

# INNOVATIONS & NEW STANDARDS FOR VILLAGES MAPPING IN INDONESIA

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## ABSTRACT

Rural development is one of the priority programs in Indonesia today. Upto two billion Indonesian Rupiah villages-fund will be granted for each village. Rural development requires comprehensive planning. This requires a village map and village information system. All this must be prepared with the principle of alignment, empowerment and acceleration. The research was conducted on several types of villages in Indonesia. From suburbs villages, typical rural villages, villages in forest areas, coastal and small islands villages, villages in isolated locations until to traditional villages. The research was conducted by survey and focus group discussion with the participants of village development activists. The result of this study is that village development requires large-scale maps of up to 1: 5,000 but does not require the geometric quality prevalent on topographic map of 1: 5,000. This inaccuracy affects the accuracy of the village area and on the amount of village funds, but all are within the limits of tolerance..

**Keywords:** villages mapping, mapping innovations

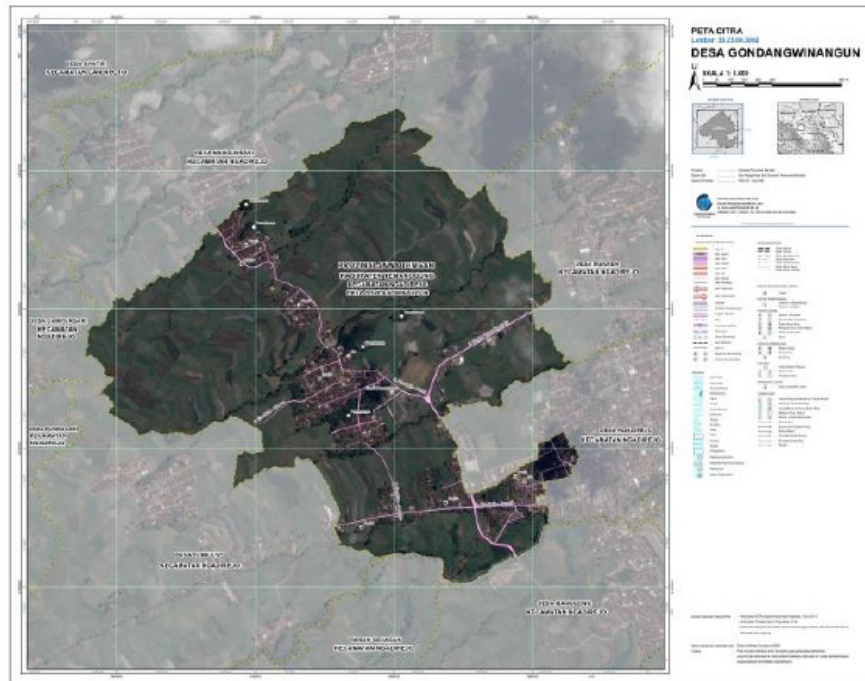
## INTRODUCTION

Rural development is one of the priority programs in Indonesia today. Upto two billion Rupiah villages fund will be granted for each village. Rural development requires comprehensive planning. This requires a village map and village information system [1].

The Geospatial Information Agency of Indonesia is the only responsible institution in making topographic base map national wide. Village map is seen as a kind of topographic map which is cropped by the village border and made in large scale. Recently, village map products in Indonesia is more similar to the standard topographic map “peta Rupa Bumi Indonesia” or RBI in scale 1:5000 [2].

The map has 8 main layers as prescribed in the Geospatial Law, i.e. coastline, hypsography (contour), hidro-network (rivers), utilities and transportation network (roads), landmarking buildings, landcover (vegetation), administrative boundary, and geographic names (toponims). The main data sources are aerial photos or high resolution satellite imageries and additional field completing work especially to identify public building, administrative boundaries and geographic names. These all are high cost. During past 3 years, only small part of villages in Java, Bali and Nusa Tenggara has mapped newly. Large part has enlarging map from RBI 1:25.000 completed with ortho-images from hires satellite imageries Pleiades and Worldview-2 (resolution better than 0.5 m).

