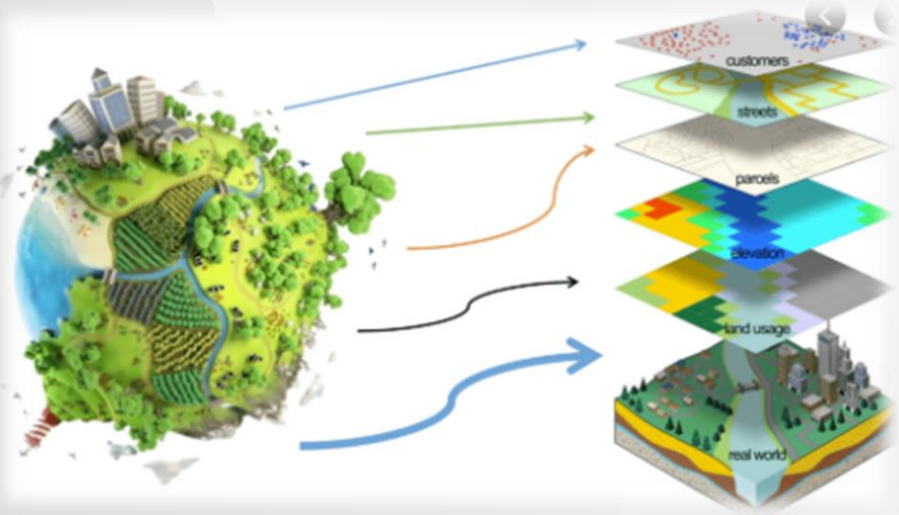
GEOGRAPHIC INFORMATION SYSTEM AND ITS APPLICATIONS

புவியியல் தகவல் அமைப்பு மற்றும் அதன் பயன்பாடுகள்



Dr. R. Jegankumar M.Sc., M.Tech., Ph.D.,
Professor and Head
Department of Geography
Bharathidasan University, Tiruchirappalli

What is GIS?

A geographic information system (GIS) is a framework for gathering, managing, and analyzing data.

GIS என்றால் என்ன ?

புவியியல் தகவல் அமைப்பு (GIS) என்பது தரவைச் சேகரித்தல், நிர்வகித்தல் மற்றும் பகுப்பாய்வு செய்வதற்கான ஒரு கட்டமைப்பாகும்.

Rooted in the science of geography, GIS integrates many types of data. It analyzes spatial location and organizes layers of information into visualizations using maps and 3D scenes.

The unique capability, GIS reveals deeper insights into data, such as patterns, link, and situations—helping users make smarter decisions.

புவி-அறிவியலில் வேரூன்றிய பல வகையான தரவை GIS ஒருங்கிணைக்கிறது.
இது இடஞ்சார்ந்த இருப்பிடத்தை பகுப்பாய்வு செய்கிறது மற்றும் வரைபடங்கள் மற்றும் 3டி காட்சிகளைப் பயன்படுத்தி தகவல்களின் அடுக்குகளை காட்சிப்படுத்தல்களில் ஒழுங்கமைக்கிறது

இந்த தனித்துவமான திறனுடன், வடிவங்கள், இணைப்பு மற்றும் சூழ்நிலைகள் போன்ற தரவைப் பற்றிய ஆழமான நுண்ணறிவுகளை **GIS** வெளிப்படுத்துகிறது.
- பயனர்கள் சிறந்த முடிவுகளை எடுக்க உதவுகிறது

The Early History of GIS

History of GIS
வரலாறு

1960

The field of geographic information systems (GIS) started in the 1960s as computers and early concepts of quantitative and computational geography emerged.

Early GIS work included important research by the academic community. Later, the National Center for Geographic Information and Analysis, led by Michael Goodchild, formalized research on key geographic information science topics such as spatial analysis and visualization.

These efforts fueled a quantitative revolution in the world of geographic science and laid the groundwork for GIS

The First GIS

Roger Tomlinson's ***pioneering work to initiate, plan, and develop the Canada Geographic Information System resulted in the first computerized GIS in the world in 1963. The Canadian government had commissioned Tomlinson to create a manageable inventory of its natural resources. He envisioned using computers to merge natural resource data from all provinces. Tomlinson created the design for automated computing to store and process large amounts of data, which enabled Canada to begin its national land-use management program. He also gave GIS its name.***

1963

The Harvard Laboratory

1965

Northwestern University in 1964, **Howard Fisher** created one of the first computer mapping software programs known as SYMAP. In 1965, he established the Harvard Laboratory for Computer Graphics. While some of the first computer map-making software was created and refined at the Lab, it also became a research center for spatial analysis and visualization. Many of the early concepts for GIS and its applications were conceived at the Lab by a talented collection of geographers, planners, computer scientists, and others from many fields.

Esri is Founded (Industries Growth)

1965

In 1969, **Jack Dangermond**—a member of the Harvard Lab—and his wife Laura founded Environmental Systems Research Institute, Inc. (Esri). The consulting firm applied computer mapping and spatial analysis to help land use planners and land resource managers make informed decisions. The company's early work demonstrated the value of GIS for problem solving. Esri went on to develop many of the GIS mapping and spatial analysis methods now in use. These results generated a wider interest in the company's software tools and work-flows that are now standard to GIS.

GIS Goes Commercial

As computing became more powerful, Esri improved its software tools. Working on projects that solved real-world problems led the company to innovate and develop robust GIS tools and approaches that could be broadly used.

1981

Open GIS

Online GIS

Cloud GIS

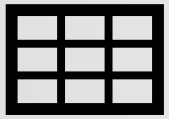
The Future of GIS

Web and cloud computing, and integration with real-time information via the Internet of Things, GIS has become a platform relevant to almost every human endeavor—a nervous system of the planet

GIS: INPUT DEVICES / உள்ளீட்டு சாதனங்கள்

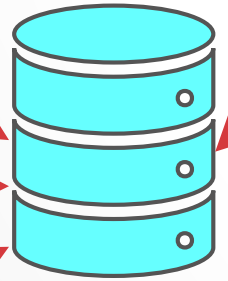
Digitizers

Imageries

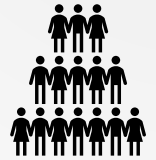


Tables

Scanners



Crowdsource



Social Media

DATA / தரவு

Spatial Data /இடம் சார்ந்த தரவு

Data with locational Information

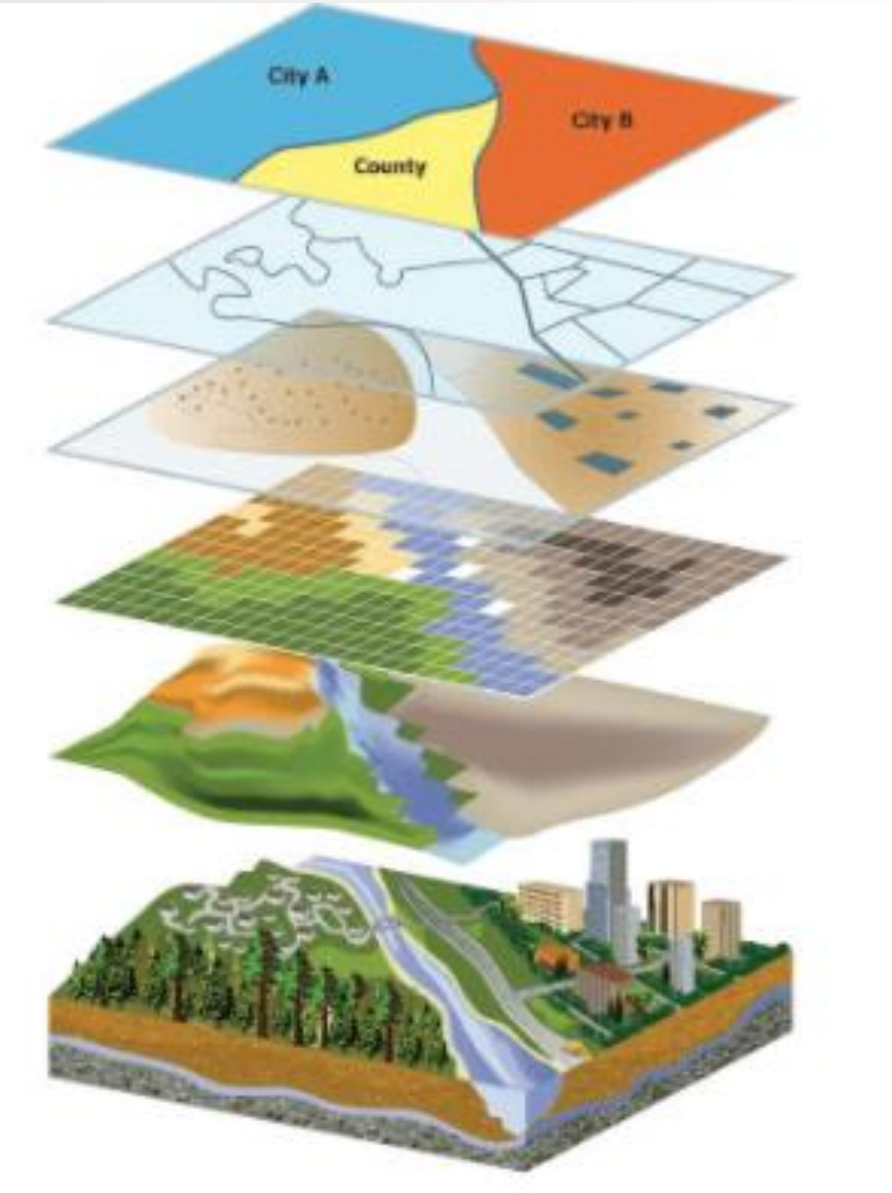
இருப்பிட தகவலுடன் கூடிய தரவுகள்

Non-Spatial Data /இடம் சாராத் தரவு

Data without locational Information

இருப்பிட தகவல் இல்லாத தரவுகள்

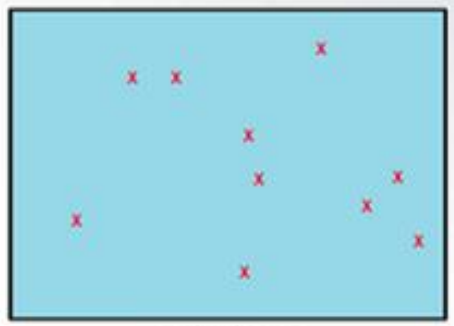
Spatial Data /இடம் சார்ந்த தரவு



Non-Spatial Data /இடம் சாராத் தரவு

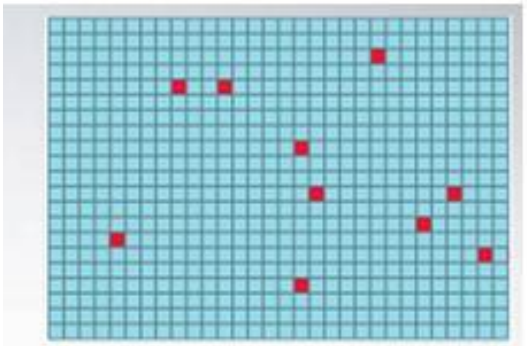
Vector Data / கூட்டுத் தரவு

Raster Data ராஸ்டர் தரவு



Point features

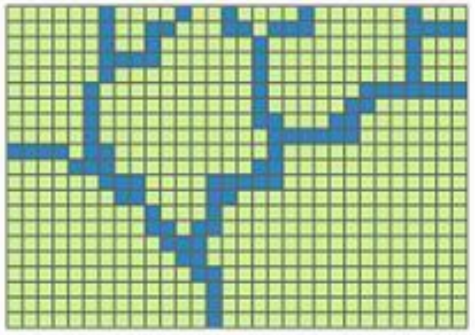
Point Data



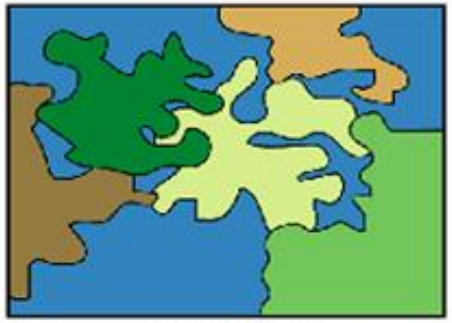
Raster point features

Line features

Vector Data

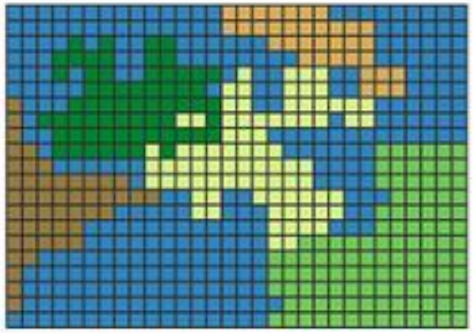


Raster line features



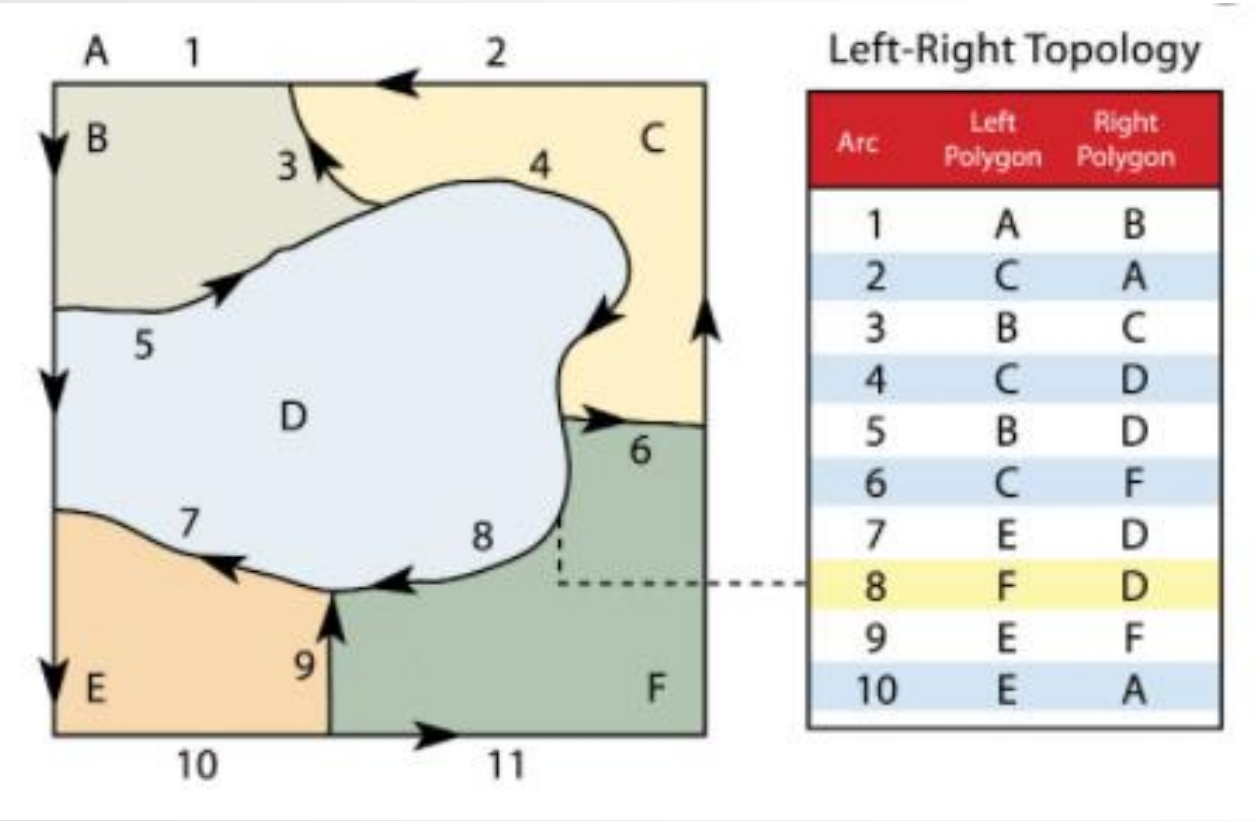
Polygon features

Polygon Data



Topology / இடவியல் in GIS is generally defined as the spatial relationships between adjacent or neighboring features.

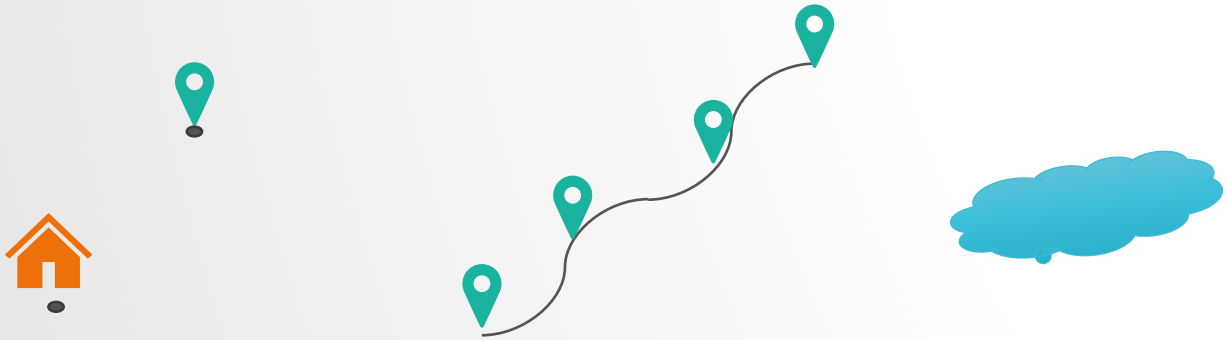
Mathematical **topology** assumes that geographic features occur on a two-dimensional plane.

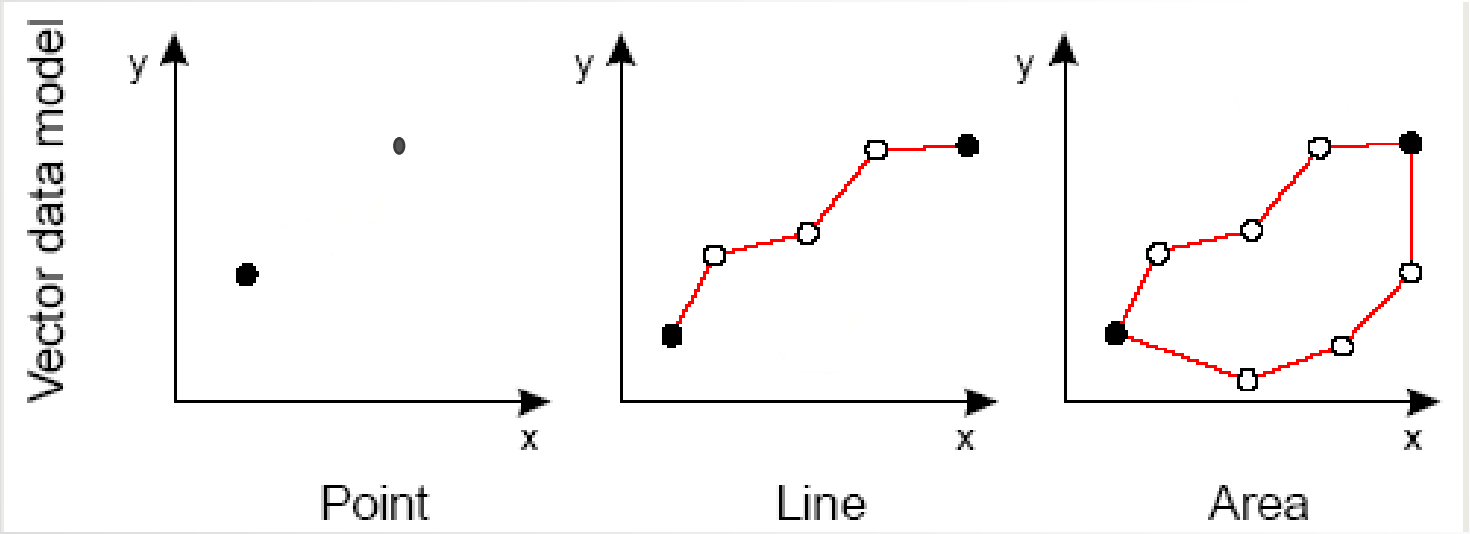


Left-Right Topology

Arc	Left Polygon	Right Polygon
1	A	B
2	C	A
3	B	C
4	C	D
5	B	D
6	C	F
7	E	D
8	F	D
9	E	F
10	E	A

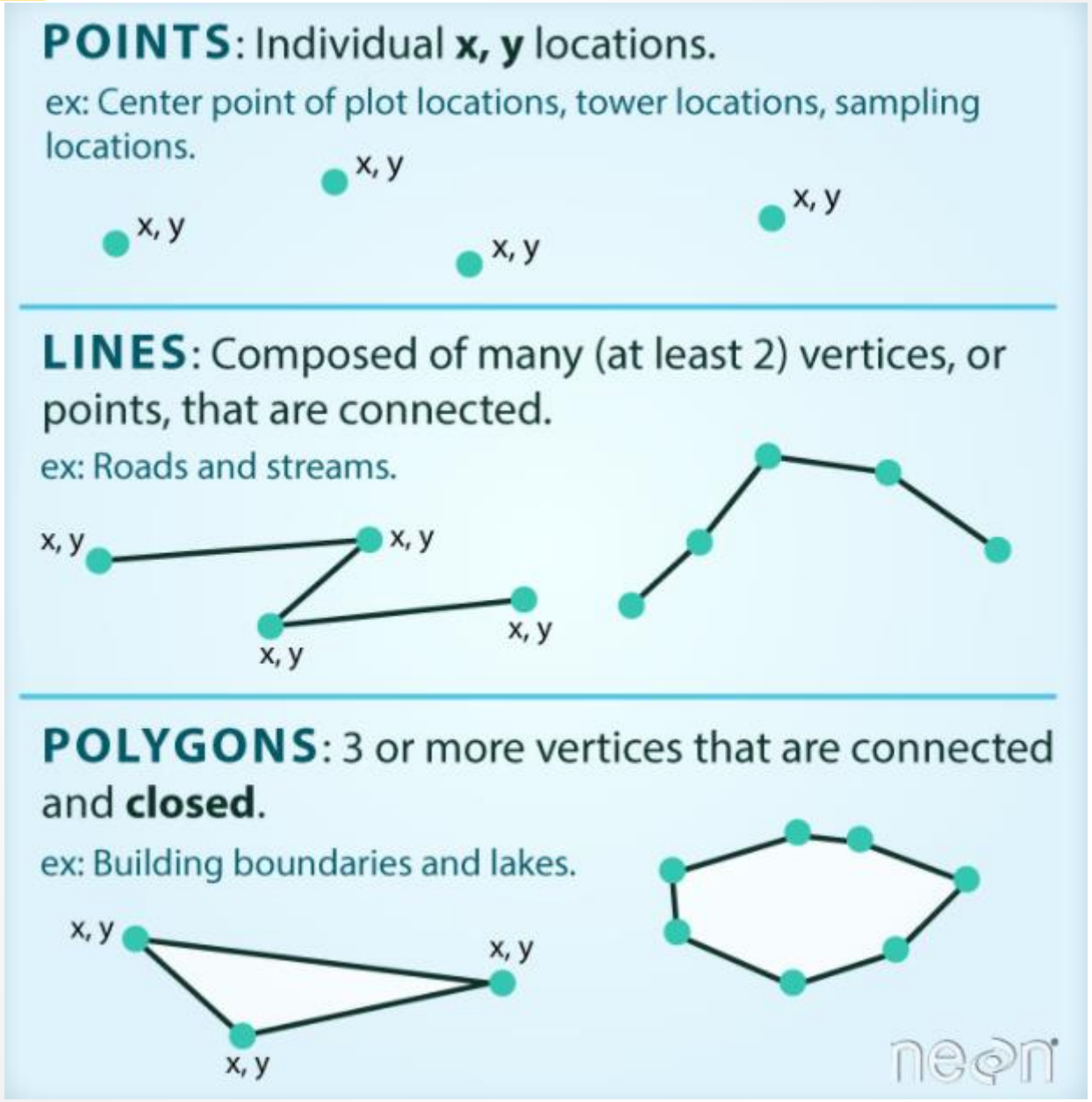
Vector Data / கூட்டுத் தரவு





Vector Data / கூட்டுத் தரவு

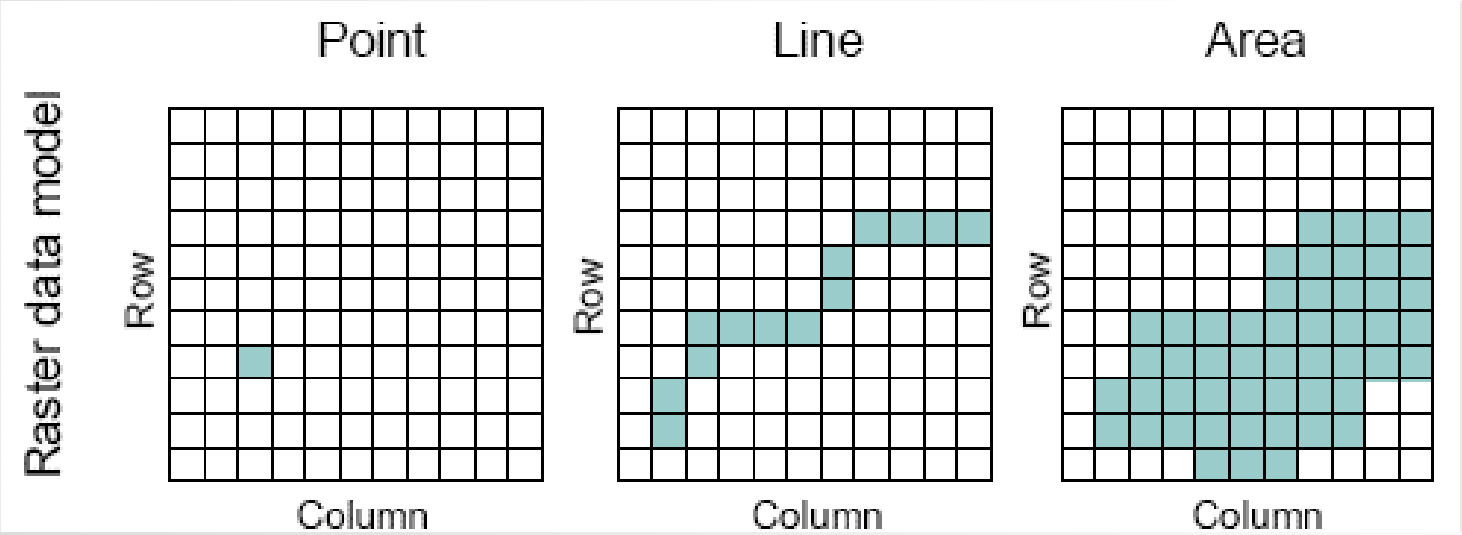
Vector data structures represent specific features on the Earth's surface, and assign attributes to those features. Vectors are composed of discrete geometric locations (x, y values) known as vertices that define the shape of the spatial object. The organization of the vertices determines the type of vector that we are working with: point, line or polygon.

