

# **The Use of Satellite Imageries to Support Tourism Sector in Bangka Belitung Islands, Indonesia**

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**Key words:** Satellite Imageries, Tourism, Bangka Belitung Islands

## **SUMMARY**

Tourism is one of important sectors which support human life. It is basically defined as people's activities to go to a certain interesting place during leisure time or holiday season. The attractive place offers some benefits to visitors, especially in relation with relaxation purpose. Tourism activities also play a role as one of the potential sectors influencing the development of a certain area and total of local income. In this case, tourism activities significantly affect the increasing of supporting facilities, for instance food stall, cottage, transportation line, etc. Furthermore, the number of visitors directly affects the total of regional income obtained from retribution fee and tax of each tourism object. Based on these reasons, local government tries to promote the existing tourism objects in order to increase both local and national income.

Bangka Belitung Islands, one of the provinces in Indonesia, has beautiful scenery which attracts a lot of foreign and domestic tourists. More than 40 interesting places located at six regencies and a city under administrative authority of Bangka Belitung Islands Province offer unforgettable moment. Most of them are natural objects, for instance beach, hot spring water, and lake. Unfortunately, the number of visitors in this area is quite low comparing with other provinces in Indonesia. Thus, this condition requires the improvement of promotion action to attract the national and international visitors.

Tourism promotion activities were generally done by developing tourism book, booklet, leaflet, and tourism's website. The contents were map, photo, and description of tourism object related to location, history, and supporting facilities. In line with the development of Remote Sensing (RS) application, tourism object can be also exposed through satellite imageries. Some satellite imageries covering the area of Bangka Belitung Islands were processed to obtain several enhanced images. Landsat images were processed into composite band of 452, 321, 432, and 542 whereas Quickbird images were presented in natural color. Those processed images were utilized to visualize the present tourism objects in this province whether in terms of location and distribution as well. All information was subsequently presented through a book called Tourism Atlas from Space of Bangka Belitung Islands Province. The book becomes one of the supporting tools to promote tourism objects in this province.

## 1. INTRODUCTION

Holiday and spare time is a free moment which is generally utilized to do many activities. Some people spend this time by visiting many interesting places whereas the others prefer to take a rest or to do some hobbies which cannot be conducted during work days. All of mentioned activities are aimed to release their daily routines and get a new energy to undergo the next tasks and duties.

People who often use up their holiday by going to some attractive places commonly arrange their trip a few days ago. They collect much information to ensure that their holiday is going well. The information may consist of object description, supporting facilities, route, and price (ticket, rate of rent house, food, etc.). Such information usually can be found on the leaflet, brochure, and travelling book.

Existing tourism book and the other tourism information currently presents some pictures of tourism object supported by description and map. The description illustrates the scenery of the object, facility, and how to get there. For some certain objects, the history of such objects is explained as well. The map is used to inform the position of the object so that people can estimate the distance of the object regarding to the nearest famous city. Unfortunately, the map is commonly developed on the small scale so that the precision of the location is not well identified.

In line with the development of Remote Sensing technology associated with the use of satellite imageries for many purposes and Geographic Information System (GIS) application related to spatial data acquisition and spatial data processing, tourism or travelling book can be added with view of satellite imageries covering the tourism object and map. The satellite imageries give a wider space view of tourism object and map presents the location of the object. Therefore, tourism book now can address the current condition of tourism book, especially to give more precise location of tourism objects and more comprehensive information as illustrated through maps and satellite images.

## 2. STUDY AREA

Bangka Belitung Islands Province has been the 31<sup>st</sup> province of the Republic of Indonesia. Administratively, this province is divided into seven administrative regions including six regencies and one municipality. These are Bangka Regency, West Bangka Regency, South Bangka Regency, Central Bangka Regency, Belitung Regency, East Belitung Regency, and Pangkalpinang Municipality.

