Alexander Calvin
2201832124
LE01 MID GEOGRAPHIC INFORMATION SYSTEM

A. ESSAY

1. State and explain data models, spatial processes (geo-processing) and the output of a GIS in the context of an information system consisting of input - process - output (10 points)

Data Model

Sets of graphic objects that represent and simplify a characteristic of real-world object to make it easy to be analysed and collected into spatial database structure. There are two type of data models:

- Vector Data (point, line, polygon)
  Graphic object that created based on the coordinate in a form of point, line, or polygon used to represent environment differ by feature type of vector data in the base map. Point feature usually used to define kinds of object type and its location, Line feature usually used for defining object shape and length for object that doesn't have area, and polygon feature that used to define object boundary that have area and line connected.

- Raster Data (satellite image, temperature, scanned map)
  Graphic object taken from real-world object which is structured into sets of data that have different value and can be used to define object type. There are many kinds of feature categorized as raster data like a continuous data e.g. temperature, population, object concentration, then a satellite data like image captured, and last is a scanned map. These features will be restructured into cells and system can analyse that cell data based on their value (usually using gradient colour).

Spatial Processes

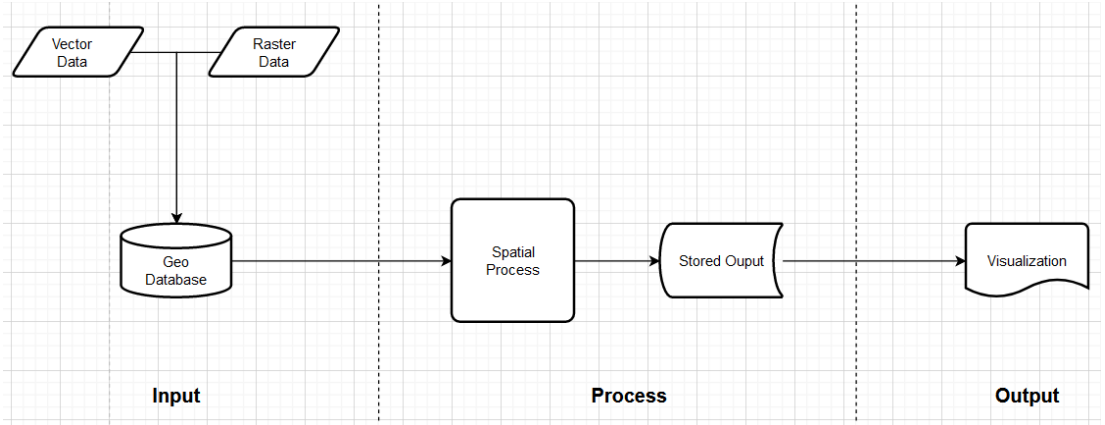
A process to create new spatial data from the related data like feature class, raster data, table, etc. and will be used to analyse the relation of each data comes out with logical conclusion and producing information for real-world problem.

Link:

- https://pro.arcgis.com/en/pro-app/help/analysis/geoprocessing/basics/what-is-geoprocessing-.htm
- http://webhelp.esri.com/arcgisdesktop/9.2/index.cfm?TopicName=Spatial_operations

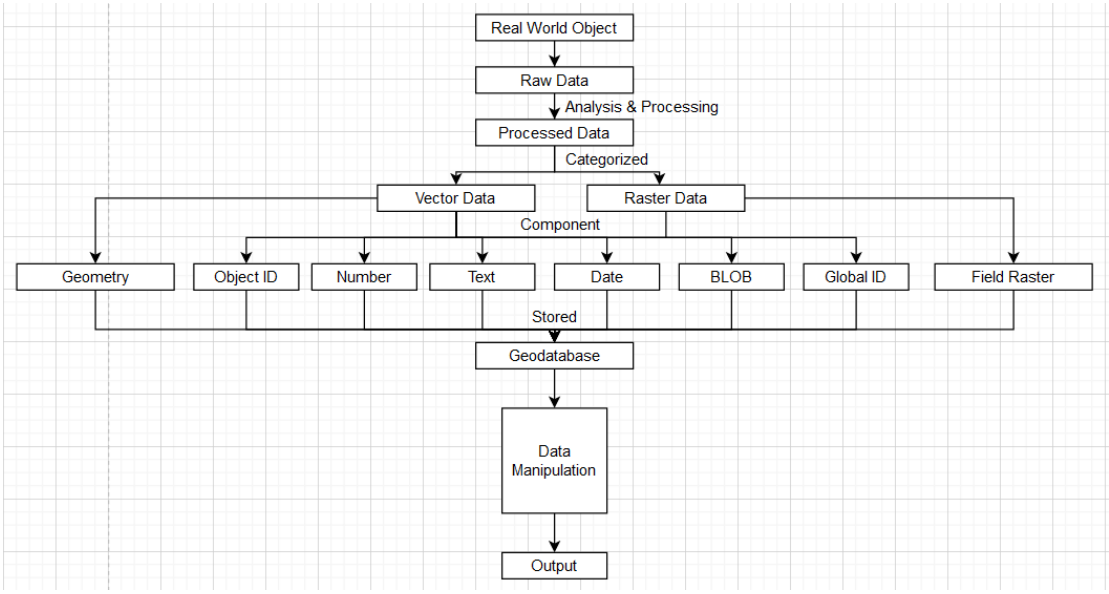
Alexander Calvin
2201832124

Input – Process – Output



So, there are three steps in context of GIS about how raw data produce structured output. First activity will be Input process where data like vector data stored into spatial database by having coordinate value and raster data from the cells value, in this stage the data is ready to be processed into the next step. The second step is after receiving the structured data, in this step GIS provide many tools that used to process the data to solve the problem and after that the output dataset will be used for visualization. In output process, data can be visualized into graph, plot, pie, or new dataset as a structured output.

