

Data Classification and Access Control In Indonesia One Map Policy Geoportal

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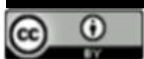
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Abstract

Indonesia has a data access policy on one map policy geoportal. Users at each level of government have different access rights to data. The President has full rights to view and downloads the data, while the governor or regent can only see certain attributes and download only its region on the same data. Data in one map policy geoportal must be able to facilitate the differences in access rights. The one map policy geoportal uses a service query system to facilitate the classification of access to process view data. In the process of downloading data geoportal using database queries. The choice of download data through the database is based on the results of the test download data from the database and service. These results indicate that downloading data through the database is faster than downloading data through a service.

Keywords: One Map Policy, Access control, KSP.

1. Introduction

Indonesia is an archipelago country with 34 provinces and 514 regencies/cities (Indonesia.go.id). Each province, district, and the city has its own government under the command of the president. Local governments have rights, authorities, and obligations over their own regions (Nadir, S. 2013). Regional policy is the absolute authority of regional government, including spatial data policies. Some local governments have mapping policies in their regions, but there are often different references and results from the central government. So that we need a policy on this spatial data.

The government through the Geospatial Information Agency (BIG) has implemented the National Spatial Data Infrastructure (NSDI) system to manage spatial data in Indonesia. NSDI in Indonesia is strengthened by regulation No. 4 of 2011 about geospatial information (UU-IG). UU-IG states that the government is obliged to facilitate the development of geospatial information infrastructure to manage the implementation of geospatial information in Indonesia. UU-IG is explained in more detail by Presidential Regulation Number 27 of 2014 about NSDI.

That presidential regulation regulates network nodes and network node connectors. Network nodes are all government institutions in Indonesia that produce spatial data, while the network node connector is BIG whose task is to integrate network nodes nationally. The hope is that the spatial data in Indonesia can be better organized. No more data

redundancies, because spatial data can be shared with each network node.

BIG developed two geoportals to facilitate the NSDI system, namely Ina-Geoportal and PALAPA. PALAPA is a geoportal for network nodes. PALAPA facilitates the storage and distribution of spatial data at each network node. Meanwhile, Ina-Geoportal is a geoportal for connecting network nodes. Ina-Geoportal does harvest metadata from each PALAPA so that spatial data from each network node can be searched and displayed in the Ina-Geoportal.

Ina-Geoportal has public characteristics. All users can access data easily. However, some spatial data have confidentiality, so it takes a different method to display the confidential data. For this reason, the One Map Policy (KSP) geoportal was built.

KSP geoportal is private. Users who can log in to the system are registered users. There are only five user levels. That is the President, the KSP Secretariat, the Minister / Head of Institutions, the Governor, and the Mayor / Regent. Each user has different access rights to data in the KSP geoportal. As an example, The President has the right to view all information on the land use map in Indonesia, but The governor cannot see the company name information on the land use map and geoportal will only display maps according to their region.

Standard of data

The data presented in the KSP geoportal is based on the Indonesian Geographical Elements Catalog (KUGI). KUGI standards organize the use of

attributes in spatial data. Standard attribute names make data use and analysis easier. The data will be more useful in the decision making process quickly.

2.1. Standard of service

KSP Geoportal uses services for the process of displaying spatial data. The service used is based on the Open Geospatial Consortium (OGC) standard. OGC establishes service delivery standards, including the Web Map Service (WMS) and Web Feature Service (WFS).

WMS is a standard for sending and receiving spatial data based on images (Pradana, G. 2018). Data in WMS format cannot be performed transactional operations such as update and delete.

WFS is a standard for sending and receiving spatial data based on vectors. This standard will allow transactional operations. WFS creates spatial data like raw data. The functions that can be applied to WFS-formatted data are the same as those commonly used in desktop-based spatial data processing applications.

KSP Geoportal uses the WMS standard to display maps and attributes. The data security factor is a consideration for not using the WFS format because this format can change and delete data.

Standar of metadata

Metadata is the most important part of the geoportal. Metadata can make spatial data easier to find, share and further use. The metadata standard used is ISO-19115.

The ISO-19115 standard defines the XML metadata structure. This standard provides information about abstract, extent, quality, spatial representation, reference and data distribution (Wei, Y. 2006).

2.2. Technology

Geoportal KSP uses paid and free applications. The paid application used is arcgis server. For free applications, KSP geoportal uses postgresSQL, apache, leafletjs, turfjs, and PHP.