This province is geographically located between 00<sup>o</sup>50' – 04<sup>o</sup>10' South and 104<sup>o</sup>50' – 109<sup>o</sup>30' East (see Figure 1). Bangka Strait separates this province with South Sumatera Province in the western part. This province is also bounded by Karimata Strait in the eastern part and South China Sea in the northern part. The total area of this province is about 81,725.14 km<sup>2</sup> and it consists of two main islands, i.e. Bangka Island and Belitung Island, as well as several small islands, such as Lepar Island, Pongok Island, Lengkuas Island, and Seliu Island.

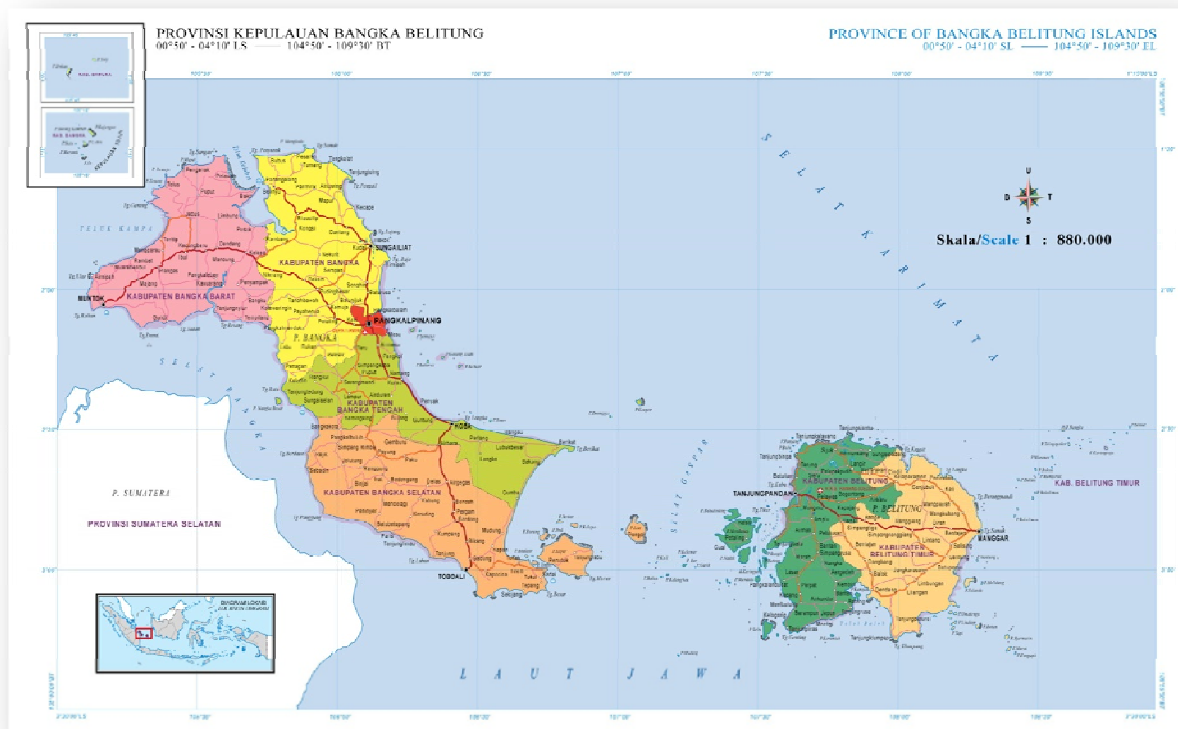


Figure 1. Administration Map of Bangka Belitung Islands Province

Bangka Belitung Islands becomes one of tourism destinations in Indonesia. At least, more than 40 tourism objects exist in this area. Commonly, it offers natural scenery of beaches and hot springs (see Table 1). The objects have unique characteristics and present unforgettable holiday moments. Those objects, particularly the famous one are supported by many facilities, for instance restaurant, cottage, and security guard.

