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Geospatial Manpower of Indonesia in 2030

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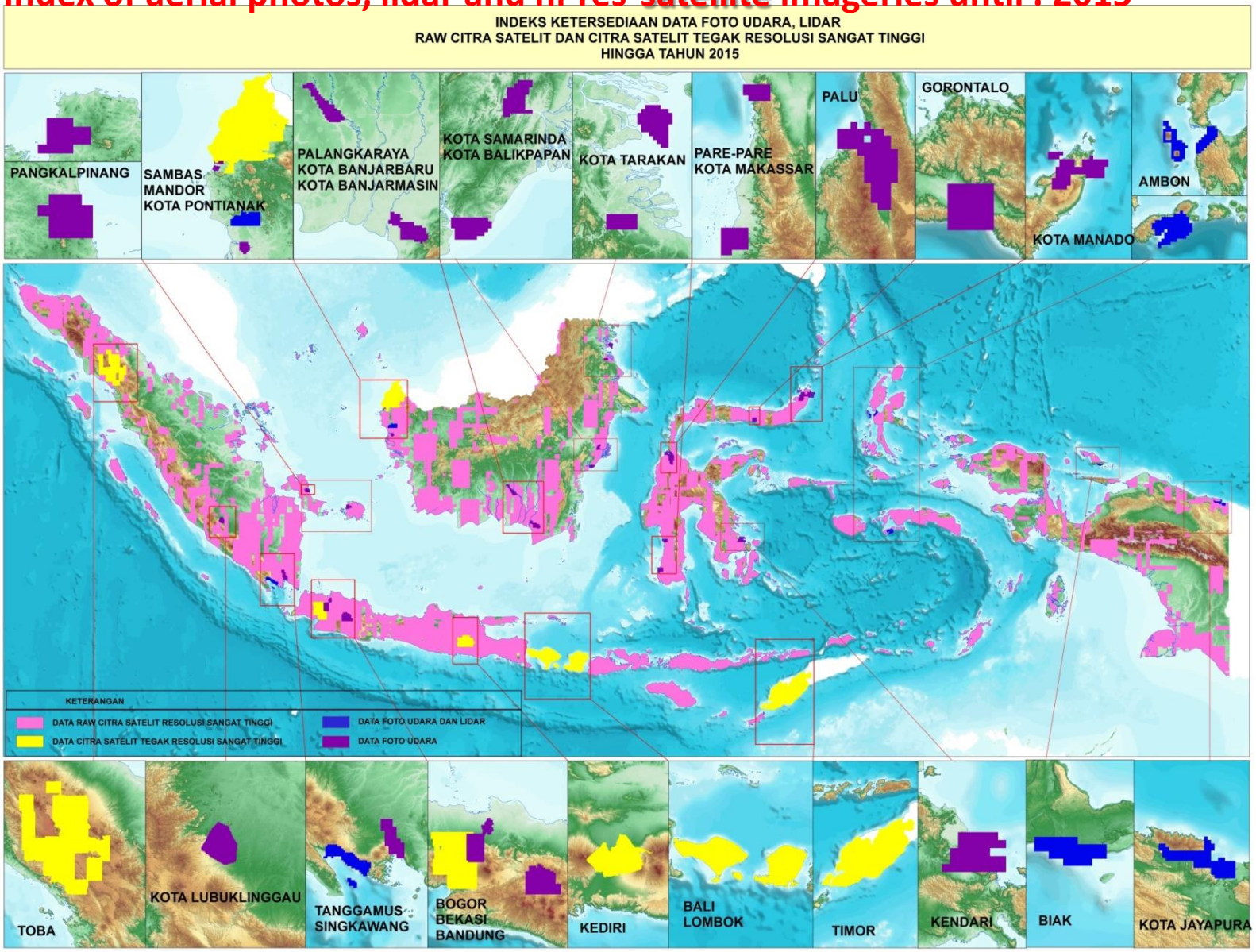
INDONESIA ???

HUGE ARCHIPELAGIC STATE

HUGE GEOSPATIAL WORK

Topographic Mapping,
Large Scale Urban Mapping,
Cadastre, Hydrography,
Disaster/Environmental Mapping,
Location Based Services,
Precission Farming, …

Index of aerial photos, lidar and hi-res satellite imageries until . 2015



HUGE DEMAND OF GEOSPATIAL MANPOWER

How much?

Which field?

Which academic level?