Database of KSP geoportal using postgresSQL. PostgreSQL functions are to store user and role information, to map user access to data, and store spatial data. Postgis is also used for spatial data intersect analysis. This function is useful when the user wants to see overlaps of two spatial data.

At the application level, the KSP geoportal uses PHP to display and communicate to the database. LeafletJS is used to display data from services. TurfJS makes it easy to present spatial data analysis, especially buffering. Apache will facilitate PHP and javascript code to be accessed from the web.

Service is handled by the ArcGIS server. ArcGIS server converts data from the database into WMS format. This WMS is displayed by the leafletJS on the map in the application.

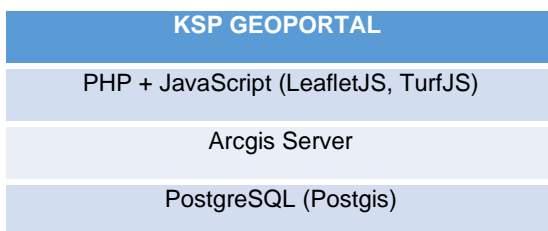


Figure 1. Application topology of KSP geoportal

2.3. Security

Geoportal is a private application. That's why comes an absolute issue that must be guaranteed its confidentiality. KSP geoportal security at the application level is divided into three, it is:

1. Application Security
2. Service Security
3. Database security

KSP Geoportal is developed based on the Open Web Application Security Project (OWASP) security standards. OWASP provides standards, articles, and information related to web security (Sonmez, F. 2019). This information is the basis for the development of the KSP geoportal.

Service security using the ArcGIS Server platform. ArcGIS Server has a function for service security, that is tokens. Services published from the ArcGIS server will be given private mode. This mode prevents the service from being opened by the public user. The service can be accessed when the user enters the authentication with a username or token. Periodically, tokens will be generated automatically in the KSP geoportal application. The purpose of making periodically is to secure data in the event of a token leak.



Figure 2. The Locked of KSP service

Raw data from KSP geoportal stored in postgresSQL is secured via network methods and security configuration in postgresSQL. In simple terms it can be explained that access to postgresSQL is limited and can be accessed by ip from the application. Users who will access through the outside network will be filtered by the firewall from the network side. Meanwhile, users who successfully log in to the internal network will not be able to access the database because the database configuration only allows one IP.

2.4. Access classification

Data classification and access control in the KSP geoportal are implemented into two functions, it is:

1. View function
2. Download function

Regulation of the Minister of Economy (Permenko) No.6 of 2018 regulates data access rights in the KSP geoportal. Who can see the data and who

can download the data. All users and thematic data in the KSP geoportal have rules. The following picture is an attachment of the regulation.

ID IGT	IGT	Layer	Klasifikasi Kewenangan Akses Untuk Berbagi Data IG								
			Entitas		Pemangku Kepentingan					Kepala Daerah	
			Field	Keterangan Field	Presiden/ Wakil Presiden	Menko Perekonomian	Menteri PPN/ Kepala Bappenas	Kepala BIG	Menteri/Pimpinan Lembaga	Gubernur	Bupati/Walikota
5	Peta Wilayah Izin Usaha Pertambangan Skala 1:50.000	Wilayah Izin Usaha Pertambangan	ISSUER	Penerbit Izin	Mengunduh	Mengunduh	Mengunduh	Mengunduh	Mengunduh	Mengunduh*	Melihat
			PROV	Provinsi	Mengunduh	Mengunduh	Mengunduh	Mengunduh	Mengunduh	Mengunduh*	Melihat
			IDPROV	ID Provinsi	Mengunduh	Mengunduh	Mengunduh	Mengunduh	Mengunduh	Mengunduh*	Melihat
			KAB	Kabupaten	Mengunduh	Mengunduh	Mengunduh	Mengunduh	Mengunduh	Mengunduh*	Melihat
			IDKAB	ID Kabupaten	Mengunduh	Mengunduh	Mengunduh	Mengunduh	Mengunduh	Mengunduh*	Melihat
			ISLAND	Gugusan Pulau	Mengunduh	Mengunduh	Mengunduh	Mengunduh	Mengunduh	Mengunduh*	Melihat
			NMOPRT	Nama Perusahaan	Mengunduh	Mengunduh	Mengunduh	Mengunduh	Mengunduh	Mengunduh*	Melihat
			TIOPR	Tipe Badan Usaha	Mengunduh	Mengunduh	Mengunduh	Mengunduh	Mengunduh	Mengunduh*	Melihat
			ADOPRT	Alamat Perusahaan	Mengunduh	Mengunduh	Mengunduh	Mengunduh	Tertutup	Tertutup	Tertutup
			PHOPRT	Telepon Perusahaan	Mengunduh	Mengunduh	Mengunduh	Mengunduh	Tertutup	Tertutup	Tertutup
			SKBLOK	Nomor SK IUP	Mengunduh	Mengunduh	Mengunduh	Mengunduh	Mengunduh	Mengunduh*	Melihat
			TIPTMB	Tipe Izin Tambang	Mengunduh	Mengunduh	Mengunduh	Mengunduh	Mengunduh	Mengunduh*	Melihat
			DATSTR	Tanggal Izin Dimulai	Mengunduh	Mengunduh	Mengunduh	Mengunduh	Mengunduh	Mengunduh*	Melihat
			DATEND	Tanggal Izin Berakhir	Mengunduh	Mengunduh	Mengunduh	Mengunduh	Mengunduh	Mengunduh*	Melihat
			LUBLOK	Luas Area (Ha)	Mengunduh	Mengunduh	Mengunduh	Mengunduh	Mengunduh	Mengunduh*	Melihat
STATUS	Tahap Kegiatan	Mengunduh	Mengunduh	Mengunduh	Mengunduh	Mengunduh	Mengunduh*	Melihat			

