Spatial and Land Thematic Map in the Relocation Project of Indonesia's National Capital City

Dony Erwan BRILIANTO, Wahyu Sari SABEKTI, Ayu NADIARIYANI, Slamet RISWANTO

SUMMARY

In order to support the Government mega project of capital city relocation, the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency (ATR/BPN) conducted a survey and mapping activity known as Spatial and Land Thematic Map or Peta Tematik Pertanahan dan Ruang (PTPR) in East Kalimantan Province. This activity aimed to provide a parcel based map attached with tenurial, ownership, land use, and utilization information, used as basic layers in determining planning policies of the relocation project.

PTPR was carried out in Penajam Paser Utara dan Kutai Kartanegara District, East Kalimantan, the Indonesia's new capital city called 'Ibukota Nusantara (IKN) or Nusantara', on an area of 256.142 Hectares (Ha) referred to as IKN National Strategic Area (KSN). Using a field delineation method on base maps from an aerial mosaic uncontrolled photo with a resolution of 15 cm, and supported by an application-'SiPetik' as data collector, data and information PTPR was obtained systematically and comprehensively. Other than primary data, secondary data from various Ministries/Agencies including local Government was also collected.

Data and information obtained regarding tenurial, ownership, land use, and land tenures from PTPR activities in KSN are that the ownership status, 58.18% or 149,029.87 Ha are forest area owned by the state and the rest are non forest area owned by individuals, groups of parties, or private sectors. For tenurial status, KSN is dominated by property rights at 41.22% with an area of 105,584.71 Ha and then private sectors at 37.51% with an area of 96,072.88 Ha. While land use and land utilization in KSN are 61.38% or area of 157,208.08 Ha, forest area, and others

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are non forest area, with 24.49% or area of 62.734,16 Ha utilized for commercial activities (markets, offices, factories, warehouses, etc), and 21.28% or area of 54,514.63 Ha for agriculture activities (paddy field, plantation, moors, etc). In detail, data and information of PTPR are stored in a digital format of geodatabase file and presented in maps, tables, and graphics.

The output of PTPR which is in a detail information-parcel based, are essentially strategic to be used as a basic layer in defining advanced planning stages, including for the preparation of a Presidential Regulation on KSN, regional regulations on regional and detailed spatial planning, preparation of Masters Plan, as well as other planning documents of Nusantara.

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1. Background

In 2019, the President of the Republic of Indonesia, Joko Widodo, had first announced the plan to relocate the capital city of Indonesia to East Kalimantan Province. As emphasized by the President, the development and economic activities are centralized in Java Island and it may lead to increased inequality in social and economic life of Indonesia's inhabitants (Berita Pemerintah, 2019). Moreover, Jakarta city as a center of governmental, business, and economic of Indonesia, is facing a huge challenge on massive and uncontrolled development. As mentioned by Lin and Hidayat, 2018, Jakarta-the fastest-sinking city in the world, has been plagued by issues of traffic congestion, overcrowding, and pollution, and therefore the relocation project is not only intended to boost development and economic equity in Java and outside Java island, but also to ease demographic pressures on the recent capital city.

Since the capital relocation was announced, the Government has immediately started its mega construction project. The major concern of the mega construction project is to design the new capital city as the world's sustainable city, secure, modern and a symbol of national identity. The concern on the new capital's development is also aligned with the country's efforts to achieve sustainable development goals, especially SDGs 11 and 13.

The new capital city to replace Jakarta is located in parts of Penajam Paser Utara dan Kutai Kartanegara District, East Kalimantan Province called by name 'Ibukota Nusantara (IKN) or Nusantara'. Nusantara will be built on an area of 256.142 Hectares (Ha) referred to as IKN National Strategic Area (KSN). The main role of ATR/BPN in the national capital relocation project is to manage land and its spatial planning aspects. As said by President Joko Widodo 'No one will be harmed. Guaranteed that!' (Kuwado, 2022), the Government must take the development project of Nusantara in East Kalimantan seriously, and assure that people who

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have lived in the area for generations will not be harmed. There will be no evictions, yet better land and spatial arrangement. It becomes the task of ATR/BPN to ensure the land and spatial planning aspects are well managed by ensuring all communities' land rights and interests attached are respected and not neglected.

The said mandate of ATR/BPN has been followed up with a survey and mapping project called Spatial and Land Thematic Map or Peta Tematik Pertanahan dan Ruang (PTPR). PTPR is a parcel based map containing tenurial, ownership, land use, and land utilization information acquired from field survey activities by identifying and delineating visible/physical boundaries added with geographical elements such as roads, water bodies, and administrative boundaries *(Petunjuk Teknis Pemetaan Tematik dan Ruang 2020)*. PTPR was intended to be a basic layer for preparing and developing the master plan, establishing regulations nationally and regionally, and formulating policies of land acquisition in non forest areas, in IKN National Strategic Area.

