

UTILIZATION OF RS DATA AND GIS FOR ACCELERATING ADMINISTRATION BOUNDARIES DELIMITATION: CASE STUDY CENTRAL KALIMANTAN PROVINCE, INDONESIA

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ABSTRACT: As a consequence of Law of Republic Indonesia No. 32/2004 on Regional Government, is the increasing number of local governments due to regional administrative growth, this has implications for increasing boundaries between regions. Until now, the total of boundaries between regions in Indonesia has 946 segments, and only 14% had been confirmed by Minister of Internal Affairs Regulatory (Subowo, 2012 in Batubara, 2013). Therefore, it is needed effort to accelerate the determination of boundaries between regions. Through utilization of remote sensing imagery and GIS analysis is as an alternative method to accelerate the process towards the establishment of the border. After pre-processing process, then was done delineation by using cartometric method as visualization of boundary in the field. The results of this cartometric boundary, is requested clarification through discussion with local governments and communities. Utilization of remote sensing image and GIS in this process helps to reduce the measurement boundary point in the field so can save time and costs. Where previously, as stated in Ministry of Internal Affairs Regulatory Number 1/2006, focused on the assertion border in order to create a clear and definite areas boundaries of both juridical and physical aspects in the field, so that the process takes more time. These corridor maps and recommendation as technical assessment proposed by Information Geospatial Agency (BIG) to Ministry of Home Affairs as input for establishment of legal aspect. This acceleration effort on administration boundaries delimitation between regions will accelerate the establishment of legal certainty and reduces the horizontal conflicts in Indonesia.

1. INTRODUCTION

As a consequence of Law of Republic Indonesia No. 32/2004 on Regional Government, is the increasing number of local governments due to regional administrative growth, this has implications for increasing boundaries between regions. Until now, the boundaries between regions totaled 946 segments, and only 14% had been confirmed by Minister of Internal Affairs Regulatory (Subowo, 2012 in Batubara, 2013). Therefore, it is needed effort to accelerate the determination of boundaries between regions. One of the alternative methods to speed up the process towards the delimitation area is through remote sensing imagery and GIS analysis using cartometric method. Referring to Minister of Internal Affairs Regulatory Number 76/2012, cartometric method is tracking or delineating of boundaries on working map and measurement of point position, distance and wide area coverage based on topographic map and other geospatial information as compliment data. Working map is created using the basic / topographic map of Indonesia that issued by Geospatial Information Agency. While the maps or other geospatial information can be used such as remote sensing imagery or other thematic maps.

1.1. Objective of Research

The purpose of this research is to study the utilization of remote sensing imagery in accelerating province delimitation, especially Central Kalimantan Province, as a technical input to the Ministry of Internal Affairs as an institution that is authorized to determine the administrative boundaries between regions in Indonesia.

1.2. Data and Methods

The data used in this research was topographic Map scale 1: 50,000, remote sensing imagery (ASTER, SPOT 5 and SRTM), coordinates of the boundary pillars, as well as the legal document such as the Regional Establishment Act, Regulation of the Minister of Internal Affairs, the minute of tracking and other region boundaries documents. The method used in this research was based on the technical aspects and the legal aspects. In the technical aspects, we did interpretation of remote sensing imagery; 3D from SRTM and tracking /delineation from the topographic map, while in the legal aspects were tracking or adjudication border, supported by field survey and other legal documents. The high

resolution imagery gave a detailed overview of geometric objects, it will be important for the determination and confirmation of the boundary by using cartometric method (Riadi, 2013). The final outcome of this research was corridor map border, as technical input to the Ministry of Internal Affairs for further becoming a product that is a valid legal Regulation of the Minister of the Internal Affairs.