Figure 3. Attachment permenko about KSP rules

Figure 3 describes the classification of access to data in the KSP geoportal. For example, the map data of the mining business license area. The president and the KSP secretariat role can view and download all the attributes in the data. The ministry / agency role cannot see and download the two attributes in the data, it is the company address and the company telephone. The governor can view and download data only in his area, except for company addresses and company phones. For example, the governor of Aceh, only data on mining business permit areas in Aceh province can be viewed and downloaded. While the regent can only see the attributes except the company address and the company's phone from the data without being able to download it.

The various access roles from one thematic data are translated into the KSP geoportal application. Two functional characteristics that can be inferred from the Permenko are view and download.

The process of view data on the KSP geoportal is as shown in the diagram in Figure 4. From the figure, it can be seen that the process of viewing KSP data will be fully handled by Arcgis server. Arcgis server will publish the data in full version. The process of view data will perform a query on the arcgis server side. The user role attribute access will be queried on the arcgis server to get the appropriate attribute.

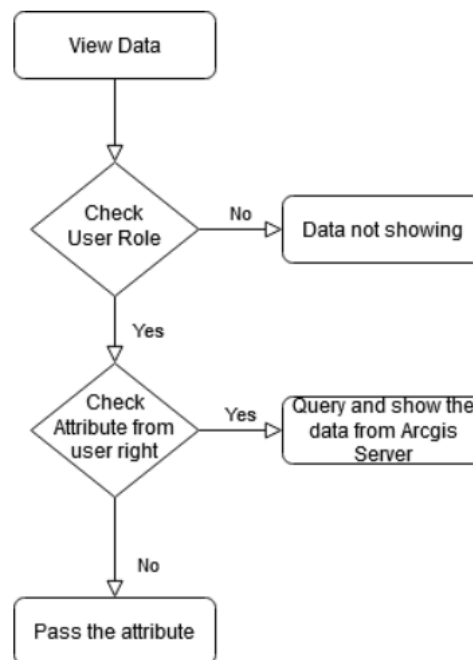


Figure 4. Flowchart of view data

The process of download data has the same method as the view process, it is query but on a different platform. In the view process, the query is performed on the arcgis server while in the process of download the query is carried out in the database.

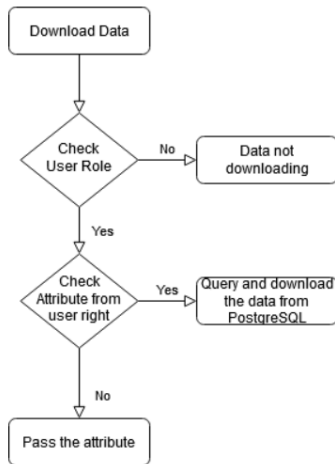


Figure 5. Flowchart of download data

3. Result and discussion

KSP Geoportal has a use case design as shown in Figure 6 below. In the use case diagram it can be seen that KSP geoportal has five user roles, the president / vice president, the KSP secretariat (Kemenko Perekonomian, Bappenas, BIG), ministry / agency, governor, mayor / regent. The five user roles have access rights to the function of view map, view metadata, query attribute, view attribute table, change the basemap, buffer analysis, intersect analysis, and download data. KSP secretariat role is also responsible for the creates an access role beside the capacity like other user roles. This function will create a mapping table of the view and download attributes of each user role.