2. Make a schematic description of the conception of real-world transformation into a computer system in a GIS including geographic objects, entity representations and data models from a GIS (15 Points)



Schema above describe how a real-world data transformed into data that computer system understands. First is real-world object taken from data like image, scanned map, or kind of raster data that will be stored into field containing raw data describing the object. Then the raw data will be processed to define each data attribute in raw data as an entity representation. And then after the data processed, result field data will be stored into data model and with the component inside data model it will be stored into the geodatabase and do further analysis on the geodatabase resulting output/information.

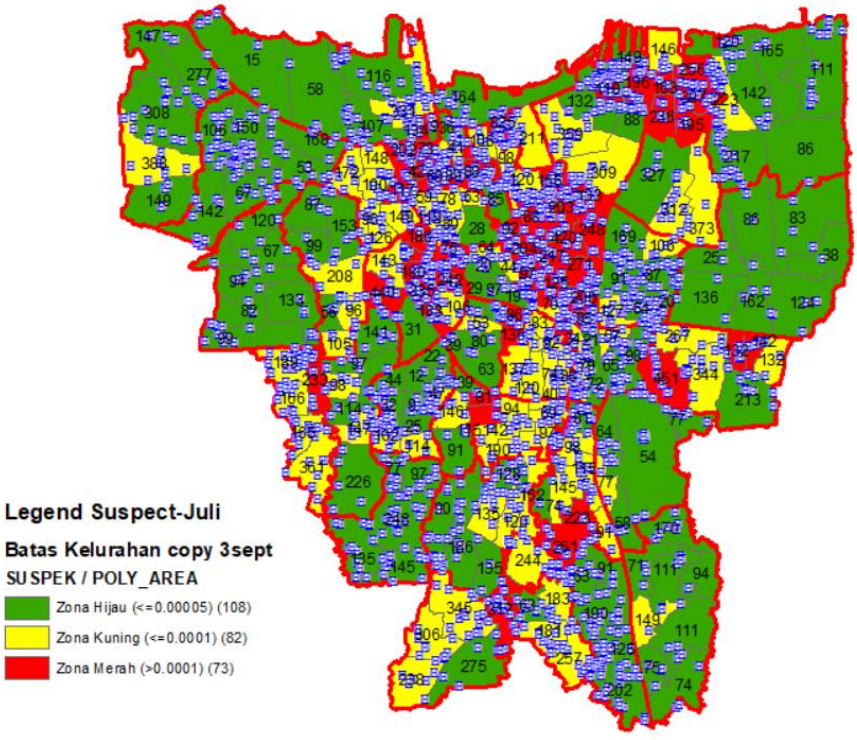
Link:

https://desktop.arcgis.com/en/arcmap/latest/manage-data/geodatabases/arcgis-field-data-types.htm

B. CASE STUDY

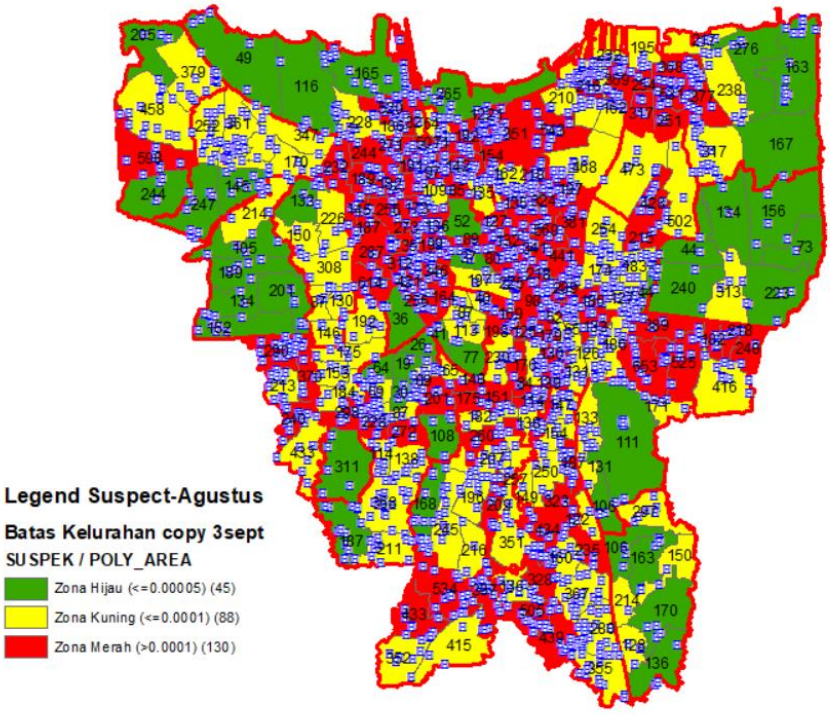
1. Kelurahan Spatial Database in DKI Jakarta