We need these for education planning

INTRODUCTION

- 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

MATERIAL & METHOD (1)
to estimate the total need and availability

- Economy Cake (state budget USD 200 B → GI ? → GIP ?)
- Benchmarking (to some ASEAN countries)
- Objective Simulation
    - A. Position → close / remote areas
    - B. Size → widely varied areas, land & sea
    - C. Number of Administrative Area → boundary
    - D. Scale→ level of detail
    - E. Worktypes → Technology → Production speed
- Observation

MATERIAL & METHOD (2)
to asses the fields & level of expertise

- Uses self estimation in form of questionnaire
- Respondents select which their competence indicator.
- The indicators are taken from working competence standard.
- From the answers, we can conclude which competence's type and competence's level the respondent has.

MATERIAL & METHOD (3)

- 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.
- Cities of respondents are classified using its population density.

MATERIAL & METHOD (4)

For the predition, simulation the need and demand of GI-manpower in the future, we can **assume** that :

- the **population growth** according the 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%.

GIP according dedication field

Academic

- non geospatial college
  - *Economy, Tourism, Anthropology, …*
- GI-using college
  - *planology, forestry, IT*
- Geospatial R & D / University

Business

- IG users
  - *Real Estat, Farm, Mining, Trans, …*
- GI Industrial Association
- Potential GI Users
  - *Tourism, Retail, Media, Finance, …*

Community

- Potential GI Users
  - *Consument protection-NGO, Cleric-NGO, …*
- GI producing NGO, PM-CM, *OSM,…*
- GI using NGO
  - *Eco-NGO …*

Government

BIG

- GI/Map Agency
- Land Agency
- GI users & producers: *Public Work, Energy, Mineral, Forestry, …*
- GI users
  - *Transport, Defense, …*
- Potential GI Users
  - Sport, Religion Affair, Finance, Women & Family, Law&Humanright, …

Type of GI Works

Capital-Intensive

The output depends on the capital, e.g. : satelit data acquisition or data buying data from 3rd party, …

Wisdom-Intensive

The output depends on the number of wise experts, e.g. : SOP-writing, make planning, teaching, R & D, …

Technology-Intensive

The output depends on the technology, e.g. : only radar can overcome the area under cloud cover, …

Labour-Intensive

The output depends the number of workers, e.g. : terrestrial surveying, image interpretation, quality control, …

From Reality to Data
(data acquisition, orthorectification)

From Data to Information
(interpreation, field-edit, visualization)

Scale (Level of Detail)

- Not the whole country should be in the homogene scale
- Scale priority according to population density & growth
- According simulation, coverage of the scale are:
  1:50.000 : 658.781 sqkm (35,4%),
  1:25.000 : 771.385 sqkm (41,5%),
  1:10.000 : 299.888 sqkm (16,1%),
  1:5.000 : 124.739 sqkm (6,7%),
  1:1000 : 3.804 sqkm (0,2%).
- The larger the scale, the shorter is the update cycle

Personnel Capacity

RESULTS & DISCUSSION (1)

- The effort for each sqKm Geospatial Information :
- GI-type = scale: ManHour (MH) : Technology
  situation map = 1:1000 : 50 MH: TLS
  situation map = 1:5000: 10 MH: UAS
  topo-map = 1:10.000: 5 MH: aerial/satellite img
  topo-map = 1:25.000: 2 MH: aerial/satellite img
- The working composition
  Data acquistion Operator 25%
  Interpreation/field-edit/visualization 65%
- Planning/Management/Quality Assurance 10%
- 1 sheet 1x1 m will need GIP
  at 1:1000 (1sqkm)= 50 MH; 1:5000 (25sqkm)=250 MH;
  1:10000 (100sqkm)=500 MH; 1:25000 (625sqkm)=1250 MH.

Needed Land Basic GI Personnel

RESULTS & DISCUSSION (2)

- In one year, effective working average is about 1000 hour, due to delay in planning-execution, transportation, weather and also re-training, hollidays etc.
- Considering the area, scale and capacity, the whole country needs for Basic GI is about 5006 Man-Years.
- When the BGI should be updated every 5 years, then for BGI should be reserved about 1000 Men.
- From this personnel, at least 10-20% should be in Gov for Planning, Management & Quality Assurance.
- Not all GI Personnel should be Univ-graduee, many could be trained for 1-3 month according to specific competency
- The same model should be work for Thematics GI