Figure 6. Use case diagram

This research focus on two functions, it is view and download data on the KSP geoportal. How the process of view and download data applied in the KSP geoportal in order to comply with the permenko number 6/2018.

3.1. Implementation of view data

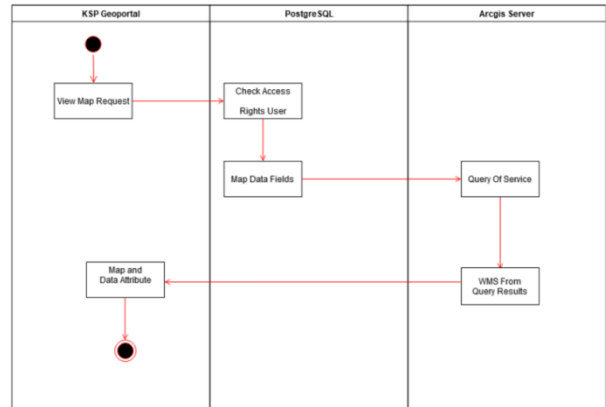


Figure 7. Activity diagram of view data

Figure 7 explains the relationship between applications in the process of view data. The user requests view menu from a specific thematic map in the KSP geoportal. The system will check the PostgreSQL database regarding the user access roles with these thematic data. The result of a query in the PostgreSQL database is a set of fields that can be accessed by the user. This field becomes the basis of the service query on the Arcgis server side. The results of the service query will produce a WMS with attributes that match the user's access role. KSP Geoportal will display WMS from query results using the library of leafletJS.

Data Output	Explain	Messages	Query History					
id_service	url_j	id_layerurl	role	query_unduh	query_lihat	field_alias_lihat	metadata	
bigint	char	integer	char	text	text	text	text	
12	112	h...	3	T...	PTNID PTNOBNAME PTNSBNAME PTND...	PTNID PTNOBNAME P...	ID untuk jenis pe...	Pengguna...
13	116	h...	132	T...	STAT_RCN DMN_RCN PRIO_RCN KET_RC...	STAT_RCN DMN_RCN ...	Status Rencana K...	RKP2017SA...
14	116	h...	75	T...	OBJECTID FCODE LCODE NAMOBI REMA...	OBJECTID FCODE LCO...	OBJECTID Kode F...	RTRWK_a...
15	110	h...	12	T...	OBJECTID PEMOHON LETAK NO_TGL_SK...	OBJECTID PEMOHON ...	OBJECTID Pemo...	lzlrlLokas...
16	116	h...	96	T...	JALUR_KA STATUS DIMENSI PRIORITAS K...	JALUR_KA STATUS DIM...	Jalur Kereta Api S...	RPMNajaku...
17	111	h...	6	T...	NAMOB FCODE TIPEL UMJREL KMXREL...	NAMOB FCODE TIPE...	Nama Objek Fea...	Sebaran Jar...
18	111	h...	14	T...	NM_INFI THN_DATA STATUS FUNGSI ME...	NM_INFI THN_DATA ST...	Nama Ruas Jalan...	JalanNasio...
19	112	h...	22	T...	OBJECTID NAMOBI PEAIRAN	OBJECTID NAMOBI PE...	OBJECTID Nama...	WilayahPe...
20	112	h...	4	T...	OBJECTID_1 PTNID PTNOBNAME PTNSB...	OBJECTID_1 PTNID PT...	FD ID untuk jeni...	Pengguna...
21	123	h...	3	T...	OBJECTID_1 KODPRV KODKAB HTR_ID R...	OBJECTID_1 KODPRV ...	OBJECTID Kode	HutanTana...
22	111	h...	7	T...	NAMOB FGSETA KLSSTA KODK KODK...	NAMOB FGSETA KLS...	Nama Objek Fun...	StasiunK...
23	111	h...	13	T...	OBJECTID NAMOBI DIMMTR REMARK SR...	OBJECTID NAMOBI DI...	OBJECTID Nama...	JaringanP...
24	111	h...	8	T...	OBJECTID NAMOBI TEGAR PGJAR STAT...	OBJECTID NAMOBI TE...	OBJECTID Nama...	JaringanLis...
25	112	h...	30	T...	UNIT_MORF KLS_LRG KOM_LRG KLS_LR...	UNIT_MORF KLS_LRG ...	Unit Morfometri (...)	Morfometri...
26	111	h...	9	T...	OBJECTID NAMOBI KAPG TEGGI STATO...	OBJECTID NAMOBI KA...	OBJECTID Nama...	GarduIndu...
27	123	h...	4	T...	DSR_PNTPN TGL_PNTPN FCODE REMAR...	DSR_PNTPN TGL_PNTP...	Dasar Pengakuan...	HutanPe...
28	111	h...	15	T...	NAMOB THNPN PROPINSI KAB_KOTA L...	NAMOB THNPN PRO...	Nama Objek Tah...	TempatPe...
29	112	h...	5	T...	PTNID PTNOBNAME PTNSBNAME PTNR...	PTNID PTNOBNAME P...	ID untuk jenis pe...	Pengguna...
30	111	h...	10	T...	OBJECTID NAMOBI DAYA JNSPLS ENRGP...	OBJECTID NAMOBI DA...	OBJECTID Nama...	Pembangi...
31	116	h...	98	T...	NAMOB FCODE PMLDRM OPDRDM LGG...	NAMOB FCODE PMLD...	Nama Objek Fea...	RKP2018AS...
32	110	h...	1	T...	OBJECTID NAMOBI FCODE REMARK MET...	OBJECTID NAMOBI FC...	OBJECTID NAMO...	IUPHHK.H...