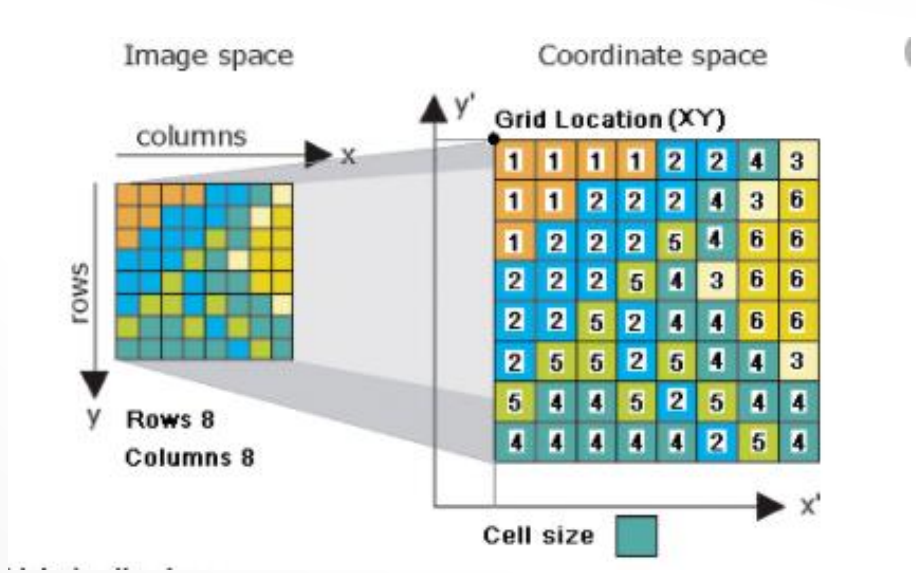


https://datacarpentry.org/organization-geospatial/aio/index.html

Raster Data ராஸ்டர் தரவு

Raster data is any pixelated (or gridded) data where each pixel is associated with a specific geographical location. The value of a pixel can be continuous (e.g. elevation) or categorical (e.g. land use). If this sounds familiar, it is because this data structure is very common: it's how we represent any digital image. A geospatial raster is only different from a digital photo in that it is accompanied by spatial information that connects the data to a particular location. This includes the raster's extent and cell size, the number of rows and columns



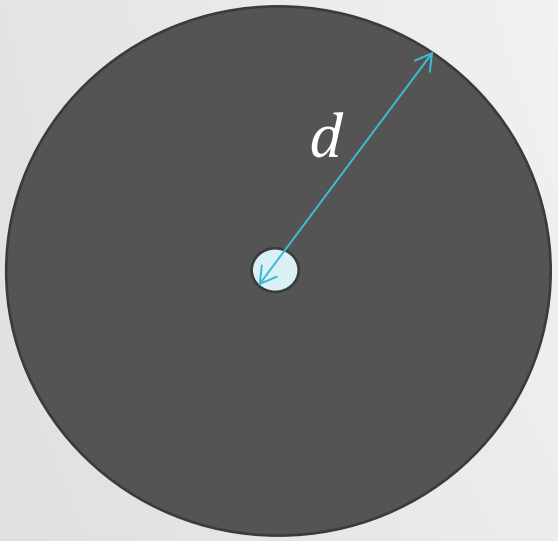


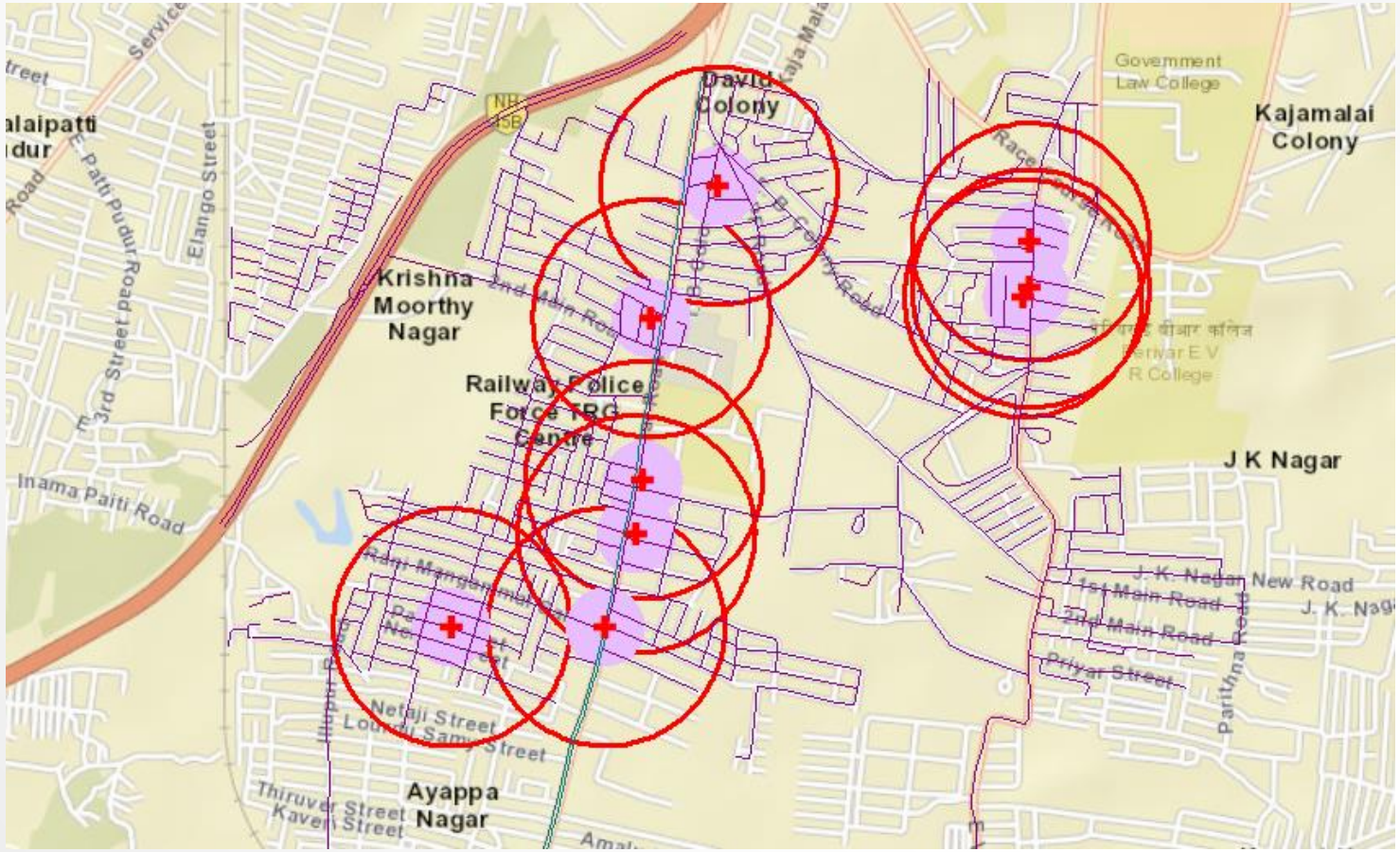
https://datacarpentry.org/organization-geospatial/aio/index.html

GIS Analysis / பகுப்பாய்வு

Buffer இடையக பகுப்பாய்வு

Point Buffer

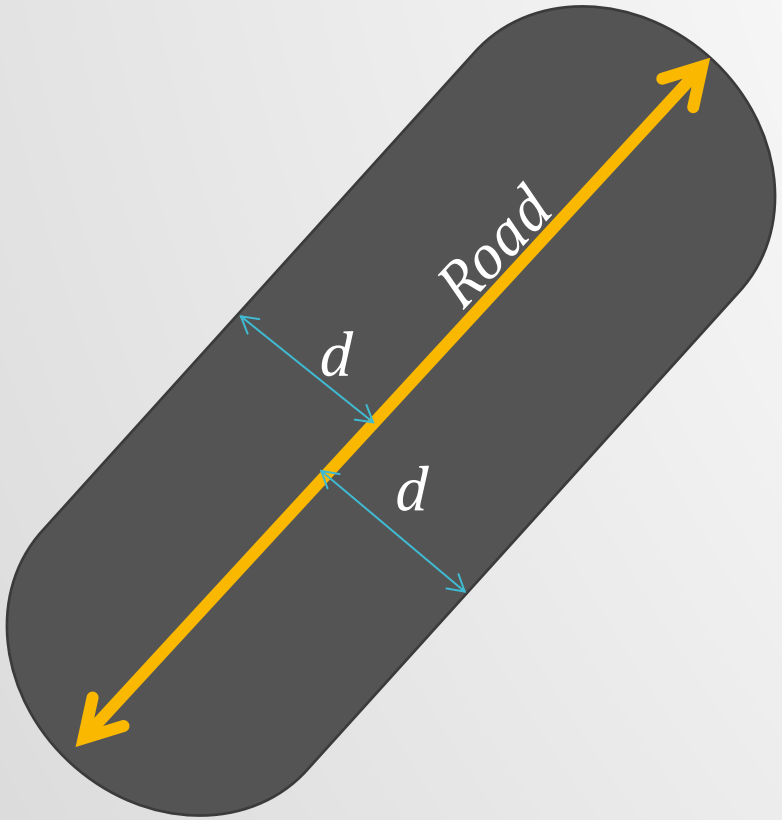


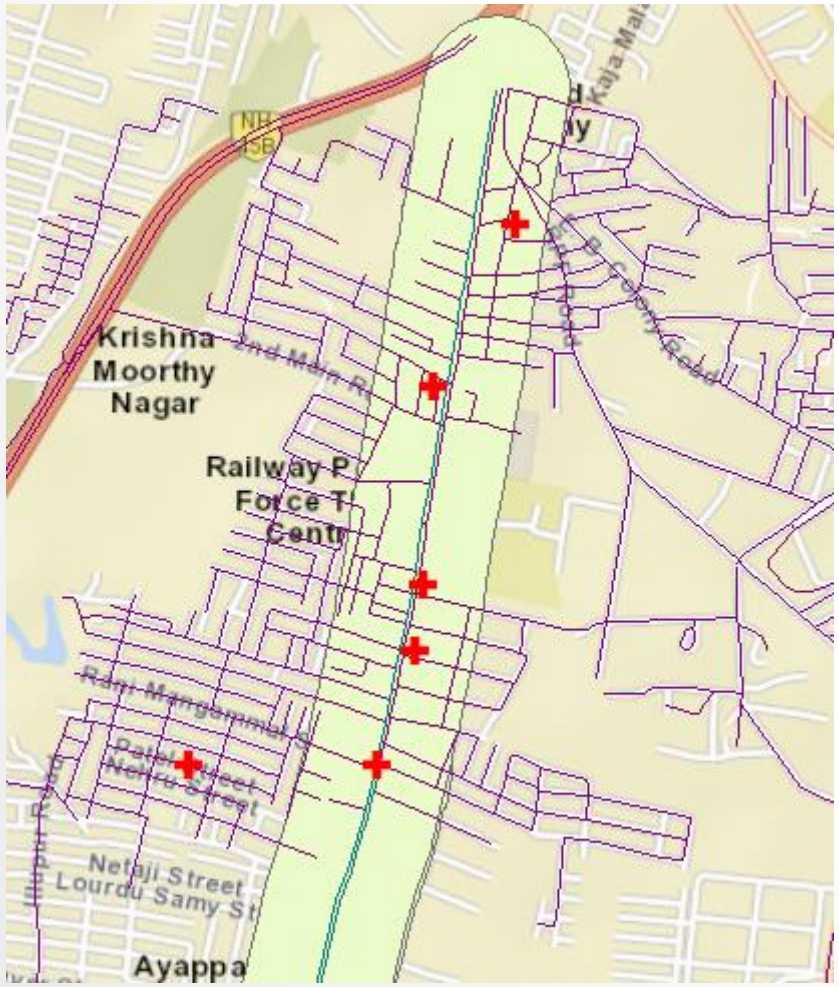


GIS Analysis / பகுப்பாய்வு

Buffer இடையக பகுப்பாய்வு

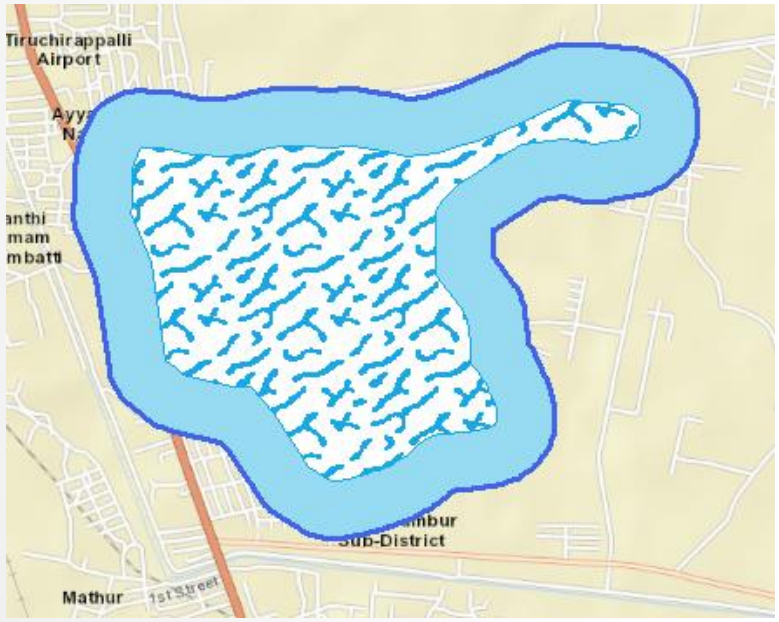
Line Buffer

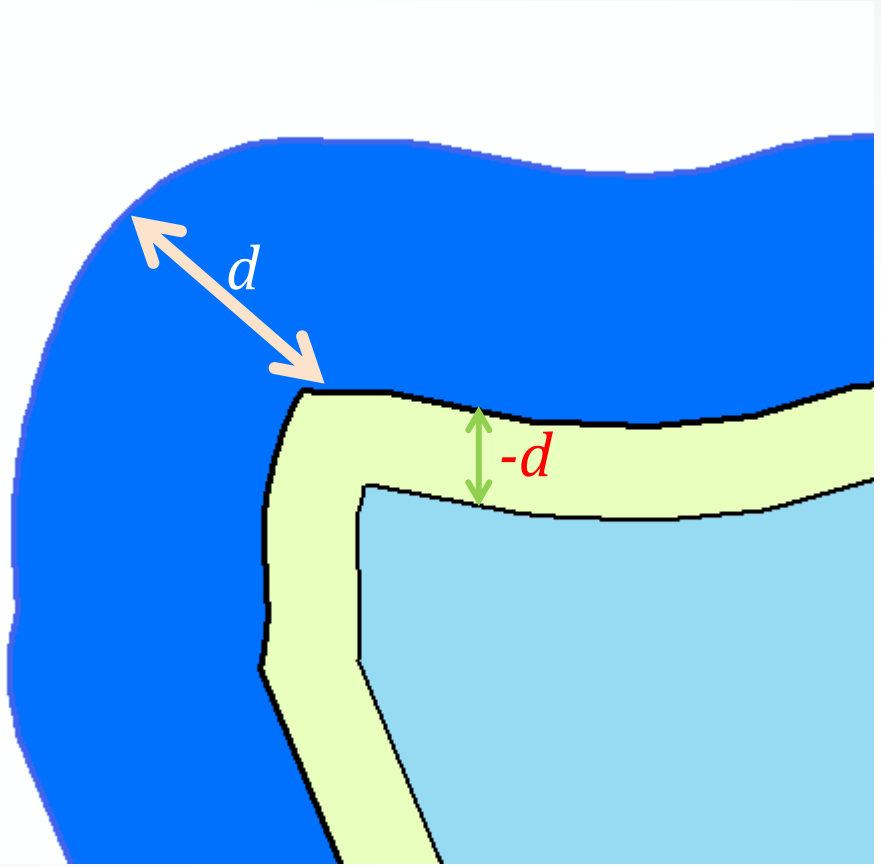




GIS Analysis / பகுப்பாய்வு

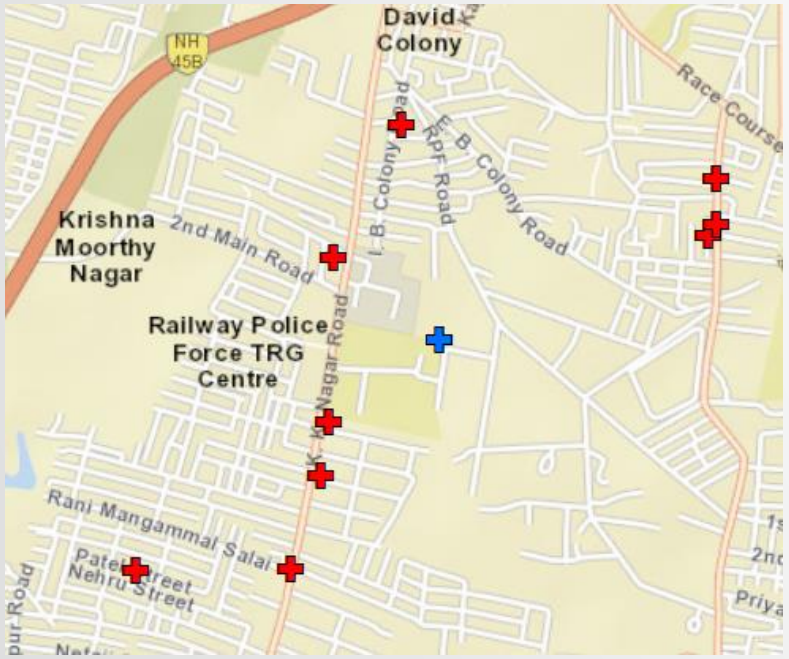
Buffer இடையக பகுப்பாய்வு
Polygon Buffer



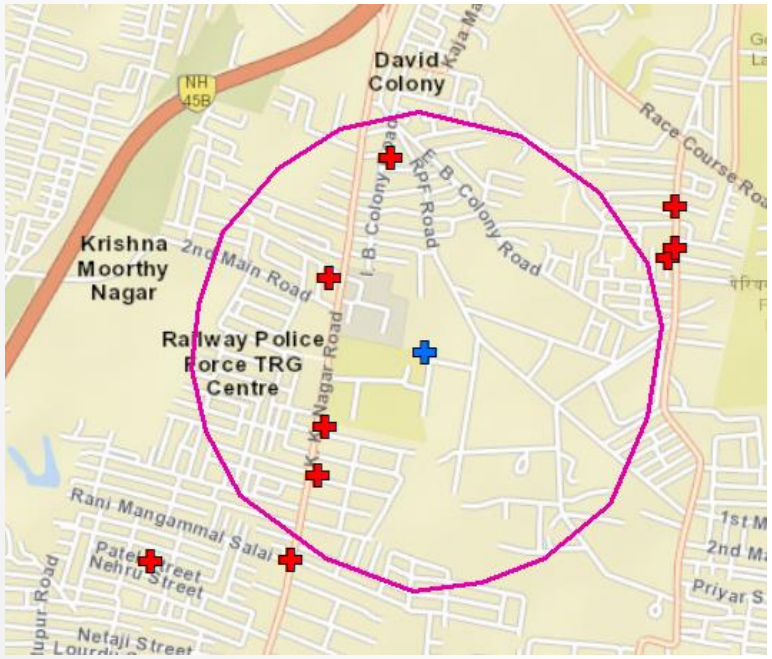


GIS Analysis / பகுப்பாய்வு

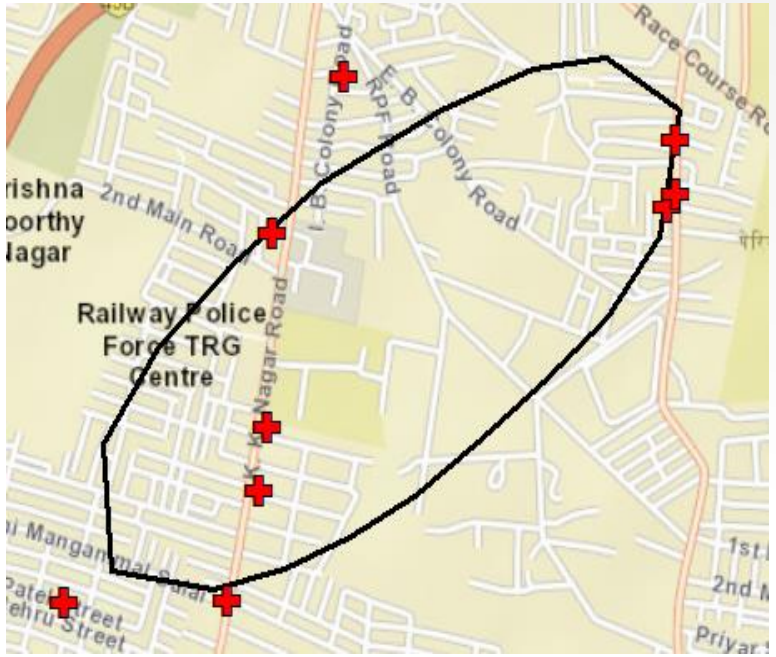
Mean Centre



Standard Distance

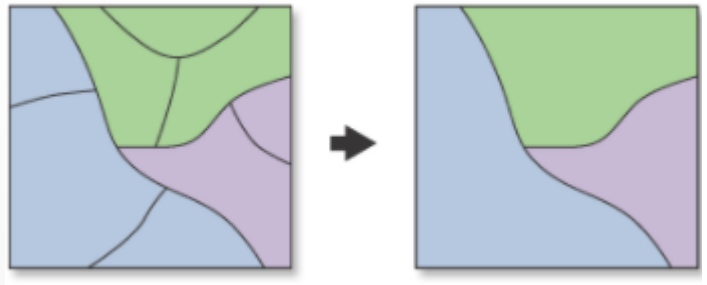


Directional Dist.

