

INTRODUCTION TO GIS

Lecturer:

Eng. Mohamed Abdel Aziz, M.Sc.

INTRODUCTION TO GIS

CONTENT

- What is GIS?
- GIS Benefits/ uses
- Methods for Geo Data Mapping
- GIS Analysis
- GIS Applications
- Challenges and overcoming

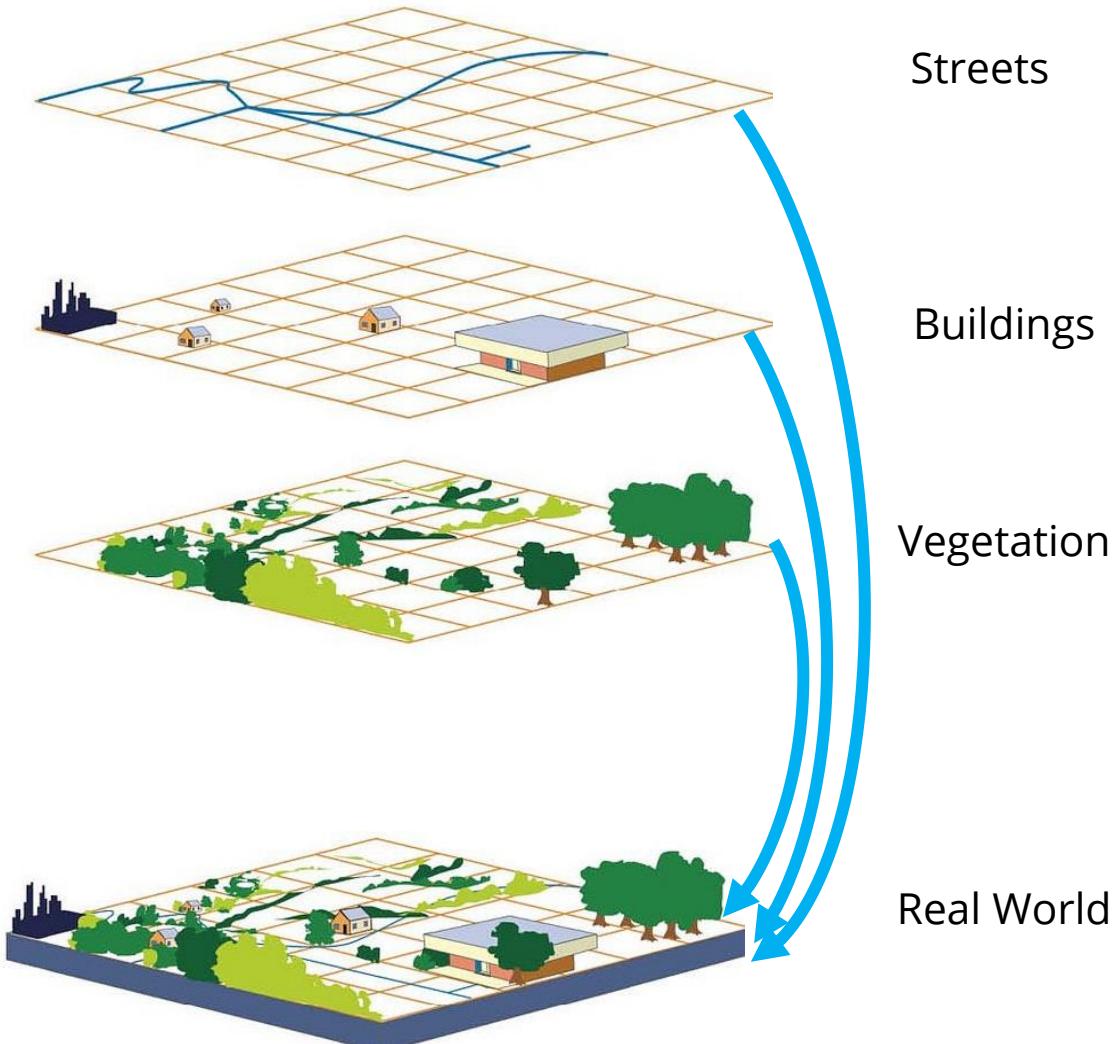
INTRODUCTION TO GIS

What is GIS

WHAT IS GIS?