Figure 8. Mapping table of user access right

Figure 8 is a mapping table of user access right. Each user role will have attributes that can be basis for access data. The query_lihat field is a collection of visible attributes for a specific role and data. The query_unduh field is for storing a set of attributes that can be downloaded. In the process of view data, the system will do queries on the mapping table according to the role who is accessing and the data to be displayed. The system will display the query_view field as shown in Figure 9.

```

ksp_v1.2 on postgres@10.10.170.18
1 SELECT query_lihat
2 FROM public.v_timpksp where id_service=110 and id_layerurl=8;

```

query_lihat	text
1	NIB NOMORHAK PERSILID PEMEGANGHA BERAKHIR TANGGAL NOMORSK

Figure 9. Query_lihat on mapping table

The query above is an access description of the KSP secretariat role for service id 110 and layer id 8. The service id and layer id are obtained from the data accessed in the KSP geoportal. The id is obtained from the data table which is the storage for the KSP spatial data. The results of the query can be seen that the role of the KSP secretariat for the data is to be able to see the attributes of NIB, NOMORHAK, PERSILID, PEMEGANGHA, BERAKHIR, TANGGAL, and NOMORSK.

The query results from the mapping table will be sent to the arcgis server. Arcgis server will do queries in WMS according to these attributes. Query for WMS attributes in arcgis server is to display outfields that match attributes from the mapping table.

Where:

Text:

Object IDs:

Time:

Input Geometry:

Geometry Type:

Input Spatial Reference:

Spatial Relationship:

Relation:

Out Fields:

Return Geometry: True False

Return True Curves: True False

Max Allowable Offset:

Geometry Precision:

Output Spatial Reference:

Return IDs Only: True False

Return Count Only: True False

Order By Fields:

Group By Fields (For Statistics):