There is an idea to accelerate the village map production, but with the principle of alignment, empowerment and acceleration. The alignment principle said the maps must be made with the empathy to the villages conditions. There are several type of villages, which should be not seen as homogeneous. There are suburban villages, agricultural villages, villages in forested region and villages in national parks. There are village on mountainious region, and villages in coastal area and small islands. There are villages near state boundary area and isolated traditional villages. The empowerment principle said villages mapping should involve the villages’ people. The villages people should later do the optimal use, maintenance and update the data for their own need, not necessary the engineer or surveyor from the Geospatial Information Agency. It means that village mapping should be easy, and only minimal training should be enough already. The acceleration principle said that villages mapping should be done as soon as possible. The president of Republic Indonesia hope that all villages’ maps of Indonesia should be finished by the terminus of his presidency, and it is October 2019 [3].



**Figure 1. Typical village map in rural area [3]**

The map is produced according the Indonesian National Standard SNI 8202:2015 about accuracy of topographic base maps [4]. The accuracy of villages map 1:5000 according this standard should be 1 m both in horizontal and vertical if we use the class-1 accuracy, or just 2.5 m in class-3 accuracy.

**Table-1. The accuracy of topographic base maps according SNI 8202:2015**

No	Skala	Interval kontur (m)	Ketelitian Peta RBI					
			Kelas 1		Kelas 2		Kelas 3	
			Horizontal (CE90 dalam m)	Vertikal (LE90 dalam m)	Horizontal (CE90 dalam m)	Vertikal (LE90 dalam m)	Horizontal (CE90 dalam m)	Vertikal (LE90 dalam m)
<b>1</b>	1:1.000.000	400	200	200	300	300,00	500	500,00
<b>2</b>	1:500.000	200	100	100	150	150,00	250	250,00
<b>3</b>	1:250.000	100	50	50	75	75,00	125	125,00
<b>4</b>	1:100.000	40	20	20	30	30,00	50	50,00
<b>5</b>	1:50.000	20	10	10	15	15,00	25	25,00
<b>6</b>	1:25.000	10	5	5	7,5	7,50	12,5	12,50
<b>7</b>	1:10.000	4	2	2	3	3,00	5	5,00
<b>8</b>	1:5.000	2	1	1	1,5	1,50	2,5	2,50
<b>9</b>	1:2.500	1	0,5	0,5	0,75	0,75	1,25	1,25
<b>10</b>	1:1000	0,4	0,2	0,2	0,3	0,30	0,5	0,50

This standard, especially class-1 accuracy is quite hard. Indonesia consisted of more than 190 million hectare lands. According the Statistical Agency, there are more than 75700 villages in the whole country and they are heterogenous. The area of the largest village is about 458,000 hectare, while the national averages is 2,900 hectare. An obligation of mapscale 1:5,000 for all villages will be still in dream [5].

An innovation with the consideration of three principle - alignment, empowerment and acceleration – together, would be very difficult without leave the standards and specification. Therefore the objectives of the research are: (1) to evaluate the existing standards and specification for villages mapping; and (2) to find innovations in villages mapping with several conditions.

## MATERIALS AND METHODS

The research was conducted on 4 types of villages in Indonesia, which some of them could represent also another type.

1. Gondangwinangun in Temanggung Central-Java province (see fig.1) is a typical agricultural village in Indonesia. Some similarities also found in Babakanpari in Bogor, West-Java which is mapped participatory by village development activist.
2. Lembang is selected as sub-urban village. It is a village with agricultural area but also with hotel and manufacturing industry.
3. Kanekes is isolated traditional villages in Banten which refuse to has any technology included electricity and road for motor vehicles. Large part of Kanekes is covered by protected forest. Mapping in Kanekes can use only hi-res satellite imagery completed with on-foot survey with distance estimation by step counting. no modern survey instrument could be applied. Some villages in Kutai Barat (East Kalimantan Province) and Mimika (Papua province) has similar condition, despite they don't refuse technology. Some village people and leader themselves don't know the boundary of their territory. So we believe that the traditional boundary is the about 2 days on foot in hunting wild animals.
4. Temajuk in Sambas West Kalimantan is village in states border mapped participatory by field practising students [6]. Temajuk is also village in coastal area. Pramuka Island is a small island village in front of Jakarta.