A lot of tourists both domestic and international have already visited Bangka Belitung Island both for business purpose and holiday purpose. Statistical data in July 2011 reported that the number of tourists who came to this province and stayed at star hotels was 17,860 people (Center of Statistical Bureau/BPS of Bangka Belitung Islands Province, 2011). This number is expected to continuously increase so it can significantly add the local income and support the regional development.

Table 1. Tourism Objects of Bangka Belitung Islands Province

No	Regency / Municipality Name of Tourism Object	No	Regency / Municipality Name of Tourism Object
1	Bangka Regency <ul style="list-style-type: none"> <li>• Tirta Tapta Pemali Hot Spring Water</li> <li>• Fuk Tet Che Temple</li> <li>• Matras Beach</li> <li>• Parai Tenggiri Beach</li> <li>• Romodong Beach</li> <li>• Tanjung Penyusuk Beach</li> <li>• Tanjung Pesona Beach</li> </ul>	5	Belitung Regency <ul style="list-style-type: none"> <li>• Berahu Hill</li> <li>• Belitung Museum</li> <li>• Awan Mendung Beach</li> <li>• Batulubang Beach</li> <li>• Mabai Beach</li> <li>• Tanjung Kelayang Beach</li> <li>• Tanjung Pendam Beach</li> </ul>

	<ul style="list-style-type: none"> <li>• Phak Kak Liang</li> <li>• Kwan Yin Goddess Temple</li> </ul>		<ul style="list-style-type: none"> <li>• Tanjung Tinggi Beach</li> <li>• Teluk Bahagia Beach</li> </ul>
2	West Bangka Regency <ul style="list-style-type: none"> <li>• Mount Menumbing</li> <li>• Pasir Kuning Beach</li> <li>• Tanjung Kalian Beach</li> <li>• Tanjung Ru Beach</li> <li>• Palm Oil Plantation</li> <li>• Ranggung House</li> </ul>	6	East Belitung Regency <ul style="list-style-type: none"> <li>• Pice Dam</li> <li>• Green Lake</li> <li>• Bukit Batu Beach</li> <li>• Burung Mandi Beach</li> <li>• Nyiur Melambai Beach</li> <li>• Serdang Beach</li> <li>• Kwan Im Goddess Temple</li> </ul>
3	South Bangka Regency <ul style="list-style-type: none"> <li>• Nyelanding Hot Spring Water</li> <li>• Sin Mu Temple</li> <li>• Tanjung Krasak Beach</li> <li>• Tanjung Tiris Beach</li> </ul>	7	Pangkalpinang Municipality <ul style="list-style-type: none"> <li>• Giri Maya Hill Golf Course</li> <li>• Tin Museum</li> <li>• Pasir Padi Beach</li> </ul>
4	Central Bangka Regency <ul style="list-style-type: none"> <li>• Ciluak Hot Spring Water</li> <li>• Kurau Fisherman Village</li> <li>• Penyak Beach</li> <li>• Sempur Beach</li> <li>• Tanjung Berikat Beach</li> </ul>		

Source: Field Survey BAKOSURTANAL, 2004

### 3. METHOD

Tourism information in Bangka Belitung Islands Province supported by satellite images was presented into a book, called Tourism Atlas from Space of Bangka Belitung Islands Province (National Coordinating Agency for Surveys and Mapping/BAKOSURTANAL, 2005). The similar atlases were also created for another province in Indonesia for the same purpose which is to support government's effort in attracting more tourists, especially foreign visitors to come and to enjoy Indonesia's tourism object.

Required data to generate the atlas was collected by field survey and institutional survey. Field survey was conducted to compile primary data, i.e. photos and current situation of the object. On the other hand, institutional survey was intended to gather secondary data from related institutions, for instance map, photo, leaflet, brochure, tourism book/guide that has been produced previously. Apart from that, the other substantial data (map, satellite image, and SRTM/Shuttle Radar Topographic Mission) are obtained by internal cooperation among divisions at BAKOSURTANAL. In this project, we used topographic map with scale of 1: 250,000, medium resolution image (Landsat 7 ETM+ year 2000 and 2001), and high resolution image (Quickbird year 2000 and 2002).