Suspect Map cumulative data on 31st July

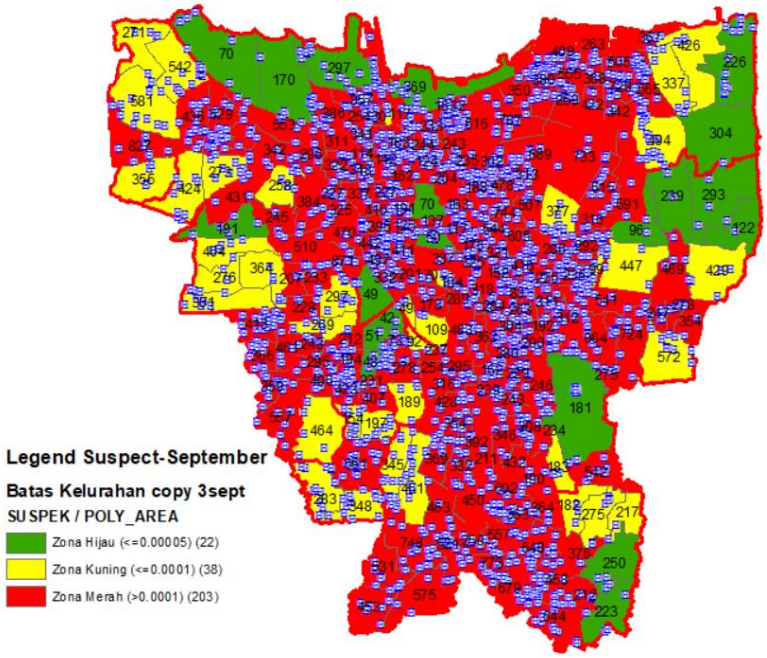


Alexander Calvin
2201832124
LE01 MID GEOGRAPHIC INFORMATION SYSTEM

Suspect Map cumulative data on 30th August



Suspect Map cumulative data on 31st September



Alexander Calvin
2201832124
LE01 MID GEOGRAPHIC INFORMATION SYSTEM

Data Attribute

FID	Shape *	KELURAHAN	KECAMATAN	WILAYAH	ID_KEL	POLY_AREA	suspect_ju	ID_KEL	Nama_provinsi	nama_kota	nama_kecamatan	nama_kelurahan	SUSPEK	Perawatan RS
0	Polygon	PASAR BARU	SAWAH BESAR	JAKARTA PUSAT	3171021001	1778862,71305	0	3171021001	DKI JAKARTA	JAKARTA PUSAT	SAWAH BESAR	PASAR BARU	85	5
1	Polygon	KARTINI	SAWAH BESAR	JAKARTA PUSAT	3171021003	519619,565774	0	3171021003	DKI JAKARTA	JAKARTA PUSAT	SAWAH BESAR	KARTINI	167	7
2	Polygon	GUNUNG SAHARI UTARA	SAWAH BESAR	JAKARTA PUSAT	3171021004	1261181,03778	0	3171021004	DKI JAKARTA	JAKARTA PUSAT	SAWAH BESAR	GUNUNG SAHARI UTARA	98	6
3	Polygon	MANGGA DUA SELATAN	SAWAH BESAR	JAKARTA PUSAT	3171021005	1301172,22759	0	3171021005	DKI JAKARTA	JAKARTA PUSAT	SAWAH BESAR	MANGGA DUA SELATAN	106	11

Isolasi di Rumah	Suspek Meninggal	Selesai Isolasi	PROBABLE	Probable Meninggal	Selesai Isolasi1	PELAKU PERJALANAN	Isolasi di Rumah1	Selesai Isolasi2	KONTAK ERAT	Isolasi di Rumah2	Selesai Isolasi3
0	2	78	0	0	0	4	0	4	179	7	172
1	1	158	0	0	0	0	0	0	282	13	269
0	1	91	0	0	0	3	2	1	142	3	139
0	1	94	0	0	0	1	0	1	195	10	185

DISCARDED	Meninggal	Selesai Isolasi4	POSITIF	Dirawat	Sembuh	Meninggal1	Self Isolation	Keterangan	FID	NAMA_BANGU	PEMANFAATA
3	0	3	26	4	20	0	2	<Null>	43	Puskesmas Kelurahan Pasar Baru	Puskesmas Kelurahan
14	0	14	56	2	46	1	7	<Null>	130	Puskesmas Kelurahan Kartini	Puskesmas Kelurahan
4	0	4	32	2	25	4	1	<Null>	228	PUSKESMAS KELURAHAN GUNUNG SAHARI UTARA (SEWA)	Puskesmas Kelurahan
8	0	8	26	0	23	0	3	<Null>	227	puskesmas sawah besar	Puskesmas Kecamatan