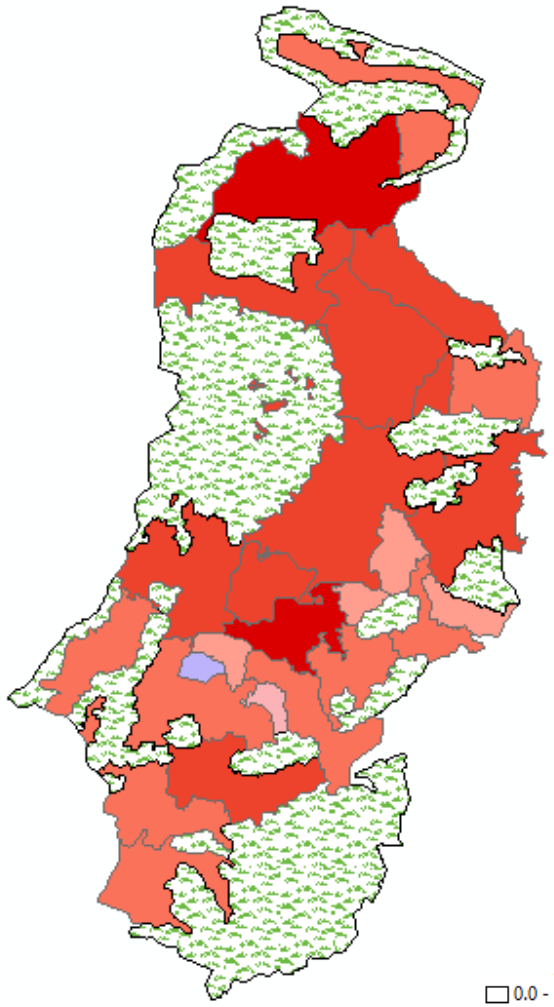


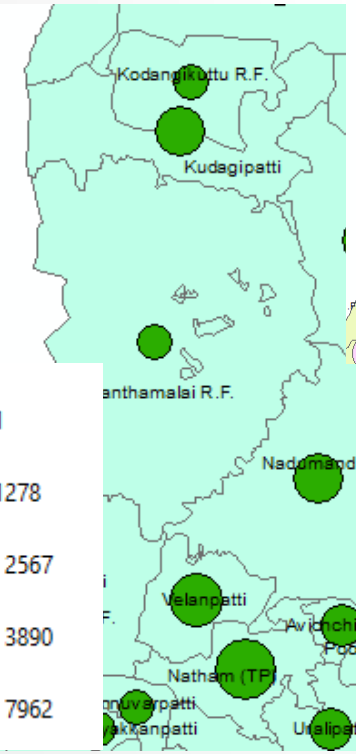
Append

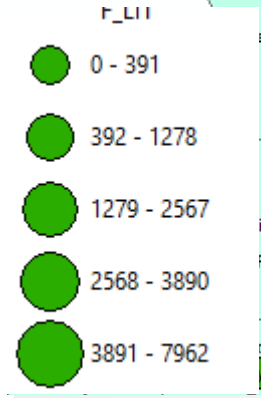
Dissolve

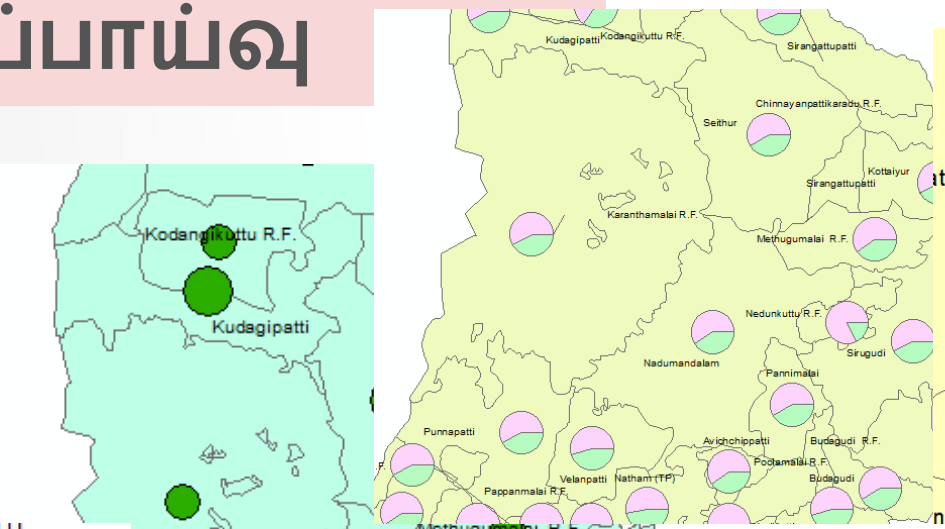


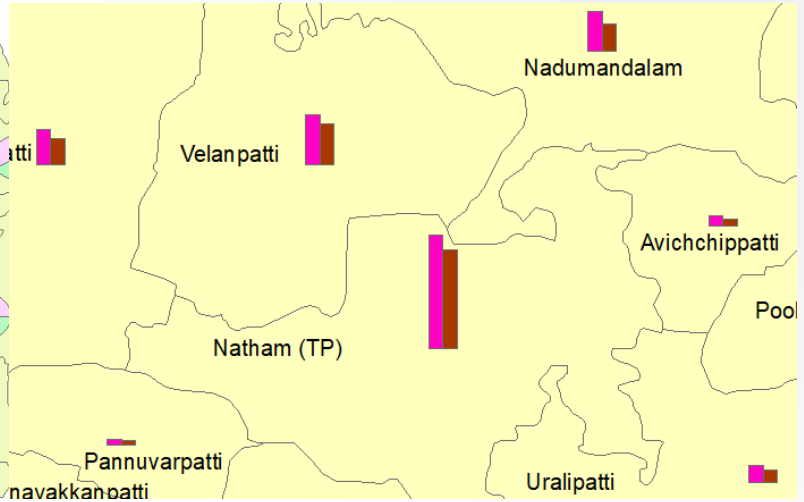
GIS Analysis / பகுப்பாய்வு

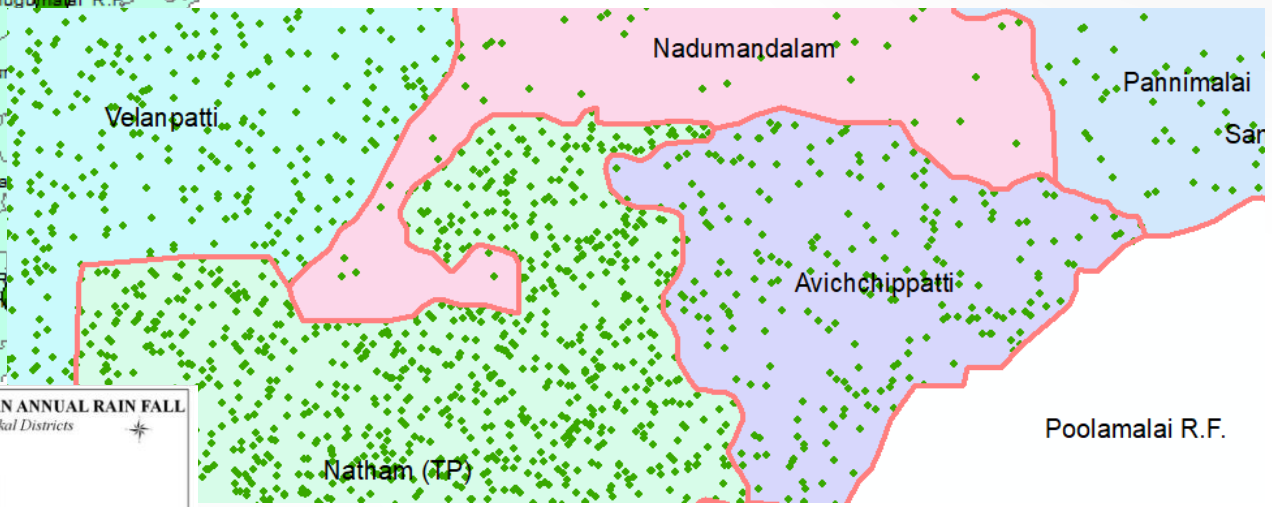


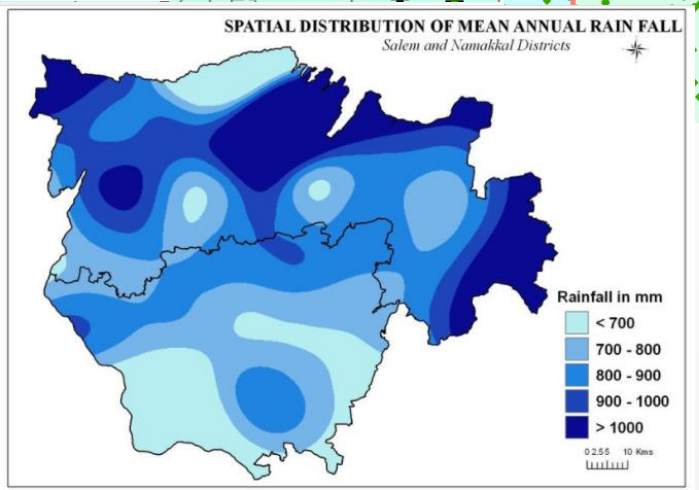




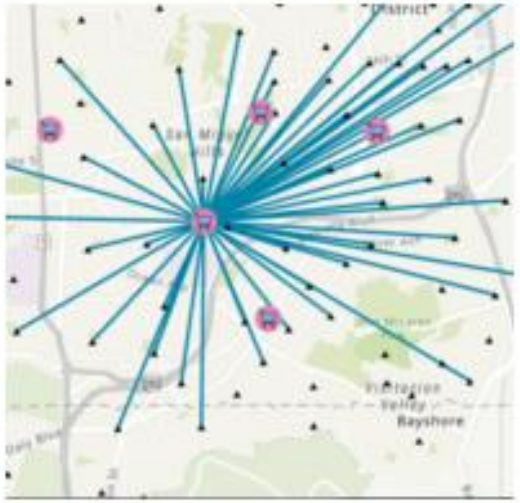








Network Analysis / பிணைய பகுப்பாய்வு



Shortest Path

Service Area

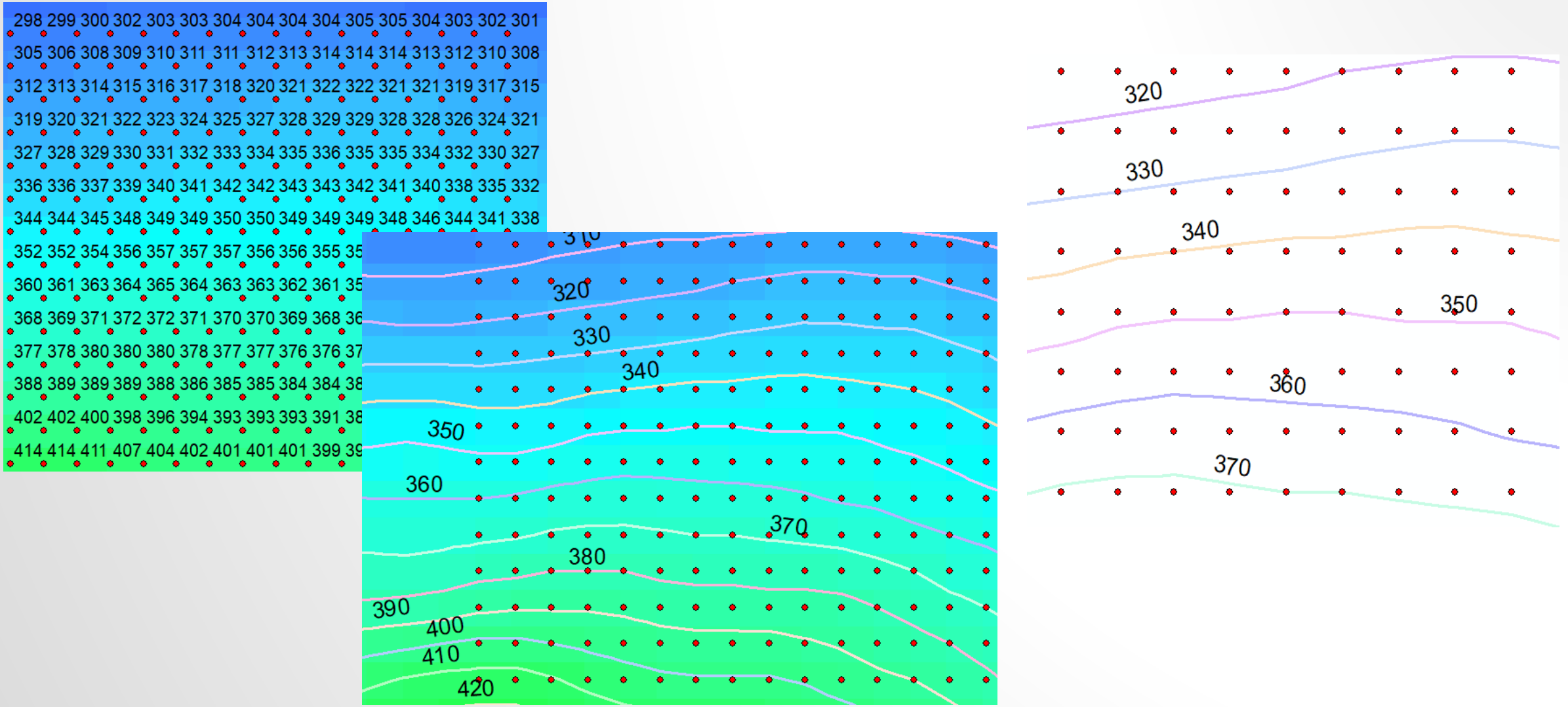
Connectivity

Traffic, Parking

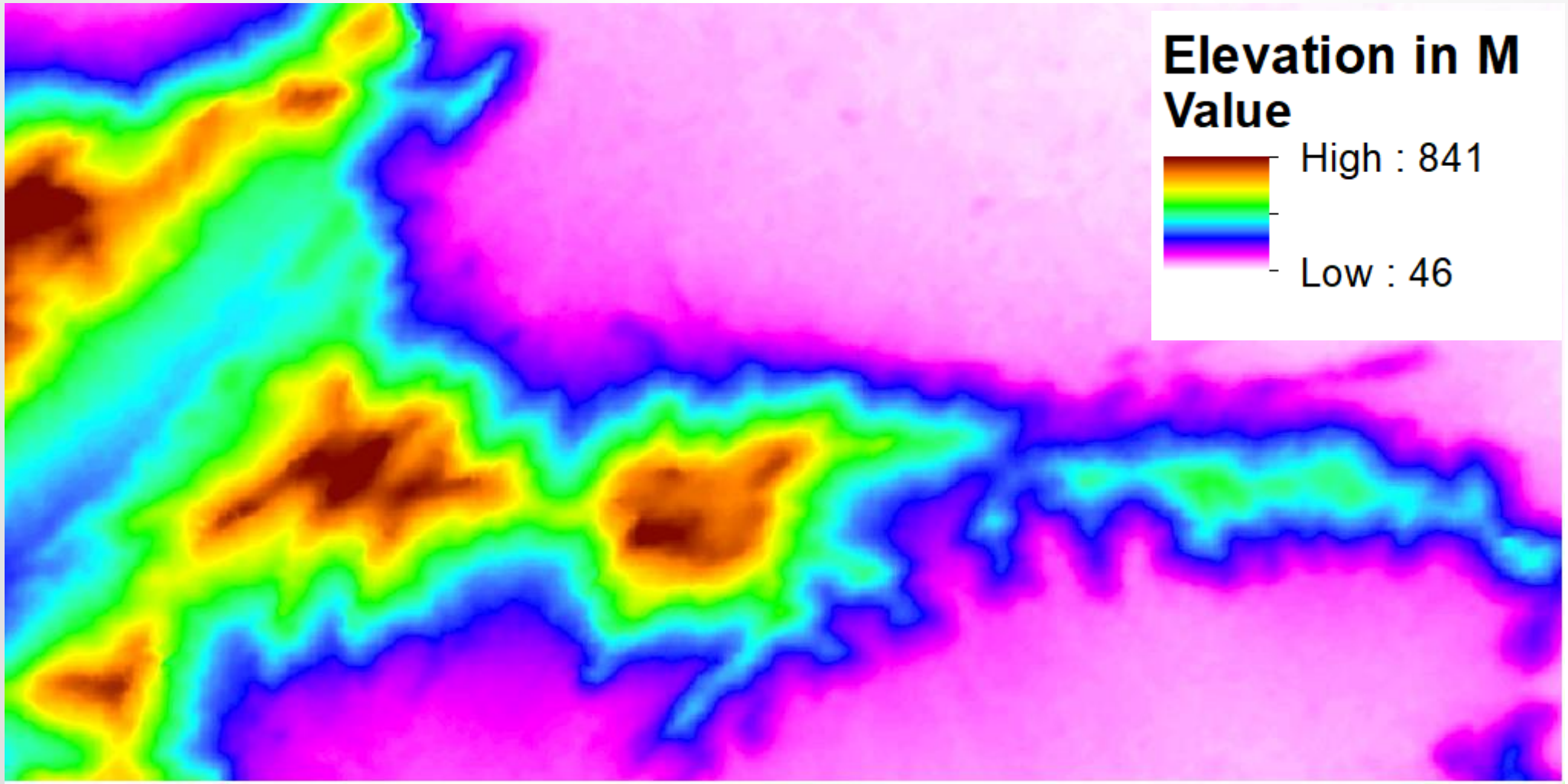
Accident

Interpolation of contour

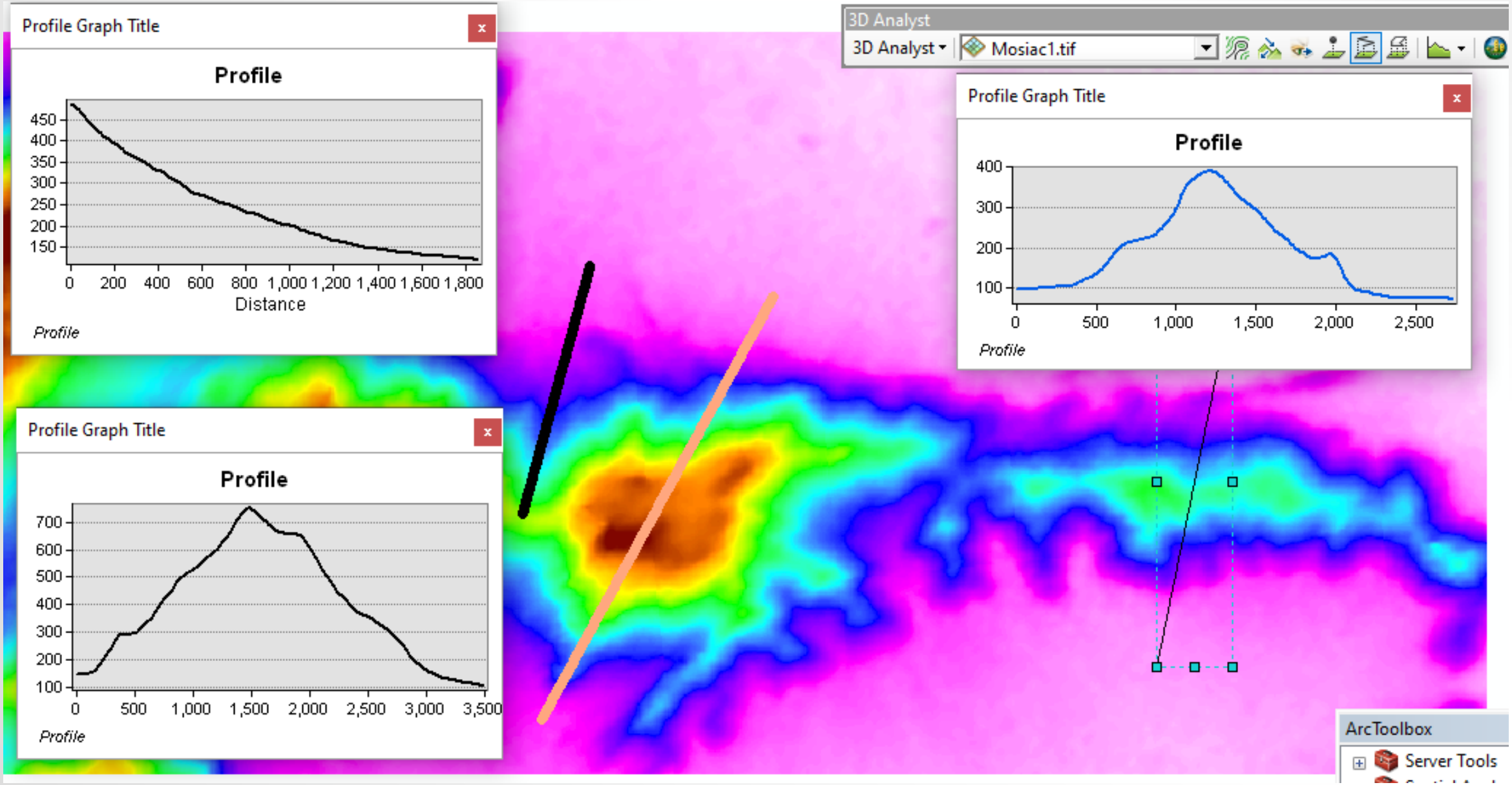
சம உயரக் கோடு வரைதல்



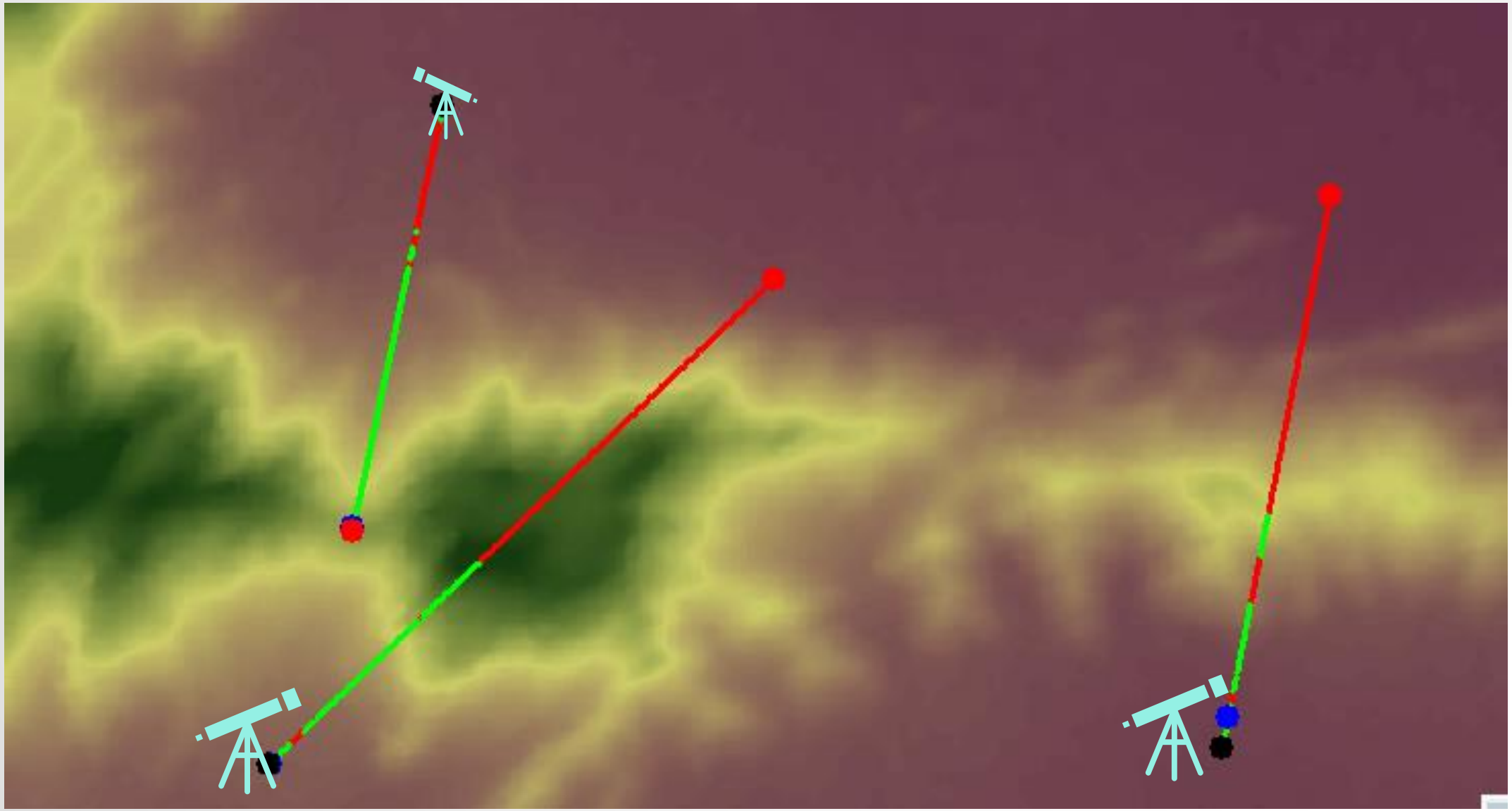
Raster Elevation

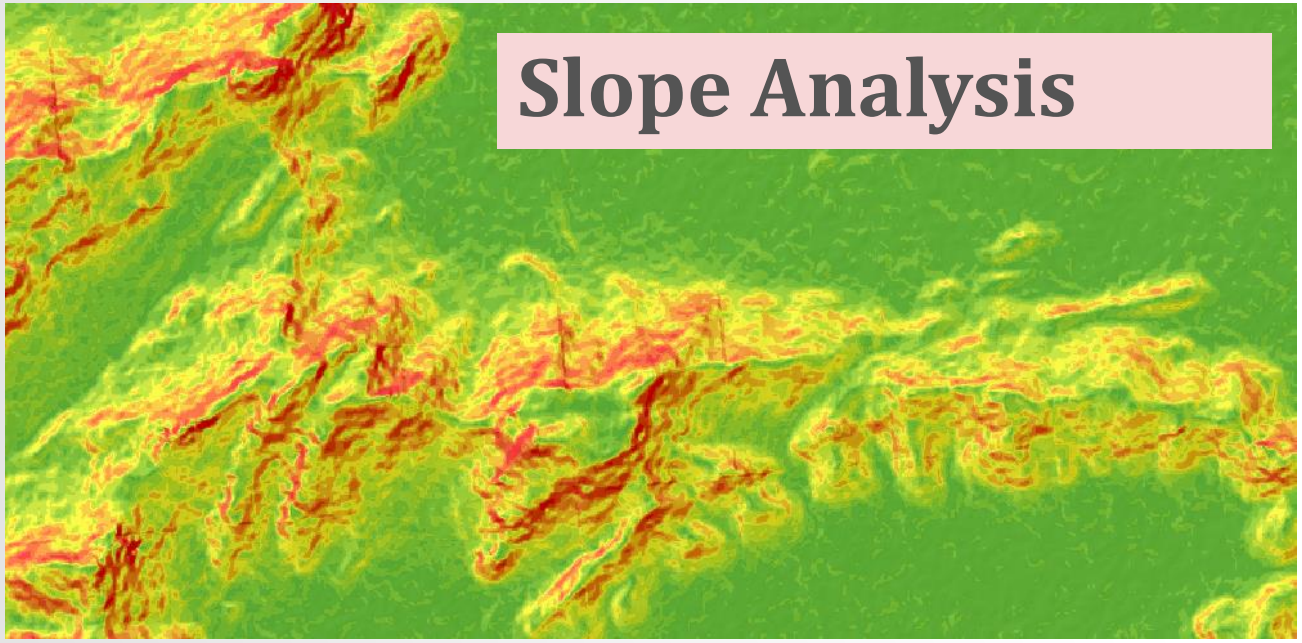


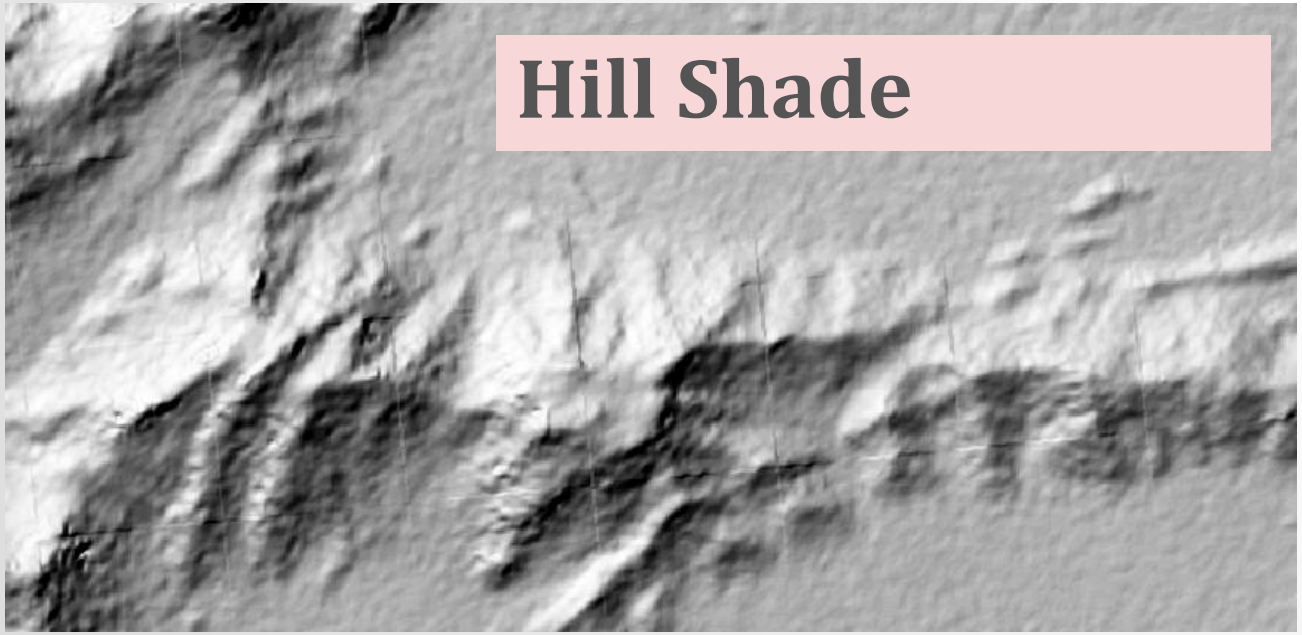
Elevation Profile



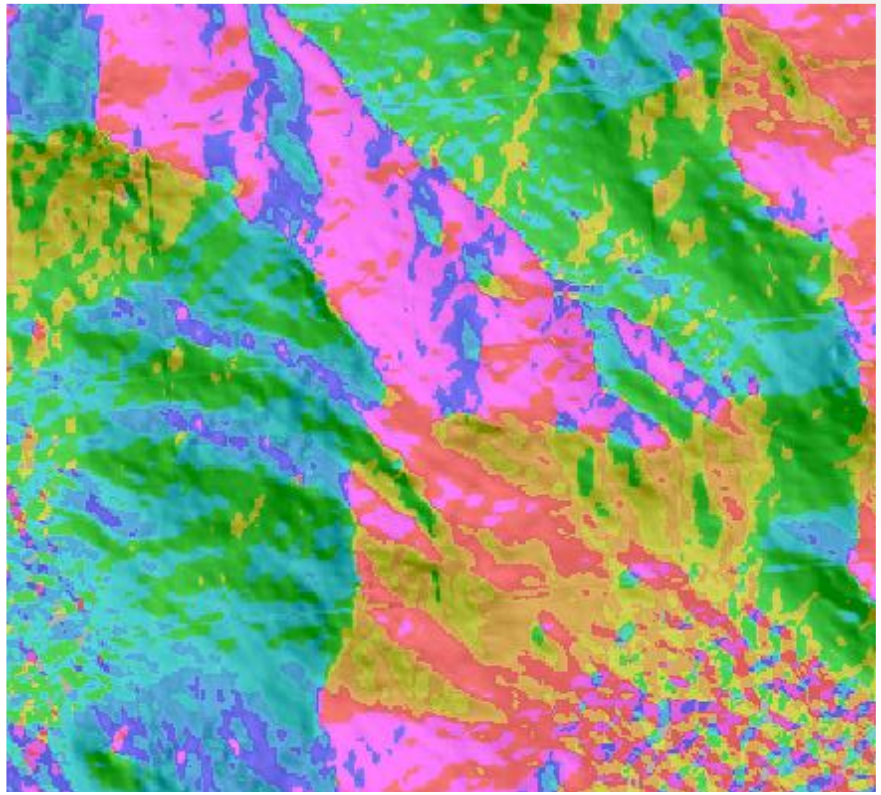
Visibility Analysis

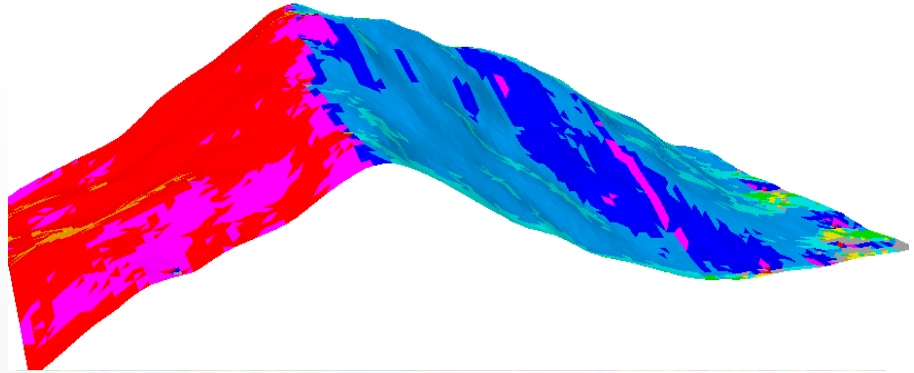




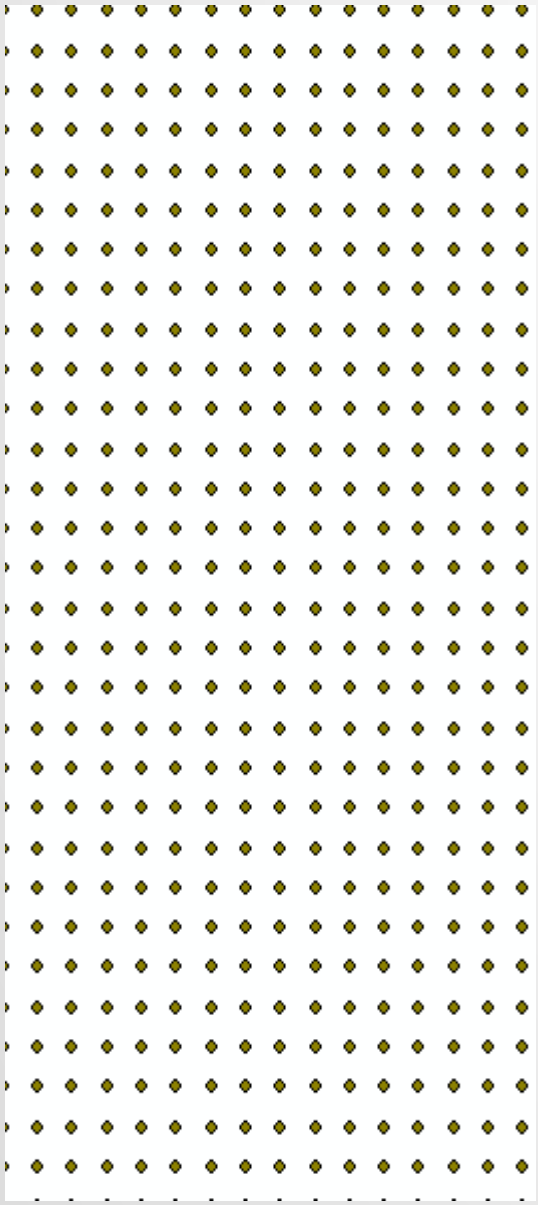


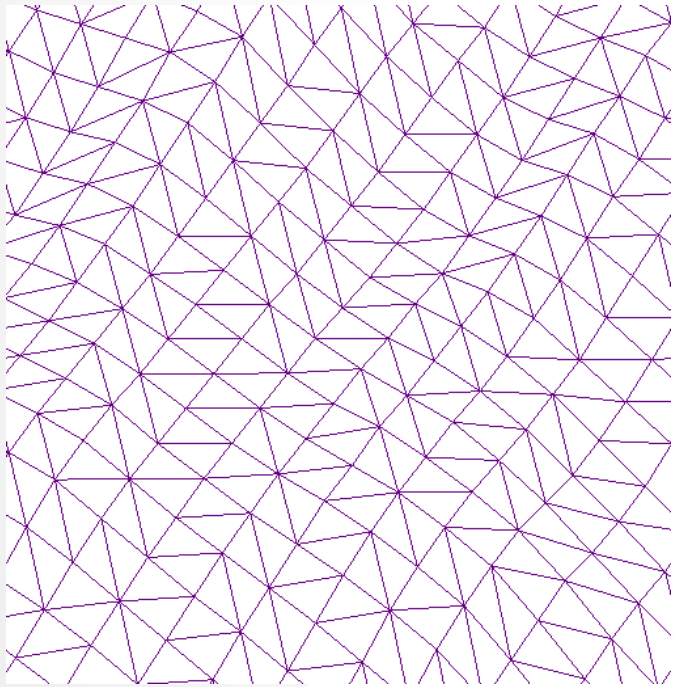
Aspect Analysis

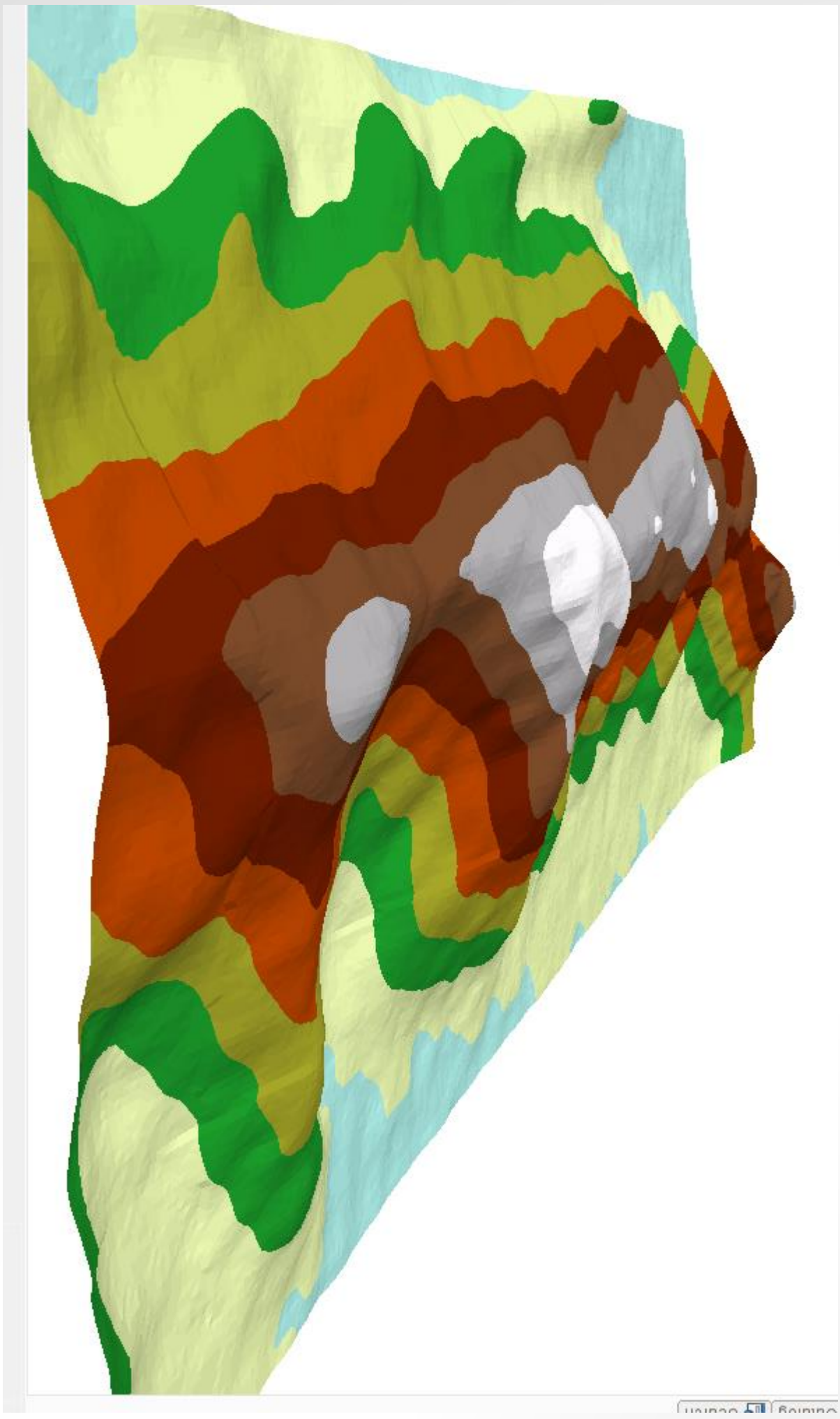