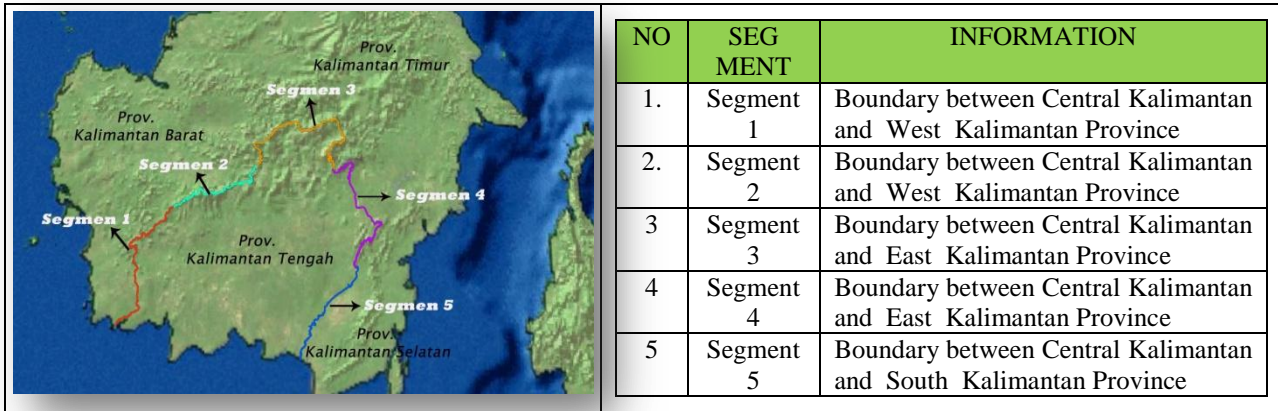


Figure 1. Research Area

In generally, the implementation of adjudication boundaries between provinces in Central Kalimantan were as follows:

1. Preparation
2. Data and material collection
3. Image processing, is done the following stages:
 - a. Pre-processing
 - i. Loading image
 - ii. Radiometric correction
 - iii. Geometric correction
 - b. Processing

At this stage the corrected images (Ortho Rectified Imagery/ORI) conducted the following stages:

 - Cropping image (ORI) according to the location of activities,
 - Overlay between image, topographic data and the territorial data
 - Imagery based analysis for updating the segment boundaries
4. Delineation integrated boundaries segment

This is done by overlay between imagery and regional data to analyze for getting updated regional data
5. Clarification with stakeholders
 - a. Clarification is done with technical meetings and discussions among stakeholders. In this case discussion done among provincial officials from Central Kalimantan, East Kalimantan and South Kalimantan Province, to adjudication on the Map regarding the interim analysis results
 - b. This activity is also a form of adjudication segment boundaries on a map, done by working group with participants from some provinces that involved
 - c. Final result is clarification and minutes of meetings, which is as correction to the results of the interim analysis
6. Cartographic layout and finalization

This stage is the depiction of the final result on the map, in the form of map of corridor region of the provincial boundary, each segment of the boundary between provinces

2. RESULT AND DISCUSSION

2.1. Result

Here are presented the results of image processing, the overlay between image with contour data or river, and also the boundary delineation on flat or hilly areas (figure 2, 3, 4 and 5). The result of processing and analyzing data was in integrated process by considering some input such as topographic (basic) map, other thematic map of region legislation related establishment of region and other legal documents. The basic map consist of land cover, hydrographic, road, contour, administrative boundary and toponym layer. Delineation on technical process considered on:

- Boundary that referred to natural features such as river, land form characteristic, etc.
- Boundary that referred to manmade features such as road, settlement/building, etc.

- Boundary that referred to other terms

There are two kind of technical approaches towards adjudication activity, namely:

1. Delineation boundary or clarification of existing boundaries or existing features
2. Delineation boundary or clarification of new boundaries or new features

2.2. Discussion

The delineation boundary on flat area considering the existing boundaries on topographic / base map, results of local region analysis of activities area, high-resolution images such as SPOT 5 by displaying natural elements such as rivers and man-made elements, and toponym information will helpful for reaching analyzing the delineation boundaries. If there were existing assertion boundaries and pillars in that segment, the pillar coordinate should be plotted on working map, and the delineation of boundaries based on that agreed pillars. Three dimensional views will helpfully for hilly or mountainous area. If delimitation boundary by using old method, its means without remote sensing imagery will takes time and huge cost because this activities needed field / ground check for all over area.

The results of Cartometric method is by using remote sensing imagery as reconstruction or visualization of real condition. So remote sensing imagery which was a blend with other geospatial information and juridical data is used as supporting the technical study. In this case we called Corridor map. And this technical result (corridor map) will be used as inputs for legal drafting by Minister of Internal Affair related to administrative boundaries. This effort will accelerate the process towards the establishment of the administrative boundaries, so it can be supporting the legal certainty and reduce horizontal conflict between region.