PEMANFAATA	ALAMAT	LATITUDE	LONGITUDE	KELURAHA_1	KECAMATA_1	WILAYAH
Puskesmas Kelurahan	Jalan Krekot Bundar Raya No. 10	106,832531	-6,160477	PASAR BARU	SAWAH BESAR	JAKARTA PUSAT
Puskesmas Kelurahan	Jalan Kartini Dalam VII no. 6B	106,831916	-6,153439	KARTINI	SAWAH BESAR	JAKARTA PUSAT
Puskesmas Kelurahan	Jl.gn sahari 7a	106,838608	-6,151886	GUNUNG SAHARI UTARA	SAWAH BESAR	JAKARTA PUSAT
Puskesmas Kecamatan	jalan mangga dua dalam blok k no.13	106,827135	-6,137811	MANGGA DUA SELATAN	SAWAH BESAR	JAKARTA PUSAT

Explanation

So, for this case framework used to make the map and spatial database is ArcMap 10.8. Map created based on Riwayat-file-covid-19 data distributed. Data taken is from last day of each month (July, August, and September) to analyse covid-19 growth rate based on the number of suspects. Then inside the data, Legend shown the density of suspect for each kelurahan (detail explanation on number 2) and number inside the map is suspect count on each kelurahan. Lastly, the data attribute is obtained from data join of kelurahan spatial data in form of polygon feature, suspect data from Riwayat-file-covid-19 website, and medical facility spatial data obtained from jakartasatu.jakarta.go.id website in the form of point feature.

2. Spatial Object and Data Model

Spatial object

- Point object representing medical facility:

In map, point object symbolized with hospital icon to specify symbol for medical facilities. Every point object has coordinate to show the real location of DKI Jakarta in base map. This object supported with detail like name, address, id, facility type, etc. With the detailed data we can use it to refer every facility to visualize it or analyse it further.

- Polygon object representing kelurahan:

Polygon object used as the base map that resemble real shape of DKI Jakarta region in by grouping it for every kelurahan. Almost the same as point object, each polygon data has coordinate based on real kelurahan location so when each polygon put in order it will form a shape of Jakarta province. This object will be the main object for visualization of suspect and facility distribution from joined spatial data between Kelurahan, Medical Facility, and data recap for suspect of each kelurahan in every month. Additional analysis using category of density of suspect in each kelurahan where it will be categorized as zona hijau when suspect exists in 1 km area lower than 5 people, zona kuning when suspect exists in 1 km area between 5 and 10 people, and zona merah when suspect exists in 1 km area higher than 10 people. The main analysis about medical analysis availibility will be explained in next one.

Data model

- Vector data

In this case, data model used is only vector data (point, polygon object). As said before, majority of analysis using joined data where the data is already prepared and that do not need raster data analysis like from data gradient. for example from my additional analysis its only need suspect data and polygon area which is already exist there. And for main analysis data needed is from count of medical facility of each kelurahan which can be retrieved from spatial join and number of suspects to categorize the result based on it is availibility.