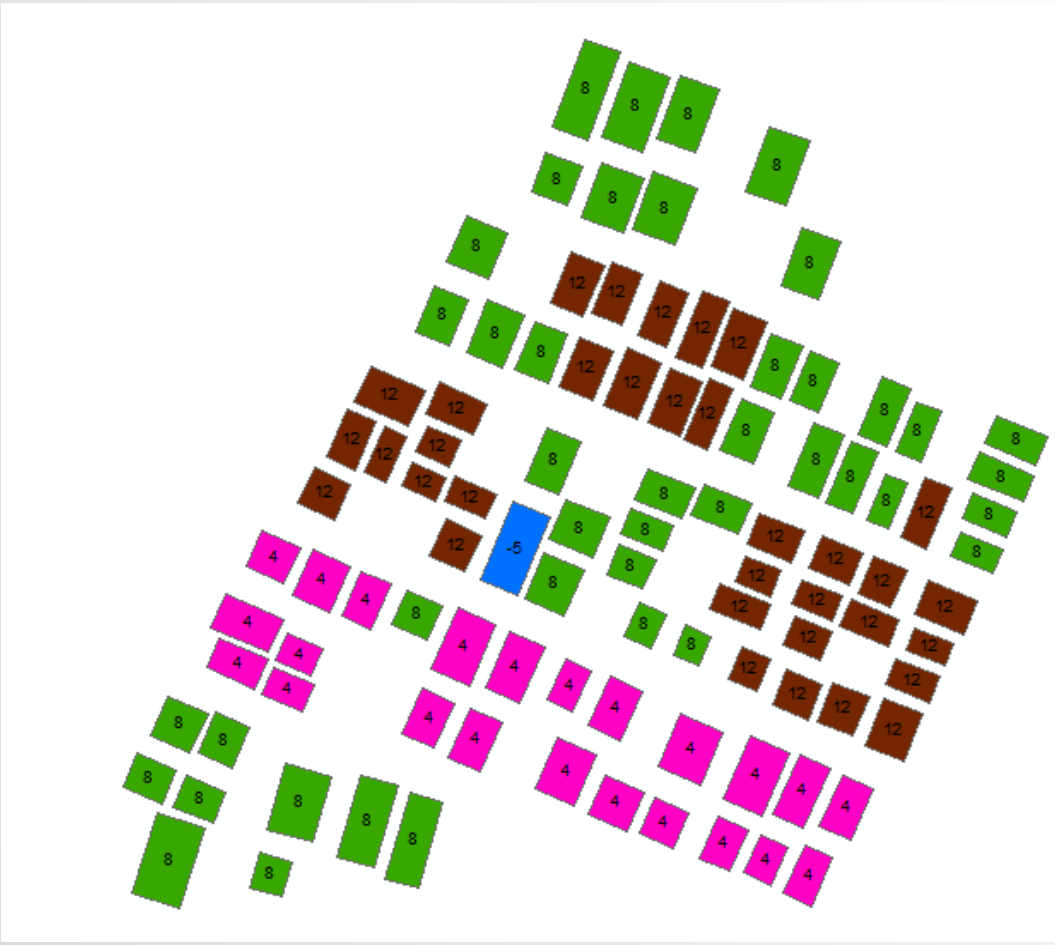
Triangulated Irregular Network (TIN)

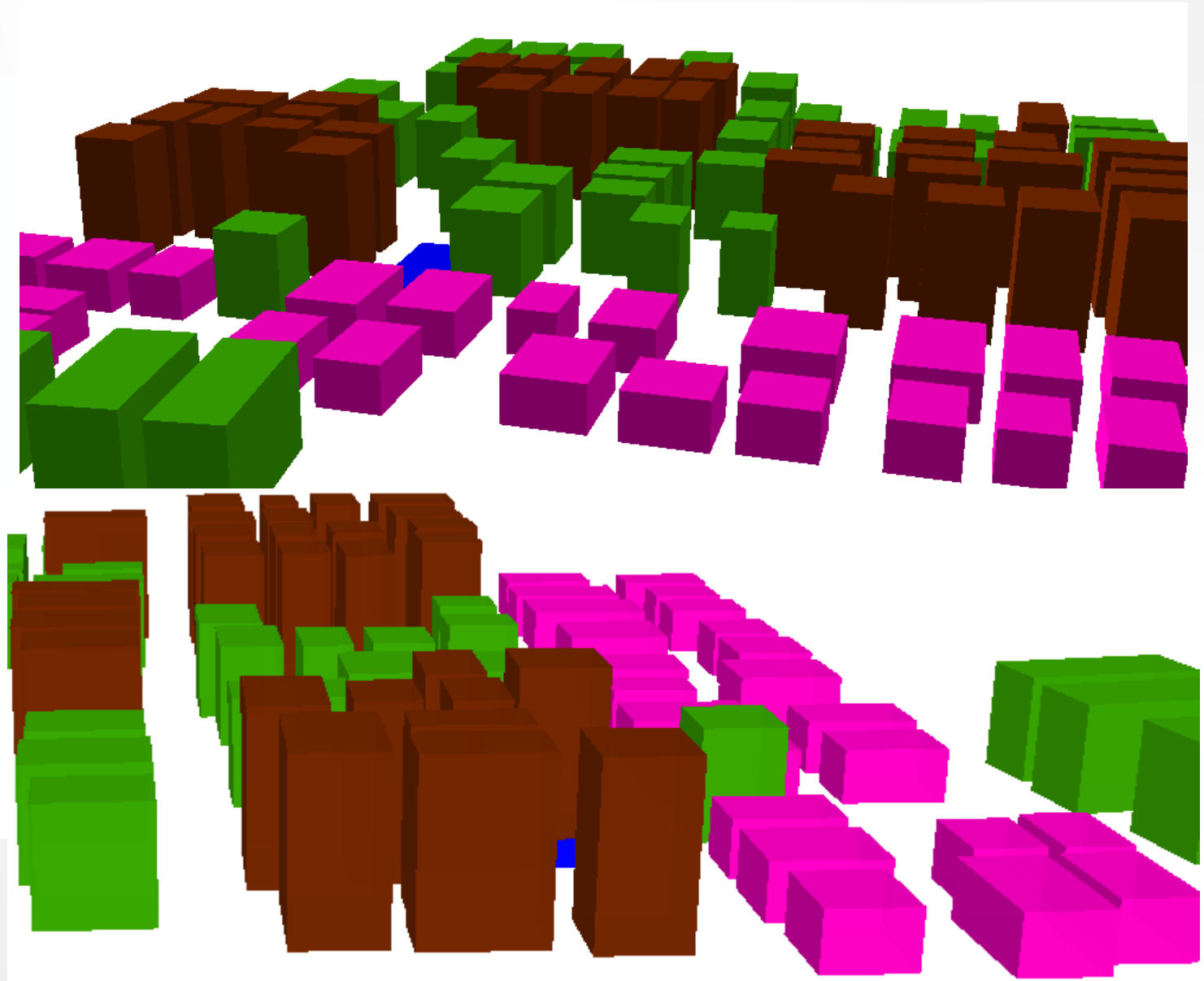






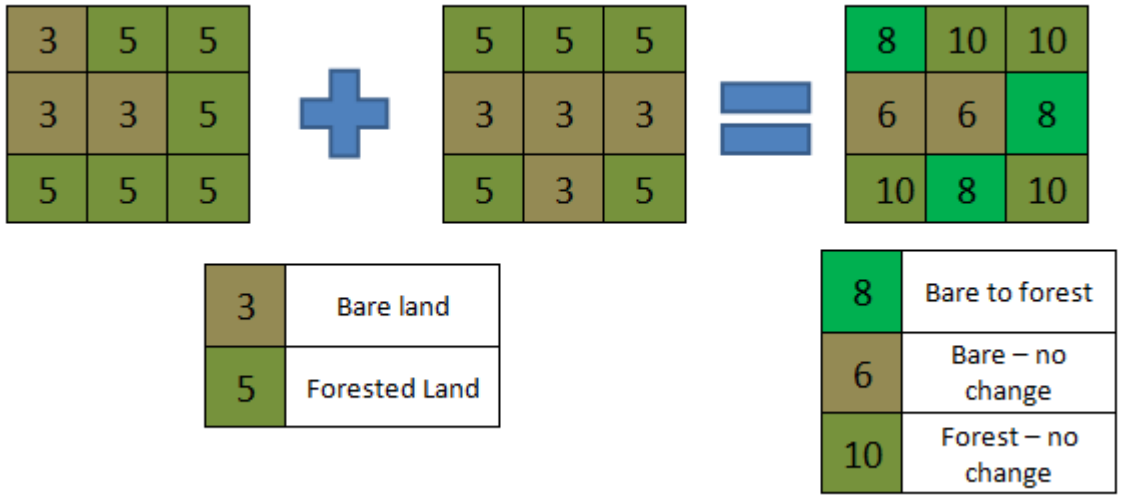
3D Building Analysis

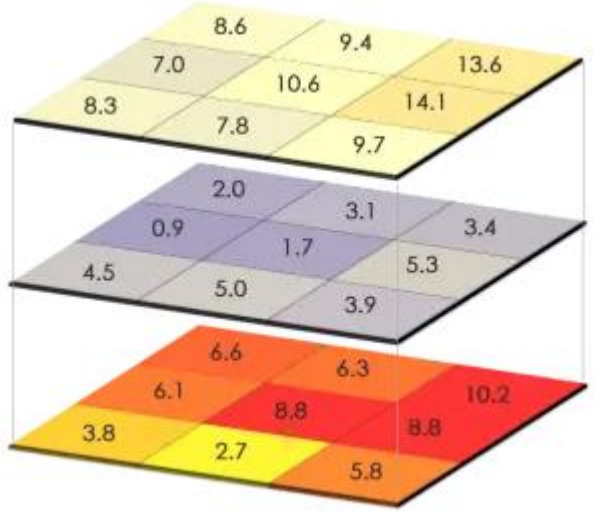




OVERLAY ANALYSIS / அடுக்கு பகுப்பாய்வு

Raster Data ராஸ்டர் தரவு



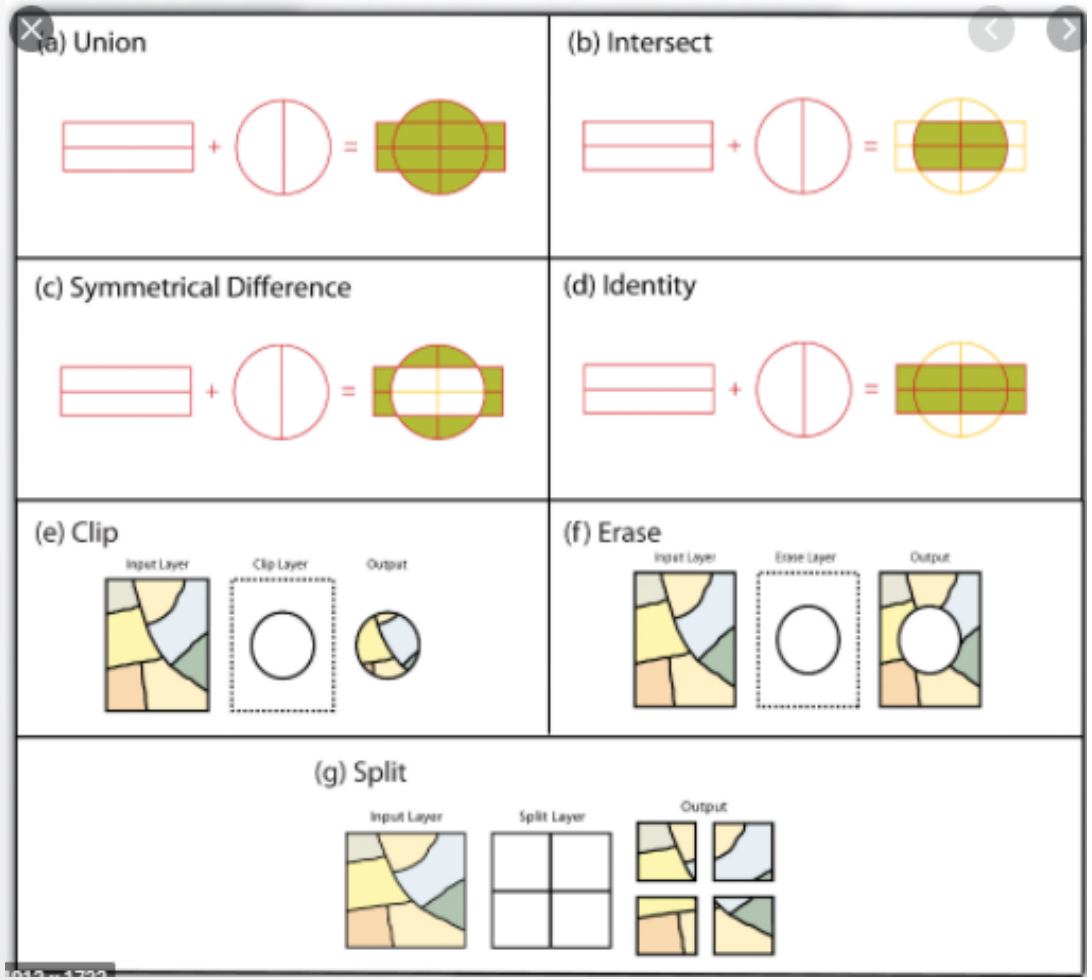


MAP ALGEBRA LOCATION OPERATIONS

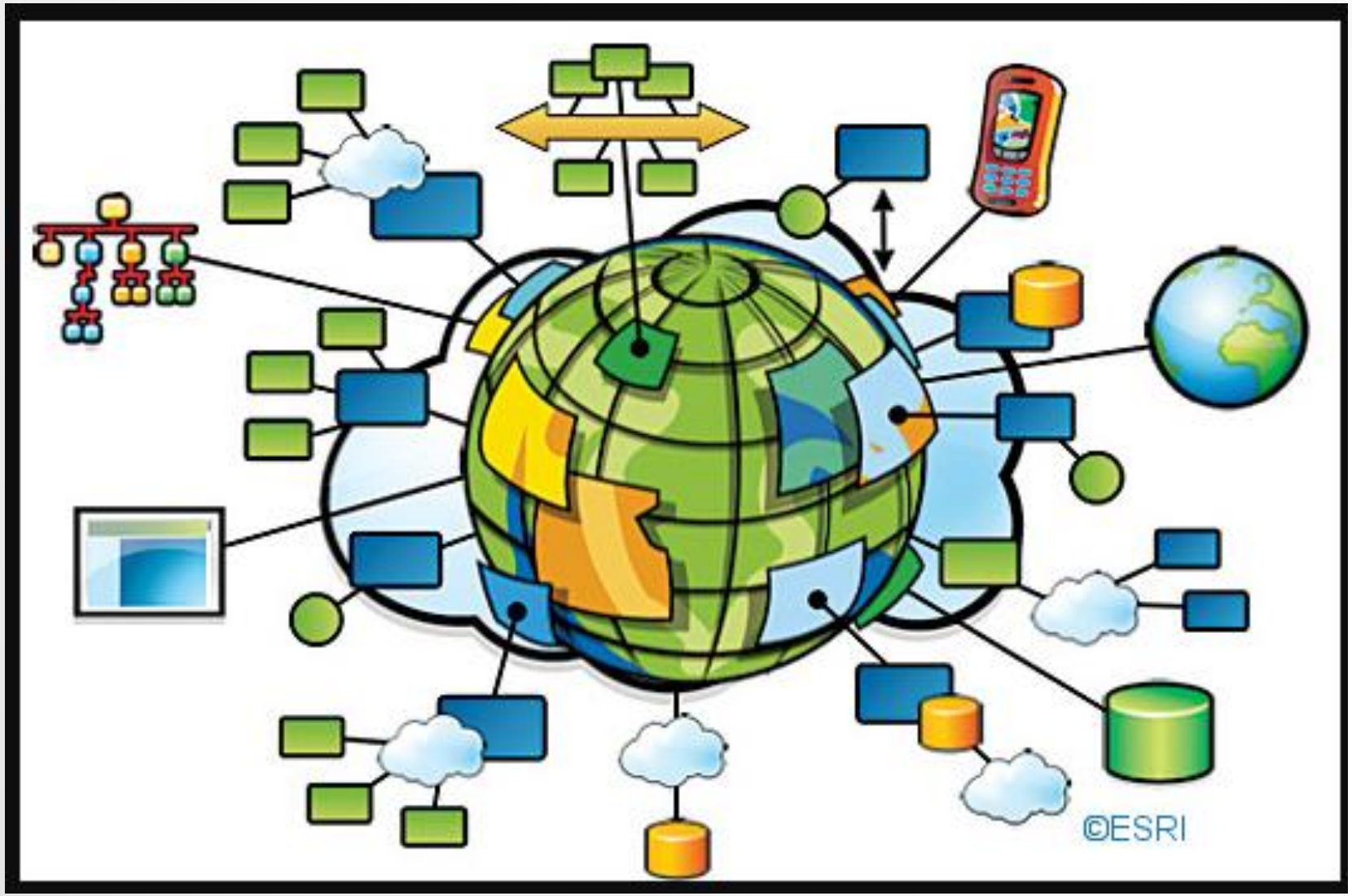
Local, Global, Zonal, and Focal

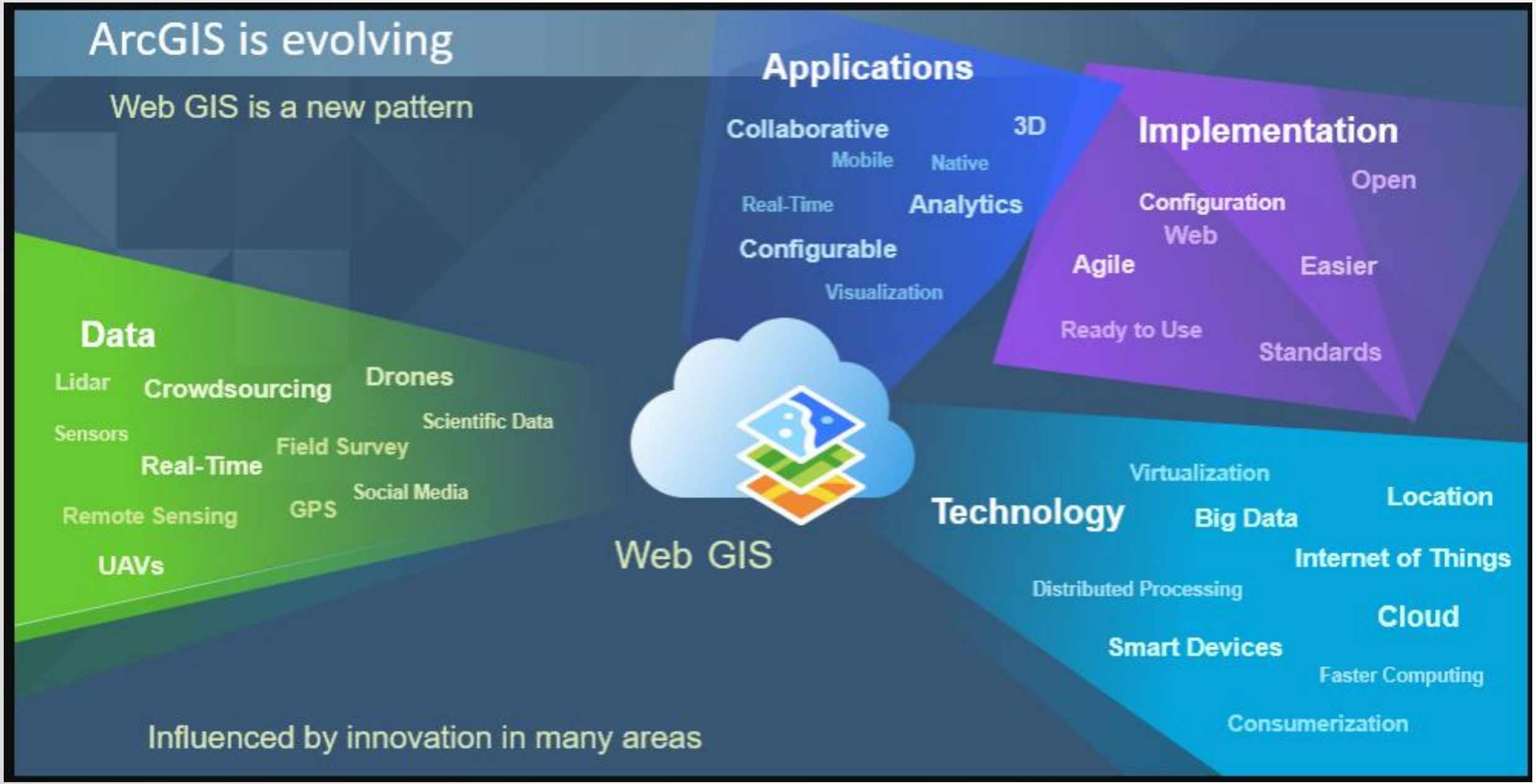
OVERLAY ANALYSIS / அடுக்கு பகுப்பாய்வு

Vector Data / கோட்டுத் தரவு



WEB GIS

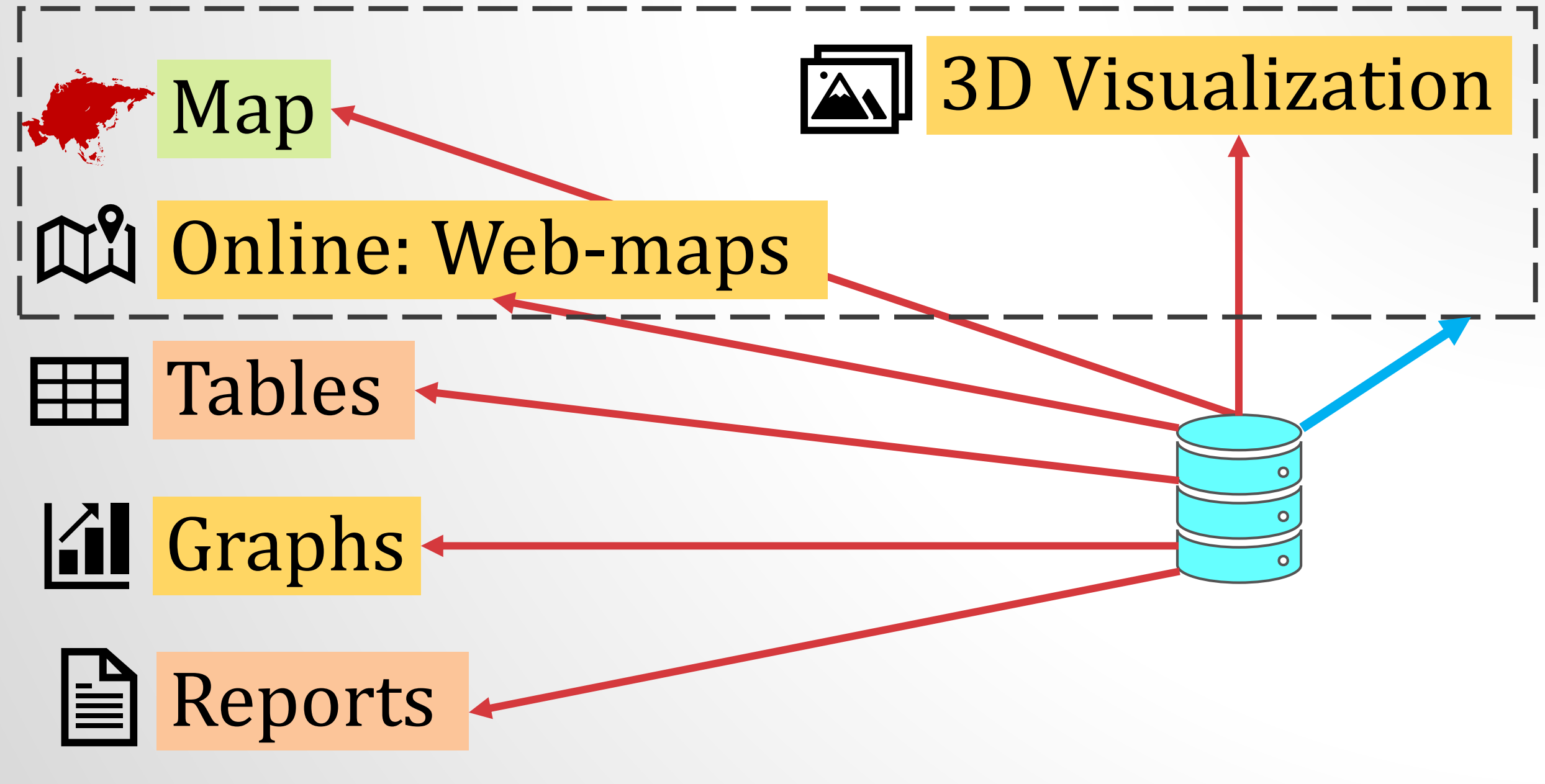



ArcGIS is evolving
Web GIS is a new pattern
Applications
Collaborative
3D
Mobile
Native
Real-Time
Analytics
Configurable
Visualization
Implementation
Open
Configuration
Web
Agile
Easier
Ready to Use
Standards
Data
Lidar
Crowdsourcing
Drones
Scientific Data
Sensors
Field Survey
Real-Time
Social Media
Remote Sensing
GPS
UAVs
Web GIS
Technology
Virtualization
Location
Big Data
Internet of Things
Distributed Processing
Cloud
Smart Devices
Faster Computing
Consumerization
Influenced by innovation in many areas


