

Development of Provincial Road Data Base Based on Geographic Information System for Accessibility to Strategic Areas of National Tourism in Bali

Kadek Wisnu Bayupati¹, I Ketut Sumantra², Nyoman Utari Vipriyanti³

Departement of Regional Development Planning and Enviromental Management,
Post-graduate Program Mahasaraswati University Denpasar

Abstract: *The Road is a transportation infrastructure that has an important role in supporting economic activities. Characteristics of a road will affect the performance of the road. The preparation of a data base of road-based geographic information system needed to accommodate the needs of the stakeholders in determining the type of road handling. Research conducted at provincial road sections in Bali. The purpose of the research was to analyze the characteristics of provincial road and designing data base information provincial road which became the responsibility of the Department of public works and Spatial Bali province in the form of program-based geographic information systems. Data collection by survey. Data processing is descriptively quantitative and produces a data characteristic of provincial road. The results show that provincial roads in good condition in 2017 only amounted to 50.29% and there are still wide provincial roads in Bali that have not met the applicable regulations although in terms of connectivity, provincial roads in Bali are connected with the National Tourism Strategic area. This study also produces the design of provincial road data base in Bali based on geographic information system.*

Keywords: characteristics, geographic information systems and road

1. Introduction

Road is a unified road network system that connects growth centres with other regions so that roads have an important role to play in developing all development areas in an effort to achieve inter-regional development level (Risdiyansyah, 2014)

Economic development of Bali Province is dominated by tourism sector. With a total area of 5,636.66 km² or 0.29 percent of the archipelago of Indonesia, Bali is one of the main tourist destinations that have the beauty of nature and balanced with the religion and culture. In 2015, foreign tourists who come directly to Bali reach 4,001,835 people and in 2016 the visit reached 4,927,937 people or experiencing growth of 23.14% (Bali Central Bureau of Statistics, 2017). Sufficient road infrastructure is needed to support such economic growth.

Data and information able to show the situation and characteristics of transportation is the first step to improve the service of transportation to the community because accurate data base data information is very determining the quality of the road network plan (Jurniadi et al, 2014) A dynamic road network information system is needed to accommodate rapid data changes and facilitate data collection, data storage, data access, analysis and display of data quickly and integrated between sectors (Setiawan, 2013). This rapid technological development enables information technology to be utilized as an information tool for the road network in the form of a geographic information system so as to facilitate the users of the system to know the condition of the road network (Endayani, 2016). The management of information on the provincial road network in the Public Works and Spatial Planning of Bali Province field is still done manually without the digital map has many disadvantages that the resulting information is less accurate,

still using conventional maps that are not in accordance with geographical conditions, data, and difficulties in making data changes. From the description above, can be formulated several problems, including :

- 1) What are the characteristics of provincial roads under the responsibility of the Bali Public Works and Spatial Planning Department?
- 2) How is the design of the Road Database of Province Based on Geographic Information System?

The purpose of this research is:

- 1) To analyze the characteristics of provincial roads under the responsibility of the Bali Public Works and Spatial Planning Department.
- 2) To design the provincial road information database which is the responsibility of Public Works Department and Spatial Planning of Bali Province in the form of Geographic Information System based program.

2. Review of Related Literature

According to the Government Regulation of the Republic of Indonesia Number 34 Year 2006 concerning roads, the definition of roads is a land transportation infrastructure covering all parts of the road, including complementary buildings and equipment intended for traffic, located on the soil surface, above the soil surface, and / or water, as well as on the water surface, except railroads, lorries, and cable roads. Public roads according to their status are grouped on national roads, provincial roads, district roads, urban roads and rural roads. The authority of provincial road operations is the responsibility of the provincial government.

Good road pavement conditions will affect the comfort and safety of road users, accidents that occur on the highway in addition to caused by the driver is also influenced by the existing road conditions. So that the road conditions in

addition to affect the convenience of road users also greatly affect the safety of road users. Examination of the condition of the provincial road pavement is carried out based on the guidance of Procedure of Survey of City Road Condition Number 018 / T / NKT / 1990. Examination of road conditions is done by observing visually so that the data obtained correctly. In controlling traffic flows, one important aspect is road capacity and its relation to speed and density. Capacity is defined as the maximum current level at which the vehicle can be expected to pass through a piece of road over a period of time for lane conditions, traffic control and prevailing weather conditions. The width of the road lane the higher the capacity and vice versa. According to Government Regulation Number 34 Year 2006 concerning roads, the width of road pavement for provincial roads is 7.5 meters.