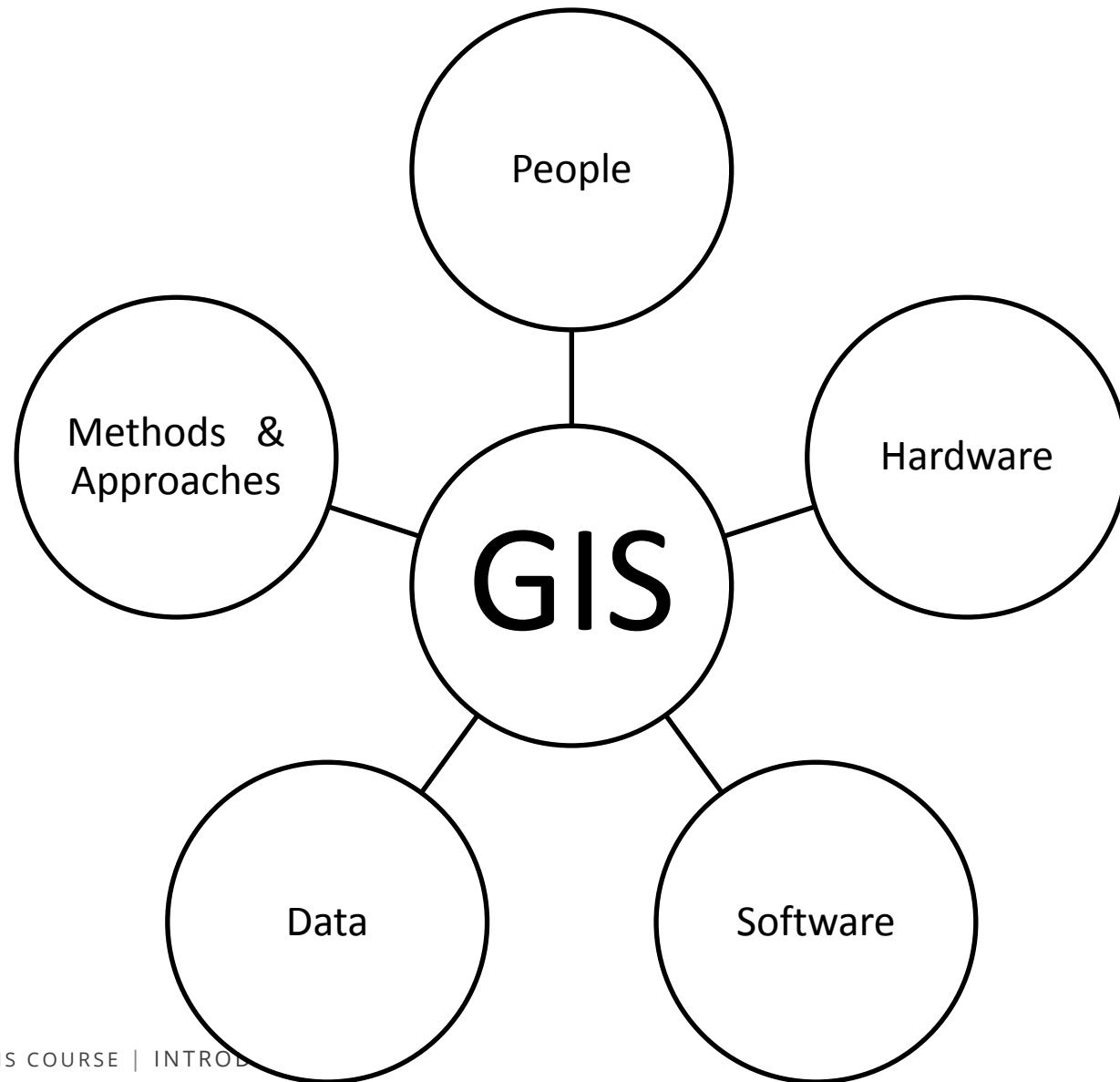
GIS definition

System to capture, manipulate, manage,
visualize and analyse the spatial data



WHAT IS GIS?

GIS Components



INTRODUCTION TO GIS

GIS Benefits/ Users

TASK

What are your
expectations about GIS?

Write down two
expectations

GIS BENEFITS/ USERS

Education



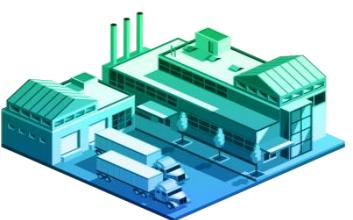
Health



Insurance



Manufacturing



Petroleum & Pipeline



Public Safety



Real Estate



Retail



Sustainability



Telecommunications



Transportation



Electric & Gas Utilities



Natural Resources



Government



Water



<https://www.esri.com/en-us/what-is-gis/overview>

https://twitter.com/vector_icons

GIS BENEFITS/ USERS

Example: The Shopping Center Group (TSCG)