GeoDa
Whitebox
Geospatial Analysis Tools
DIVA-GIS
free, simple & effective
OPEN JUMP
MAPWINDOW
ILWIS
open
3.7
52north
gvSIG

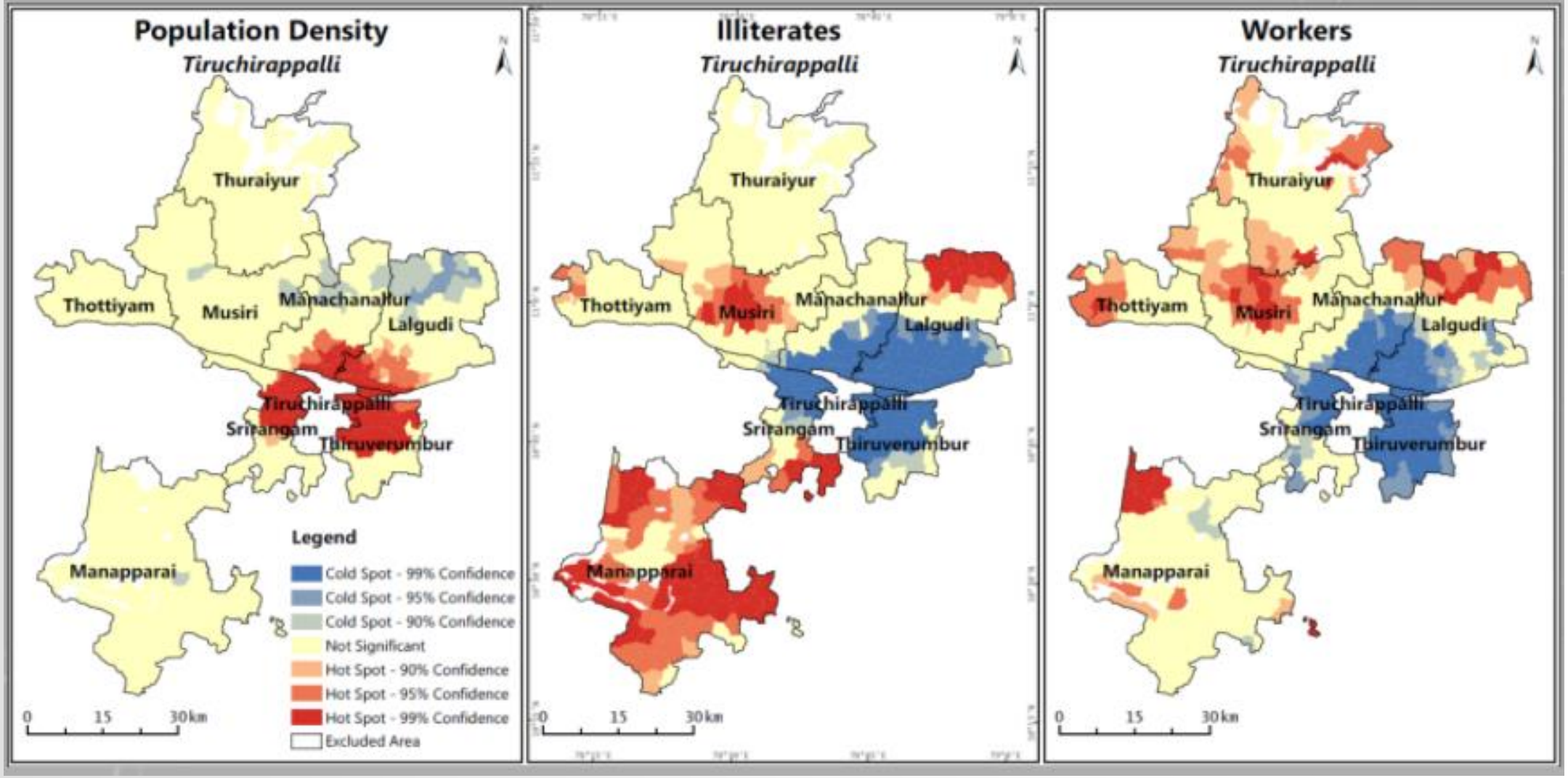

GDAL
OGC®
Making location count.
OSGeo
Project
gvSIG
PROJ.4
OPEN JUMP
Jump Unified Mapping Platform

GIS: OUTPT DEVICES / வெளியீட்டு சாதனங்கள்



APPLICATIONS

DEMOGRAPHIC CHARACTERISTICS



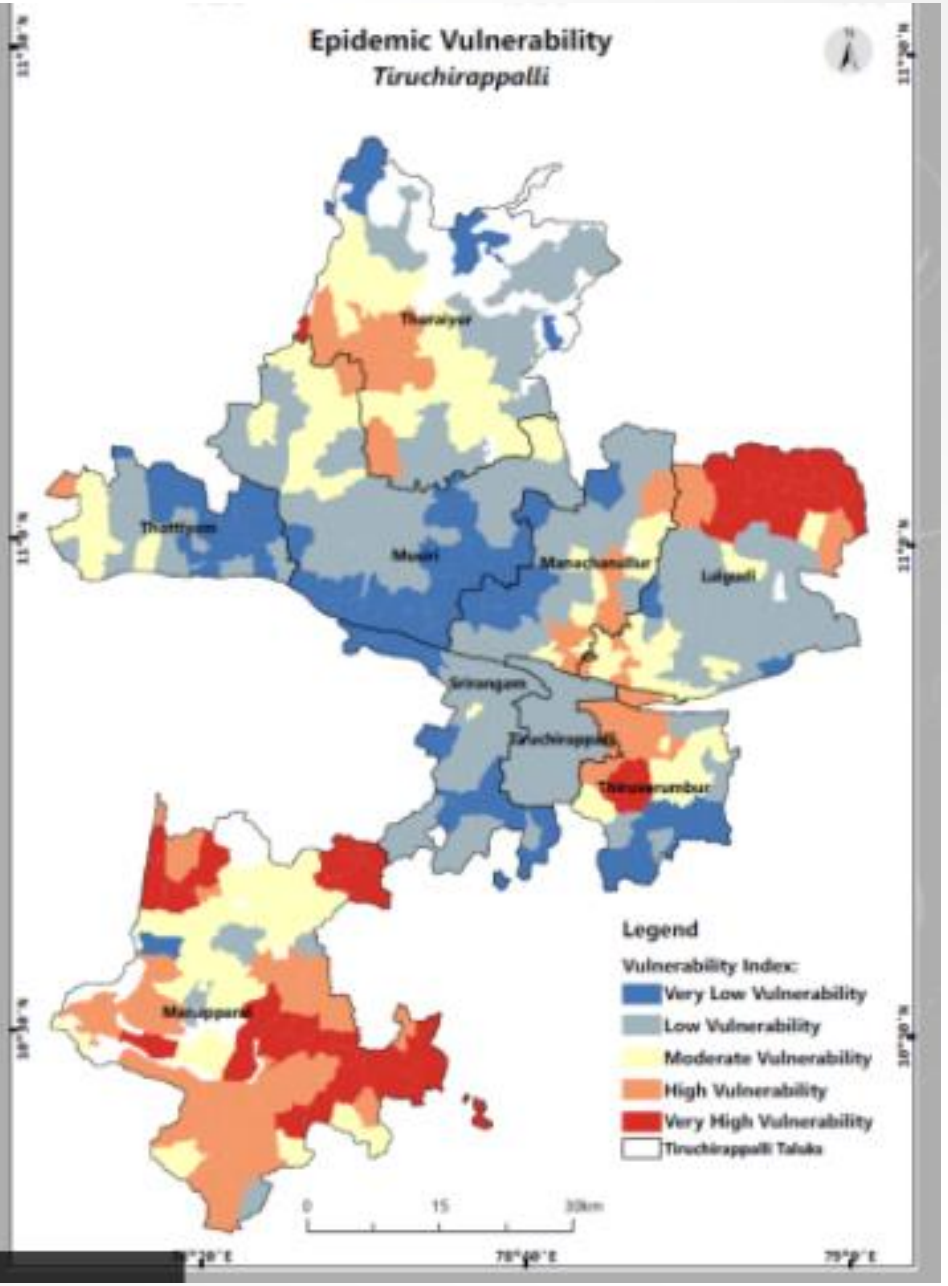
VULNERABILITY

In the study area there are,

- 132 (48 Very High & 84 High) villages with high vulnerability
- 104 villages with moderate vulnerability and
- 229 (161 Low & 68 Very Low) villages with low vulnerability

to the spread of diseases were identified.

- The clusters of high vulnerability are found around Manapparai, Thiruverumbur, Thuraiyur and Lalgudi taluks.
- Figure shows the vulnerable areas for epidemics.
- The study gives a basic understanding on spatial distribution and clustering of demographic and household data which associates the vulnerable areas for the spread of contagious diseases.
- With more holistic data and rigorous statistical application this method could deliver more promising results.
- The study could further include many other demographic and housing data like age, health condition, sanitation, hygiene etc., to enhance the results to provide a comprehensive solution.



Weight and Rank for Agro Potential Zones (APZ)

Geomorphology	Weight	Rank
Structural Origin-Low Dissected Hills and Valleys	0.03	-
Structural Origin-Moderately Dissected Hills and Valleys		-
Structural Origin-Moderately Dissected Lower Plateau		-
Structural Origin-Moderately Dissected Lower Plateau		-
Den Origin Highly Dissected Hills and Valleys		-
Den Origin-Low Dissected Hills and Valleys		-
Den Origin-Low Dissected Upper Plateau		-
Den Origin-Moderately Dissected Hills and Valleys		-
Den Origin-Moderately Dissected Lower Plateau		-
Den Origin-Moderately Dissected Upper Plateau		-
Den Origin-Pediment-PediPlain Complex		25
Fluvial Origin-Bajada		35
Fluvial Origin-Active Flood Plain		40

Climatic Sub type	Weight	Rank
B1A'1da'7	0.17	6
B1A'1s2/w2a'8		6
B1A'2da'8		5
B1A'3da'7		5
B2A'2da'7		5
B2A'3da'8		5
B2B'4da'7		5
C1A'2s2/w2a'8		5
C1A'3da'7		5
C1A'3da'8		5
C1A'4da'7		5
C1A'4da'8		5
C1A'5da'8		5
C2A'1da'8		3
C2A'1s2/w2a'8		3
C2A'2da'7		3
C2A'2s2/w2a'8		3
DA'3da'8		3
DA'4da'8		3
DA'5da'7		3
DA'5da'8		3
DA'6da'7		3
DA'6da'8		3
DA'7da'8		3
EA'4da'8		1
EA'5da'7		1
EA'5da'8		1
EA'6da'7		1

Length of Growing Period	Weight	Rank
0-90	0.17	10
90-150	0.17	25
150-210	0.17	30
> 210	0.17	35

Soil Texture	Weight	Rank
c	0.07	16
ls	0.07	6
ls-scl	0.07	13
R - ls	0.07	3
R - scl	0.07	1
sc - scl	0.07	21
scl	0.07	11
scl - sc	0.07	4
scl - sl	0.07	6
sl	0.07	8
sl - scl	0.07	11

Soil Irrigability	Weight	Rank
2d	0.04	11.75
2s		11.75
2s-2d		11.75
2s-3s		11.75
3d		10.00
3s		10.00
3s-4s		9.00
4s		5.00
4s-3s		5.00
4st		5.00
6s-6t		3.00
6t-4s		3.00
6t-6s		3.00

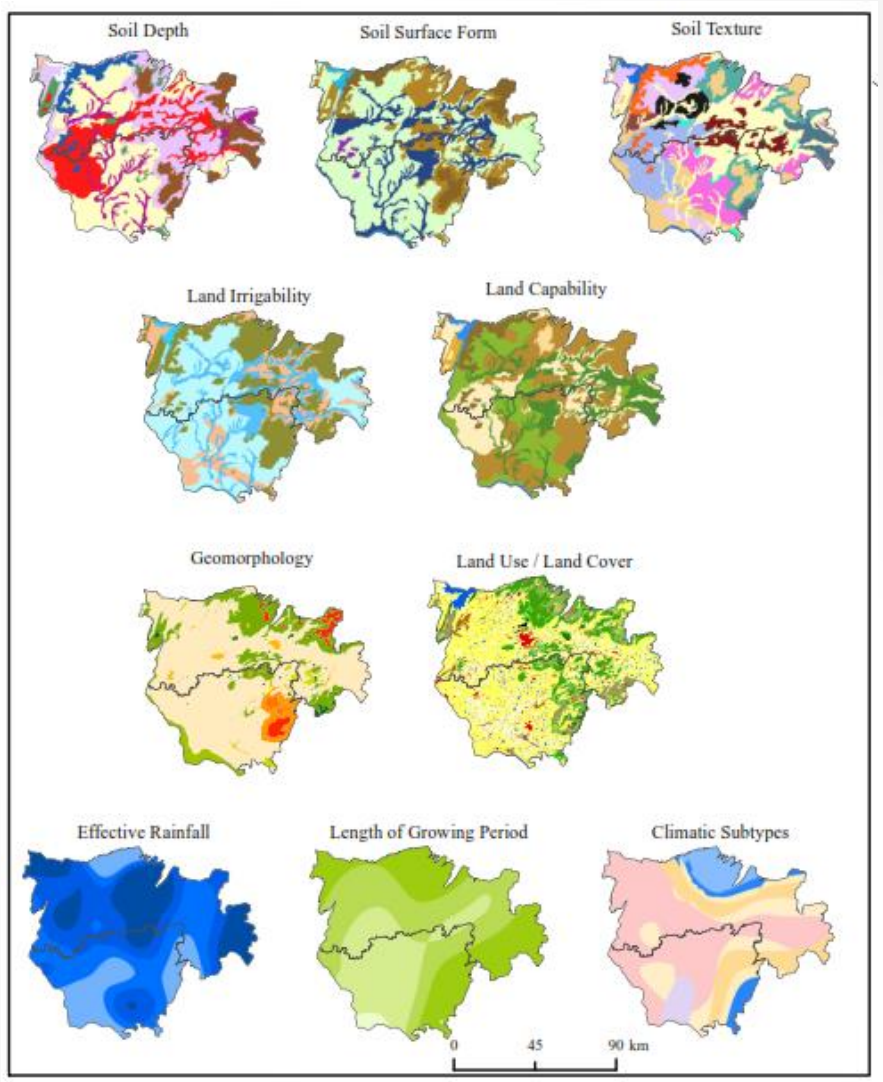
Soil DEPTH	Weight	Rank
<25	0.12	3
25-50		12
50-75		15
75-100		20
100-150		19
>150		24
R 25-50		5
R 50-75		2

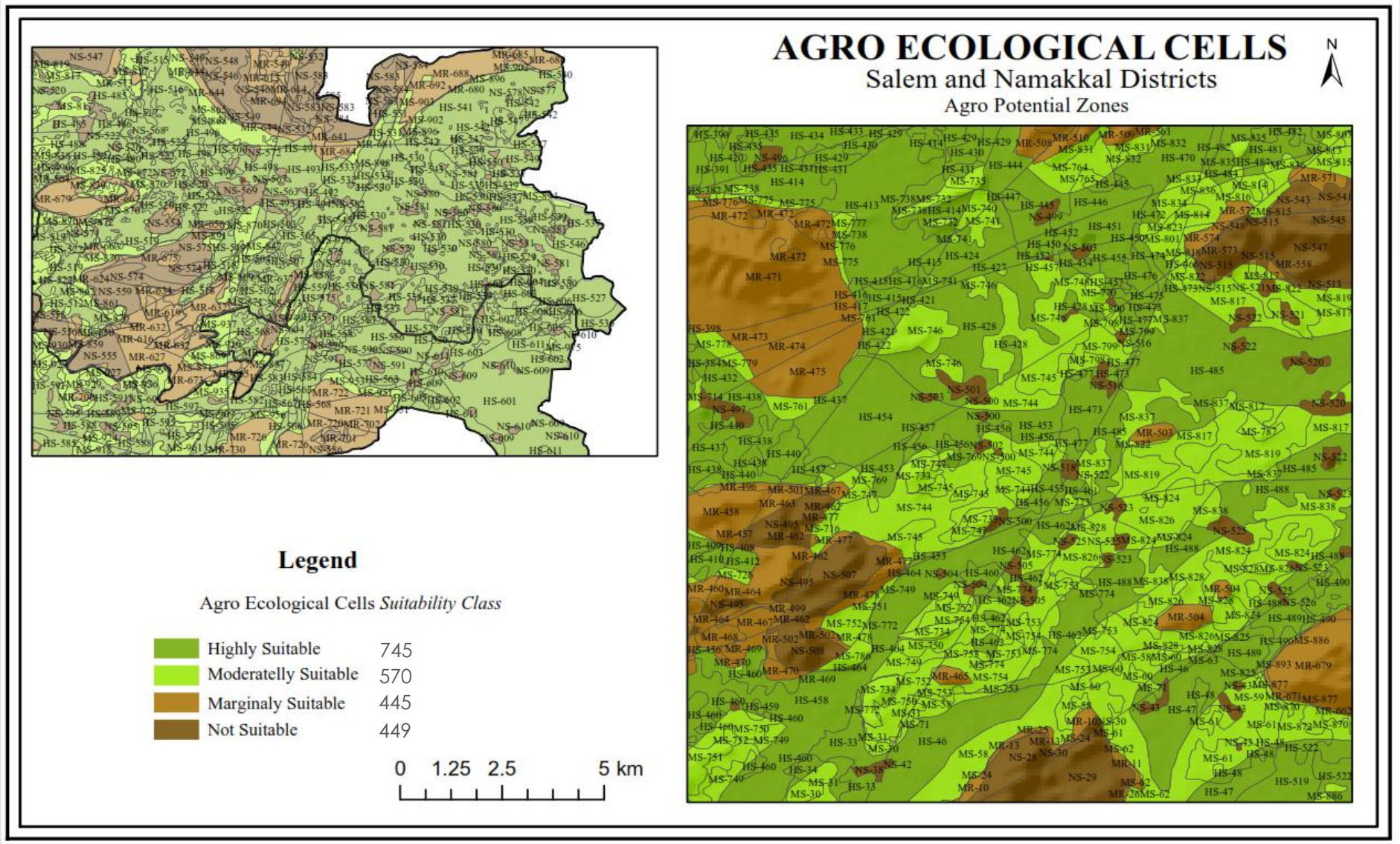
Soil surface forms	Weight	Rank
Gently Sloping	0.13	35
Level		12
Rolling Steep		9
Steep		8
Undulating		6
Valleys		30

Effective Rainfall	Weight	Rank
< 550	0.08	10
550-650		20
650-750		30
> 750		40

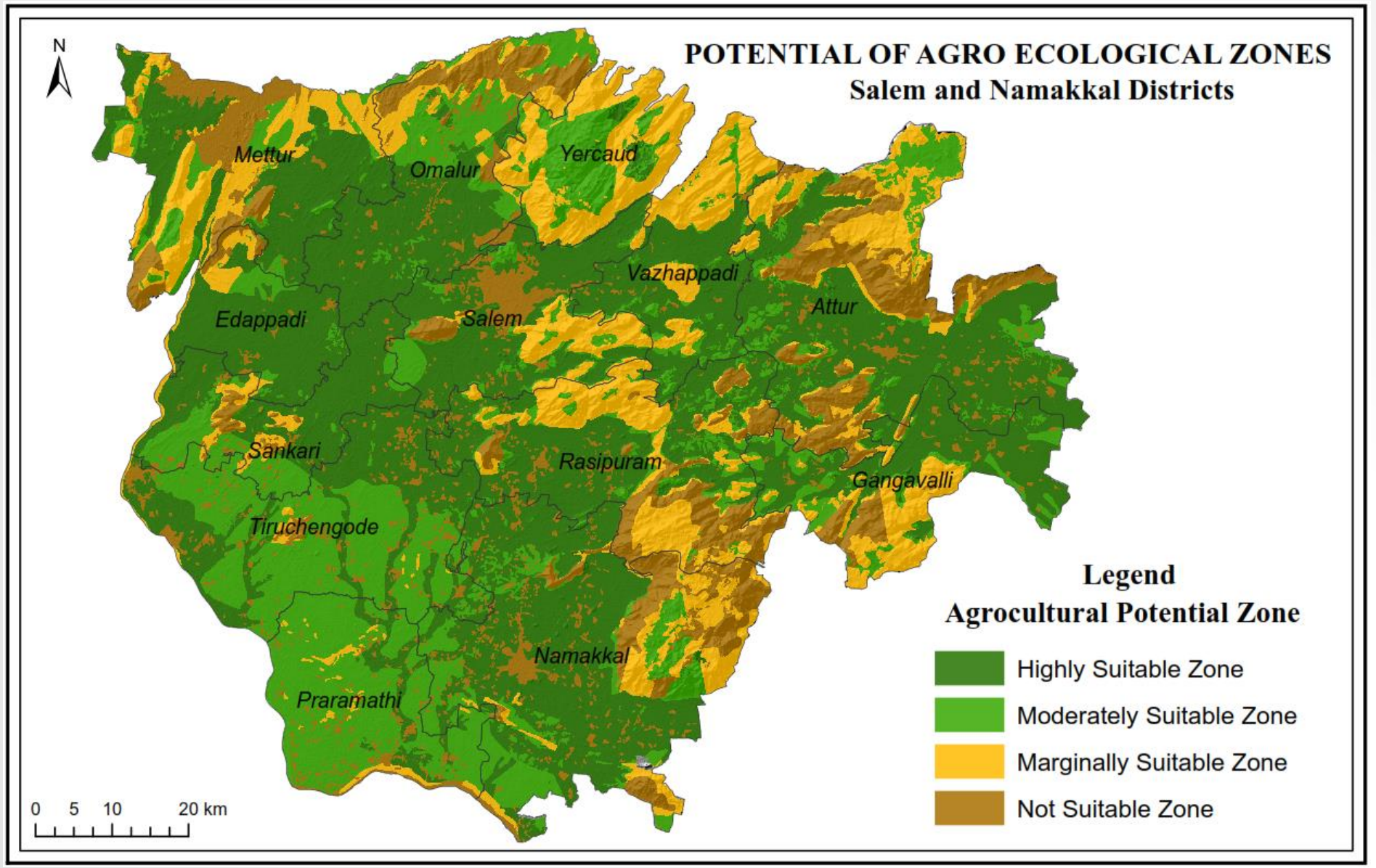
Land Use / Land Cover	Weight	Rank
Built-up, Mining	0.13	0
Built-up, Rural		0
Built-up, Urban		0
Agriculture, Crop land		35
Agriculture, Plantation		45
Scrub land		20
Barren rocky		0
Barren, Ravinous Land		0
Reserved Forest		0

Land capability	Weight	Rank
IIe	0.13	12
IIes		11
IIIe		10
IIIes		9
IIIes-IIIs		9
IIIs		10
IIIs-IIs		11
IIs		13
IVes-IIIes		5
IVes-IVe		2
Ve		2
Vles		1
Vles-IVls		1
Vles-VIIes		1
VIIes		1
VIII-VIe		1
VIII-VIes		1





- ✓ **Agro-ecological Cell (AEC)** is defined by a unique combination of landform, soil and climatic characteristics. The AEC is the basic processing unit for physical analysis in an AEZ study
- ✓ **Agro-ecological Zone** is a land resource mapping unit, defined in terms of climate, landform and soils, and/or land cover, and having a specific range of potentials and constraints for land use.