The research was conducted by desain various kind of village maps, experimenting a survey idea, and focus group discussion with the participants of village buerocrats, academician and development activists form civil societies.

## RESULTS AND DISCUSSION

In Gondangwinangun (see Fig. 1), the use of hi-res ortho imagery seem sufficient, although it is in hilly terrain, and terasering farm is clearly visible [7]. In agriculture area, dense settlement is rare so that ortho-image with spatial resolution 0.5 m and Digital Elevation Model from RBI 1:25.000 seems sufficient for village map of 1:5000. But in Lembang (Fig. 2), where denser settlement is exist, higher accuracy map will be necessary.

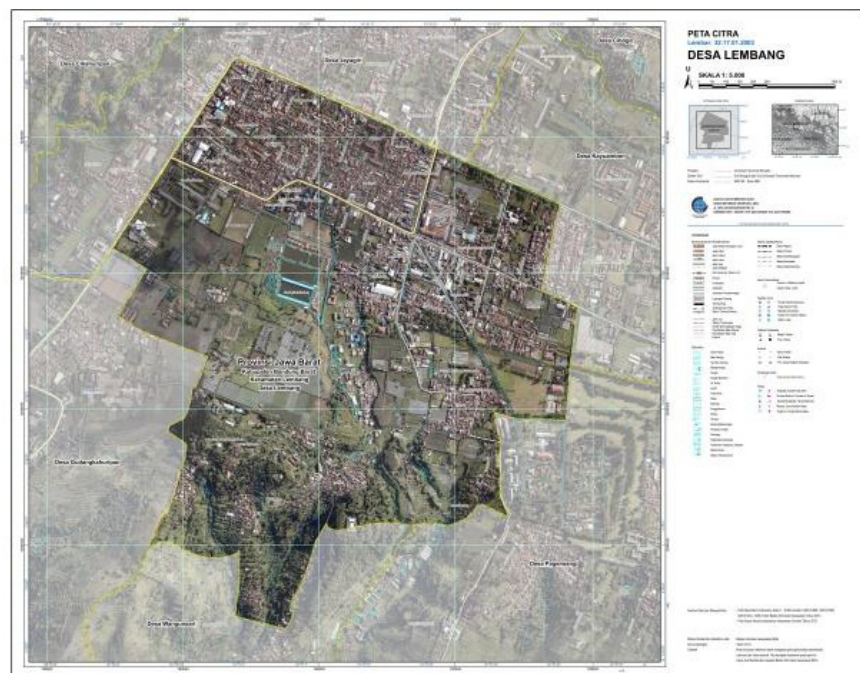
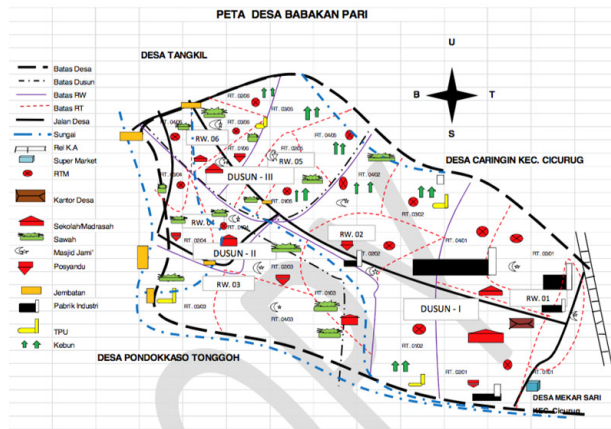


Figure 2. Village map in sub urban area [1]

In Babakanpari Bogor, participatory mapping (Fig. 3b) has produced sketch (not yet “map” in geospatial law definition) but useful enough for the work of development activist (Fig 3a). Although some participatory mapping organization has used satellite imageries, handheld GPS and also drone with camera, but many of them has little competence in produced technical map, but sketch – but their sketch is in many tasks very useful already.