3. Map Number of Covid-19 Suspect and Health Facilities

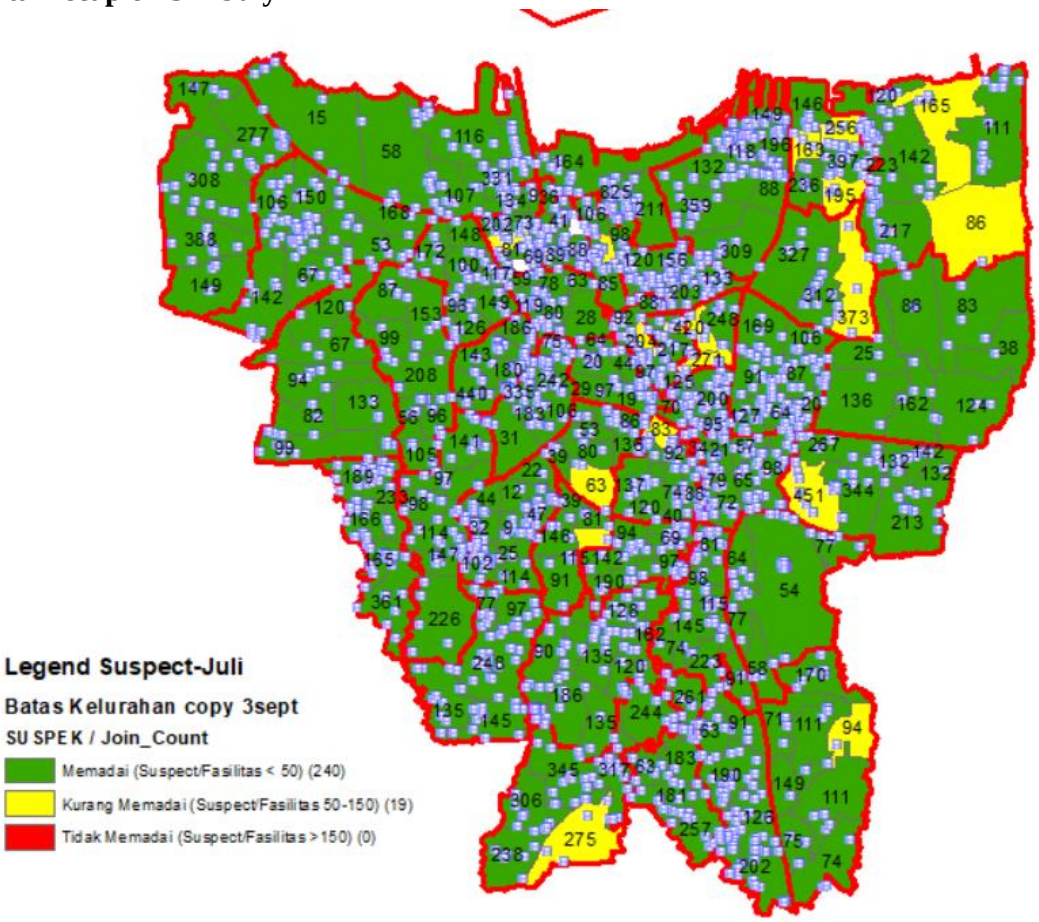
Total Facilities each Urban Village

Distribusi Rumah Sakit
Fasilitas_Kesehatan
KELURAHA_1

- (17)
- ANCOL (12)
- ANGKE (8)
- BALE KAMBANG (2)
- BALI MESTER (6)
- BAMBU APUS (4)
- BANGKA (5)
- BARU (8)
- BATU AMPAR (5)
- BENDUNGAN HILIR (11)
- BIDARA CINA (16)
- BINTARO (10)
- BUKIT DURI (8)
- BUNGUR (5)
- CAKUNG BARAT (4)
- CAKUNG TIMUR (4)
- CAWANG (15)
- CEGER (3)
- CEMPAKA BARU (5)
- CEMPAKA PUTIH BARAT (3)
- CEMPAKA PUTIH TIMUR (8)
- CENGKARENG BARAT (16)
- CENGKARENG TIMUR (24)
- CIBUBUR (27)
- CIDENG (16)
- CIGANJUR (8)
- CIJANTUNG (5)
- CIKINI (3)
- CIKOKO (5)
- CILANDAK BARAT (24)
- CILANDAK TIMUR (27)
- CILANGKAP (4)
- CILILITAN (5)
- CILINCING (3)
- CIPAYUNG (4)
- CIPEDAK (7)
- CIPETE SELATAN (8)
- CIPETE UTARA (5)
- CIPINANG (16)
- CIPINANG BESAR SELATAN (12)
- CIPINANG BESAR UTARA (6)
- CIPINANG CEMPEDAK (6)
- CIPINANG MELAYU (9)
- CIPINANG MUARA (14)
- CIPULIR (8)
- CIRACAS (14)
- DUKUH (2)
- DUREN SAWIT (13)
- DUREN TIGA (6)
- DURI KEPA (7)
- DURI KOSAMBI (10)
- DURI PULO (6)
- DURI UTARA (3)
- GALUR (2)
- GAMBIR (3)
- GANDARIA SELATAN (9)
- GANDARIA UTARA (19)
- GEDONG (8)
- GELORA (3)
- GLODOK (2)
- GONDANGDIA (10)
- GROGOL (6)
- GROGOL SELATAN (5)
- GROGOL UTARA (8)
- GUNTUR (5)
- GUNUNG (9)
- GUNUNG SAHARI SELATAN (6)
- GUNUNG SAHARI UTARA (4)
- HALIM PERDANA KUSUMAH (28)
- HARAPAN MULIA (6)
- JAGAKARSA (14)
- JATI (12)
- JATI PADANG (5)
- JATI PULO (4)
- JATINEGARA (9)
- JATINEGARA KAUM (9)
- JELAMBAR (8)
- JELAMBAR BARU (5)
- JEMBATAN BESI (5)
- JEMBATAN LIMA (3)
- JOGLO (6)
- JOHAR BARU (8)
- KALI ANYAR (4)
- KALIBARU (6)
- KALIBATA (7)
- KALIDERES (9)
- KALISARI (11)
- KAMAL (6)
- KAMAL MUARA (10)
- KAMPUNG BALI (5)
- KAMPUNG MELAYU (2)
- KAMPUNG RAWA (1)
- KAMPUNG TENGAH (7)
- KAPUK (11)
- KAPUK MUARA (8)
- KARANG ANYAR (7)
- KARET (2)
- KARET KUNINGAN (4)
- KARET SEMANGGI (3)
- KARET TENGSIN (5)
- KARTINI (2)
- KAYU MANIS (4)
- KAYU PUTIH (11)
- KEAGUNGAN (6)
- KEBAGUSAN (4)
- KEBAYORAN LAMA SELATAN (14)
- KEBAYORAN LAMA UTARA (8)
- KEBON BARU (9)
- KEBON BAWANG (16)
- KEBON JERUK (5)
- KEBON KACANG (11)
- KEBON KELAPA (2)
- KEBON KOSONG (14)
- KEBON MANGGIS (3)
- KEBON MELATI (11)
- KEBON PALA (4)
- KEBON SIRIH (3)
- KEDAUNG KALI ANGKE (9)
- KEDOYA SELATAN (3)
- KEDOYA UTARA (7)
- KELAPA DUA (7)
- KELAPA DUA WETAN (21)
- KELAPA GADING BARAT (9)
- KELAPA GADING TIMUR (11)
- KEMANGGISAN (7)
