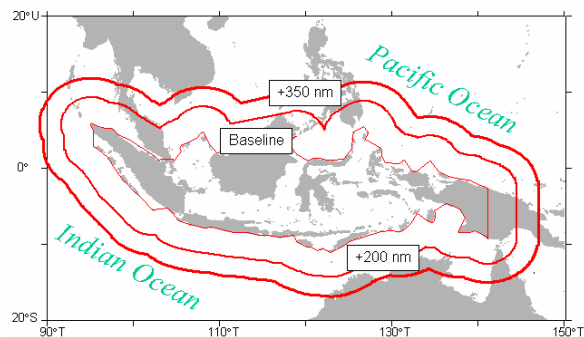


Figure 7. Indonesian Baseline and the +200nm and +350nm lines

### Cut-off line

The Cut-off line is computed follows the procedure described above:

- Create contour line of 2500 m Isobath based on available data (in this case ETOPO2). It can be done using Surfer version 8 or Caris Lots 4.0
- Remove the unnecessary 2500 m isobath line, example: all 2500 m isobath line inside the internal water.

<sup>3</sup> To simplify the computation, all baselines are supposed as straight baseline and the boundary agreement between Indonesia and his neighboring countries are disregard. The changes of basepoints as consequences of East Timor and Sipadan/Ligitan cases are also ignored.

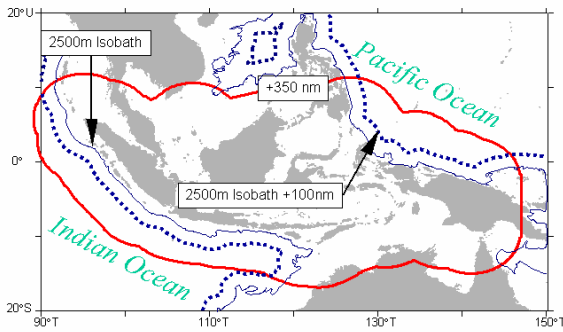


Figure 8. The cut-off line for delimitation of Indonesian outer limits of continental shelf

- Generate buffer lines 100 nm seaward from 2500 m isobath. Technically it can be done using AutoDesk Map, MapInfo or Caris Lots<sup>4</sup>. The combination of the 2500m Isobath +100 nm line and the baseline +350 nm is shown in figure.

From figure 8, it can be clearly seen that for Indonesian waters the 2500m Isobath + 100nm line falls 100% inside the +350nm line. Thus, the cut-off line is fully the +350nm line.

#### Applying Formula Line

The first step to apply the formula line is determination of Foot of the Slope (FOS). The FOS point is the first maximum change of slope points as we proceed from seaward to landward along the profile.

Once we have determined the FOS lines, we can project them 60 nm seaward to realize the "distance formula". Further, the Gardiner formula is applied to determine the 1% sediment thickness. It is location of points at which the sediment thickness is equal to 1% of the distance to the FOS point, see figure 9

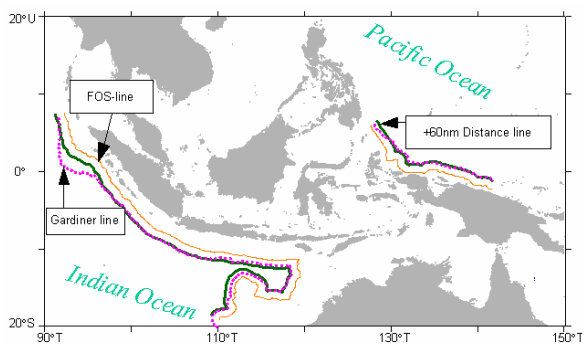


Figure 9. Results of computation of formula line

## Conclusions

Based on the results shown in previous paragraph, we can conclude:

- ❖ This preliminary study results show that in some certain areas, i.e. West of Sumatera, North of Papua and South of Sumba island, indicated their potential prospects to claim continental shelf limits extends beyond 200 nautical miles.
- ❖ To ensure more precise results, this desktop study need further seismic data derived from real survey. So that we have set a plan to conduct geophysical survey in the near future.

<sup>4</sup> Buffering procedure using AutoDesk Map and MapInfo deliver same results, but using Caris Lots 4.0 the results shows a different of about 1-2 nm beyond the results derived from AutoDesk or MapInfo.

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