2. Scope of Work

The scope of PTPR work in the new capital's relocation project consisted of the following :
a. The survey activities were carried out by in-house surveyors from ATR/BPN and accompanied by the local community.
b. The activities were focused on primary data and information collection of land parcels through field surveys.
c. Data and information of land parcels were collected systematically including the registered parcels (legal) and unregistered parcels (legitimate), both in forest area and non forest area, in a complete administrative area.
d. Parcel boundaries, both tenurial boundaries (land tenure and land ownership) and utility boundaries (land use and land utilization), were general boundaries acquired without any cadastral measurement. Thus, land parcel information regarding calculation of the number and area of land parcels was intended for quick count as a preliminary overview and reference to support the Government in preparing land planning and arrangement in the relocation project.

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e. Area of interest of the project was in Penajam Paser Utara and Kutai Kartanegara District, East Kalimantan based on determination from the Ministry of National Development Planning/Bappenas.

f. Data collection processes were supported by the "SiPetik" survey application installed in mobile phones or tablets, as well as ArcGIS data processing software .

g. A base map used was an aerial mosaic uncontrolled photo with a resolution of 15 cm from the Geospatial Information Agency (BIG) acquired in 2019.

h. Other supporting secondary data sets are derived from related Ministries/Agencies including local government, such as mining concession data, forestry data, road access, and IKN delineation.

3. Area of Interest (AoI)

Geographically, the new capital city-Nusantara, is in the center of the country: North at 117°0'31.282" east longitude and 0°38'44.912" south latitude, South at 117°11'51.903" east longitude and 1°15'25.260" south latitude, West at 116°31'37.728" east longitude and 0°59'22.510" south latitude, East at 117°18'28.084" east longitude and 1°6'42.398" south latitude. In general, Nusantara is located in the middle, from Sabang to Merauke, as Indonesia's outermost boundary, making the Nusantara close and accessible from the various parts of Indonesia.
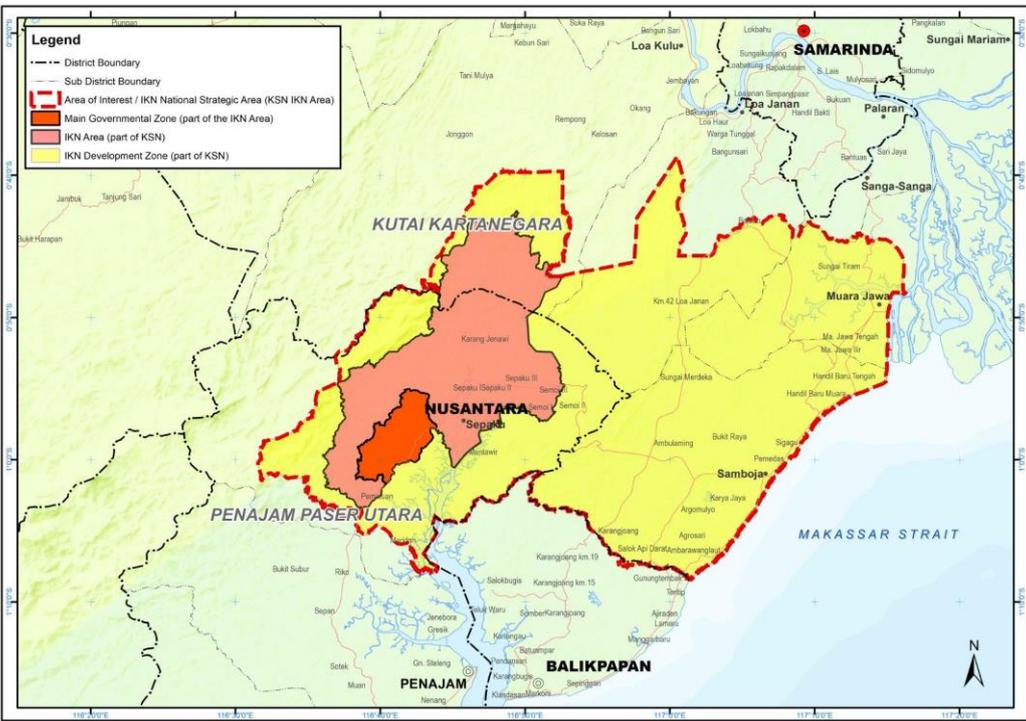

Picture 1: Location of Nusantara

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Administratively, based on delineation agreement led by the Ministry of National Development Planning/Bappenas on October 28th, 2019 and yet legalized through Act No 3/2022, the area of Nusantara is located in two Districts, Penajam Paser Utara at Penajam and Sepaku sub-district, and Kutai Kartanegara at Loa Kulu, Loa Janan, Muara Jawa, and Samboja sub-district, with an area of 256.142 Ha known as IKN National Strategic Area (KSN). KSN is divided into three planning area which are IKN Development Zone (part of KSN) with an area of 199.962 Ha, the IKN Area (part of KSN) with an area of 56.180 Ha, and the Main Governmental Zone (part of the IKN area) with an area of 6.596 Ha. The area of interest of the PTPR project is shown below:

Picture 2: Area of Interest/AoI of PTPR Project in Nusantara

Further, this paper will generally present the work output (data and information) of PTPR in IKN National Strategic Area (KSN).