**Fig 3a. Result of Participatory Mapping (sketch)**

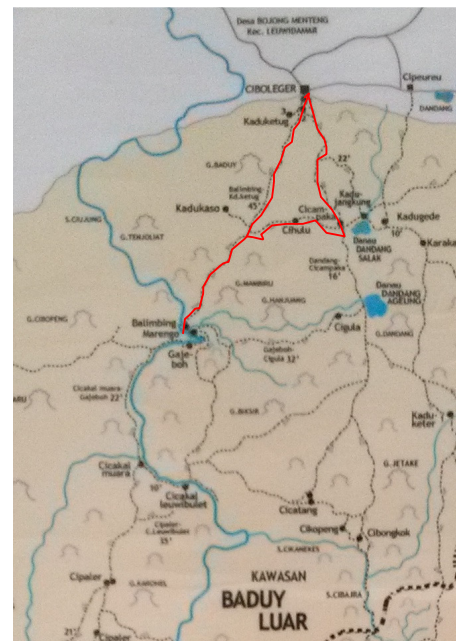


**Fig. 3b. Workshop of Participatory Mapping**

In Kanekes, the research team conducted a survey of several villages in Outer Badui (Baduy Luar) to directly know the access and physical condition of some of Kanekes Village directly. Search starts from Kanekes Village Office then follow the path to Kampung Gajeboh then to Kampung Cihulu, Kampung Cicampaka, Kampung Kaduketug and back to Kanekes Village Office. The search was conducted with the help of Kanekes village map in the village office to find out the route between villages. The existing Kanekes map is made by on foot survey with distance estimation by step counting (Fig. 4a). In Outer-Badui, where the technology restriction is not so strict like in Inner-Badui (Badui Dalam), we “callibrated” the step method with GPS tracking. The result in is Fig 4b. We surprised with the accuracy of “on foot steps mapping” [8].



**Figure 4a. Typical “road” in Kanekes village**



**Figure 4b. Callibrating Step-counting map with GPS tracking**

In Temajuk, some students made Tourism Map, although there is seldom tourist to this very isolated village at the border to Serawak-Malaysia. Some data sources is taken from Google-map and SRTM data (Fig. 5). The map will be created using GIS software, so larger maps scale is possible. This map has shown also that isolated village could have also nice map.



**Figure 5. Tourism Map in Temajuk Village**

Village empowerment and development programs have long been implemented in Indonesia, although - initially - the name may not be village empowerment or development. Since the beginning of independence, especially since the New Order era, the development of agriculture is done almost in all parts of Indonesia as one way of doing rural and village development. Agricultural development will not be separated from rural development, so that agricultural development is inherent in rural development - agricultural and rural development.

Although it has been a long time ago, this kind of development pattern is still needed in Indonesia, because most of our people are still active in agriculture in rural areas. However, since activities in the village do not merely include agricultural activities, but also other activities, the scope of activities needs to be expanded, not only to include on farm activities, but also on the processing of agricultural products and other natural resources (off farm ), as well as other non-farm activities (non farm), such as craft industry, tourism, trading. This pattern of rural development is known as integrated agricultural and rural development - integrated agricultural and rural development. This pattern of development is not only the physical development of agriculture, but also has accommodated all aspects (dimensions) of human life in rural areas: physical, social, economic, environmental and others.

Currently, village development programs have involved various programs. But essentially, the development of the village utilizes all available resources in the village, both human and natural resources, and covers all aspects of community life.

As rural development encompasses all of the above activities, the "village map" we are discussing should also represent a map of all dimensions of development in the village.

Village planning and development activities require the availability of geospatial information, especially village maps. The village map not only includes the determination and affirmation of village

boundaries but also identifies and inventories the various village potentials, infrastructure conditions, demographics, socioeconomics, and so on. Through the Village Map, should also be known things that can be an obstacle in the effort to empower the potential, so that can be done step completion comprehensively.

The making of village map has various interests, among others [5]:

- knowing the position of the village against the surrounding area,
- identifying village potentials,
- inventory of village assets,
- assist village infrastructure development planning,
- help to overcome the problem of boundary disputes,
- as the basis of information for the spatial integration of regional development
- as a basis for making village development policies

The shape of village maps in Indonesia is still very diverse, both in terms of scale and method of manufacture - ranging from maps that are still manual to the already modern (digital). In relatively undeveloped villages (which account for more than half the number of villages in Indonesia), often the village map has not specified the boundaries of the territory, so the accuracy of the village map is still relatively low. The village map is also generally relatively simple, so it is not very interesting and informative. Manual maps, both contour maps, land use maps, village infrastructure maps are generally made on paper without color, making it very unattractive and less communicative. Therefore, the village map needs to be standardized, including a standard procedure and a prototype of the village map, as a basis for making a national village map.