Figure 10. Arcgis Server query

Figure 10 is the query process on the arcgis server. The results of this query can be seen in Figure 11. The result of the query is a WMS with attributes defined in the previous outfield column.

```

PERSILID: 3AC95AD9F3F4DC6AE05311D080A9842
PEMEGANGHA: H.YULIA AGUSTINI
BERAKHIR: -
TANGGAL: 19/10/2016
NOMORSK: 156/HGU/BNP-36.02/2016
Polygon:
[106.132016426700008, -6.405983589999948], [106.123071860000005, -6.406179470999976], [106.231273563000006, -6.405979644999945] more...

NIB: 00224
NOMORHAK: 2803000200101
PERSILID: 07E0F06449F310132043021D080A7929
PEMEGANGHA: PT. AGRI BUMI SENTOSA
BERAKHIR: -
TANGGAL: -
NOMORSK: -
Polygon:
[106.129021498000008, -6.540949510999951], [106.124993309000005, -6.541088483999943], [106.124786797000004, -6.541085381999949] more...

NIB: 00181
NOMORHAK: 2803000200095
PERSILID: 07E0F06449F310132043021D080A5222
PEMEGANGHA: PT. AGRI BUMI SENTOSA
BERAKHIR: -
TANGGAL: -
NOMORSK: -
Polygon:
[106.134684457000005, -6.499843634999934], [106.135083567000009, -6.5003678449999395], [106.135155545000009, -6.500468397999953] more...
[106.134430081000006, -6.50552309999996], [106.134597769000008, -6.505384213999946], [106.134556633000006, -6.505013666999968] more...

NIB: 00007
NOMORHAK: 28031202200003
PERSILID: 8E7672809F8B851E34080BA14726F
PEMEGANGHA: PT. PERKEBUNJAN NUSANTARA VII
BERAKHIR: -
TANGGAL: 23/06/2008
NOMORSK: 15/HGU/BNP/2004-A-2
Polygon:
[106.006627020000005, -6.670174429999975], [106.005985498000004, -6.670283559999939], [106.004788321000004, -6.670210674999964] more...

```

Figure 11. Result of attribute query on arcgis server

Then, this WMS will be displayed in the KSP geoportal. So that when the user who have role as the KSP secretariat accesses these data attributes, the system has filtered the attributes that appear. The results of the implementation in the KSP geoportal can be seen in Figure 12.



Figure 12. View data result of KSP geoportal

3.2. Implementation of download data

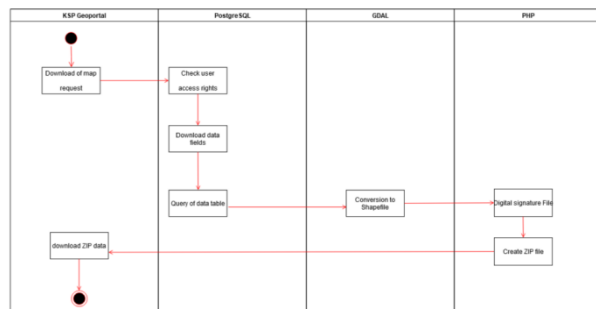


Figure 13. Activity diagram of download data

Figure 13 is an activity diagram between applications in the data download process. The user requests the map to download. KSP Geoportal sends user data and maps to be downloaded to the postgresQL database. PostgreSQL checks the user's access rights to the data. The results of the checks access role become the basis for the query of the data. Data that has been queried according to user permissions are converted into shapefiles using GDAL. The shapefile will be signed by the system to maintain data validity. After that PHP will compress the shapefile into a ZIP file. This zip file will be obtained by the user.

The following figure is the result of checking HGU data by the KSP secretariat user. It is that the KSP secretariat can download HGU data with attributes NIB, NOMORHAK, PERSILID, PEMEGANGHA, BERAKHIR, TANGGAL, and NOMORSK.

```

ksp_v1.2 on postgres@10.10.170.18
1 SELECT query_unduh
2 FROM public.v_timpksp where id_service=110 and id_layerurl=8;

```

query_unduh	text
1	NIB NOMORHAK PERSILID PEMEGANGHA BERAKHIR TANGGAL NOMORSK

Figure 14. Download attribute of KSP secretariat

To see differences in access rights between roles, other users are tested. Figure 15 shows the

results of checking HGU data by the governor's user role. It can be seen that for the same data, the governor is only allowed to download the NIB and PERSILID attributes. The data will also be clipped according to the region.

```
ksp_v1.2 on postgres@10.10.170.18
1 SELECT query_unduh, wilayah
2 FROM public.v_rolegubernur where id_service=110 and id_layerurl=8;
```

query_unduh	wilayah
NIB PERSILID	1

Figure 15. Download attribute of governor

These results form become the basis for queries into the HGU spatial data. The query process is carried out in two stages. The first step is to query the downloadable data attributes. The second stage is

to check the area access rights. If the user who accesses is only entitled to the data in his area, Postgis will clip the data according to the administrative boundaries of his area.

The next step, the query result table will be converted by GDAL. The GDAL command used is ogr2ogr. Ogr2ogr converts spatial data in postgresSQL tables into shapefiles. The following is the ogr2ogr command to convert the HGU data.

```
ogr2ogr -f "ESRI Shapefile" HGU.shp
PG:"host=" dbname=" user=" password=" port="
"duaperizinan_dan_pertanahan8(shape)"
```

The result of ogr2ogr produces four files, it is shp, shx, dbf and prj. The four files will be signed using PHP before being compressed into a ZIP file. These ZIP file can download by user.