4. Methodology

As briefly explained, PTPR was carried out by survey with a photogrammetric method using base maps from an aerial mosaic uncontrolled photo with a resolution of 15 cm. The survey

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activity was conducted systematically and comprehensively to identify all land parcels concerning land tenure, land ownership, land use, and land utilization in an administrative area. Identification and boundary delineation of parcels were conducted by a participatory mapping approach where active roles of the local communities in providing reliable information of related parcels were necessary. Using a cartographic delineation technique, local communities: land owners, leaseholder, elders or village officials, directly identified, appointed, and drew parcel boundaries on base maps. The data collection technique applied was a combination of visual interpretation and field surveys as a ground-check.

The procedure of PTPR project can be shown in the diagram below:
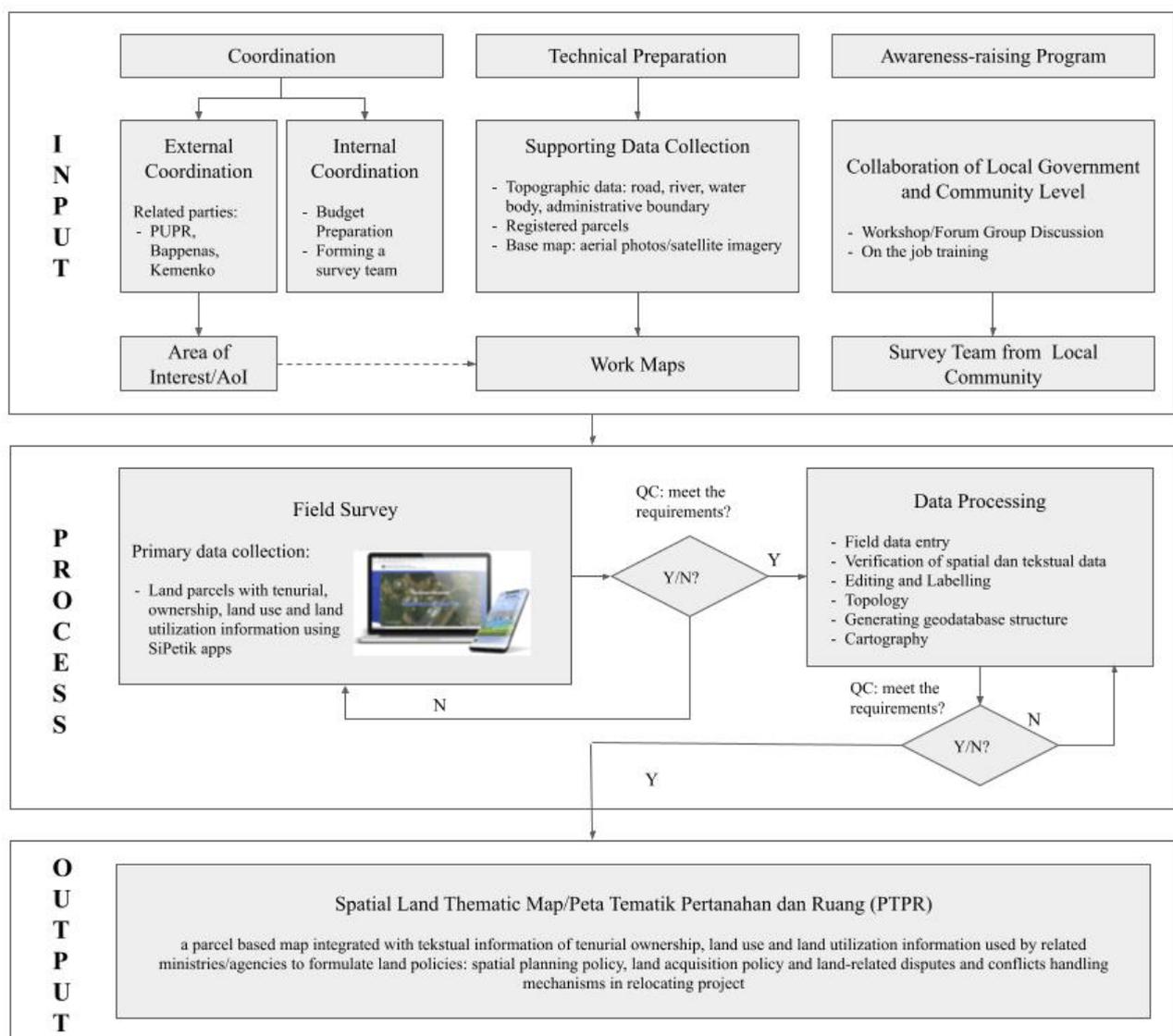
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Diagram 1: The Procedure of PTPR Project