The limited knowledge of the village and community apparatus on the importance of the Village Map is also often a constraint in the utilization of village maps that have been made though. Therefore, various types of village maps with their territorial boundaries need to be socialized to village officials and village community representatives (village heads, heads of RW) in a forum for socializing the making and utilization of the Village Map, so that the village map can be optimized for use in the planning process and development of a village.

Ideally, the Village Map should be regularly revised, as the village condition changes dynamically over time. This occurs because: a definitive region boundary change (e.g. due to the division of the village), also due to changes in the map component. However, these village map changes can be constrained by the availability of funds.

Map is a tool in conveying spatial information. Based on the function then a map should be equipped with various components and completed to facilitate the user in reading / using the map. Elements of map completeness generally include: Title, Legend, Scale, Wind direction, as well as date (map creation date).

Functionally, the necessary Village Map may include the following information maps:

- 1) Potential landscapes, natural resources and land cover: mountains, hills, rivers, land use for agriculture / plantation / livestock / fishery / forestry, mining, and the products produced
- 2) Land use maps: housing, non-housing, yards, cemeteries, and others
- 3) Map of the product processing industry in the village
- 4) Road network and utilities network maps: electricity, telecommunication, drinking water, irrigation water services
- 5) The presence of village social and economic facilities, including: education services (schools / madrasah / pesantren), health services (hospitals / puskesmas), houses of worship, economic facilities (markets, shops, cooperatives / cooperatives village units, rural credit / baitul maal), houses of worship, and others

The components number 1, 2 and 5 is standard and already exist in RBI 1:25,000. Number 3 is optional when industry exist in village. This feature is not yet standard in RBI. Number 4 is standard except drinking water which could be very simple in the villages, which could be not mapped in RBI. Poverty is one of the major problems in Indonesia. To support the goal of poverty alleviation, which is the main target of national development, it is necessary to create an additional map, the Village "Poverty Map", which gives an idea of how many people in a village are poor (break down to hamlet level, RW and RT). The map of this condition needs to be overlaid with a map of conditions and the utilization of its natural resources, so it can be seen how the appropriate approach (program) in order to overcome the problem of poverty.

With the enactment of Law no. 6 year 2014 about the village, the village serves as the subject of development, no longer as the object of development. The current village development approach is more to the bottom-up or participatory than the top-down ones. The village has the authority to govern itself, as a self-governing community. Therefore, the role of village officials is becoming increasingly important in planning and implementing development in their villages. Without being followed by their knowledge, capacity and skills (knowledge, capacity and skills) efforts, village development can not be done optimally.

The existence of a comprehensive Village Map is a necessary condition for the planning and implementation of village development. However, the existence of village maps will not benefit, if the map has not been able to be utilized by the apparatus (pamong) village optimally. Also, given that a village changes from time to time due to the development process it does, the village map must be constantly updated (updated) following the rapid development of the village.

To overcome this problem, village map design should be participatory by involving the village apparatus from the very beginning in the process of making it, although the implementation can be done by a certain technical team (consultant). With the participation of the village apparatus in the preparation of the village map, they will understand and master the detailed information presented on a village map; so that will facilitate them in doing village development planning. Then, on a regular basis, their capabilities continue to be upgraded through training programs at the regional (provincial or district / city) level.

Although the village map should be accurate, but in these Focus Group Discussions it appears that the public is not really interested in a very accurate map, but a pretty useful map, they understand enough and can update themselves. Only when they work for cadastral, or for building permission, then an incidental surveying could be done.

## **CONCLUSION**

The result of this study is that village development requires large-scale maps of up to 1: 5,000 but does not require the geometric quality prevalent on topographic map of 1: 5,000.

In some villages with huge area of forest or unpopulated part, smaller mapscale is enough.

This inaccuracy affects the accuracy of the village area and on the amount of village funds, but all are within the limits of tolerance..

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