SKALA PETA RDTR KAB/KOTA SE INDONESIA

										MODEL EXPONENSIAL EMPIRIS					LUAS SESUAI SKALA			
										1:50k	1:25k	1:10k	1:5k	1:2k	50	25	10	5
								Jumlah		34	117	126	125	38	0	0	0	0
										A	B	C	D	E	A	B	C	D
										1	2	3	4	5	1	2	3	4
	NO PER	KODE	NAMA KABUPATEN / KOTA	JUMLAH KEC	JUMLAH KEL	JUMLAH A	LUAS WILAYAH	JUMLAH PENDUDUK	Density	9.2	68.2	504.3	3726.2	27533.1				
										9.2	68.2	504.3	3726.2	27533.1				
136	3	21.03	KAB. NATUNA	9	6	44	1511.88	87354	57.8		B					1512		
137	4	21.04	KAB. LINGGA *)	5	3	36	411.1	77078	187.5			C					411	
138	5	21.05	KOTA BATAM	8	51		969	572452	590.8				D					969
139	6	21.06	KOTA TANJUNG PINANG	4	18		239.4	160918	672.2				D					239
140	1	31.01	KAB.ADM.KEP.SERIBU***	2	6		8.69	21217	2441.5				D					9
141	2	31.71	KODYA JAKARTA PUSAT	8	44		50.56	912290	18043.7					E				
142	3	31.72	KODYA JAKARTA UTARA	6	31		162.95	1478729	9074.7					E				
143	4	31.73	KODYA JAKARTA BARAT	8	56		212.39	2146324	10105.6					E				
144	5	31.74	KODYA JAKARTA SELAT	10	65		122.46	1943473	15870.3					E				
145	6	31.75	KODYA JAKARTA TIMUR	10	65		183.24	2609638	14241.6					E				
146	1	32.01	KAB. BOGOR	40	16	410	3357.92	4038764	1202.8				D					3358
445	7	91.07	KAB. TELUK WONDAMA	6		56	5788	14165	2.4	A					5788			
446	8	91.08	KAB. KAIMA	7	1	77	18500	27908	1.5	A					18500			
447	9	92.71	KOTA SORONG	4	20		717.9	141839	197.6			C					718	
448																		
449															658781	771385	299888	124739
450															35.4%	41.5%	16.1%	6.7%

Prov-Density | Kab-Density-exp | **Kab-Density-RDTR** | Kab-Density-RDTR (2)

Ready 80%

Skala 1:	OJ/km2	area (km2) @1 m2 peta	OJ utk 1m2 peta	Luas wil Indo dalam skala ini	OJ-tuntas	OT OJ/1000
A	B	C	D	E	F	G
1,000	50	1	50	3,804	190,200	190.2
5,000	10	25	250	124,739	1,247,390	1247.4
10,000	5	100	500	299,888	1,499,440	1499.4
25,000	2	625	1250	771,385	1,542,770	1542.8
50,000	0.8	2500	2000	658,781	527,025	527.0
		Luas Daratan Indonesia =		1,858,597	Jumlah =	5006.8

Overview of National GIP Need

RESULTS & DISCUSSION (3)

	Government	Business	Community	Academic
Basic GI	200	800	2000	700
Primary TGI	5550	22200		
Potential TGI	350	1400		
GI-Infrastructure	200	800		
Sum	6300	25200	2000	
Grandsum total	34200			

- GI-Infrastructure: 10 in each of 20 GI-Clearance-Houses.
- Community : about 4 men in each of about 500 municipality
- Academic: ratio lecturer:student ~ 1:10, to educate 4 students-years which regerate all needed GI Personnel in 20 years.

Demand according Business World

RESULTS & DISCUSSION (4)

- Need of surveyors / mapper (non univ-graduee)
- Palm farm 8 Mio ha: 5000 persons
- Rubber farm 10000
  - Expansion for the next 10 year, now 1500 ha/person
  - If setup finished, maintainance 8000 ha/person
  - Geodesy 80% (BSc 15%, non unigrad 65%)
  - Geography/Tematic 20% (BSc 12%, non unigrad 8%)
- In mining industry 5000 persons
- In construction & engineering 2000 persons
- In geospatial product reseller / consultant 1000 persons
- Others branch: 3000 persons.