Input stage: a preliminary step in which the output is essential as a benchmark to accelerate data collection systematically and accurately. This step requires collaboration within the related parties in terms of data, human resources, and permits. The activities of the input stage consist of: Coordination, Technical Preparation, and Awareness-raising Program.

a. Coordination stage is a planning step to achieve the project goals where the activities include both external and internal coordination. External coordination is an activity involving collaboration of related ministries/agencies, namely the Ministry of National Development Planning/Bappenas, Coordinating Ministry for Economic Affairs, and the Ministry of Public Works and Housing, to formulate and authorize the areas of interest (AoI). Further, internal coordination is an activity to arrange the projected budget, timeline, and a survey team based on the defined AoI conducted by ATR/BPN.

b. Technical Preparation is an activity carried out to produce work maps applied in a field survey. Work maps are formed by overlaying topographic data such as roads, water bodies, administrative boundaries, and registered parcels on base maps. For the record, work maps are used to assist surveyors and local communities in identifying and delineating objects (parcel boundaries) easily and precisely. The base maps used for work maps are aerial photos/satellite imagery. The work maps are then printed out in papers and installed in survey devices.

c. Awareness-raising Program aims to increase local government and public awareness of the existence of the project scaled-up by collaboration between central government, local government, and local community. The form of collaboration is their engagement during the field data collection. The awareness-raising program is carried-out in two schemes which are a workshop/forum group discussion and on the job training. A workshop/Forum Group Discussion is a formal forum to introduce the project program by gathering local government and community levels to obtain support in permits, public issues affected in policy determination, data and personnel involved in the field surveys. While on the job training is an action to give basic knowledge and skills of survey and mapping using survey devices to the local community appointed as field survey assistants.

Process stage: a series of activities to generate the assigned output (data and information of P4T) by performing field survey and data processing as well as quality control of field survey and data processing.

Field surveys are performed by combining both delineation of land parcels on work maps to get spatial data, and interviews to get textual data. The data collected from field surveys consist of the following:

a. Land Tenure, a legal relation between individuals, groups of parties, or private sectors to parcels. Land tenure is classified into property rights, leaseholder, private sector, government, and no occupancy.

b. Land Ownership, a legal relation between individuals, groups of parties, or private sectors to parcels associated with evidence of ownership both registered and unregistered. Land ownership is divided into 2 categories, land ownership in forest area belongs to the government and in non forest area belongs to the government and public. Then for land ownerships in forest area are classified into 2 parts, registered and unregistered parcels.

c. Land Use, a form of land surfaces both formed naturally and artificially. Land use is classified into settlement, paddy field, moors, plantation, waterbodies, paddock, public facilities, industry, husbandry, shrubs, forest.

d. Land Utilization, an activity to add the value of parcels without changing the physical form of its land use. Land utilization is classified into residential, agriculture, commercial, business center, public facilities/social facilities, and no utilization.

Hereinafter, the field survey data collected are processed using GIS software-ArcGIS into digital data as a reference of an advanced spatial analysis. The activities of data processing are:

a. Data entry: an activity to fill in the attribute data according to field survey forms.

b. Digitization: an activity to draw parcel boundaries based on tenurial/ownership and utility boundaries, geographical features (roads, water bodies, coast line), and administrative boundaries, using on-screen digitization technique.

c. Topology: a spatial relation of objects depicted. The rules of topology must not overlap and must not have gaps.

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d. Synchronization and Edge Matching: activities to compile all vector data from the digitization process in order to build a seamless data-no gap, no overlap.

e. Geodatabase structure: an integration of all data layers to a single data set in order to simplify data store, data management, and data analysis.

In the field survey and data processing, there is a quality control step which is a detailed verification of each activities component to ensure the output is in accordance with the established standard. There is a standard form of quality control. A quality control of field surveys is done by a ground-check/sampling method. It consists of suitability verification of spatial and textual data collected by surveyors according to the existing condition in fields, also verification of the accuracy and compatibility of making sketches/delineations of land parcel boundaries. While in quality control of data processing, there are two steps taken which are spatial and attribute data verifications. Spatial data verifications require that parcel data must cover all specified areas and there are no overlapping objects. The objective of attribute data verification is to ensure the suitability of the filling in attribute tables and its text writing.