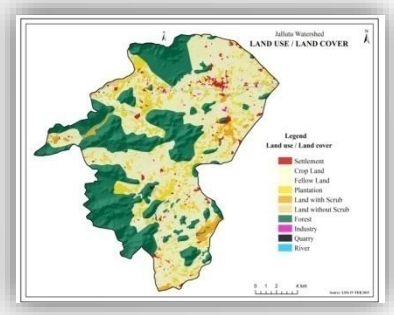


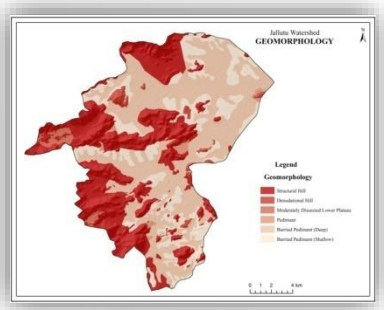
Blocks	HSZ	HSZ%	MSZ	MSZ%	MRZ	MRZ%	HRZ	HRZ%
Todal/Average	3830.64	44.24	2002.10	23.12	1478.14	17.07	1347.12	15.56

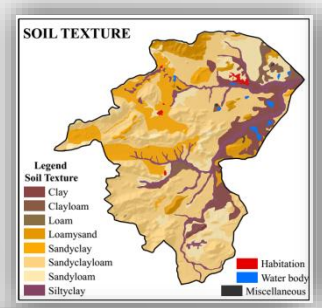
(Area in Km^2)

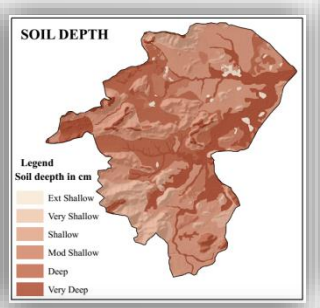
LAND UNITS

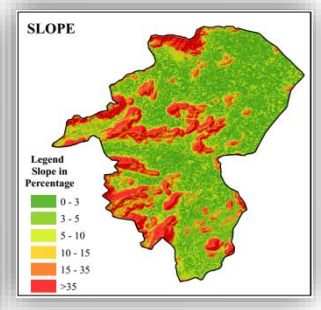
LAND MAPPING UNITS ARE MAPPED AREA OF LAND WITH SPECIFIED CHARACTERISTICS

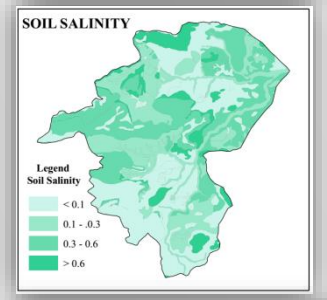


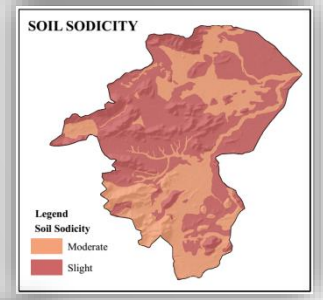


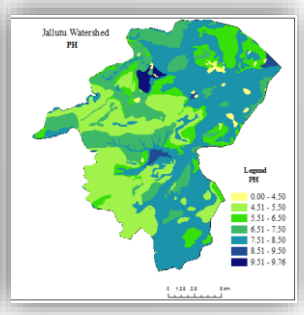


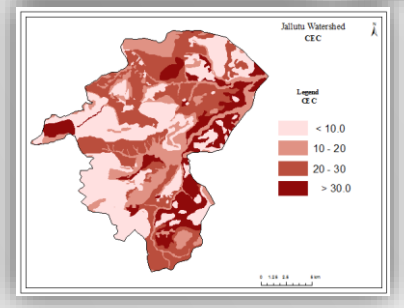


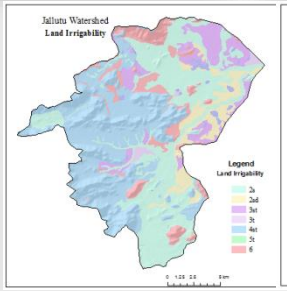


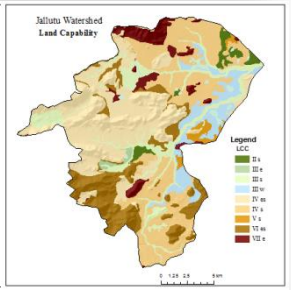


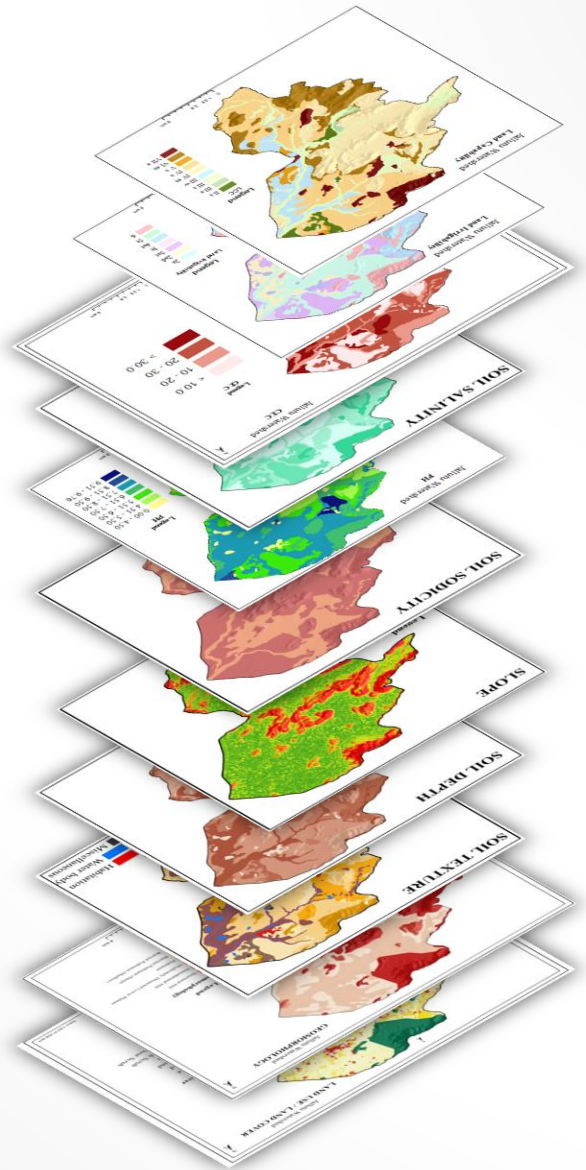






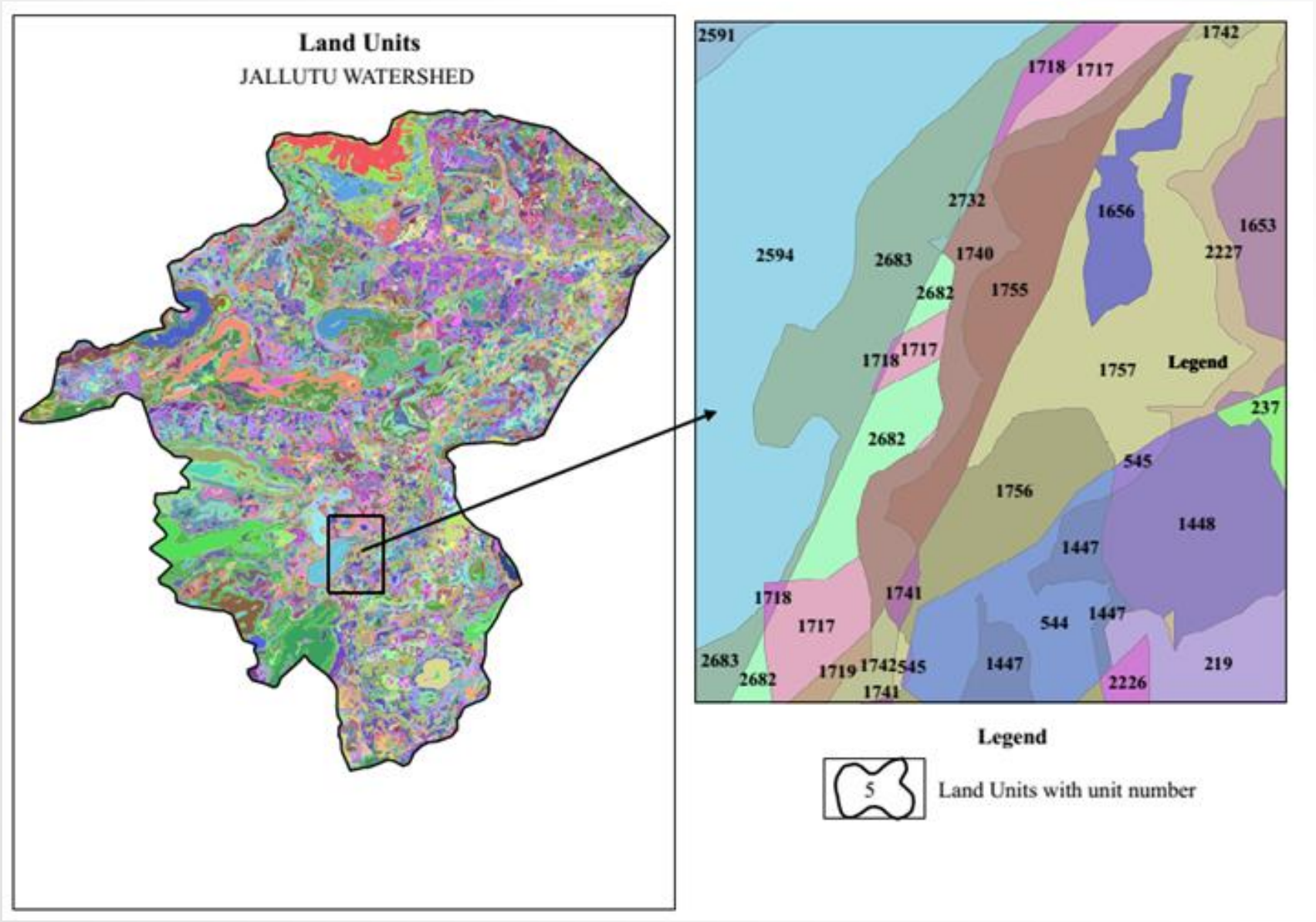






LAND UNITS

LAND MAPPING UNITS ARE MAPPED AREA OF LAND WITH SPECIFIED CHARACTERISTICS

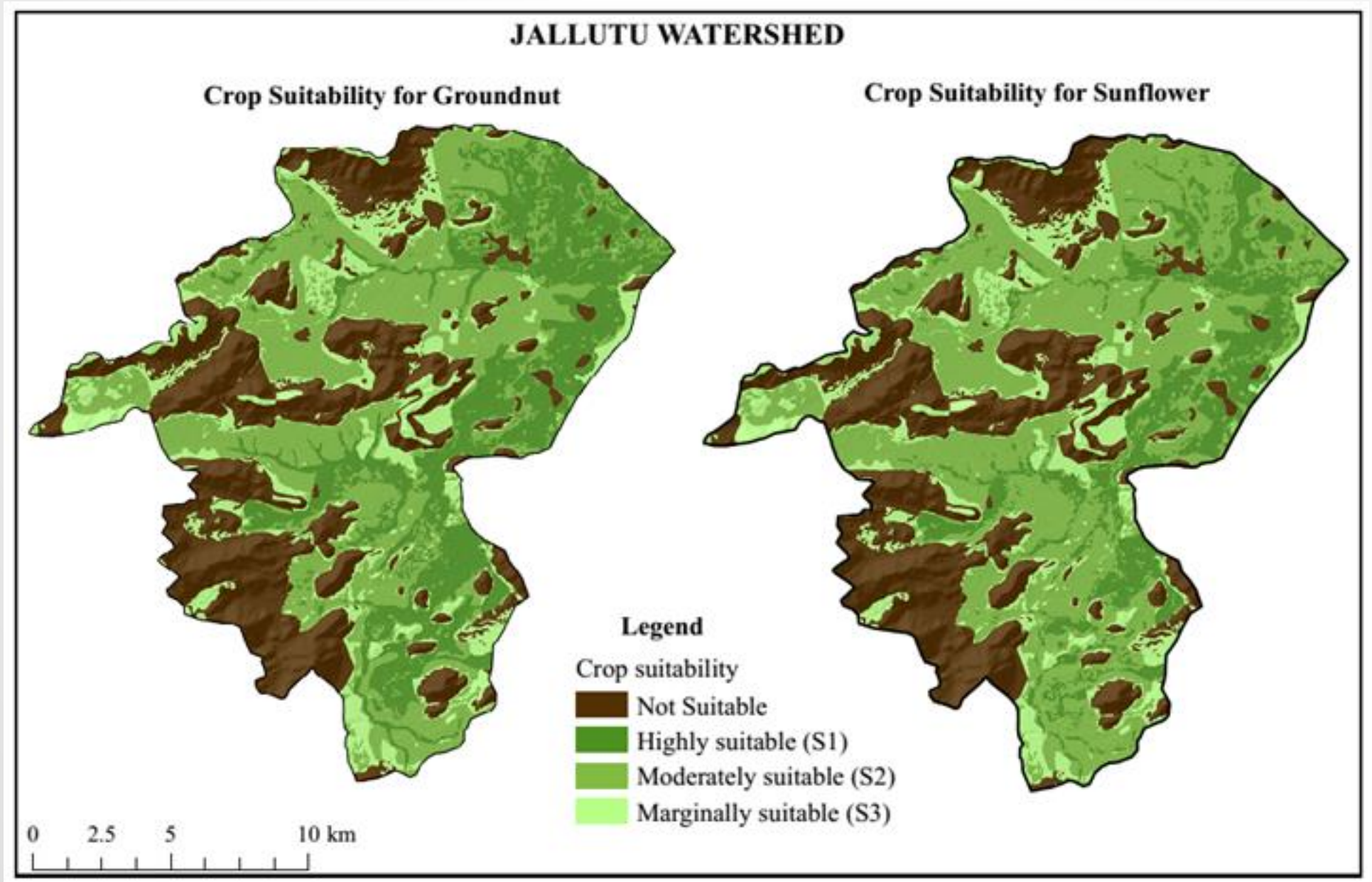


Land Units

Land mapping units are mapped area of land with specified characteristics

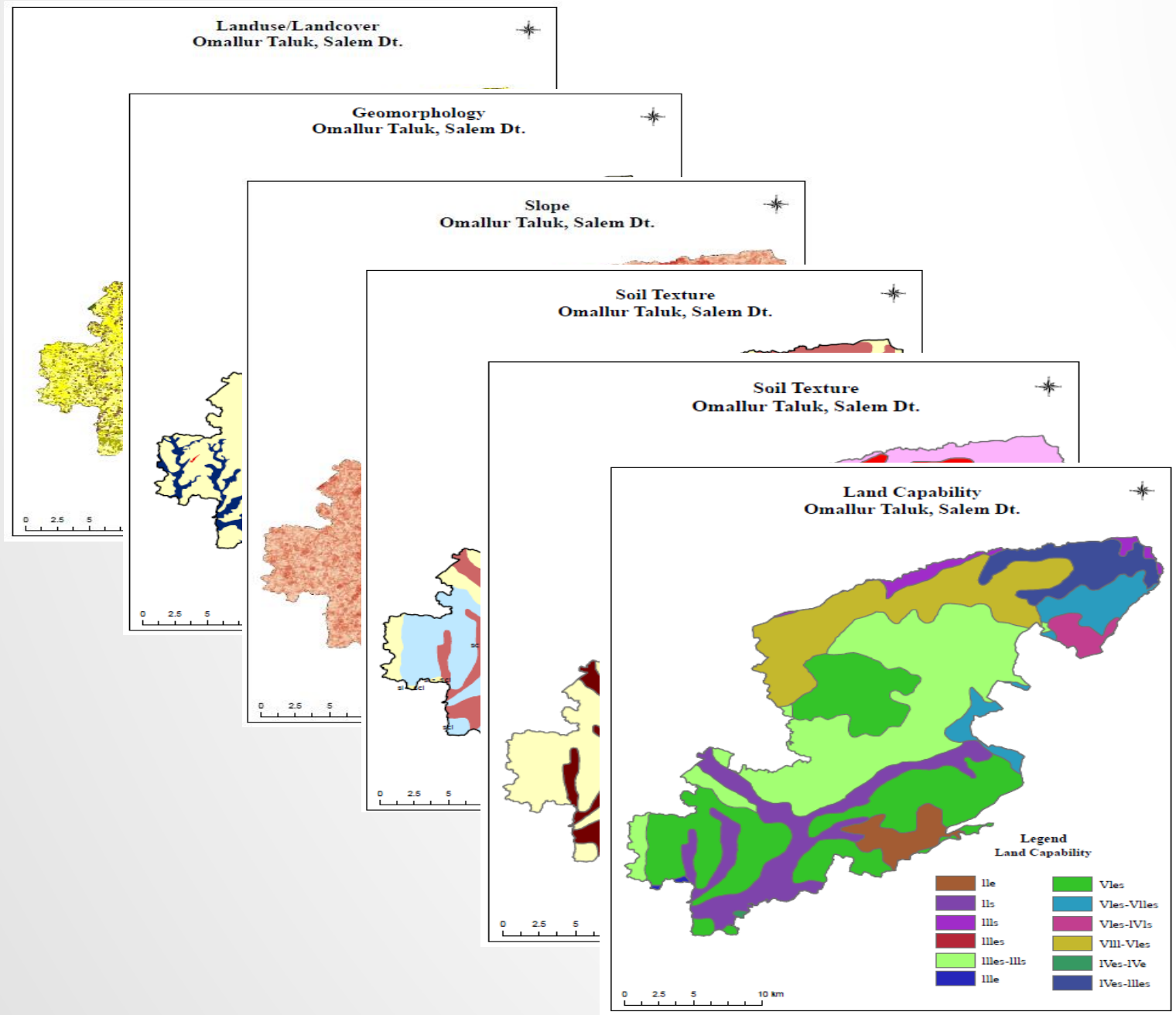
Geomorphology	Slope	Soil depth	Texture	Land capability	Land Irrigability	Ph	Ec	CEC	Oc per	Esp	Land Use	Land Unit No.
Buried Pediment (Deep)	*0 - 3*	*46*	*Sandy Clay loam*	*IV s*	*2s*	*8.2*	*0.1*	*23.31*	*0.92*	*10.64*	*Crop Land*	**1**
Buried Pediment (Deep)	*05-10*	*46*	*Sandy Clay loam*	*IV s*	*2s*	*8.2*	*0.1*	*23.31*	*0.92*	*10.64*	*Crop Land*	**2**
Buried Pediment (Deep)	*0 - 3*	*46*	*Sandy Clay loam*	*IV s*	*2s*	*8.2*	*0.1*	*23.31*	*0.92*	*10.64*	*Crop Land*	**3**
Buried Pediment (Deep)	*0 - 3*	*46*	*Sandy Clay loam*	*IV s*	*2s*	*8.2*	*0.1*	*23.31*	*0.92*	*10.64*	*Plantation*	**4**
Buried Pediment (Deep)	*0 - 3*	*46*	*Sandy Clay loam*	*IV s*	*2s*	*8.2*	*0.1*	*23.31*	*0.92*	*10.64*	*Fellow Land*	**5**
Buried Pediment (Deep)	*0 - 3*	*46*	*Sandy Clay loam*	*IV s*	*2s*	*8.2*	*0.1*	*23.31*	*0.92*	*10.64*	*Fellow Land*	**6**
Buried Pediment (Deep)	*05-10*	*160*	*Silty clay*	*III s*	*2s*	*8.43*	*0.16*	*18.8*	*0.24*	*7.05*	*Plantation*	**7**
Buried Pediment (Deep)	*05-10*	*46*	*Sandy Clay loam*	*IV s*	*2s*	*8.2*	*0.1*	*23.31*	*0.92*	*10.64*	*Plantation*	**8**
Buried Pediment (Deep)	*05-10*	*46*	*Sandy Clay loam*	*IV s*	*2s*	*8.2*	*0.1*	*23.31*	*0.92*	*10.64*	*Crop Land*	**9**
Buried Pediment (Deep)	*05-10*	*46*	*Sandy Clay loam*	*IV s*	*2s*	*8.2*	*0.1*	*23.31*	*0.92*	*10.64*	*Fellow Land*	**10**

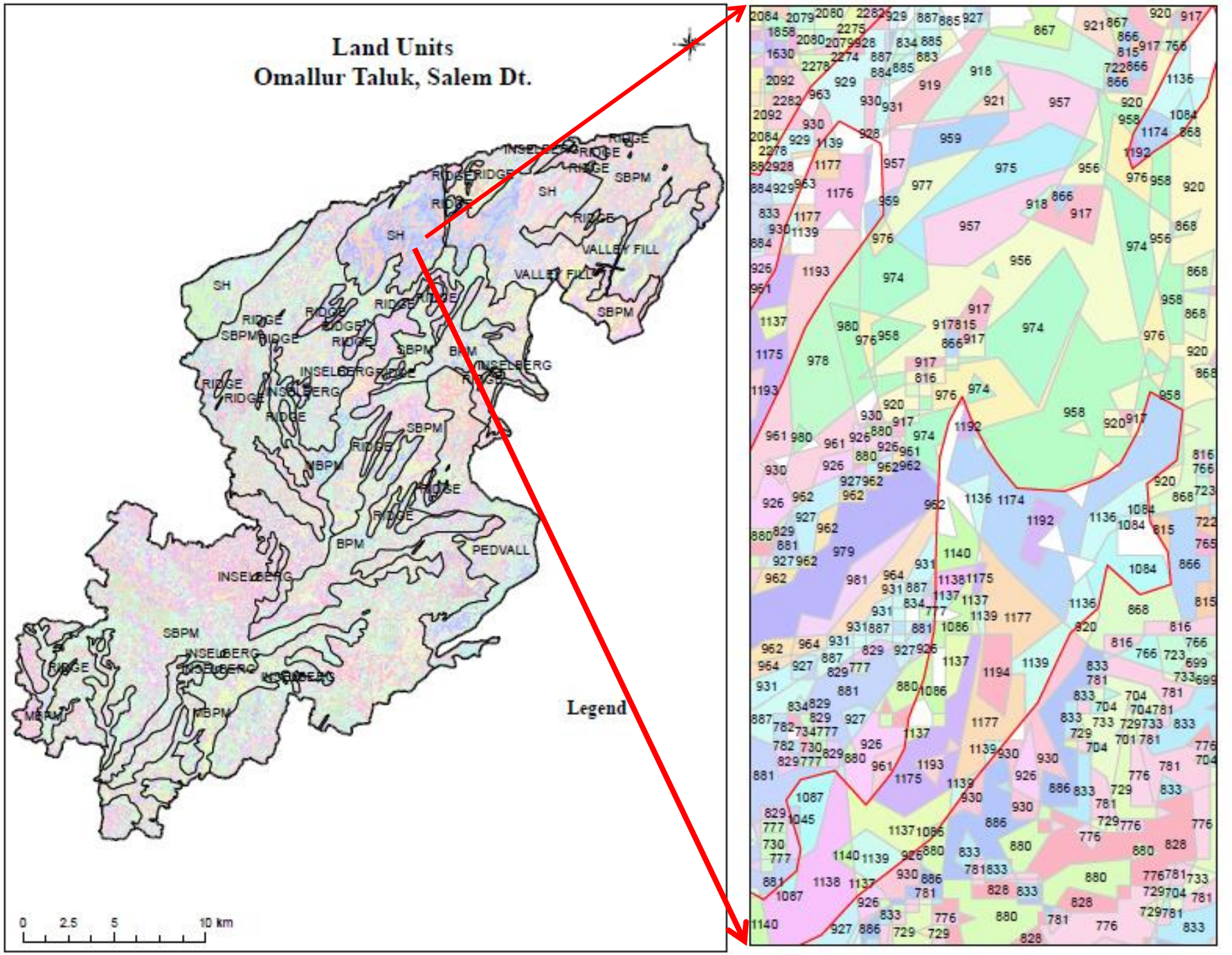
Crop Suitability for Groundnut & Sunflower



Multi criteria Overlay Analysis

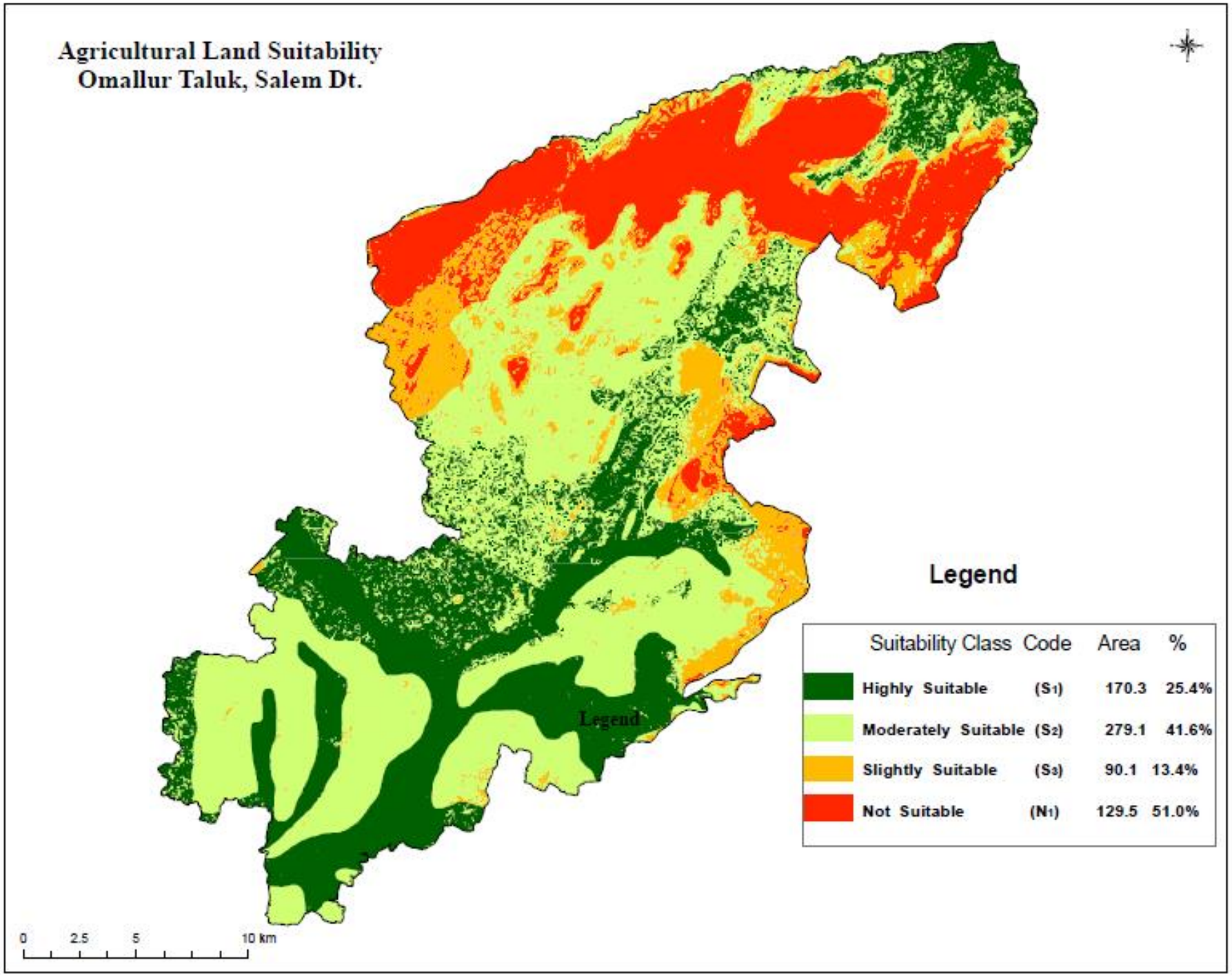
Agriculture Suitability = W X R (Lu/LC) + W X R (Geomorphology) + W X R (Slope) + W X R (Soil Texture)+ W X R (Soil Depth) + W X R (Land Capability) + W X R (Rainfall) + W X R (Geology)


Landuse/Landcover
Omallur Taluk, Salem Dt.
Geomorphology
Omallur Taluk, Salem Dt.
Slope
Omallur Taluk, Salem Dt.
Soil Texture
Omallur Taluk, Salem Dt.
Soil Texture
Omallur Taluk, Salem Dt.
Land Capability
Omallur Taluk, Salem Dt.
Legend
Land Capability
IIe
IIs
IIIs
IIIes
IIIes-IIIs
IIIe
VIes
VIes-VIIes
VIes-IVIs
VIII-VIes
IVes-IVe
IVes-IIIes
0 2.5 5 10 km


Land Units
Omallur Taluk, Salem Dt.
RIDGE
SH
SBPM
VALLEY FILL
INSELBERG
BPM
PEDVALL
Legend
0 2.5 5 10 km