Figure 2. Boundary Delineation on Hilly Areas with 3D View

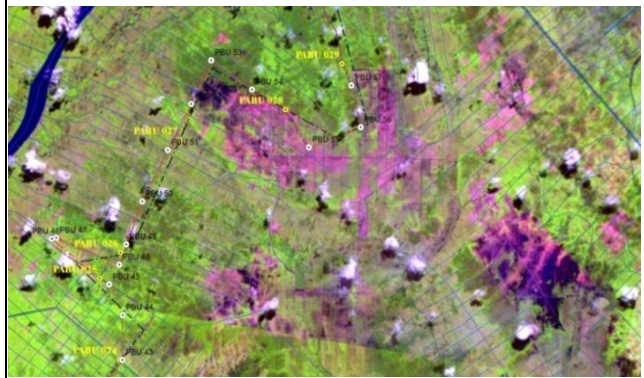


Figure 3. Boundary Delineation on Flat Area

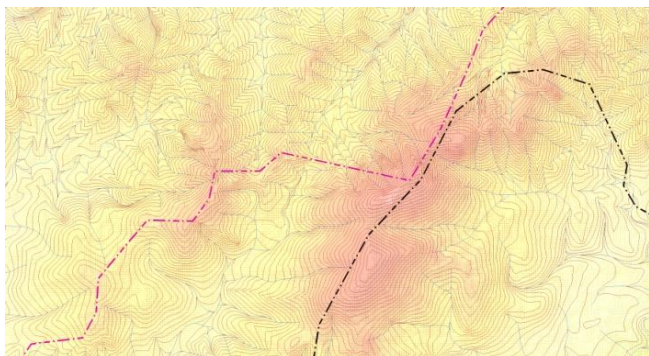


Figure 4. Boundary Delineation on Hilly Area Overlay with Contour Data

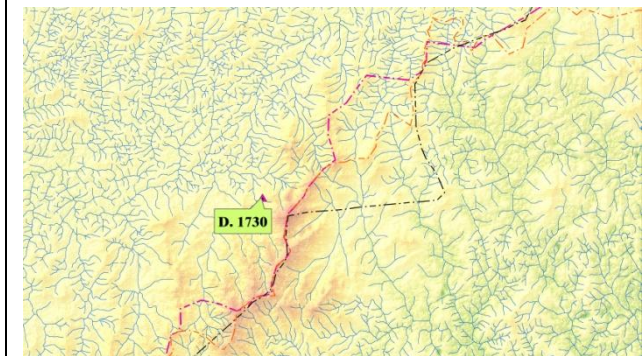


Figure 5. Boundary Delineation on Hilly Area Overlay with River Data

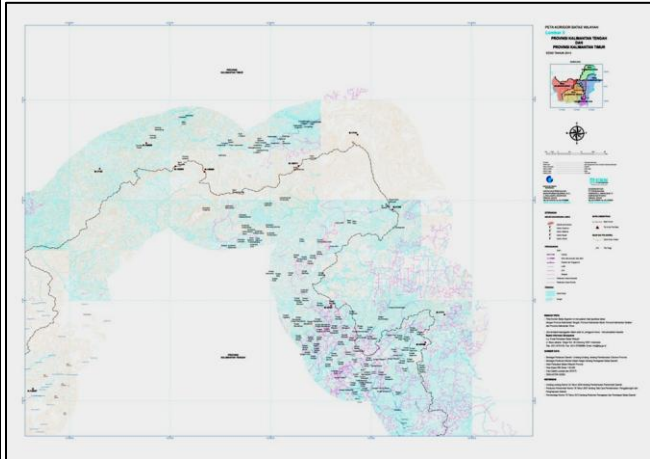


Figure 6. Corridor Map between Central Kalimantan and East Kalimantan Province

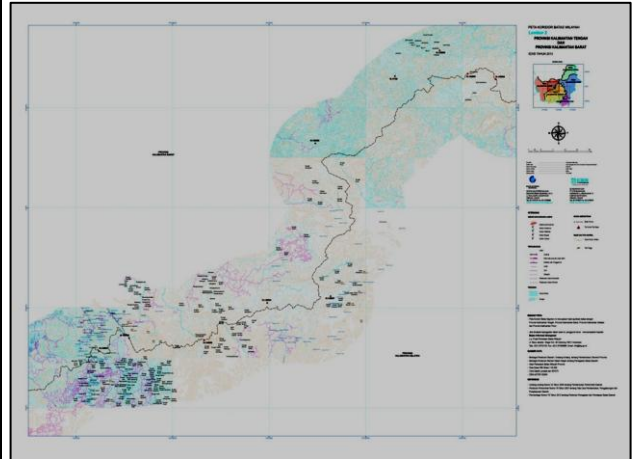


Figure 7. Corridor Map between Central Kalimantan and West Kalimantan Province

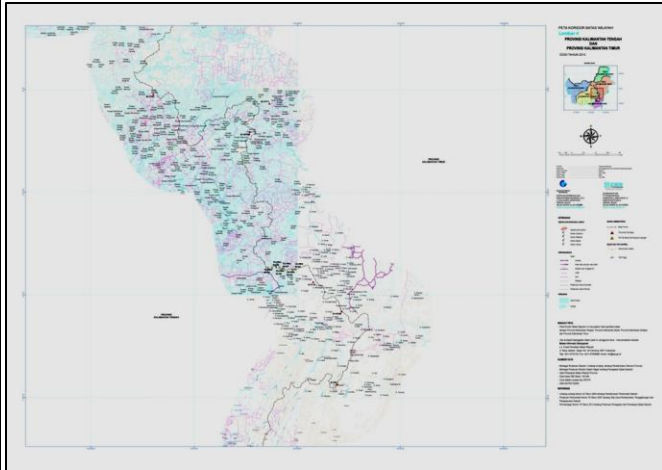


Figure 8. Corridor Map between Central Kalimantan and East Kalimantan Province (above)

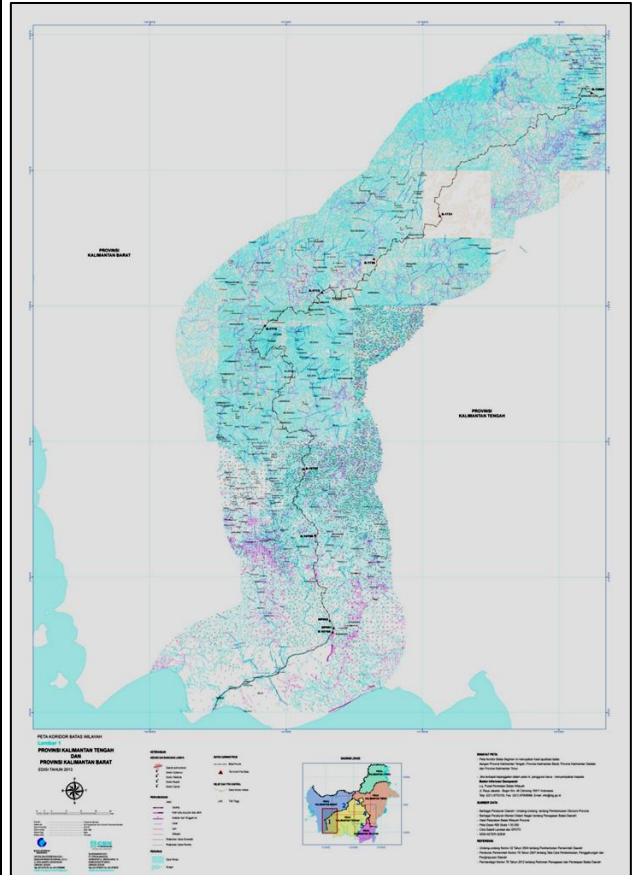


Figure 9. Corridor Map between Central Kalimantan and West Kalimantan Province (right)

3. CONCLUSION

Based on the processing and analyzing result of this research can be concluded that high resolution of remote sensing data (SPOT 5) and 3D views highly recommended for supporting the adjudication process of administrative delimitation province boundaries, since it represents more detailed than medium or lower resolution of RS data because it is represent the actual conditions in the field clearly. Cartometric method combining the remote sensing data with

other geospatial data and legal aspect documents will helpfully for accelerating the delineation administrative boundaries between regions. By using this method can minimize time, cost and number of human resources.

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