Output stage:

The output projects, data and information of land tenure, land ownership, land use, and utilization are stored in a digital format of geodatabase file. Data and information are then presented in maps, tables, and graphics.

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5. Outputs

As previously explained, the results of PTPR project are presented in four specific data and information layers regarding tenurial, ownership, land use, and land utilization. Each layer is described in a predefined classification (see Process Stage).

a. Land Tenure

Tenurial information in KSN is dominated by property rights around 41.22% with an area of 105,584.71 Ha and followed by private sectors at 37.51% with an area of 96,072.88 Ha. Details of land tenure can be seen in the picture below:
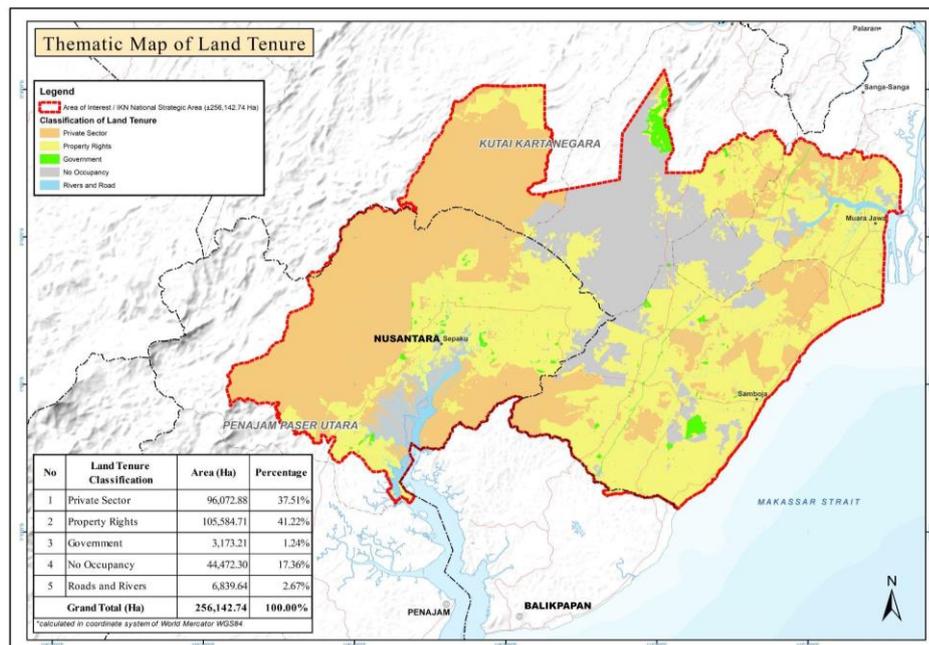
Picture 3: Thematic Map of Land Tenure

b. Land Ownership

For Land Ownership information, 58.18% of KSN is categorized as registered parcels in non forest area with an area of 149,029.87 Ha. The complete information of Land Ownership is depicted below:

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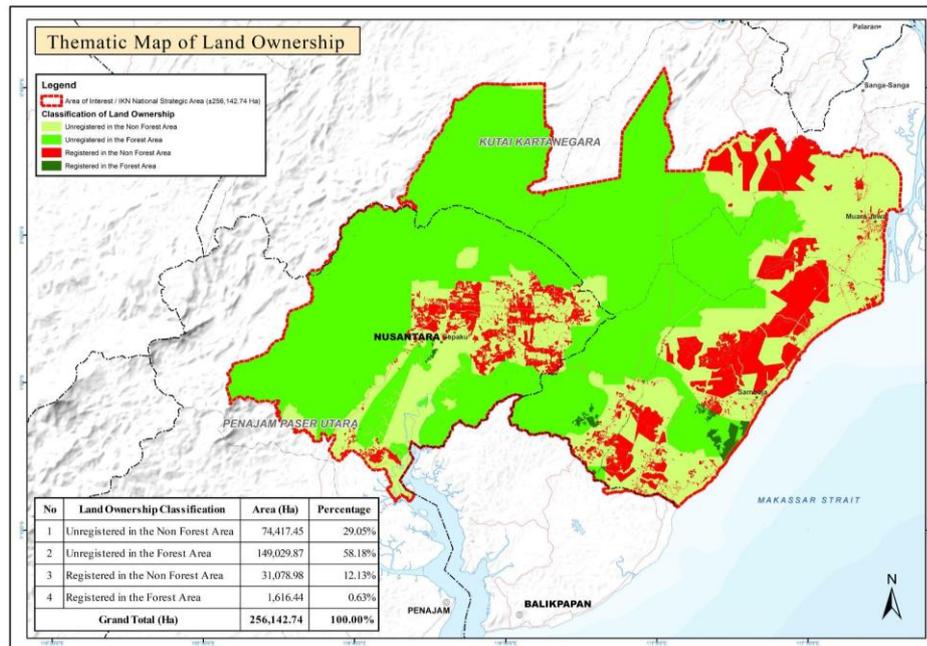
Picture 4: Thematic Map of Land Ownership

c. Land Use

Forest is the dominant land use in KSN, with an area of 157,208.08 Ha or with a percentage of 61.38%. Detailed area and percentage of Land Use in KSN is shown below :