All collected data are simply processed through several stages involving satellite image processing, map processing, photo's quality enhancement, preparation of description of tourism object into two languages (Indonesia and English), and lay out. To minimize the errors and to improve the quality of the atlas, quality control activities were done in each processing step. The global workflow of development of the atlas is described below:

### 3.1. Satellite Image Processing

The obtained satellite images were already rectified so that the next process was focused on image enhancement, and image lay out. To process the satellite images, we used Er Mapper 6.4 and ArcView 3.2. Er Mapper was utilized to enhance the image appearance while ArcView was used to lay out the image.

According to the data availability, Landsat images covering Bangka Island have already processed into composite band of 542. The images were only then enhanced to achieve a better appearance. Landsat images covering Belitung Island were processed into four composite bands which are 321, 432, 452, and 542. On the other side, Quickbird images were managed to be presented in natural color.

The next step is image lay out. In this stage, the processed images were arranged to produce satellite image map. Point representing location of tourism objects was put on the map. The point was depicted into a specific symbol based on the rule and specification of tourism atlas. The symbol of tourism object is shown in Figure 2.

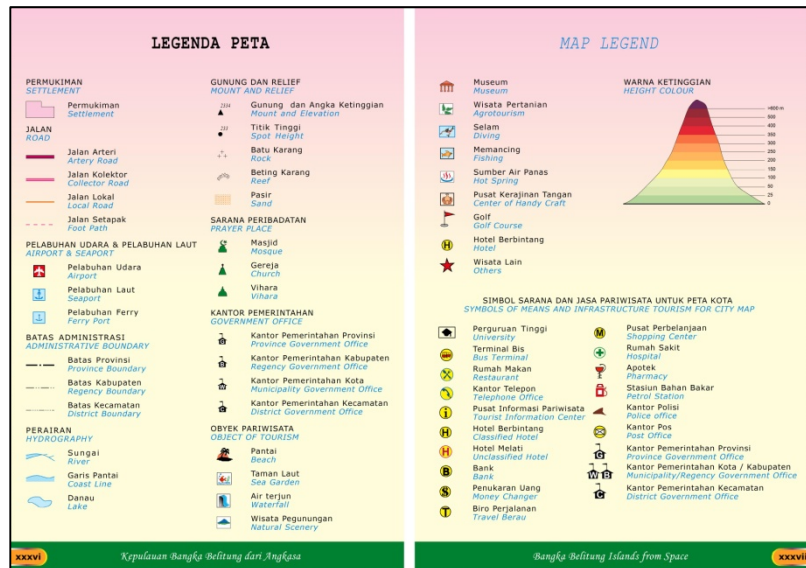


Figure 2. Symbol of Tourism Object Presented on Map Legend

### 3.2. Map Processing

Map processing in terms of generalization was performed by using ArcView and Macromedia Freehand. The topographic maps with scale of 1 : 250,000 (for regency area) and scale of 1 : 50,000 (for city area) were generalized by means of ArcView to obtain the smaller scaled map. Map layers taken from topographic map are shore line, road network, river, land use, and elevation. Henceforth, the generalized map was converted into graphical format to be processed by using Macromedia Freehand. Since the atlas has specific dimension (210 mm height and 148 mm width or similar with A5-paper), the generalization process considered its dimension in order to fit the map with available space.

The maps showing the location of tourism object were presented on 20 sheets of tourism map which consist of 18 sheets for regency area and scale two sheets for municipality region. Those maps were subsequently cropped to portray the position of each tourism object.

### 3.3. Photo's Quality Enhancement and Preparation of Description of Tourism Object

The photo enhancement was proposed to manage brightness and contrast of photo and to add some effects on the photos. This activity was done by using Adobe Photoshop. Each

photo passed this step to provide different appearance of photo in the atlas. It is intended to bring more dynamic appearance of the atlas so that the users are more interested to completely read the book.