- KEMAYORAN (9)
- KEMBANGAN SELATAN (4)
- KEMBANGAN UTARA (4)
- KENARI (15)
- KERENDANG (2)
- KLENDER (6)
- KOJA (5)
- KOTA BAMBU SELATAN (5)
- KOTA BAMBU UTARA (16)
- KRAMAT (3)
- KRAMAT JATI (11)
- KRAMAT PELA (10)
- KRUKUT (5)
- KUNINGAN BARAT (3)
- KUNINGAN TIMUR (1)
- KWITANG (4)
- LAGOA (5)
- LEBAK BULUS (11)
- LENTENG AGUNG (18)
- LUBANG BUAYA (6)
- MAKASAR (2)
- MALAKA JAYA (7)
- MALAKA SARI (6)
- MAMPANG PRAPATAN (5)
- MANGGA BESAR (5)
- MANGGA DUA SELATAN (8)
- MANGGARAI (1)
- MANGGARAI SELATAN (6)
- MAPHAR (7)
- MARUNDA (14)
- MELAWAI (12)
- MENTENG (4)
- MENTENG ATAS (7)
- MENTENG DALAM (6)
- MERUYA SELATAN (5)
- MERUYA UTARA (6)
- MUNJUL (3)
- PADEMANGAN BARAT (25)
- PADEMANGAN TIMUR (13)
- PALMERIAM (6)
- PALMERAH (12)
- PANCORAN (5)
- PAPANGGO (9)
- PASAR BARU (5)
- PASAR MANGGIS (6)
- PASAR MINGGU (12)
- PASEBAN (9)
- PEGADUNGAN (14)
- PEGANGSAAN (10)
- PEGANGSAAN DUA (5)
- PEJAGALAN (15)
- PEJATEN BARAT (18)
- PEJATEN TIMUR (5)
- PEKAYON (8)
- PEKOJAN (6)
- PELA MAMPANG (6)
- PENGADEGAN (9)
- PENGGILINGAN (6)
- PENJARINGAN (27)
- PESANGGRAHAN (16)
- PETAMBURAN (17)
- PETOGOGAN (10)
- PETOJO SELATAN (7)
- PETOJO UTARA (5)
- PETUKANGAN SELATAN (11)
- PETUKANGAN UTARA (17)
- PINANG RANTI (4)
- PINANGSIA (4)
- PISANGAN BARU (8)
- PISANGAN TIMUR (14)
- PLUIT (12)
- PONDOK BAMBU (9)
- PONDOK KELAPA (10)
- PONDOK KOPI (4)
- PONDOK LABU (12)
- PONDOK PINANG (5)
- PONDOK RANGGON (4)
- PULO (4)
- PULO GADUNG (5)
- PULO GEBANG (3)
- RAGUNAN (17)
- RAMBUTAN (5)
- RAWA BADAK SELATAN (5)
- RAWA BADAK UTARA (3)
- RAWA BARAT (11)
- RAWA BUAYA (11)
- RAWA BUNGA (5)
- RAWA JATI (8)
- RAWA TERATE (2)
- RAWAMANGUN (12)
- RAWASARI (4)
- ROA MALAKA (2)
- ROROTAN (1)
- SELONG (3)
- SEMANAN (6)
- SEMPER BARAT (23)
- SEMPER TIMUR (7)
- SENAYAN (1)
- SENEN (4)
- SERDANG (6)
- SETIA BUDI (2)
- SETU (1)
- SLIPI (22)
- SRENGSENG (7)
- SRENGSENG SAWAH (4)
- SUKABUMI SELATAN (4)
- SUKABUMI UTARA (5)
- SUKAPURA (20)
- SUMUR BATU (8)
- SUNGAI BAMBU (12)
- SUNTER AGUNG (15)
- SUNTER JAYA (11)
- SUSUKAN (15)
- TAMAN SARI (7)
- TAMBORA (3)
- TANAH SEREAL (9)
- TANAH TINGGI (5)
- TANJUNG BARAT (7)
- TANJUNG DUREN SELATAN (6)
- TANJUNG DUREN UTARA (9)
- TANJUNG PRIOK (26)
- TEBET BARAT (6)
- TEBET TIMUR (5)
- TEGAL ALUR (12)
- TEGAL PARANG (1)
- TOMANG (6)
- TUGU SELATAN (3)
- TUGU UTARA (19)
- UJUNG MENTENG (1)
- ULUJAMI (9)
- UTAN KAYU SELATAN (13)
- UTAN KAYU UTARA (5)
- UTAN PANJANG (9)
- WARAKAS (12)
- WIJAYA KUSUMA (5)