Estimated Total > **26000**

RESULTS & DISCUSSION (5)

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**

RESULTS & DISCUSSION (6)

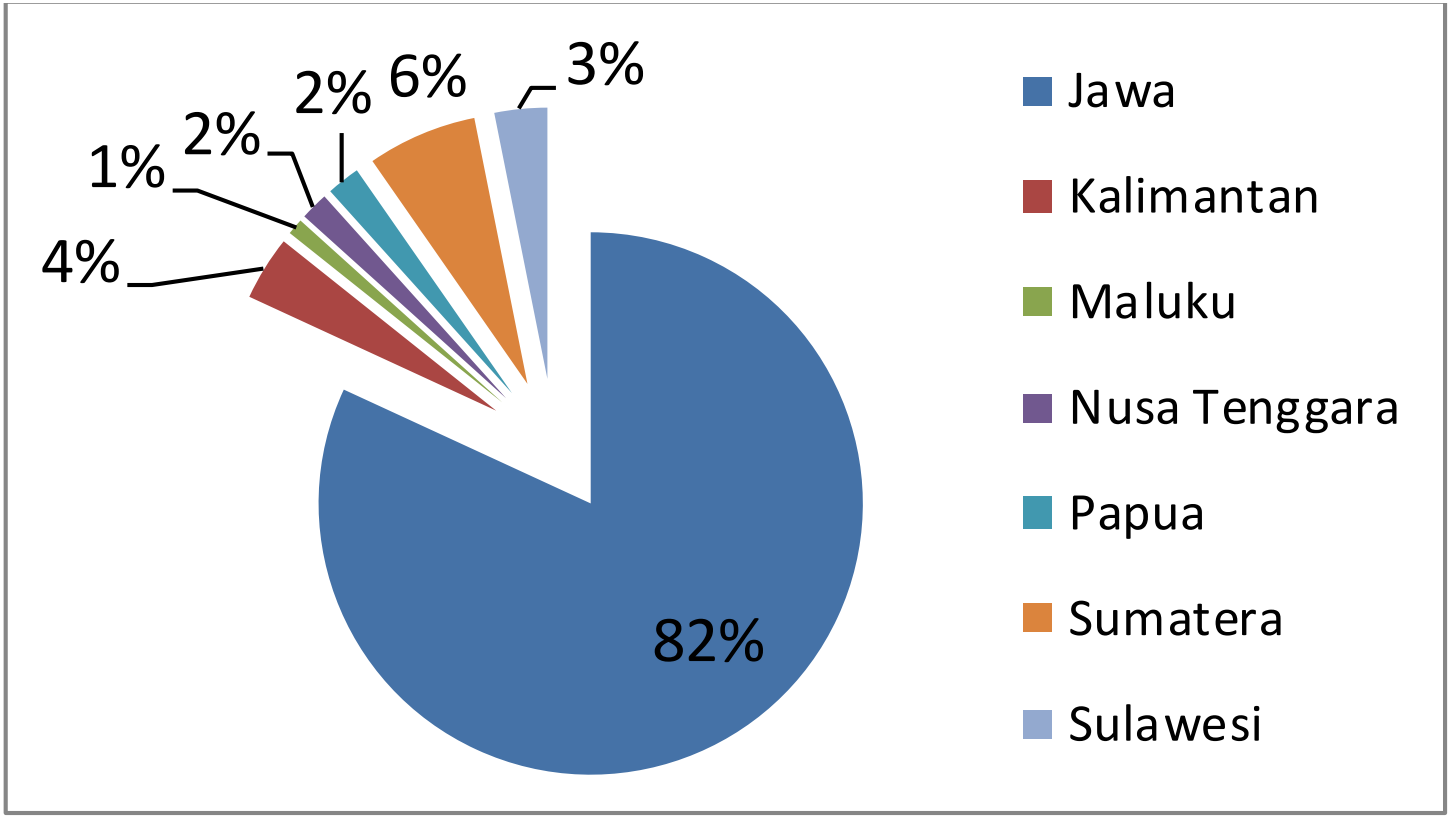


Fig 3-1 Procentages of GI-manpower availability in big islands

RESULTS & DISCUSSION (3)

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%).