INSELBI	14.0	0.0	15-30	15.0	0.0	50-75	10.0	2.0	20.0	Fine + Loamy	scl - sl	11.0	2.0	22.0	Vles	20.0	1.0	20.0	500.0	10.0	1.0
INSELBI	14.0	0.0	15-30	15.0	0.0	50-75	10.0	2.0	20.0	Fine + Loamy	scl - sl	11.0	2.0	22.0	Vles	20.0	1.0	20.0	500.0	10.0	1.0
INSELBI	14.0	0.0	15-30	15.0	0.0	50-75	10.0	2.0	20.0	Fine + Loamy	scl - sl	11.0	2.0	22.0	Vles	20.0	1.0	20.0	500.0	10.0	1.0
INSELBI	14.0	0.0	15-30	15.0	0.0	50-75	10.0	2.0	20.0	Fine + Loamy	scl - sl	11.0	2.0	22.0	Vles	20.0	1.0	20.0	500.0	10.0	1.0
INSELBI	14.0	0.0	15-30	15.0	0.0	50-75	10.0	2.0	20.0	Fine + Loamy	scl - sl	11.0	2.0	22.0	Vles	20.0	1.0	20.0	500.0	10.0	1.0
INSELBI	14.0	0.0	30-50	15.0	0.0	50-75	10.0	2.0	20.0	Fine + Claye	sl	11.0	2.0	22.0	IIIes-IIIs	20.0	2.0	40.0	700.0	10.0	2.0
INSELBI	14.0	0.0	30-50	15.0	0.0	50-75	10.0	2.0	20.0	Fine + Loamy	scl - sl	11.0	2.0	22.0	Vles	20.0	1.0	20.0	700.0	10.0	2.0
INSELBI	14.0	0.0	30-50	15.0	0.0	50-75	10.0	2.0	20.0	Fine + Loamy	scl - sl	11.0	2.0	22.0	Vles	20.0	1.0	20.0	700.0	10.0	2.0
INSELBI	14.0	0.0	30-50	15.0	0.0	50-75	10.0	2.0	20.0	Fine + Loamy	scl - sl	11.0	2.0	22.0	Vles	20.0	1.0	20.0	500.0	10.0	1.0
INSELBI	14.0	0.0	30-50	15.0	0.0	50-75	10.0	2.0	20.0	Fine + Loamy	scl - sl	11.0	2.0	22.0	Vles	20.0	1.0	20.0	500.0	10.0	1.0
INSELBI	14.0	0.0	30-50	15.0	0.0	50-75	10.0	2.0	20.0	Fine + Loamy	scl - sl	11.0	2.0	22.0	Vles	20.0	1.0	20.0	500.0	10.0	1.0
INSELBI	14.0	0.0	30-50	15.0	0.0	50-75	10.0	2.0	20.0	Fine + Loamy	scl - sl	11.0	2.0	22.0	Vles	20.0	1.0	20.0	500.0	10.0	1.0
INSELBI	14.0	0.0	30-50	15.0	0.0	50-75	10.0	2.0	20.0	Fine + Loamy	scl - sl	11.0	2.0	22.0	Vles	20.0	1.0	20.0	500.0	10.0	1.0
INSELBI	14.0	0.0	50++	15.0	0.0	50-75	10.0	2.0	20.0	Fine + Loamy	scl - sl	11.0	2.0	22.0	Vles	20.0	1.0	20.0	700.0	10.0	2.0
INSELBI	14.0	0.0	50++	15.0	0.0	50-75	10.0	2.0	20.0	Fine + Loamy	scl - sl	11.0	2.0	22.0	Vles	20.0	1.0	20.0	500.0	10.0	1.0
INSELBI	14.0	0.0	50++	15.0	0.0	50-75	10.0	2.0	20.0	Fine + Loamy	scl - sl	11.0	2.0	22.0	Vles	20.0	1.0	20.0	500.0	10.0	1.0
MBPM	14.0	2.0	0-1	15.0	3.0	50-75	10.0	2.0	20.0	Clayey-skele	sc - scl	11.0	3.0	33.0	IIe	20.0	3.0	60.0	900.0	10.0	3.0
MBPM	14.0	2.0	0-1	15.0	3.0	50-75	10.0	2.0	20.0	Clayey-skele	sc - scl	11.0	3.0	33.0	IIe	20.0	3.0	60.0	900.0	10.0	3.0
MBPM	14.0	2.0	0-1	15.0	3.0	50-75	10.0	2.0	20.0	Clayey-skele	sc - scl	11.0	3.0	33.0	IIe	20.0	3.0	60.0	900.0	10.0	3.0
MBPM	14.0	2.0	0-1	15.0	3.0	50-75	10.0	2.0	20.0	Clayey-skele	sc - scl	11.0	3.0	33.0	IIe	20.0	3.0	60.0	900.0	10.0	3.0
MBPM	14.0	2.0	0-1	15.0	3.0	50-75	10.0	2.0	20.0	Fine + Claye	sl	11.0	2.0	22.0	IIIes-IIIs	20.0	2.0	40.0	900.0	10.0	3.0
MBPM	14.0	2.0	0-1	15.0	3.0	50-75	10.0	2.0	20.0	Fine + Claye	sl	11.0	2.0	22.0	IIIes-IIIs	20.0	2.0	40.0	900.0	10.0	3.0
MBPM	14.0	2.0	0-1	15.0	3.0	50-75	10.0	2.0	20.0	Fine + Claye	sl	11.0	2.0	22.0	IIIes-IIIs	20.0	2.0	40.0	900.0	10.0	3.0
MBPM	14.0	2.0	0-1	15.0	3.0	50-75	10.0	2.0	20.0	Fine + Claye	sl	11.0	2.0	22.0	IIIes-IIIs	20.0	2.0	40.0	900.0	10.0	3.0
MBPM	14.0	2.0	0-1	15.0	3.0	50-75	10.0	2.0	20.0	Fine + Claye	sl	11.0	2.0	22.0	IIIes-IIIs	20.0	2.0	40.0	900.0	10.0	3.0
MBPM	14.0	2.0	0-1	15.0	3.0	50-75	10.0	2.0	20.0	Fine + Claye	sl	11.0	2.0	22.0	IIIes-IIIs	20.0	2.0	40.0	900.0	10.0	3.0
MBPM	14.0	2.0	0-1	15.0	3.0	50-75	10.0	2.0	20.0	Fine + Claye	sl	11.0	2.0	22.0	IIIes-IIIs	20.0	2.0	40.0	700.0	10.0	2.0
MBPM	14.0	2.0	0-1	15.0	3.0	50-75	10.0	2.0	20.0	Fine + Claye	sl	11.0	2.0	22.0	IIIes-IIIs	20.0	2.0	40.0	700.0	10.0	2.0
MBPM	14.0	2.0	0-1	15.0	3.0	50-75	10.0	2.0	20.0	Fine + Claye	sl	11.0	2.0	22.0	IIIes-IIIs	20.0	2.0	40.0	700.0	10.0	2.0
MBPM	14.0	2.0	0-1	15.0	3.0	50-75	10.0	2.0	20.0	Fine + Claye	sl	11.0	2.0	22.0	IIIes-IIIs	20.0	2.0	40.0	700.0	10.0	2.0

issile h	5.0	2.0	10.0	112.0	337	0.0	1.0
issile h	5.0	2.0	10.0	82.0	338	0.0	1.0
harnoc	5.0	1.0	5.0	122.0	339	0.0	2.0
issile h	5.0	2.0	10.0	127.0	340	0.0	2.0
issile h	5.0	2.0	10.0	127.0	341	0.0	2.0
aterite	5.0	2.0	10.0	157.0	342	0.0	2.0
issile h	5.0	2.0	10.0	92.0	343	0.2	1.0
issile h	5.0	2.0	10.0	137.0	344	0.0	2.0
issile h	5.0	2.0	10.0	82.0	345	0.0	1.0
harnoc	5.0	1.0	5.0	122.0	346	0.0	2.0
issile h	5.0	2.0	10.0	127.0	347	0.0	2.0
harnoc	5.0	1.0	5.0	122.0	348	0.0	2.0
issile h	5.0	2.0	10.0	127.0	349	0.0	2.0
issile h	5.0	2.0	10.0	92.0	350	0.1	1.0
harnoc	5.0	1.0	5.0	122.0	351	0.0	2.0
issile h	5.0	2.0	10.0	127.0	352	0.0	2.0
issile h	5.0	2.0	10.0	256.0	353	0.0	4.0
issile h	5.0	2.0	10.0	271.0	354	0.1	4.0
issile h	5.0	2.0	10.0	271.0	355	0.1	4.0
issile h	5.0	2.0	10.0	256.0	356	0.0	4.0
issile h	5.0	2.0	10.0	195.0	357	0.0	3.0
issile h	5.0	2.0	10.0	225.0	358	0.1	4.0
issile h	5.0	2.0	10.0	240.0	359	0.1	4.0
issile h	5.0	2.0	10.0	240.0	360	0.1	4.0
issile h	5.0	2.0	10.0	225.0	361	0.0	4.0
issile h	5.0	2.0	10.0	210.0	362	0.0	3.0
harnoc	5.0	1.0	5.0	210.0	363	0.0	3.0
issile h	5.0	2.0	10.0	215.0	364	0.1	3.0
harnoc	5.0	1.0	5.0	225.0	365	0.0	4.0
issile h	5.0	2.0	10.0	230.0	366	0.1	4.0


Agricultural Land Suitability
Omallur Taluk, Salem Dt.
Legend
Legend
Suitability Class Code Area %
Highly Suitable (S1) 170.3 25.4%
Moderately Suitable (S2) 279.1 41.6%
Slightly Suitable (S3) 90.1 13.4%
Not Suitable (N1) 129.5 51.0%
0 2.5 5 10 km

Assigning Weights

	C1	C2	C3	C4	C5	C6	C7	C8
C1	1	2	2	4	3	3	2	3
C2	0.5	1	2	2	3	2	3	2
C3	0.5	0.5	1	3	4	4	3	3
C4	0.25	0.50	0.33	1	2	3	2	3
C5	0.33	0.33	0.25	0.50	1	3	4	2
C6	0.33	0.50	0.25	0.33	0.33	1	2	2
C7	0.50	0.33	0.33	0.50	0.25	0.50	1	3
C8	0.33	0.50	0.33	0.33	0.50	0.50	0.33	1
	3.75	5.67	6.50	11.67	14.08	17.00	17.33	19

C1	LU/LC
C2	Geomophology
C3	Lineament
C4	soil
C5	Geology
C6	Soil
C7	Drinage Density
C8	Rainfall

	C1	C2	C3	C4	C5	C6	C7	C8	W	AW
C1	0.267	0.353	0.308	0.343	0.213	0.176	0.115	0.158	1.933	0.242
C2	0.133	0.176	0.308	0.171	0.213	0.118	0.173	0.105	1.398	0.175
C3	0.133	0.088	0.154	0.257	0.284	0.235	0.173	0.158	1.483	0.185
C4	0.067	0.088	0.051	0.086	0.142	0.176	0.115	0.158	0.884	0.11
C5	0.089	0.059	0.038	0.043	0.071	0.176	0.231	0.105	0.813	0.102
C6	0.089	0.088	0.038	0.029	0.024	0.059	0.115	0.105	0.547	0.068
C7	0.133	0.059	0.051	0.043	0.018	0.029	0.058	0.158	0.549	0.069
C8	0.089	0.088	0.051	0.029	0.036	0.029	0.019	0.053	0.394	0.049

Normalized Weights

Average Weights	Vector	Average Weights/Vector
0.242	2.198403	9.099858
0.175	1.632973	9.345553
0.185	1.758307	9.486274
0.110	1.013259	9.173504
0.102	0.920066	9.05851
0.068	0.588997	8.610041
0.069	0.571912	8.333654
0.049	0.423575	8.60692

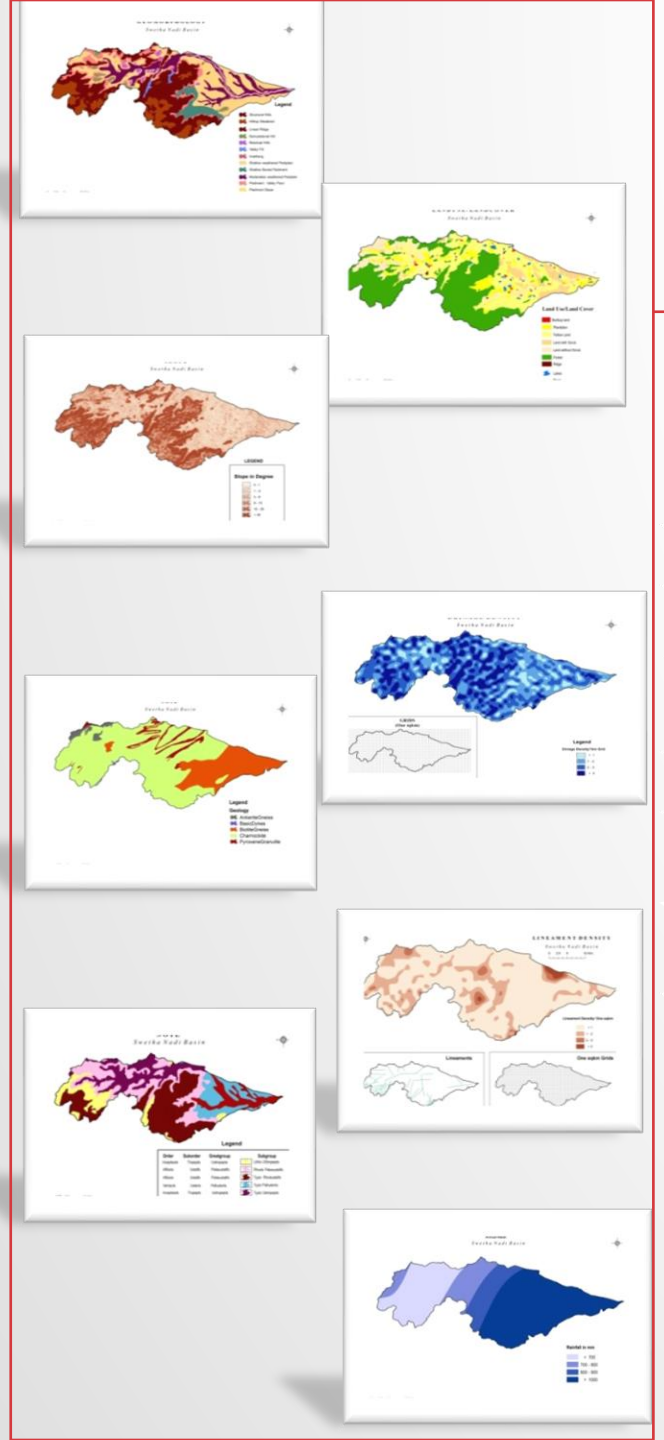
Lambda = 9.100 +9.346+ 9.486 +9.174+ 9.059+ 8.610+ 8.334 +8.607/8 =

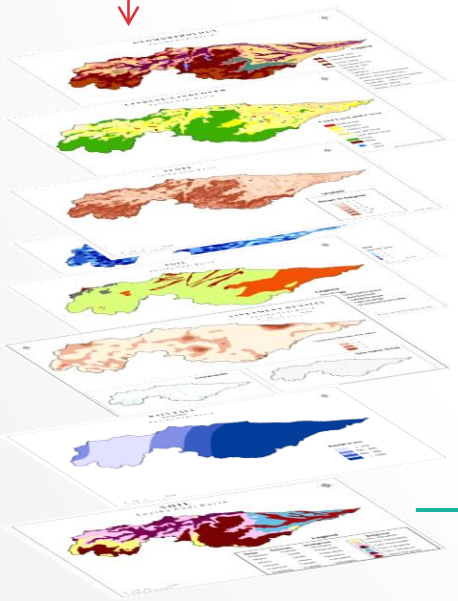
8.964

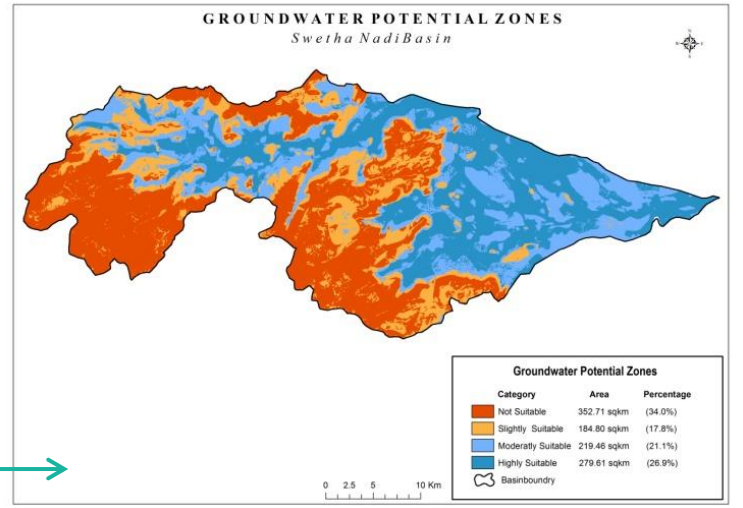
Consistency Index (CI) = 8.964 -8/8-1 = 0.1377

Consistency Ratio (CR) = 0.1377/1.141 = 0.097

Consistency Ratio (CR) = 0.097 < 0.1

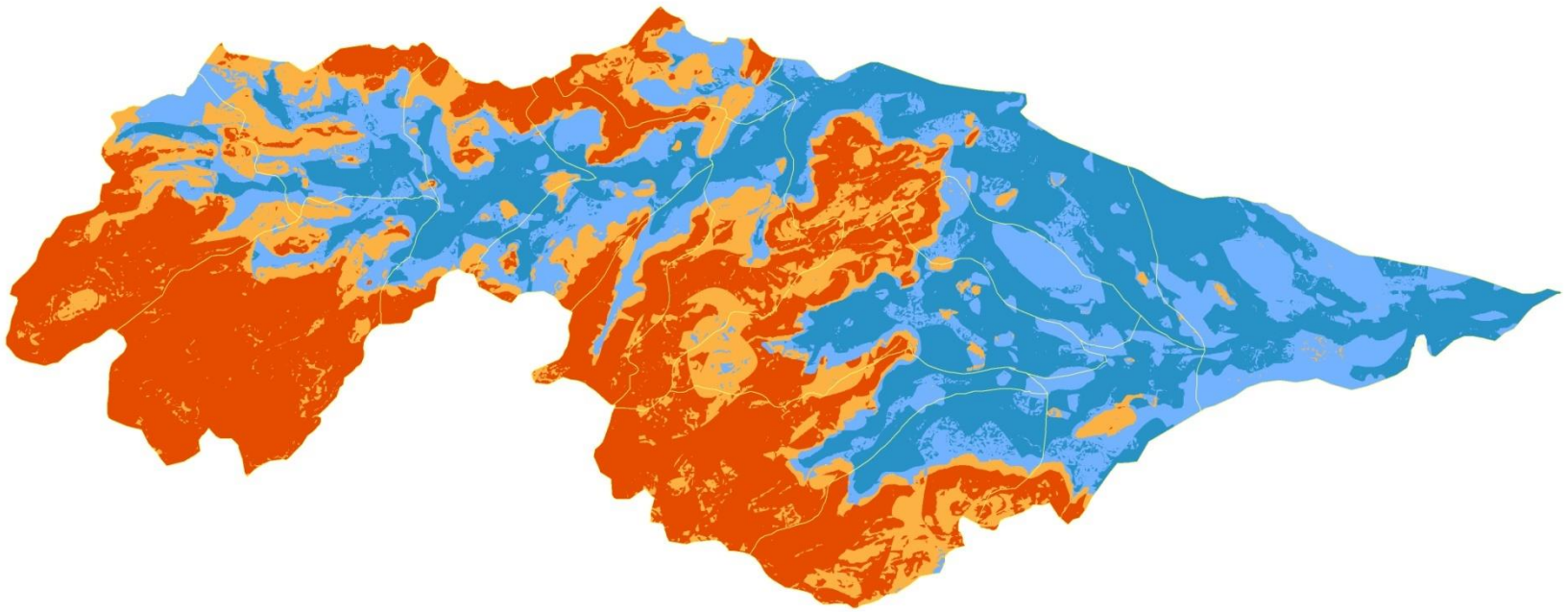





GROUNDWATER POTENTIAL ZONES
Swetha NadiBasin
Groundwater Potential Zones
Category Area Percentage
Not Suitable 352.71 sqkm (34.0%)
Slightly Suitable 184.80 sqkm (17.8%)
Moderatly Suitable 219.46 sqkm (21.1%)
Highly Suitable 279.61 sqkm (26.9%)
Basinboundry
0 2.5 5 10 Km

GROUNDWATER POTENTIAL ZONES

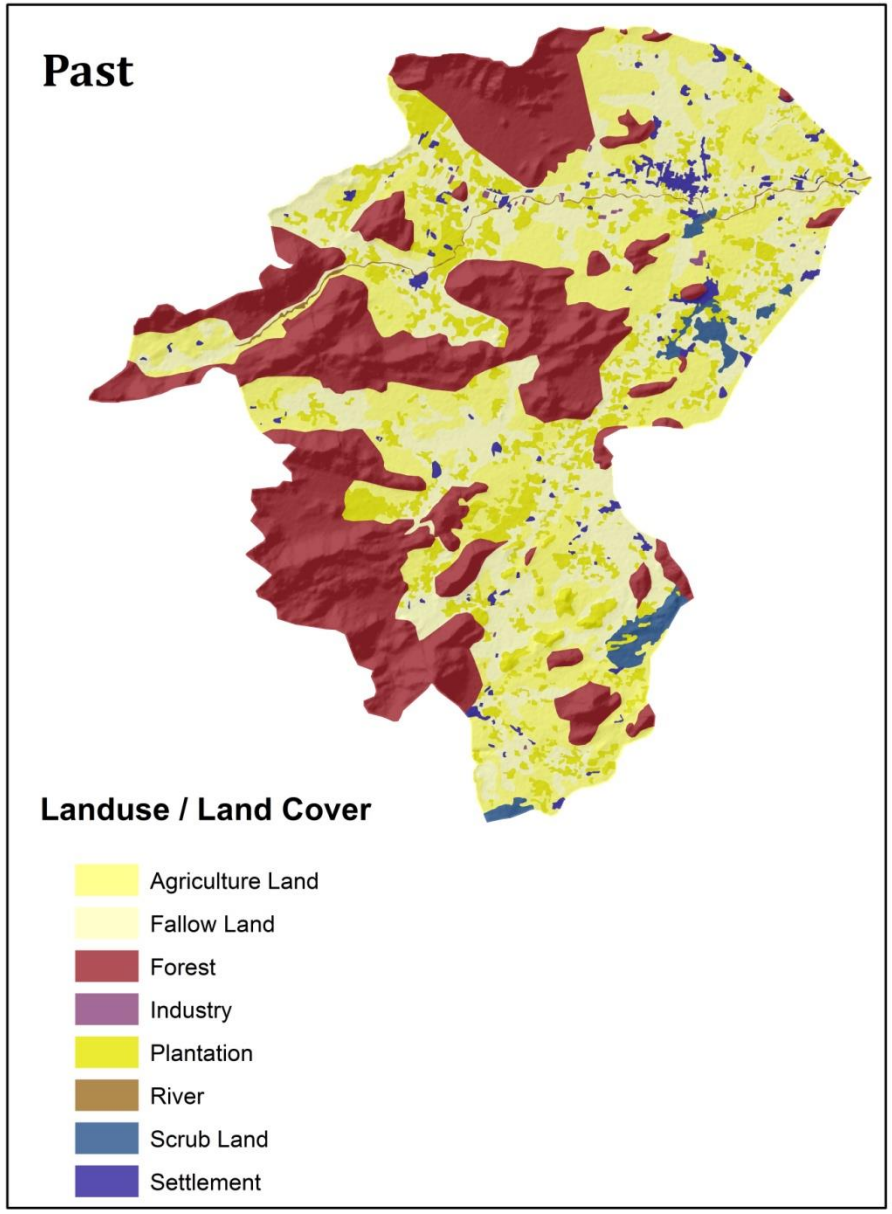
Swetha NadiBasin

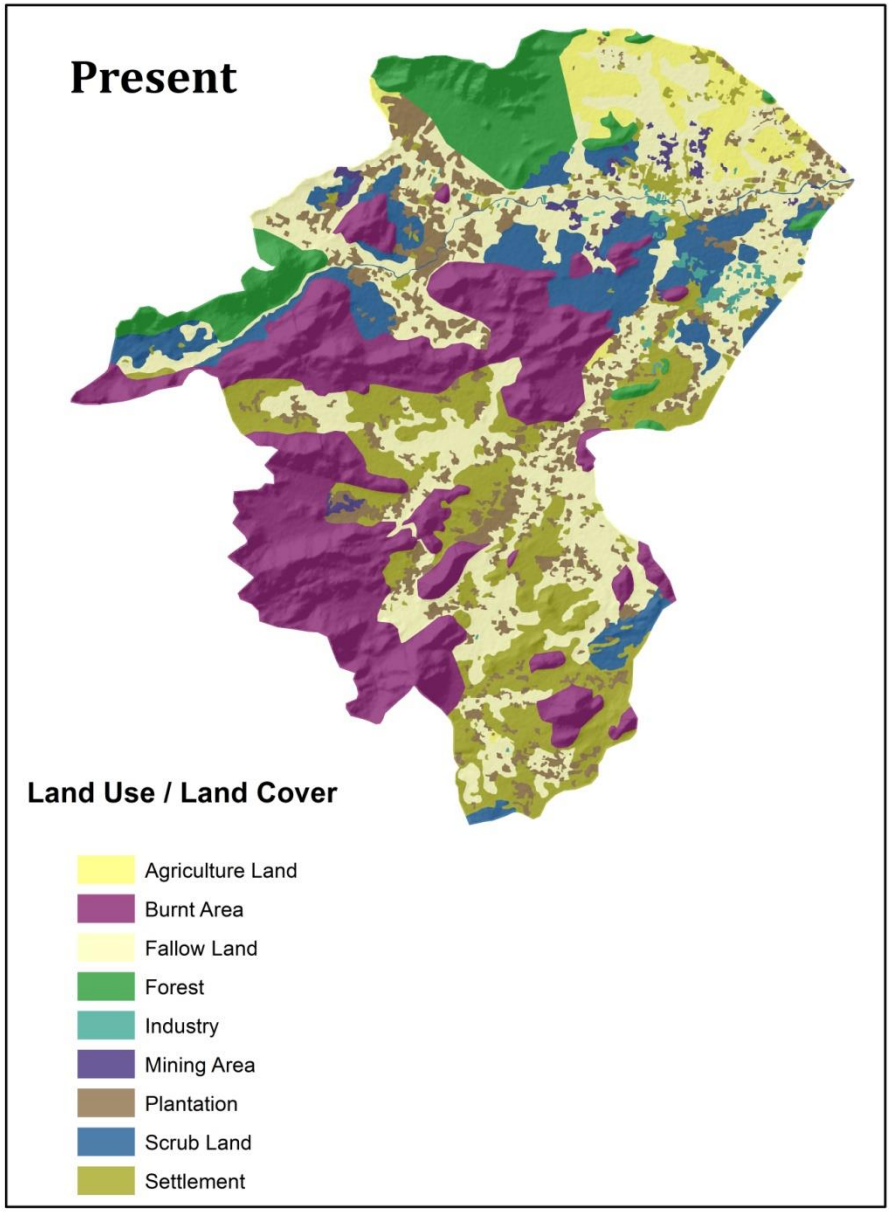


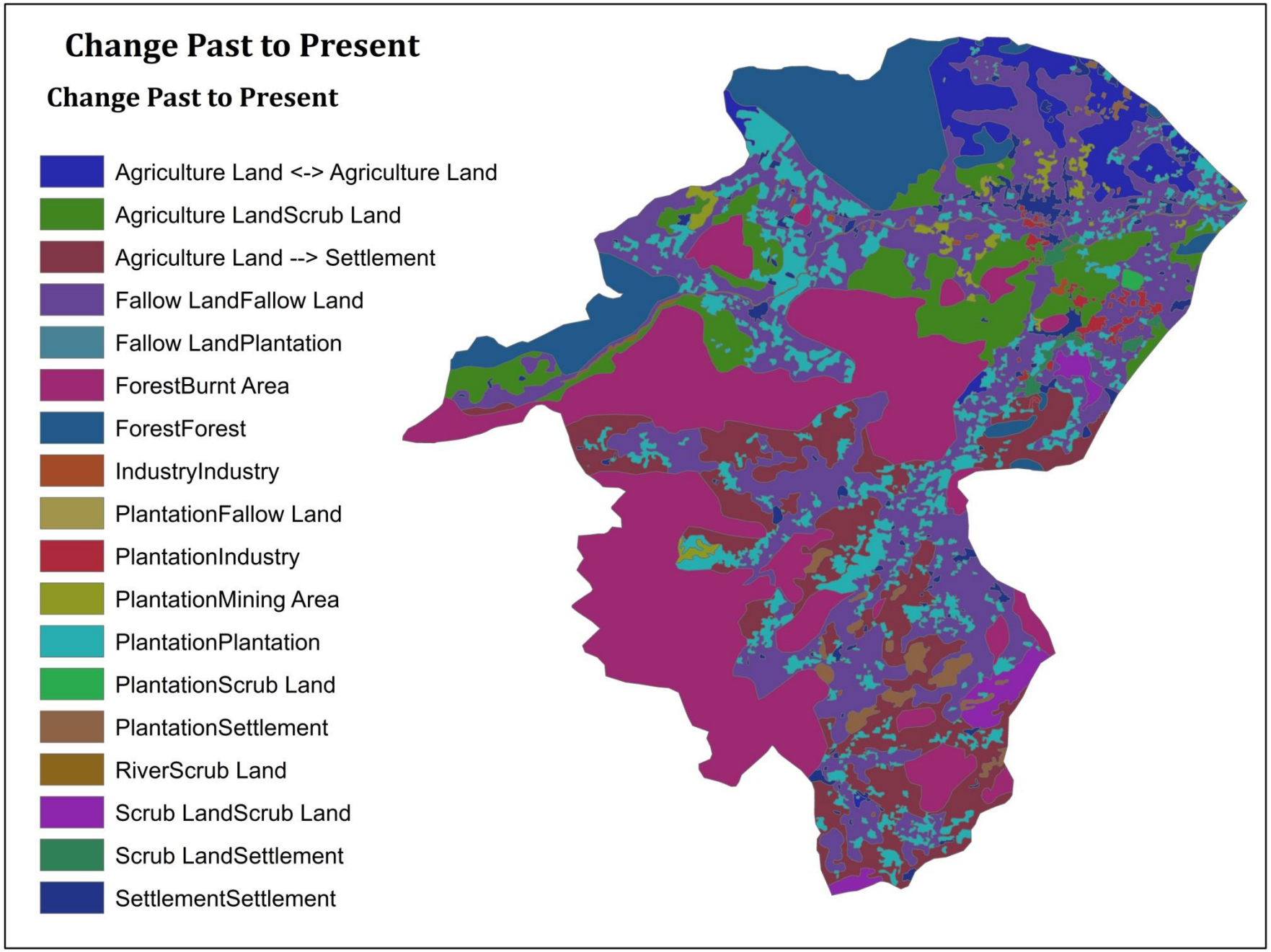
Groundwater Potential Zones

Category	Area	Percentage
Very Poor	352.71 sqkm	(34.0%)
Poor	184.80 sqkm	(17.8%)
Good	219.46 sqkm	(21.1%)
Very Good	279.61 sqkm	(26.9%)
Basinboundry		