The other important activity is preparation of tourism object description. The description was compiled leaflet, brochure, tourism book, and field survey report. Kind of information that must be described generally consists of feature and scenery of the object, available supporting facilities (hotel/cottage, restaurant/food stall, parking area, and miscellaneous service), and relative position of the object illustrated by the distance of the object associated with the nearest well-known city or region. The other information needed to be provided is cultural calendar and annual tourism event held in some locations. This event will attract more visitors since the events are not daily presented.

### 3.4.Lay Out

Lay out stage is a process to combine all processed data on the book pages. This activity was done by using specific software, i.e. Macromedia Freehand. This software was chosen regarding to the need to print out the manuscript of the atlas.

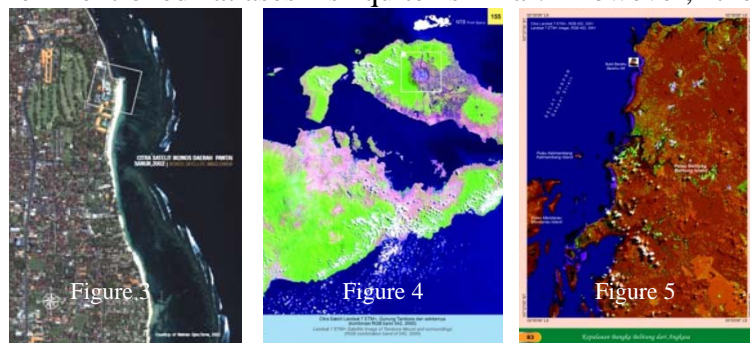
Duration of layout process was longer than other stages. Since the process to depict and arrange the data (satellite image, map, photo, and description) must consider art aspect and avoid monotonous view. During this process, quality control activity was intensively conducted to find the mistake and inappropriate information in the atlas and to revise it as well.

## 4. RESULTS

### 4.a. Tourism Atlas of Bangka Belitung Islands Province

Tourism atlas from space of Bangka Belitung Islands Province is one of the series of tourism atlas from space. There were two atlases which had been previously produced, i.e. tourism atlas from space of Bali Province (BAKOSURTANAL, 2003) and tourism atlas from space of West Nusa Tenggara Province (BAKOSURTANAL, 2004).

The general content of the mentioned atlases is quite similar. However, the improvement was still performed in order to produce a better appearance of the atlas. The improvement is commonly related to the satellite image processing. The additional attributes, for instance symbol of tourism object, edge coordinate of satellite image map, and some important topographic names surrounded the object, were appended which in order to give more comprehensive information on the satellite image map. The example of satellite image used on those three atlases is shown in figure 3-5.



The Appearance of Satellite Image on Tourism Atlas from Space of: Bali Province (Figure 3), West Nusa Tenggara Province (Figure 4), and Bangka Belitung Islands Province (Figure 5)



To help users to understand the satellite image particularly Landsat image, this atlas is supported by interpretation key. The interpretation key provides several natural features, such as lake, sea, beach, and settlement. The key will assist readers in distinguishing the appearance of such kind natural features on various composite bands (see Figure 6).

This atlas is also equipped by brief explanation of remote sensing technology (see Figure 7). This information is intended to give preliminary knowledge in relation with the basic process to obtain satellite image. Therefore, the readers are expected to have better understanding about satellite image.

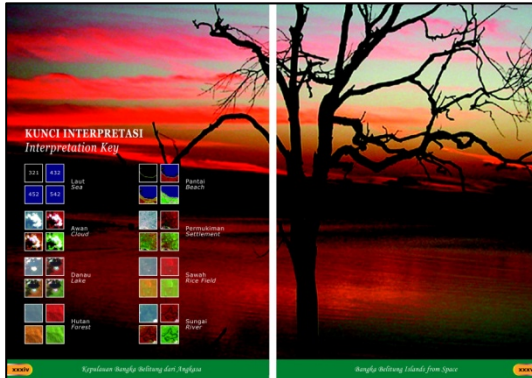


Figure 6. Interpretation Key



Figure 7. Remote Sensing Overview

The next part of this atlas is related to the way to combine all data of a certain object on the book pages. As mentioned in previous chapter, book layout is an important step in which all processed data were artistically combined to achieve interesting appearance. Some example pages can be seen in the following figures.