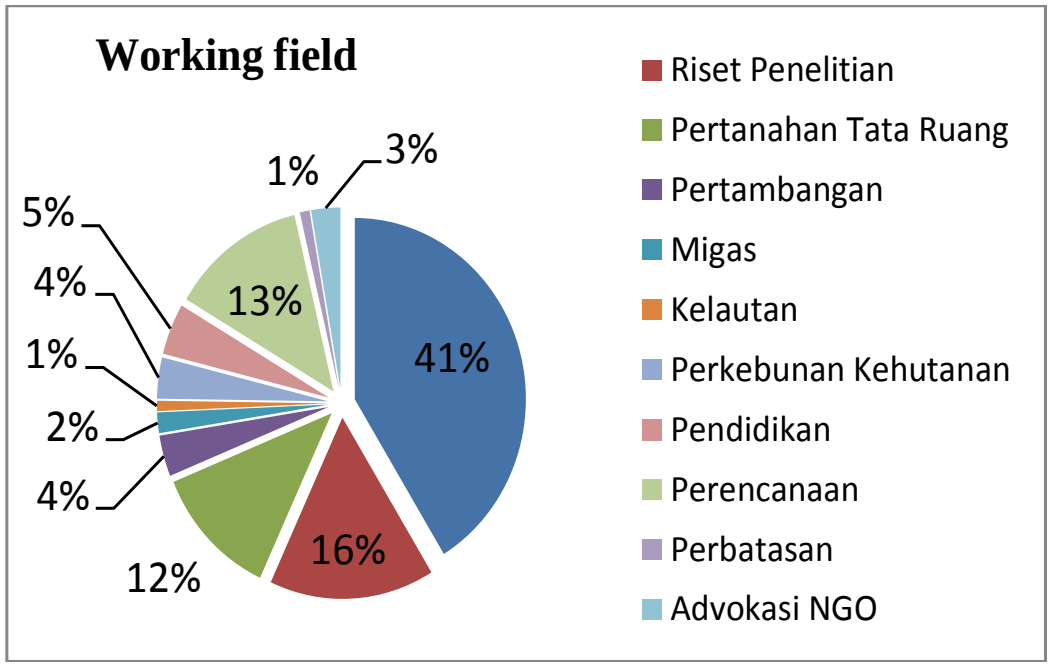


Fig 3-2 Procentages of GI-manpower in working fields

RESULTS & DISCUSSION (7)

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		

RESULTS & DISCUSSION (8)

Year	Need Projection	Manpower availability	Manpower gap	Manpower fulfillment	Fulfillment plan
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
2025	41,924	33,584	10,841	2,500	8,341
2026	43,140	36,084	9,556	2,500	7,056
2027	44,391	38,584	8,308	2,500	5,808
2028	45,678	41,084	7,095	2,500	4,595
2029	47,003	43,584	5,920	2,500	3,420
2030	48,366	46,084	4,783	2,500	2,283

RESULTS & DISCUSSION (6)

TAHUN	TERRESTRIAL		HYDROGRAPHY		PHOTOGRAMMETRY		REMOTESENSING		GIS		CARTOGRAPHY	
	VHS	B.Eng.	VHS	B.Eng.	VHS	B.Eng.	VHS	B.Eng.	VHS	B.Eng.	VHS	B.Eng.
2017	4591	1968	106	248	2262	1508	567	851	2368	3552	874	874
2018	4235	1815	98	229	2086	1391	523	785	2185	3277	807	807
2019	3886	1665	90	210	1914	1276	480	720	2004	3006	740	740
2020	3543	1518	82	192	1745	1164	438	657	1828	2741	675	675
2021	3207	1374	74	173	1580	1053	396	594	1654	2481	611	611
2022	2878	1234	67	156	1418	945	356	533	1485	2227	548	548
2023	2557	1096	59	138	1260	840	316	474	1319	1978	487	487
2024	2243	961	52	121	1105	737	277	416	1157	1736	427	427
2025	1937	830	45	105	954	636	239	359	999	1499	369	369
2026	1639	702	38	89	807	538	202	304	845	1268	312	312
2027	1349	578	31	73	664	443	167	250	696	1043	257	257
2028	1067	457	25	58	526	350	132	198	550	826	203	203
2029	794	340	18	43	391	261	98	147	410	614	151	151
2030	530	227	12	29	261	174	65	98	273	410	101	101

CONCLUSION

- The surveys give accurate information about number and distribution of geospatial manpower and industries in some aspects: field, level and location.
- In 2017, about 33353 manpowers is needed, only 13584 available (Gap is 22270). It is projected that in 2030: 48366 needed, 13584 availabel (Gap 4783).
- 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 regonal and global market.

LIMITATION OF THE RESULT

- Prediction the future is difficult !!!
- There are some technology breakthrough & industry disruption in the past 5 years.
- Some new jobs are created (UAV pilots, LBS designer, GeoData Scientist), some dissapeared (Surveying assistant, photogrammetric operator).
- Change in international strategic condition (South-China-problem, Trump-effect etc) could make change the assumption for the simulation.

TERIMA KASIH – THANK YOU

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