0 2.75 5.5 11 Km


Past
Landuse / Land Cover
Agriculture Land
Fallow Land
Forest
Industry
Plantation
River
Scrub Land
Settlement


Present
Land Use / Land Cover
Agriculture Land
Burnt Area
Fallow Land
Forest
Industry
Mining Area
Plantation
Scrub Land
Settlement

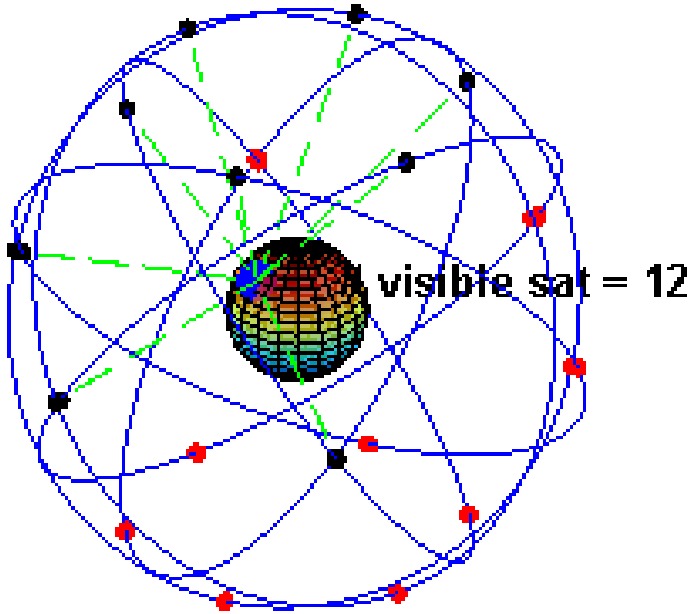

Change Past to Present
Change Past to Present
Agriculture Land <-> Agriculture Land
Agriculture LandScrub Land
Agriculture Land --> Settlement
Fallow LandFallow Land
Fallow LandPlantation
ForestBurnt Area
ForestForest
IndustryIndustry
PlantationFallow Land
PlantationIndustry
PlantationMining Area
PlantationPlantation
PlantationScrub Land
PlantationSettlement
RiverScrub Land
Scrub LandScrub Land
Scrub LandSettlement
SettlementSettlement

	Agriculture Land	Fellow Land	Forest	Industry	Plantation	River	Scrub Land	Settlemer	Burnt Area	Mining Area	Area (Sqkm)
Agriculture Land	11.93						20.78	31.78			64.5
Fellow Land		70.45									70.4
Forest			24.74						72.59		97.3
Industry				0.36							0.4
Plantation				1.50	26.11		0.28	3.04		2.60	33.5
River							0.78				0.8
Scrub Land							3.45	1.22			4.7
Settlement								5.32			5.3
Burnt Area											0.0
Mining Area											0.0
Area (Sqkm)	11.93	70.45	24.74	1.85	26.11	0.00	25.28	41.36	72.59	2.60	276.91

lulc	Lulc_Pr	change
Agriculture Land	Agriculture Land	11.93
Agriculture Land	Scrub Land	20.78
Agriculture Land	Settlement	31.78
Fallow Land	Fallow Land	70.45
Forest	Burnt Area	72.59
Forest	Forest	24.74
Industry	Industry	0.36
Plantation	Industry	1.50
Plantation	Mining Area	2.60
Plantation	Plantation	26.11
Plantation	Scrub Land	0.28
Plantation	Settlement	3.04
River	Scrub Land	0.78
Scrub Land	Scrub Land	3.45
Scrub Land	Settlement	1.22
Settlement	Settlement	5.32
		276.91

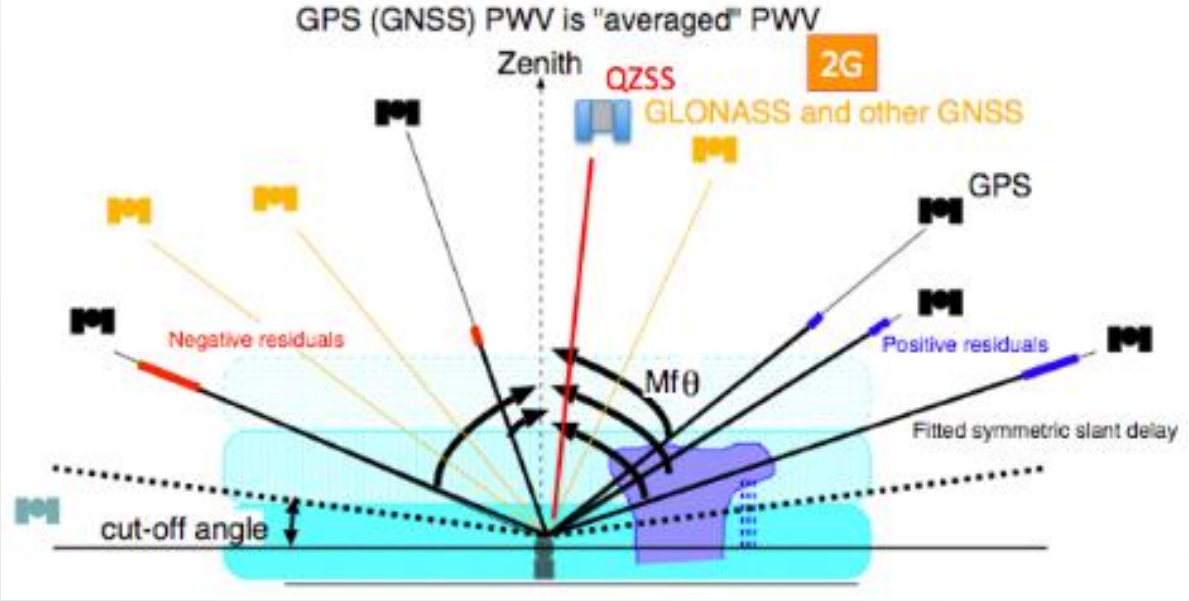
Past		Present	
Landuse	Area	Landuse	Area
Agriculture Land	64.49	Agricultur	11.93
Fellow Land	71.18	Fellow Lan	71.18
Forest	97.32	Forest	24.74
Industry	0.36	Industry	1.85
Plantation	34.26	Plantation	26.84
River	0.78		
Scrub Land	4.67	Scrub Lan	25.28
Settlement	5.32	Settlemen	41.36
		Burnt Area	72.59
		Mining Are	2.60

Global Navigation Satellite System



Global Navigation Satellite System

*A **satellite navigation** or **sat nav** system is a system of satellites that provide autonomous geo-spatial positioning with global coverage. It allows small electronic receivers to determine their location (longitude, latitude, and altitude) to high precision (within a few metres) using time signals transmitted along a line of sight by radio from satellites. The signals also allow the electronic receivers to calculate the current local time to high precision, which allows time synchronization. A satellite navigation system with global coverage may be termed a **global navigation satellite system** or **GNSS***



Global Navigation Satellite Systems
GNSS
Accuracy 10m or better

Galileo
EU/ESA

GPS
USA

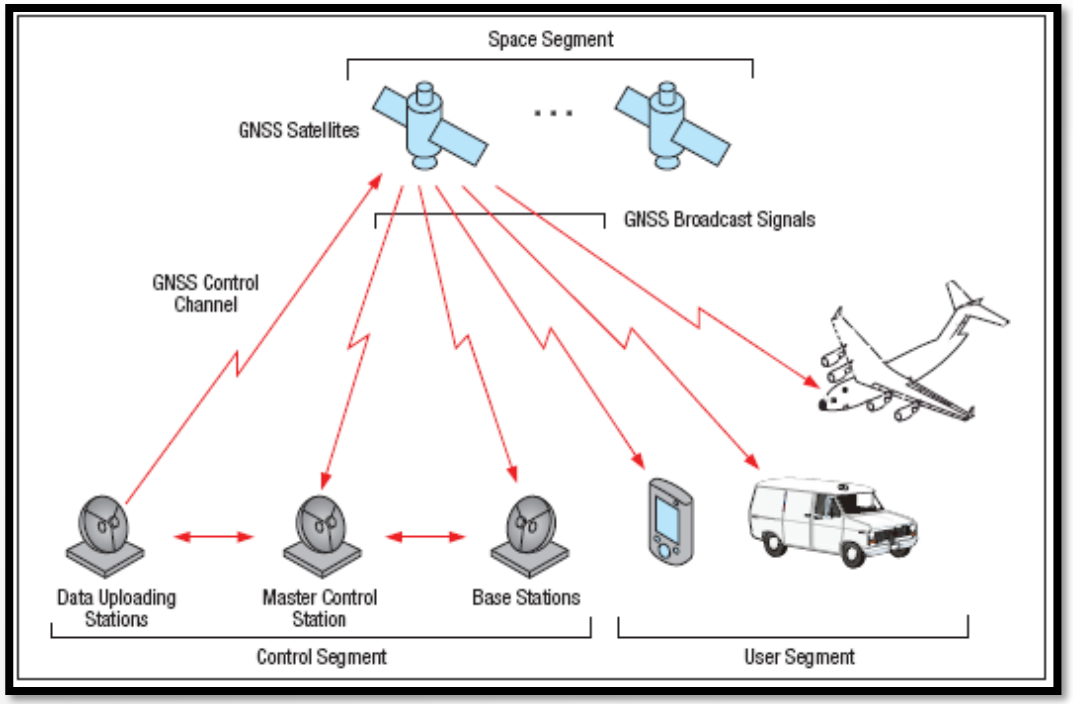
GLONASS
Russia

Planned
India, Japan,
Korea

Compass
China

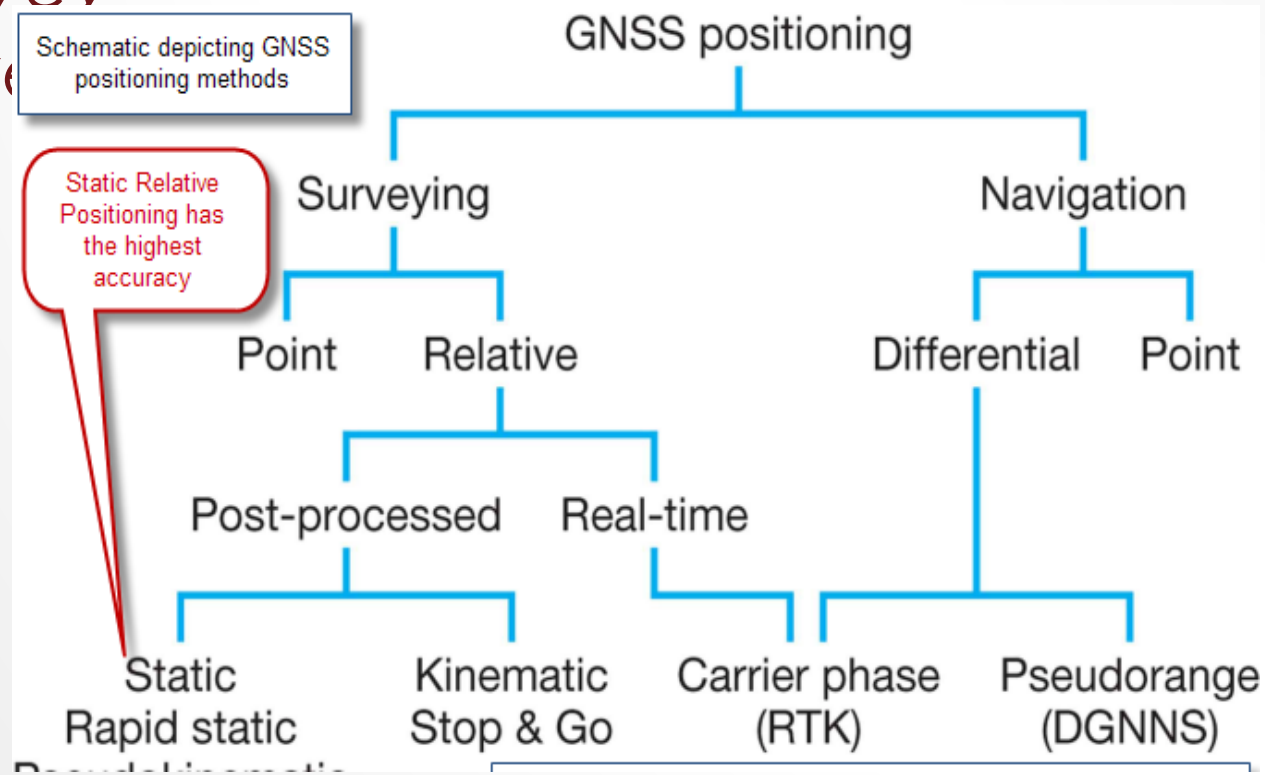
Architecture

- GNSS satellite systems consists of three major components or “segments:
  - Space Segment
  - Control Segment
  - User Segment

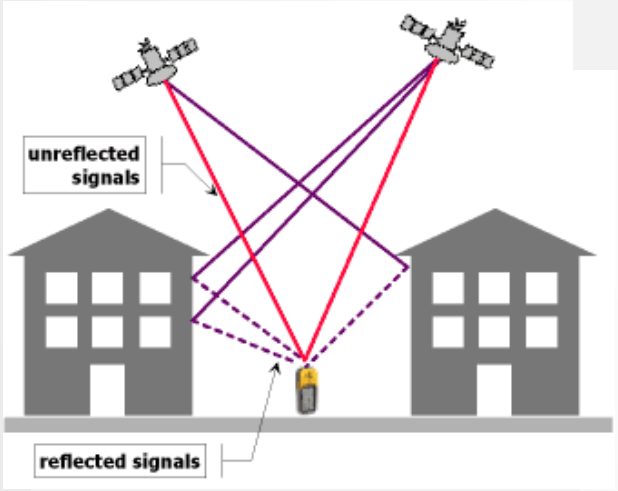


Survey Methods

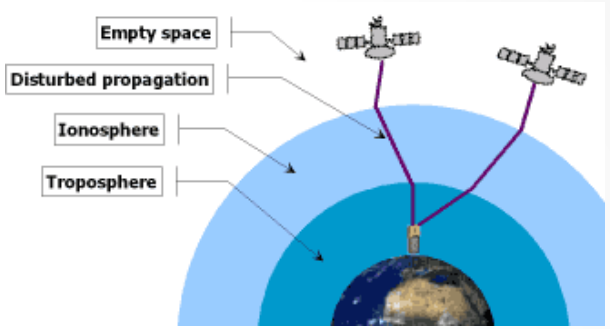
Static Method
Continuous Survey
Differential Surve



GNSS Errors

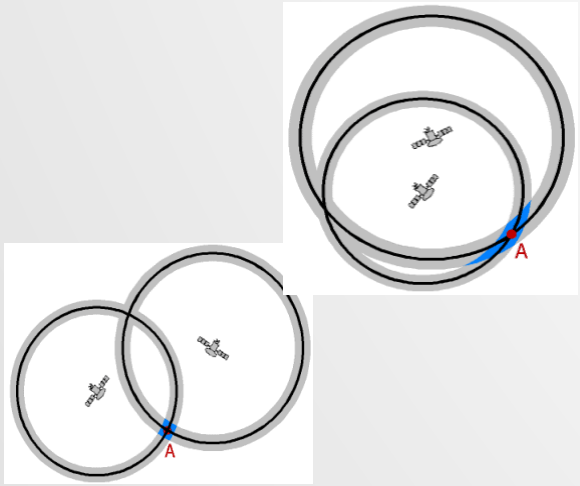


Canyon Effect – 1 metre



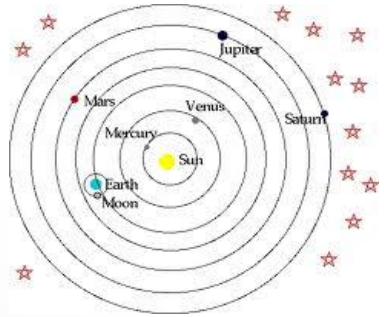
Ionospheric & Tropospheric diffraction 10 + 1 metres

Part copied from http://www.kowoma.de/en/gps/errors.htm



Geometry up to 100m

Timimg errors 4m – Rounding errors



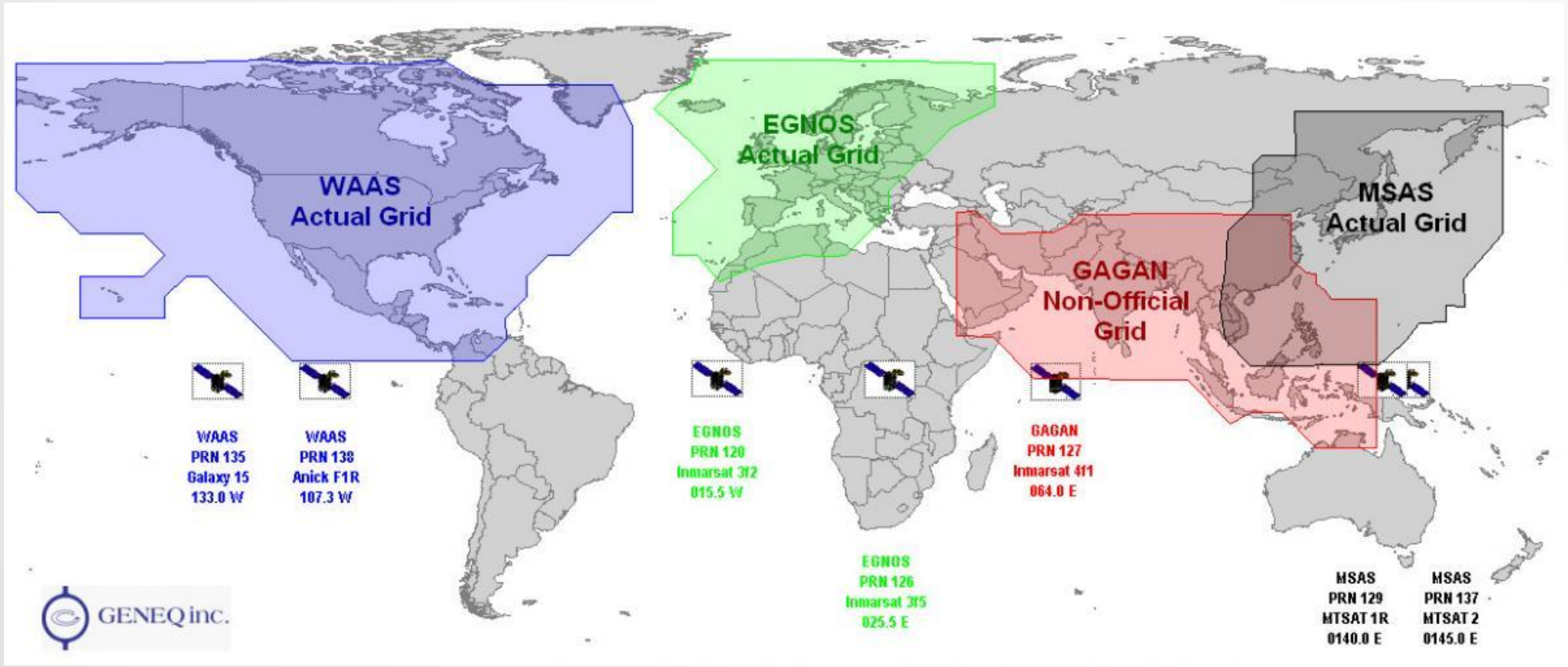
Orbits up to 5m

DIFFERENT "GRADES" OF GNSS RECEIVERS

- **Recreational Grade GNSS**
  - *Accurate to within 5 meters (could be better, but don't rely on it)*
  - *Suitable for hunting, recreational, and some busin uses*
  - *Lowest cost (smallest, and easiest to use):*

- **Mapping Grade GNSS**
  - *Accurate to within 1 meter (3 feet)*
  - *Requires differential processing (from a base station)*
  - *Suitable for many natural resource ons, city planning*
- **Survey Grade GNSS**
- *Accurate to within 1 cm*
- *Suitable for building bridges.*

Space Based Augmentation Systems
Improves GNSS accuracy to 3 metres



PROVIDES INDIA WITH ASSURED NAVIGATION SERVICE FOR VITAL CIVILIAN & MILITARY APPLICATIONS WITHOUT HAVING TO DEPEND ON ANOTHER COUNTRY; FIRST SATELLITE TO BE LAUNCHED ON JULY 1; RZEMAINING 6 BY 2015

IRNSS: INDIAN REGIONAL NAVIGATION SATELLITE SYSTEM

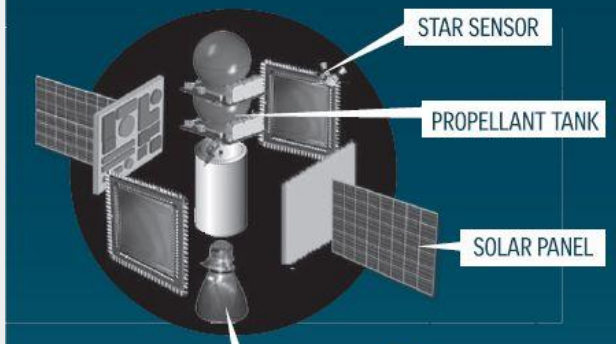
7 SATELLITES

3 GEOSTATIONARY

4 GEOSYNCHRONUS

ORBIT ALTITUDE 36,000 KM

COST ₹1,420 CRORES



Covers India and up to **1,500** km beyond its borders

3 extremely accurate rubidium atomic clocks in each satellite

GPS receivers will not work; need special receivers (yet to be developed)

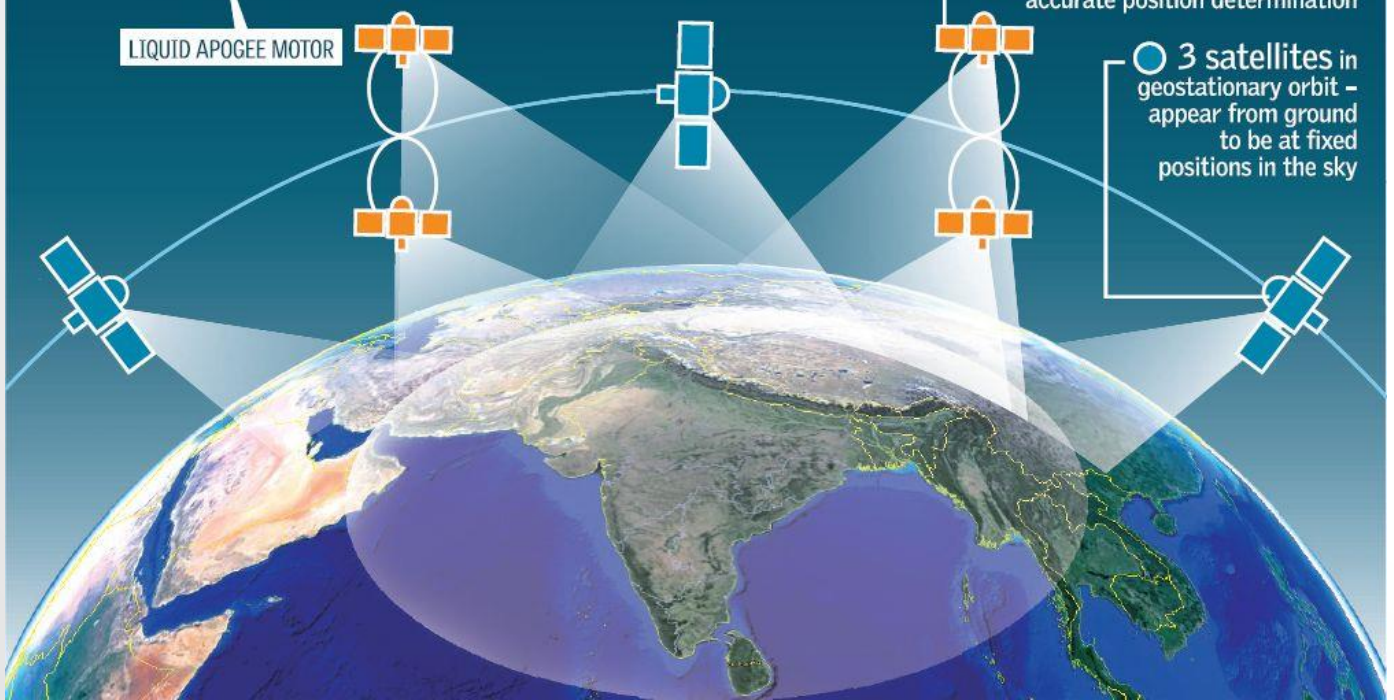
IRNSS provides Standard Positioning Service

Open to all users

Accuracy better than 20 metres

● 4 satellites in geosynchronous orbit – in pairs, move in two inclined orbits – appear from ground to travel in figure '8' – assist in accurate position determination

○ 3 satellites in geostationary orbit – appear from ground to be at fixed positions in the sky



GNSS Applications


Agriculture


Aviation


Environment


Marine


Public Safety & Disaster Relief

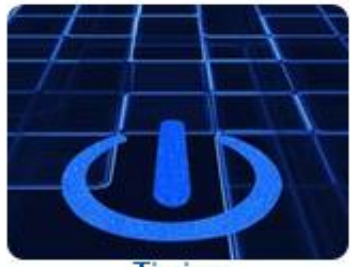

Rail


Recreation


Roads & Highways


Space


Surveying & Mapping


Timing

Thank You