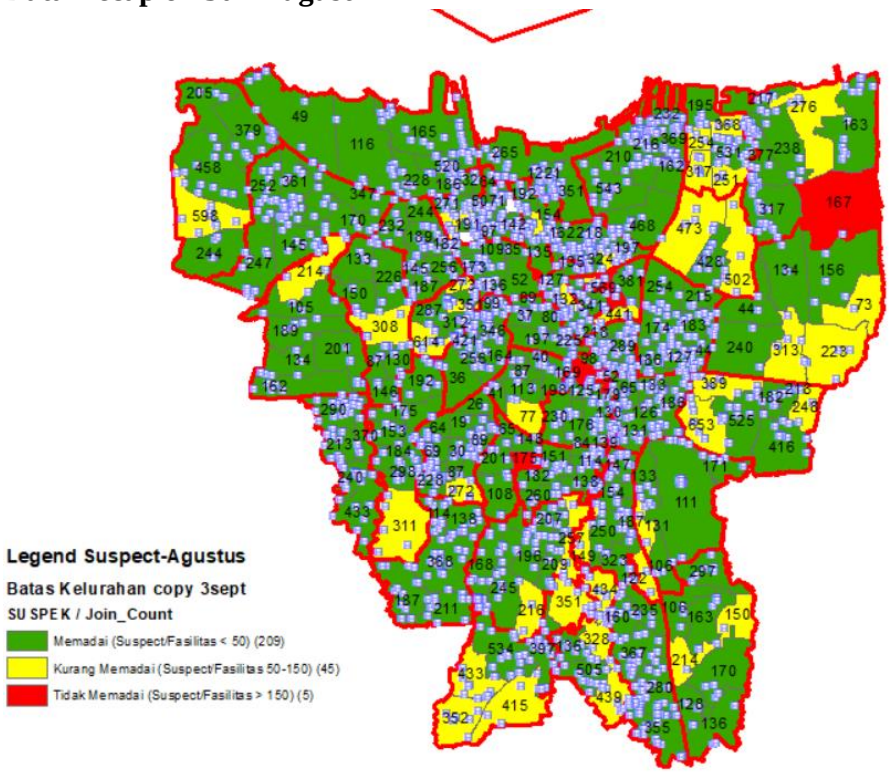
Alexander Calvin
2201832124
LE01 MID GEOGRAPHIC INFORMATION SYSTEM

