Projection of Geospatial Human Resources In Indonesia Until 2025

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SUMMARY

In the next decade, there are lot of changes in geospatial landscape in Indonesia caused by the rise of new technologies, challenges from global climate change, coming of global market and also some new regulations after enacted of Indonesian Geospatial Law in 2011.

In 2014 and 2015, we have measured the preparedness of geospatial human resources in Indonesian government and industries. Their competence is measured to national standard of working competence, using self estimation. Some problematic for the industries is also captured. This research used methods of stratified- & purposive random-sampling in nearly all provinces in Indonesia and the questionnaires are filled by hundreds respondent.

The surveys give accurate information about distribution of geospatial human resources and industries in some aspects: expertise field, expertise level and location. Some expertise fields such as photogrammetry, hydrography and GIS software development, still need high number of human resources. However, industries in this expertise have also good competitive advantages in global market.

This paper discuss also how the demand will be fulfilled for the next 10 years with a simulation based on assumption in population growth, economic growth, effect of technology and global market development. This simulation will be useful for policy making in geospatial education and manpower.

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1. INTRODUCTION

1.1 Background

Indonesian's Geospatial Information Law No. 4 of 2011 (Article 55 & 56) ordered that Industry and human resources of geospatial information have to be competent and certified. In 2013, Geospatial Information Agency of Indonesia (BIG) launched the Indonesian National Working Competence Standards in the field of Geospatial Information (SKKNI-IG), which is the foundation of Competence Based Human Resources Development Management Systems (Badan Nasional Standardisasi Profesi, 2014). The existence of industry and competent human resources in geospatial information is urged to be held since the implementation of the Asean Free Trade in 2015. By the entry into force of the ASEAN Economic Community (AEC) in 2015, Indonesia has still a shortage of Industry and personnel who are competent in the field of Geospatial Information.

GI - Human resources (or GI - manpower) are expected to have a standard of quality that can be measured in the national or international level and be able to compete regionally and globally. They are also expected to grow in line with the dynamics of GI industry that can compete freely and openly. They are (of various levels) have the same opportunity to improve their quality and synergy with the GI's industry and the world of education. GI manpower have to be full supported by the education-world as a producer of human capital, by adjusting and sharpening academic curriculum tailored to GI-industry needs.

The population of Indonesia is about 240 million, one-third of the population of the ASEAN, and the productive population of Indonesia in 2020 will reached 60% (IMF, 2014). In 2013, there are about 4000 GI-manpower working in the government, geospatial industry, NGOs, vocational schools, and universities (Amhar, F. et al 2015). The availability of GI-manpower is still uneven and concentrated in Java (especially Jakarta and its surrounding). There are not so much certified GI - manpower, however certificate of competency is a tool for competitiveness. Job opportunities for local GI-manpower is increasingly narrow because of the ease requirements for foreign GI-manpower working in Indonesia.

1.2 Research Objectives

Research Objectives are (1) to capture the existing situation of geospatial information manpower in Indonesia, their distribution , competence type and competence level; (2) to make prediction about need of geospatial information manpower in the next 10 years. The result of prediction could give a

benchmark for the education sector, how to fulfill the manpower gap and which competence type and level which they should have

2. MATERIAL & METHODS

In Indonesia we have already the national standard of working competence in geospatial information, but the certification and accreditation is not yet running. Therefore it is also difficult to count the certificate bearer. We decided to uses self estimation in form of questionnaire (Carmeli, A. & Freund, A. 2004). The respondents should select which competence indicator they have. The indicators are taken from the standard of working competence. From the answers, we can conclude which competence's type and competence's level the respondent has. There are 6 competence types, i.e. Terrestrial Surveying, Hydrography, Photogrammetry, Remote Sensing, GIS and Cartography The competence level is divided in 9 levels, but in this research, only level 3 to level 9 will be practically effective. The research used stratified- & purposive random-sampling in nearly all provinces in Indonesia and the questionnaires are filled by hundreds respondent. The cities of respondents are classified using its population density. It is assumed that denser populated cities have more geospatial problematic and also geospatial job opportunities. We like to see how good is the problem well distributed.