According to Government Regulation Number 50 Year 2011 concerning the Master Plan of National Tourism Development 2010-2025, the National Tourism Strategic Area, hereinafter abbreviated as KSPN is a region that has the main function of tourism or has potential for national tourism development that has an important influence in one or more aspects, such as economic, social and cultural growth, natural resources empowerment, environmental carrying capacity, and defense and security. In Bali Province, 10 (ten) regions included in the National Tourism Strategic Area are: Kintamani-Danau Batur and Surroundings; Kuta-Sanur-Nusa Dua and surrounding areas; North Bali / Singaraja Area; Karangasem- Amuk and surrounding areas; West Bali National Park and Surrounding Area; Tulamben-Amed and its surroundings; Bedugul and its surroundings; Nusa Penida and its surroundings; Ubud and surroundings and Besakih-Gunung Agung and surrounding areas.

According to Prahasta (2006), Geographic Information Systems can integrate spatial data (vector maps and digital images), attributes (database system tables) as well as other important properties. It is these capabilities that distinguish geographic information systems with other information systems and make geographic information systems more useful in providing information closer to real-world conditions, predicting outcomes and strategic planning. Geographic information systems are designed to collect, store and analyze objects where geographical location is an important characteristic. Conceptually, GIS can be seen as a collection of multiple maps represented into layers, where each layer is linked to another layer. (Maya, 2011). All layers in the GIS can be combined or overlay with each other in accordance with the wishes of users system. In a simpler process, GIS allows an automated version of a map analysis. For example, overlay analysis is a function of the most common and widely used GIS.

3. Research Methods

The study was conducted in 2017 on road segments whose status is provincial roads spread across 9 districts / cities in Bali connecting provincial capitals with district capitals, tourism areas, economic and agricultural areas and transport nodes in Bali. Data collection method applied in this research is survey research with quantitative descriptive strategy, where research more lead to disclosure of a

problem. Data processing using GIS is chosen because GIS program capability can answer the need of efficient information system and able to manage data with complex structure and geographical based (spatial) like road network and because SIG able to store, analyze, present data both spatial data and data attribute (table), able to answer spatial question (how far distance, where the position of certain object / path) and non-spatial question (how long and how wide) so as to provide more informative data compared to other computer-based Information System that can finally assist the process quick and precise decision making.

The parameters used to determine the priority level of provincial road maintenance or how urgent / urgent a road segment to be addressed are: how big is the extent of road damage, how wide the current provincial road is and how the provincial road connectivity to the tourist areas and the economy in Bali.

4. Findings and Discussions

In accordance with Governor's Decree Number 2063/03-C / HK / 2015. The total number of provincial roads in Bali totalling 111 segments with total road length is 743,34 Km.

Based on the research results obtained the following results :

- 1) From the characteristics of provincial roads in Bali studied namely :
 - a) In relation to the condition of provincial road pavement in Bali, the number of provincial roads in good condition is 373,85 Km or 50.29%, medium condition is 241,05 Km or 32,43% is as long as 128,44 Km or equal to 17,28% and there is no provincial road that suffered serious damage condition. The type of provincial road damage is largely a type of crack damage.
 - b) Related to the width of the provincial road pavement in Bali, provincial roads with a width of more than or equal to 7.5 meters of 36 sections, while provincial roads with width less than 7.5 meters of 75 segments.
 - c) In relation to provincial road connectivity to the National Tourism Strategic Area in Bali, observations indicate that there are 55 segments connected to the National Tourism Strategic Area, while the other 56 sections are the connecting link between the provincial capital and the regency / municipal capital as well as access to the National Strategic Area in Bali Province.
- 2) Database Design of Provincial Road Based on Geographic Information System:
 - a) Here are the steps taken to create administrative spatial data using maps obtained from the Public Works Department and Spatial Planning Bali Province :
 - Insert map layer of Bali Island in the form of open street map contained in ArcGis. This type of map was chosen to make it easier to define the road segment to be used as the baseline as shown in Figure 4.1

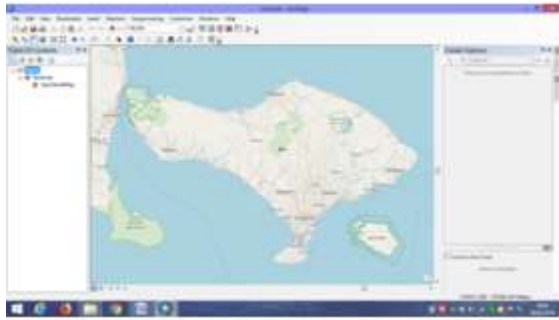


Figure 4.1: Open street map on ArcGis
 Source: Analysis Result, 2017

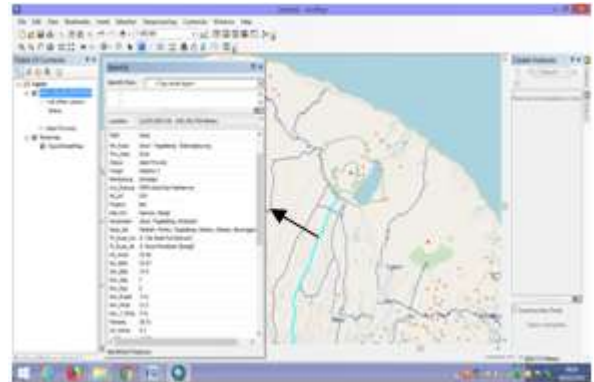


Figure 4.3: Information on ArcGis
 Source: Analysis Result, 2017

- Inserting a provincial roadmap layer into the ArcGis work field to determine the provincial roads in Bali. It is marked in blue as shown in Figure 4.2