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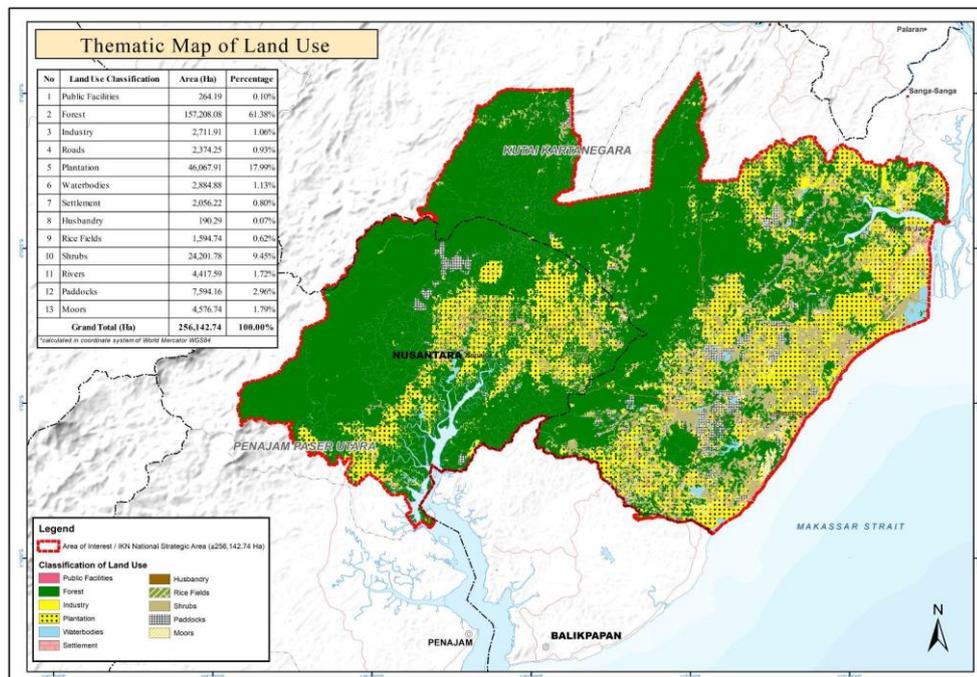
Picture 5: Thematic Map of Land Use

d. Land Utilization

50.67% or area of 129,781.11 Ha from data surveys is classified as unutilized land as the land covers itself as forest area, and then followed by the commercial services with 24.49% or area of 62.734,16 Ha, Agriculture 21.28% or area of 54,514.63 Ha, and others. The detailed of Land Utilization information in KSN is shown as follows:

Thematic Map of Land Utilization

| No	Land Utilization Classification	Area (Ha)	Percentage
1	Public Facilities/Social Facilities	263.23	0.10%
2	Commercial	62,734.16	24.49%
3	Agriculture	54,514.63	21.28%
4	Residence	2,055.05	0.80%
5	Business Center	2.72	0.00%
6	No Utilization	129,781.11	50.67%
7	Rivers	4,417.59	1.72%
8	Roads	2,374.25	0.93%
	Grand Total (Ha)	**256,142.74**	**100.00%**

calculated in coordinate system of World Mercator WGS84

Picture 6: Thematic Map of Land Utilization

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6. Findings

The output of PTPR project consists of a set of information regarding land issues, a general description of land and spatial status in Nusantara. Findings are generated from field data analysis by carrying out spatial analysis, and are aimed to determine the policies of land management. Further, leverage upon the output of PTPR can be done by adding spatial analysis steps by overlaying the primary (data and information of tenurial, ownership, land use, and utilization) and secondary data. The following are some examples of spatial analysis results:

a. Communities' ownerships/occupations in the Main Governmental Zone

Based on survey and mapping activities, it is found that not all land in the Main Governmental Zone owned by the state, there are ± 845 Ha area owned/occupied by communities.
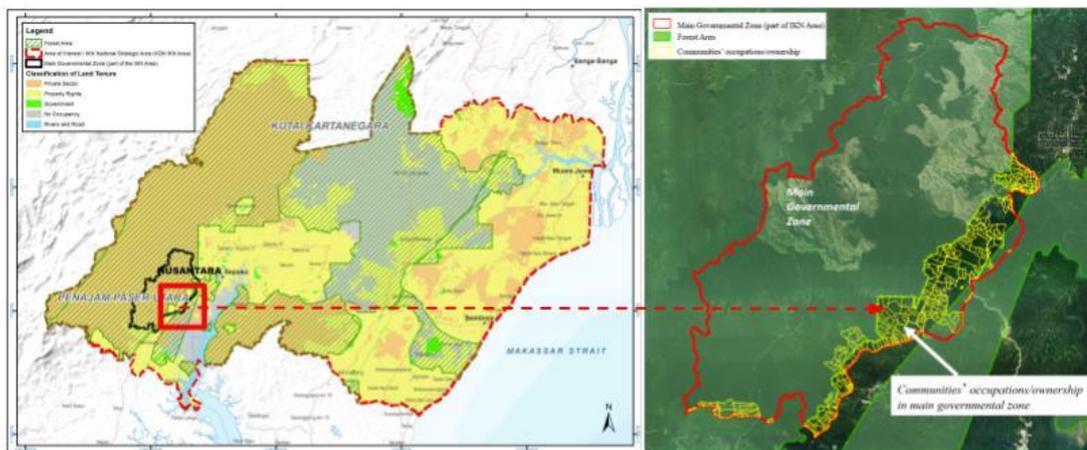
Picture 7: Communities' occupations/ownerships in Main Governmental Zone

b. Communities' land occupations in forest area

By overlying primary data surveys of land tenure and the existing forestry data (Map of the Development Forest Zone Confirmation of East Kalimantan year of 2018), it is found out that there are communities' occupations in the forest area with an area of ± 30.259,76 Ha.

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Picture 8: Communities' Land Occupations in Forest Area

c. Incompatibility with its use: cultivation rights registered for plantation are used for minings

By overlaying the primary data surveys of land use and registered parcels of cultivation rights specifically for plantation business permits, it is derived that some of the licensed area are used as coal minings with an area of ± 737,58 Ha. This shows incompatibility in its defined uses.

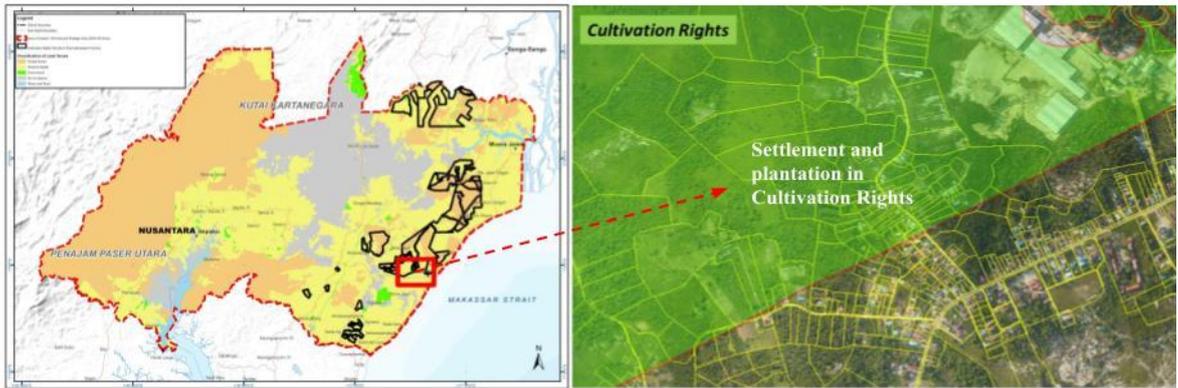Picture 9: Cultivation Rights for Plantation, in existing for Mining

d. An indication of an abandoned cultivation rights

From the field surveys, there is an indication of neglected cultivation rights in KSN where the existing condition is used for communities' settlement and plantation, while the valid and legitimate data of registered parcels, the land status is cultivation rights