For the simulation the need and demand of GI-manpower in the future, we can assume that the population growth according the Central Statistics Agency is 1.9%, the domestic economic growth is 3%, the impact of regional free trade area is about -1% and the impact of technological efficiency is also -1%.

3. RESULTS & DISCUSSION

3.1. Existing Situation

This survey gives a portrait in Table 3-1 that GI manpower is dominated by Vocational High School graduates and mostly in Central Government Offices (especially Land Offices) and GI-industries. Many other industry such as in mining, agro-forestry or real estate take their GI-manpower from GI-industries in contractual base.

Table 3-1 Distribution of GI manpower according education level and workplaces.

No.	Workplaces	Educational Level			
		VHS	Vocational	Bachelor	Post Graduates
1	Central Government Offices	1.872	-	1.144	67
2	Cities / Municipalities Offices	79	237	948	316
3	States Own Enterprises	60	-	319	20
4	Mining Industries	17	11	84	0
5	Agro-Forestry Industries	26	5	71	0

6	Real Estate Industries	21	14	106	0
7	Geospatial Information Industries	1.712	86	999	57
8	Cities Consultant Offices	22	15	175	7
9	NGO	9	14	56	14
	Total (8.584)	**3.817**	**382**	**3.903**	**481**

Since Java Island is most populated and best developed island of Indonesia, it is not astonish when also Java have the most number (82%) of GI manpower (see Fig. 3-1)

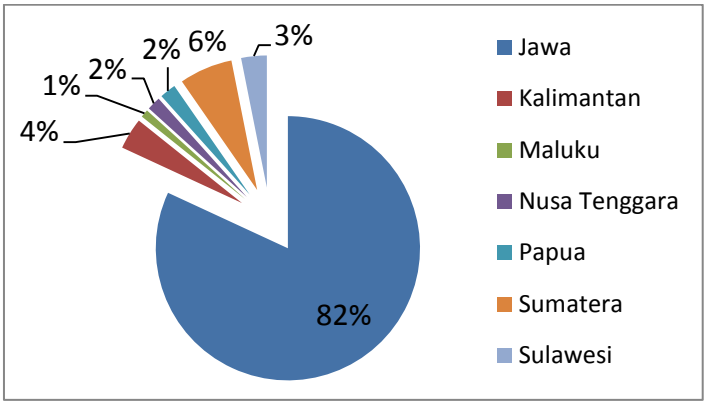

Fig 3-1 Procentages of GI-manpower availability in big islands

According to working field, big number the existing GI manpower in Indonesia are working in surveys & mapping (41%), followed by research and development (16%), spatial planning (13%) and land cadaster (12%).

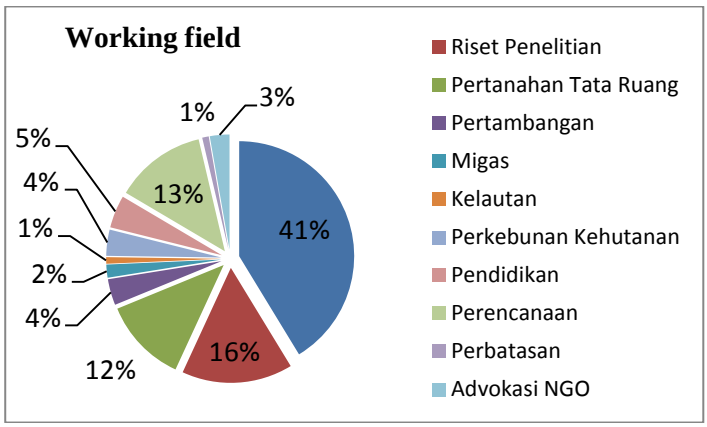

Fig 3-2 Procentages of GI-manpower in working fields

After self estimation using questionnaires, we got the competence type and competence level of all GI manpower (Table 3-2).