Figure 4.2: The provincial road line in Bali
 Source: Analysis Result, 2017

- The spatial data that has been created then comes with information relating to the spatial data. The information is inserted into the table attribute. such as Table 4.1

Table 4.1: Table attributes of provincial roads

Source: Analysis Result, 2017

- Views in provincial road database information should be easily understood and used by users, as in this menu there are attribute data that tend to be most commonly seen by users. The ArcGis layout map view containing the provincial road database information can be seen in Figure 4.3

In Figure 4.3 the selected road is Jalan Ubud-Tegalalang-Bubungbayung. The line on the provincial road turns blue toska in contrast to other blue colored roads and the road information is seen in the table designated by the arrow.

5. Conclusions and Suggestions

5.1 Conclusions

Based on the findings and discussion, it can be concluded as follows:

- 1) Characteristics of provincial roads in Bali are viewed from the condition of road pavement, only 50.29% of provincial roads in Bali are in good condition, the rest are in moderate and damaged condition. The width of the provincial road pavement with a width of more than or equal to 7.5 meters is only 36 segments, while less than 7.5 meters of 75 segments. The provincial road connectivity to the National Tourism Strategic Area shows there are 55 streets of 111 provincial road links connected to the National Tourism Strategic Area.
- 2) The establishment of a provincial road database design in Bali based on Geographic Information System which contains information on the characteristics of provincial roads in Bali which are the responsibility of the Public Works Department and Spatial Planning of Bali Province.

5.2 Suggestions

Based on the conclusions of the results of findings and discussion, we can suggest the following :

- 1) It is necessary to prioritize the handling of roads in the form of improving the structure and capacity of the provincial road segments that have not reached the good condition and the width that has not met the applicable standards and regulations.
- 2) There needs to be coordination between the field within the Public Works and Spatial Planning Office of Bali Province related to the design of data bases in each field so that compiled 1(one) map based data base Geographic Information System which is the responsibility of the Public Works Department and Spatial Planning Bali Province.

References

- [1] Bali Central Bureau of Statistics. 2017.
- [2] Bali In Figures 2017. Denpasar.
- [3] Directorate General of Highways. 1990, Technical Guidelines for Planning and Programming of Roads of District. Directorate General of Highways, Directorate of Road Program Development.
- [4] Endayani, Sri. 2016. Geographic Information System for Road Networks in Samarinda City Region Using Digital Maps. Journal of AGRIFOR, Vol. XV, No. 1, ISSN: 1412 - 6885.
- [5] Juniardi, Ferry., Azwansyah, Heri. 2014. Preparation of Geographic Information System of Kapuas Hulu Sub-district Transportation Infrastructure. Journal of ELKHA, Vol. 6, No. 1, 6-12.
- [6] Maya,I Nyoman Jagat. 2011. "Preparation of National Road Database Based on Geographic Information System (Case Study: National Road of Bali Province Under Responsibility Snvt P2jj Metropolitan Denpasar)", (Thesis) Denpasar.Udayana University.
- [7] Government of the Republic of Indonesia. 2004. Law of the Republic of Indonesia Number 38 Year 2004 Concerning the Road. Jakarta.
- [8] Government of the Republic of Indonesia. 2006. Government Regulation Number 34 Year 2006 concerning Roads. Jakarta.
- [9] Government of the Republic of Indonesia. 2011. Government Regulation Number. 50 Year 2011 concerning Master Plan of National Tourism Development Year 2010 - 2025. Jakarta.
- [10] Regional Regulation of Bali Province, 2014. Regional Medium Term Development Plan of Bali Year 2013-2018. Denpasar.
- [11] Prahasta, Eddy. 2006. Geographic Information System Build Web-based GIS Application with MapServer. Informatics. Bandung.
- [12] Risdiansyah., Isya, M., Saleh, Sofyan M. 2014. Priority Study of Handling of Bireuen National Road - Lhokseumawe- Pantan Labu. Journal of Civil Engineering. Vol. 3, No. 2, ISSN 2302-0253.
- [13] Setiawan, Budi. 2013. Monitoring the condition of Road Based Geographic Information System To Assist the planning and construction of Depok City Road. UG Journal. Vol. 7, No. 05, 23-25.
- [14] Bali Governor's Decree. 2015. Number : 2063/03-C / HK / 2015 Concerning Roads By Their Status As A Provincial Road in Bali Province, Denpasar. Public Works Department and Spatial Planning Bali Province.