The following figure is the result of downloading the HGU file from the KSP secretariat user. It can see that the downloaded data has attributes according to its access rights.

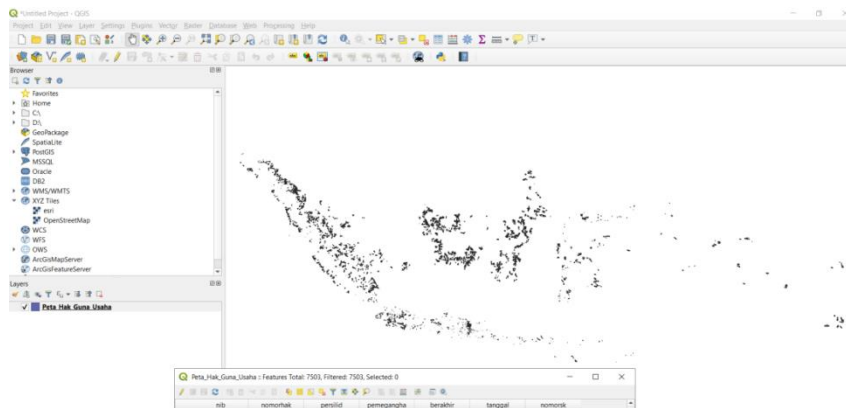


Figure 16. Result of download data from KSP secretariat user

Users with the role of governor will get data with attributes only NIB and PERSILID. The governor can only download by region. Seen in the figure below.

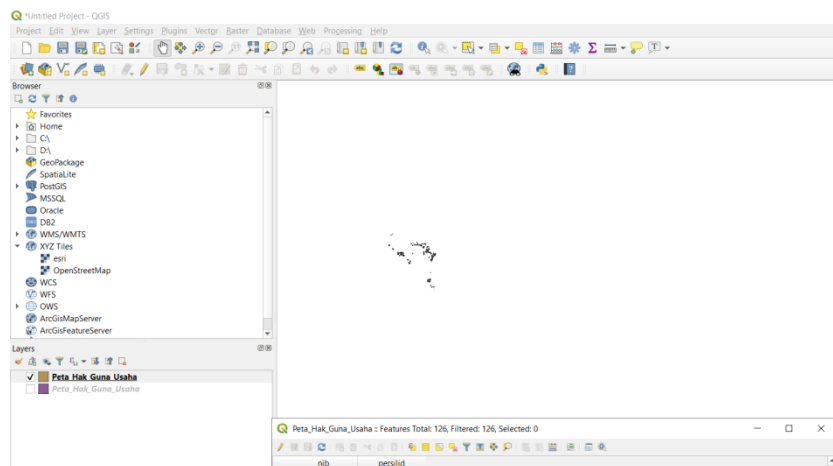


Figure 16. Result of download data from governor user

3.3. Comparison of downloading data through databases and services

The following test shows the waiting time for downloading data from the method applied in the KSP geoportal with downloading data from the service. In this test, four data samples were carried out. The four data are classified based on data size. Download data from the service using the GDAL method which converts the geojson results from the Arcgis server query into a shapefile.

Table 1 Test results of download data

No	IGT	Size	Service	Database
1	Forest area designation	507.614.720 KB (507.6 MB)	15.51 Minute	1.15 Minute
2	Land Cover	2.177.703.084 KB (2.1 GB)	Time out	4.04 Minute
3	HGU	16.442.732 KB (16.4 MB)	Time out	4 Second
4	Administrative boundary	3.776.844 KB (3.7 MB)	11 Second	3 Second

From the table, it can be seen that the data download method using the database is faster than downloading through a service. The HGU data and land cover download through the service did not get results. There is a time out message on both data. While, when data is downloaded through the database, the two data can be downloaded properly. This test is the basis for the KSP geoportal using the download method from the database.

4. Conclusion

From the results of this study it can be concluded that the classification of access data can be facilitated by the query method. Access classification in the process of view data using a query on the arcgis server side. While, the access classification in the download data process uses a query from the database. The choice of query from the database based on the results of comparison testing with service query. The test results show that the download time using database query is faster than using service query. However, to download data with a size of more than 2 GB is still very long. This is because the process of compressing the file into a ZIP file is quite long.

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