as   shown   below:
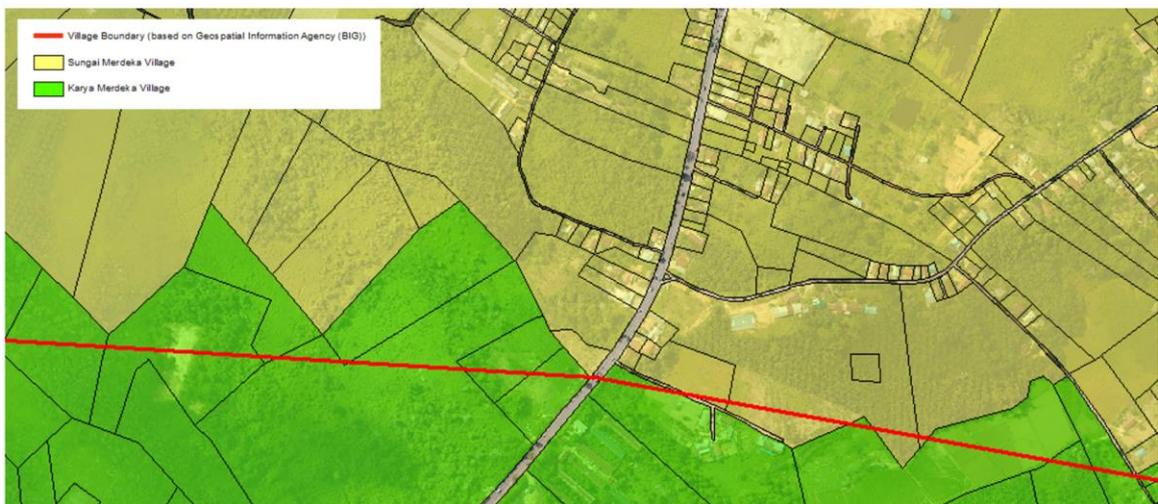

Picture 10: Communities' Settlement and Plantation in Cultivation Rights

e. Incompatibility in village administrative boundaries

From identification and acquisition of land parcels per village, it was found that village administrative boundaries of secondary data (source: BIG) is not in accordance with the existing condition.

Picture 11: Incompatibility in Village Administrative Boundaries

f. Discrepancy of registered parcels in ATR/BPN's land office system (GeoKKP) with the existing condition

Discrepancies of parcel data found as a result of PTPR are not all registered parcel data recorded in GeoKKP, position of registered data is not in accordance with the existing (need to be shifted/adjusted). Further some of the flying registered parcels are found and can be plotted/mapped.

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Picture 12: Discrepancy of registered parcels in GeoKKP with the existing condition

7. Conclusions and Recommendations

Conclusions

From the results of PTRP project, it can be concluded as follows:

a. Data and information obtained regarding tenurial, ownership, land use, and land tenures from PTPR activities in KSN are:

- the ownership status, 58.18% or 149,029.87 Ha are forest area owned by the state and the rest are non forest area owned by individuals, groups of parties, or private sectors;

- tenurial status, KSN is dominated by property rights at 41.22% with an area of 105,584.71 Ha and then private sectors at 37.51% with an area of 96,072.88 Ha;

- land use and land utilization in KSN are 61.38% or area of 157,208.08 Ha, forest area, and others are non forest area, with 24.49% or area of 62.734,16 Ha utilization for commercial activities (markets, offices, factories, warehouses, etc), and 21.28% or area of 54,514.63 Ha for agriculture activities (paddy field, plantation, moors, etc).

b. The development of the new national capital city of Indonesia that is expected to be a city that is sustainable yet has a conducive business climate, does not disturb social

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order and is environmentally friendly will be achieved through the management of integrated land administration functions based on effective land management and spatial planning.

c. The integration of land administration functions starts with the massive and comprehensive survey and mapping of all land parcels (no one parcel left behind) in one system (both forest areas and non-forest areas, both certified and uncertified) to be used as a basic layer obtained from PTPR (land tenure, land ownership, land use, and land utilization).

d. The use of survey application, 'SiPetik', significantly accelerates field data collection as this application integrates spatial and textual data collection in one application digitally (not manual by combining spatial data from delineation procedure and textual data from interview forms).

Recommendations

Data and information resulted from the PTPR project, a massive and comprehensive survey and mapping, can be used as a recommendation document and reference for line Ministries or Agencies, including local government, in determining relocation policies regarding land and spatial planning matters in Nusantara, with the following examples:

a. Since there were found communities' ownerships/occupations (non forest area) in the Main Governmental Zone, data and information of PTPR can be followed up as an initial data in calculating the requirement of land acquisition by the Government in non forest area as well as a reference of land value control policies (land freezing).

b. Data and information of communities' occupancy in forest areas can be followed up by the Ministry of Forestry and Environment to manage and derive policies at its forest area. The data can be used as a consideration in excluding the communities' occupancy in forest area as non forest area or social forestry area or be an object of agrarian reform from forest area (land consolidation and redistribution).

c. Discrepancies in land use permits based on field findings, can be tools as judicial review by related central or local governments in considering to re-manage and re-control its land use including reviews of its spatial planning. For instance, the neglected cultivation rights, its land is potential to be an object of agrarian reform.

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d. Survey and mapping activities of PTPR generate detailed data of administrative boundaries per villages; these data can be followed by the Ministry of Internal Affairs in revising the established village boundary delineation.

e. PTPR's outputs, systematic and comprehensive parcels data and information, can be used ATR/BPN as a tool to improve the parcel data quality (by identifying all registered parcels both recorded and unrecorded in GeoKKP including position adjustment based on existing condition as well mapped the registered flying parcels) and to accelerate mapped area coverage in Indonesia (thorough mapping both registered and unregistered parcels).

f. The data collector, 'SiPetik', needs to be developed since it only runs in an android system, and in order to obtain more accurate spatial data position (land parcels) by integrating SiPetik with geodetic measuring instruments.

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