Table 3-3 Profile of respondent according competence type and competence level

Competence Level	Operator	Analyst			Expert		
	3	**4**	**5**	**6**	**7**	**8**	**9**
Terrestrial Surveying	6	2	7	10			
Hydrography	1	1	3	3	4	11	
Photogrammetry	1	3		3	1	1	
Remote Sensing	0	0	0	4	3	7	
GIS	13			10	1	2	4
Cartography	5			2	2		

3.2 Prediction

The result of simulation is in the table 3-4 give the number of manpower gap to be fulfill both from VHS or from universities. In table 3-5, the manpower gap will be breakdown in 6 competence type.

Table-3-4 Result of Geospatial Information Manpower Simulation

Year	**Need Projection**	**Manpower availability**	**Manpower gap**	**Manpower fulfillment**	**Fulfillment plan**
2015	31,500	8,584	22,917		22,917
2016	32,414	11,084	23,830	2,500	21,330
2017	33,353	13,584	22,270	2,500	19,770
2018	34,321	16,084	20,737	2,500	18,237
2019	35,316	18,584	19,233	2,500	16,733
2020	36,340	21,084	17,757	2,500	15,257
2021	37,394	23,584	16,311	2,500	13,811
2022	38,479	26,084	14,895	2,500	12,395
2023	39,594	28,584	13,511	2,500	11,011
2024	40,743	31,084	12,159	2,500	9,659

Table 3-5 Projection of National Demand of Geospatial Information Manpower

Year	Terrestr		Hydrogr		Photogr		RemSens		GIS		Carto	
	VHS	BSc	VHS	BSc	VHS	BSc	VHS	BSc	VHS	BSc	VHS	BSc
2015	5,322	2,281	123	288	2,622	1,748	657	986	2,745	4,118	1,014	1,014
2016	4,953	2,123	115	268	2,440	1,627	612	918	2,555	3,833	943	943
2017	4,591	1,968	106	248	2,262	1,508	567	851	2,368	3,552	874	874
2018	4,235	1,815	98	229	2,086	1,391	523	785	2,185	3,277	807	807

Year	Terrestr		Hydrogr		Photogr		RemSens		GIS		Carto	
	VHS	BSc	VHS	BSc	VHS	BSc	VHS	BSc	VHS	BSc	VHS	BSc
2019	3,886	1,665	90	210	1,914	1,276	480	720	2,004	3,006	740	740
2020	3,543	1,518	82	192	1,745	1,164	438	657	1,828	2,741	675	675
2021	3,207	1,374	74	173	1,580	1,053	396	594	1,654	2,481	611	611
2022	2,878	1,234	67	156	1,418	945	356	533	1,485	2,227	548	548
2023	2,557	1,096	59	138	1,260	840	316	474	1,319	1,978	487	487
2024	2,243	961	52	121	1,105	737	277	416	1,157	1,736	427	427

Annotation: TERRESTR (Terrestrial Survey), HYDROGR (Hydrography), FOTOGR (Photogrammetry),
REMSENS (Remote Sensing), GIS (Geographical Information System), CARTO (Cartography & Spatial Multimedia),
VHS = Vocational High School, BSc = University's Bachelor degree.

From this simulation we can see that the largest gap will be in GIS followed by photogrammetry. It seem in corresponding with common sense. Photogrammetry, which is recently more popular with UAV and drone, and also with laser scanning, lidar and radar, is more demanded but in otherwise more difficult to learn. In the other side, GIS will be more involved in large area of new applications.

4. CONCLUSION

The surveys give accurate information about distribution of geospatial human resources and industries in some aspects: expertise field, expertise level and location, Some expertise fields such as photogrammetry and GIS software development, still need high number of human resources, However, industries in this expertise have also good competitive advantages in global market,

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BIOGRAPHICAL NOTES

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