Data Recap on 31st July

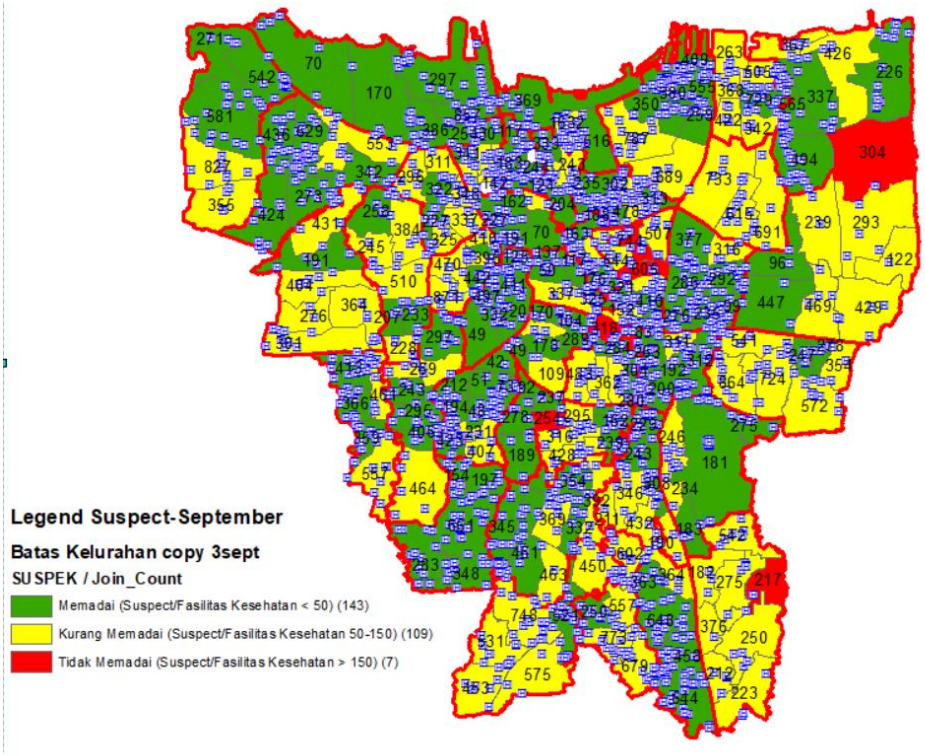


Alexander Calvin
2201832124
LE01
MID GEOGRAPHIC INFORMATION SYSTEM

Data Recap on 30th August



Data Recap on 31st September



Alexander Calvin
2201832124
LE01 MID GEOGRAPHIC INFORMATION SYSTEM

Attribute Data

FID	Shape *	KELURAHAN	KECAMATAN	WILAYAH	ID_KEL	POLY_AREA	suspect_ju	ID_KEL	Nama_provinsi	nama_kota	nama_kecamatan	nama_kelurahan	SUSPEK	Perawatan RS
0	Polygon	PASAR BARU	SAWAH BESAR	JAKARTA PUSAT	3171021001	1778862,71305	0	3171021001	DKI JAKARTA	JAKARTA PUSAT	SAWAH BESAR	PASAR BARU	85	5
1	Polygon	KARTINI	SAWAH BESAR	JAKARTA PUSAT	3171021003	519619,565774	0	3171021003	DKI JAKARTA	JAKARTA PUSAT	SAWAH BESAR	KARTINI	167	7
2	Polygon	GUNUNG SAHARI UTARA	SAWAH BESAR	JAKARTA PUSAT	3171021004	1261181,03778	0	3171021004	DKI JAKARTA	JAKARTA PUSAT	SAWAH BESAR	GUNUNG SAHARI UTARA	98	6
3	Polygon	MANGGA DUA SELATAN	SAWAH BESAR	JAKARTA PUSAT	3171021005	1301172,22759	0	3171021005	DKI JAKARTA	JAKARTA PUSAT	SAWAH BESAR	MANGGA DUA SELATAN	106	11

Isolasi di Rumah	Suspek Meninggal	Selesai Isolasi	PROBABLE	Probable Meninggal	Selesai Isolasi1	PELAKU PERJALANAN	Isolasi di Rumah1	Selesai Isolasi2	KONTAK ERAT	Isolasi di Rumah2	Selesai Isolasi3
0	2	78	0	0	0	4	0	4	179	7	172
1	1	158	0	0	0	0	0	0	282	13	269
0	1	91	0	0	0	3	2	1	142	3	139
0	1	94	0	0	0	1	0	1	195	10	185
6	3	149	0	0	0	0	0	0	256	11	245

DISCARDED	Meninggal	Selesai Isolasi4	POSITIF	Dirawat	Sembuh	Meninggal1	Self Isolation	Keterangan	FID *	Join_Count	TARGET_FID	NAMA_BANGU
3	0	3	26	4	20	0	2	<Null>	1	5	0	Puskesmas Kelurahan Pasar Baru
14	0	14	56	2	46	1	7	<Null>	2	2	1	Puskesmas Kelurahan Kartini
4	0	4	32	2	25	4	1	<Null>	3	4	2	PUSKESMAS KELURAHAN GUNUNG SAHARI UTARA (SEWA)
8	0	8	26	0	23	0	3	<Null>	4	8	3	puskesmas sawah besar

PEMANFAATA	ALAMAT	LATITUDE	LONGITUDE	KELURAHA_1 *	KECAMATA_1	WILAYAH_1	Shape_Length	Shape_Area
Puskesmas Kelurahan	Jalan Krekot Bundar Raya No. 10	106,832531	-6,160477	PASAR BARU	5	JAKARTA PUSAT	6432,020253	1778862,713052
Puskesmas Kelurahan	Jalan Kartini Dalam VII no. 6B	106,831916	-6,153439	KARTINI	2	JAKARTA PUSAT	3302,925818	519619,565774
Puskesmas Kelurahan	Jl.gn sahari 7a	106,838608	-6,151886	GUNUNG SAHARI UTARA	4	JAKARTA PUSAT	6019,598161	1261181,037779
Puskesmas Kecamatan	jalan mangga dua dalam blok k no.13	106,827135	-6,137811	MANGGA DUA SELATAN	8	JAKARTA PUSAT	5093,511024	1301172,227592

4. Pattern and Changes of number Covid-19 Suspect

The changes on the number of suspects is raising in different ratio which between July and August having higher rate rather than August to September based on the data shown. There are various factor like from the additional analysis about the density and main analysis about the health facility availability, and external factor like regulations timeline causing higher rate in this case. First of all, in the additional data shown that number of covid suspect is already high in July having safe state only 45% kelurahan and 55% risk state and then in August the suspect rate raising into 85% risk state which is higher than august-september ratio with 90% risk state. Then pattern obtained from the main analysis, it shows that the distribution is not completely equal where it overly focusing into red zone area and we can see that it solve the problem on that area by comparing additional result and distribution result, but the proportion given to some safe area which is too low actually raising the rate of number increases in that area, so even if the distribution suppress some high risk area increase rate but not to the other area. And last is external factor where actually DKI Jakarta start the PSBB transition regulation from 4th June – 13rd September and back to using PSBB regulation on 14th September which affect the increase rate between data in July-August and August-September.

5. Spatial Relationship between the number of Covid-19 suspects and the availability and distribution of health facilities

As said before about the distribution of health facilities can suppress the growth rate of Suspect number is coming from the main analysis data which is taken from the normalized value between facilities (join_count attribute) and suspect number (SUSPEK attribute) of each kelurahan so we can know the average of suspect handled on Health facility. Spatial relationship happens between polygon feature containing suspect data and coordinate and point feature containing detail of each health facilities. Those features joined into new field using spatial join to get the count total of facilities in each kelurahan based on the how many points feature inside one polygon. From this count data we can do analysis to categorize the distribution of each kelurahan whether it is ‘Memadai’, ‘Kurang Memadai’, atau ‘Tidak Memadai’.

Alexander Calvin
2201832124
LE01 MID GEOGRAPHIC INFORMATION SYSTEM