Figure 8. Examples of Book Contents

#### 4.b. Further Usage of Tourism Atlas from Space

Tourism atlas from space as a part of tourism atlas series has been disseminated to many regions in Indonesia. Generally, the atlas is assigned to tourism agency. However, some atlases are allocated as a supporting information at Regional Development and Planning Board (BAPPEDA) since this institution has authority to arrange regional spatial plan. In this case, tourism aspect becomes one of considerations in spatial planning process. Therefore, they can organize a proper plan, particularly to develop all tourism sites in order to increase local income and to encourage the development and collaboration of economic activities among local government, private sector, and community.

In relation with Tourism Atlas of Bangka Belitung Islands Province, the information provided by this book can be also employed to improve the current promotion action done by local government of Bangka Belitung Island Province. As seen on the local government's web (Tourism and Culture Agency of Bangka Belitung Islands Province, 2011), satellite image is not fully used to introduce tourism objects. Most of tourism objects are only described through photos and narrative as shown in Figure 9. However, some objects are already supported by satellite image taken from Google Maps (see Figure 10). Based on this situation, this atlas has two further functions, i.e.:

- a. Provides some additional information (satellite image, map) to improve the current information on the tourism web.
- b. Substitutes the source of satellite image used on the web. Local government can use low/medium/high resolution satellite images as presented on the atlas.



Figure 9. Tourism Object without Satellite Image Data



Figure 10. Tourism Object with Satellite Image Data

Apart from that, this atlas also needs improvement, particularly to update the number of existing tourism sites and their characteristic. This information can be exclusively provided by local government. On the other words, the cooperation among related institutions is required in terms of data sharing and knowledge transfer. In the future, tourism information both in the form of book and web can be complemented one to another.

#### CONCLUSION

The use of satellite image to support tourism sector is needed. Through satellite images presented on tourism atlas from space, visitors are given more inclusive information to learn the situation of the tourism objects. In the future, the appearance of satellite image on the atlas can be improved by adding some features, for instance 3d dimension and higher resolution satellite imagery.



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## BIOGRAPHICAL NOTES

The author has been working at Center for Atlas and Spatial Planning, National Coordinating Agency for Surveys and Mapping (BAKOSURTANAL) since February 1<sup>st</sup>, 2005. The main task is focused on developing several thematic atlases in the form of printed book (atlas) and digital format (multimedia and web GIS). Author has written several papers in collaboration with another researcher, as follow:

- a. Spatial Data and Geographic Information System (GIS) Application for Supporting Sustainable Tourism, published at The 1<sup>st</sup> International Symposium for Sustainable Humanosphere (ISSH), 3 October 2011 in Maluku, Indonesia.
- b. The Utilization of Satellite Imageries to Promote Tourism Objects of North Sulawesi Province, Indonesia, published at International Cartographic Conference (ICC), 3 – 8 July 2011 in Paris, France.
- c. Comparing Scoring Method and Modified USDA Method to Determine Land Use Function in Spatial Planning, published on Geoinformatika Magazine.
- d. Landslide Susceptibility Mapping with Heuristic Approach in Mountainous Area, published at International Society of Photogrammetry and Remote Sensing (ISPRS) Technical Commission VIII Symposium, 9 - 12 August 2010 in Kyoto, Japan.
- e. Integrating Geo-Hazard into land Capability Assessment for Spatial Planning, published at The 1st International Conference on Sustainable Built Environment, 27 – 29 May 2010 in Yogyakarta, Indonesia.

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