https://www.youtube.com/watch?v=Td0_85fbuDE

GIS BENEFITS/ USERS

Example: Using GIS to enhance Citizen Participation



https://www.youtube.com/watch?v=TtBnJTF2_nk

INTRODUCTION TO GIS

Methods for Geo Data Mapping

METHODS FOR GEO DATA MAPPING

Draw Maps Manually

Inaccurate scale and measurement /
patchwork of maps



GIZ-PDP

GIZ-PDP

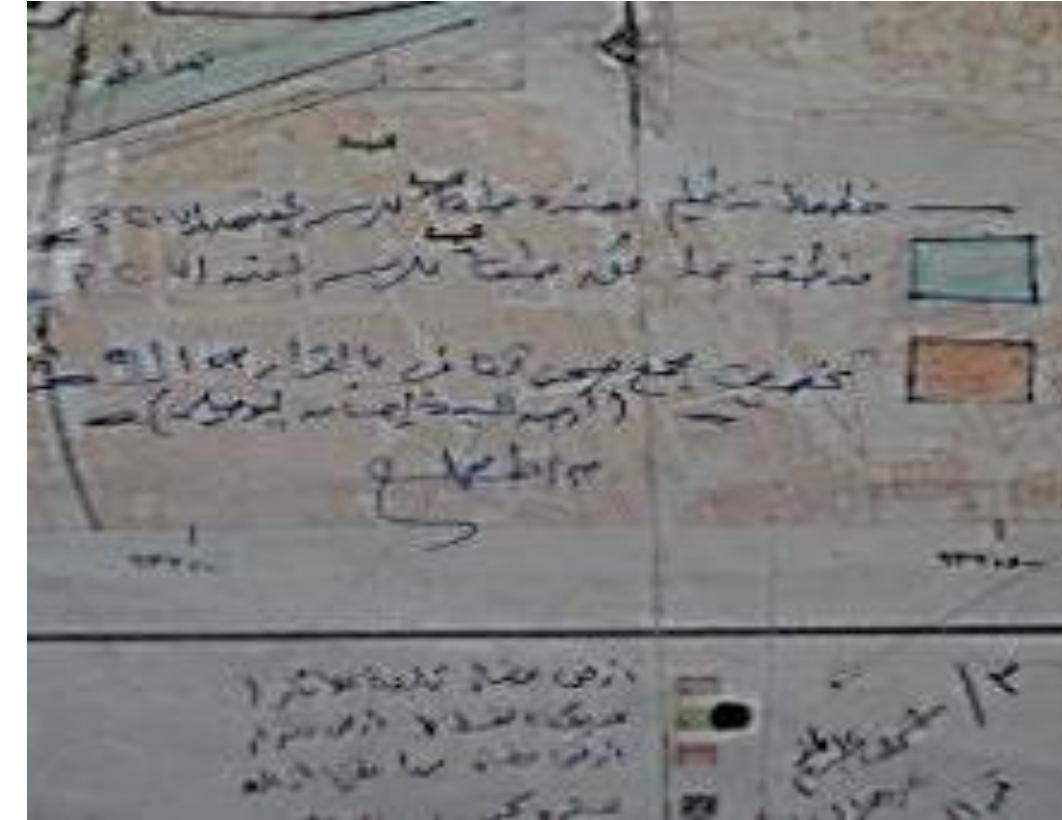
METHODS FOR GEO DATA MAPPING

Draw Maps Manually

Inaccurate scale and measurement /
patchwork of maps



GIZ-PDP

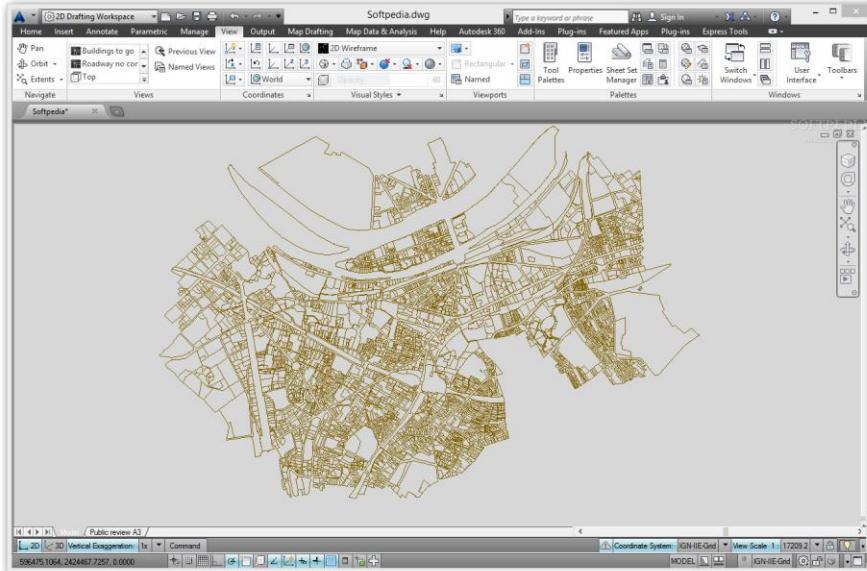


GIZ-PDP

METHODS FOR GEO DATA MAPPING

Using AutoCAD and Excel sheets

Expensive and not related information
(spatial data only)



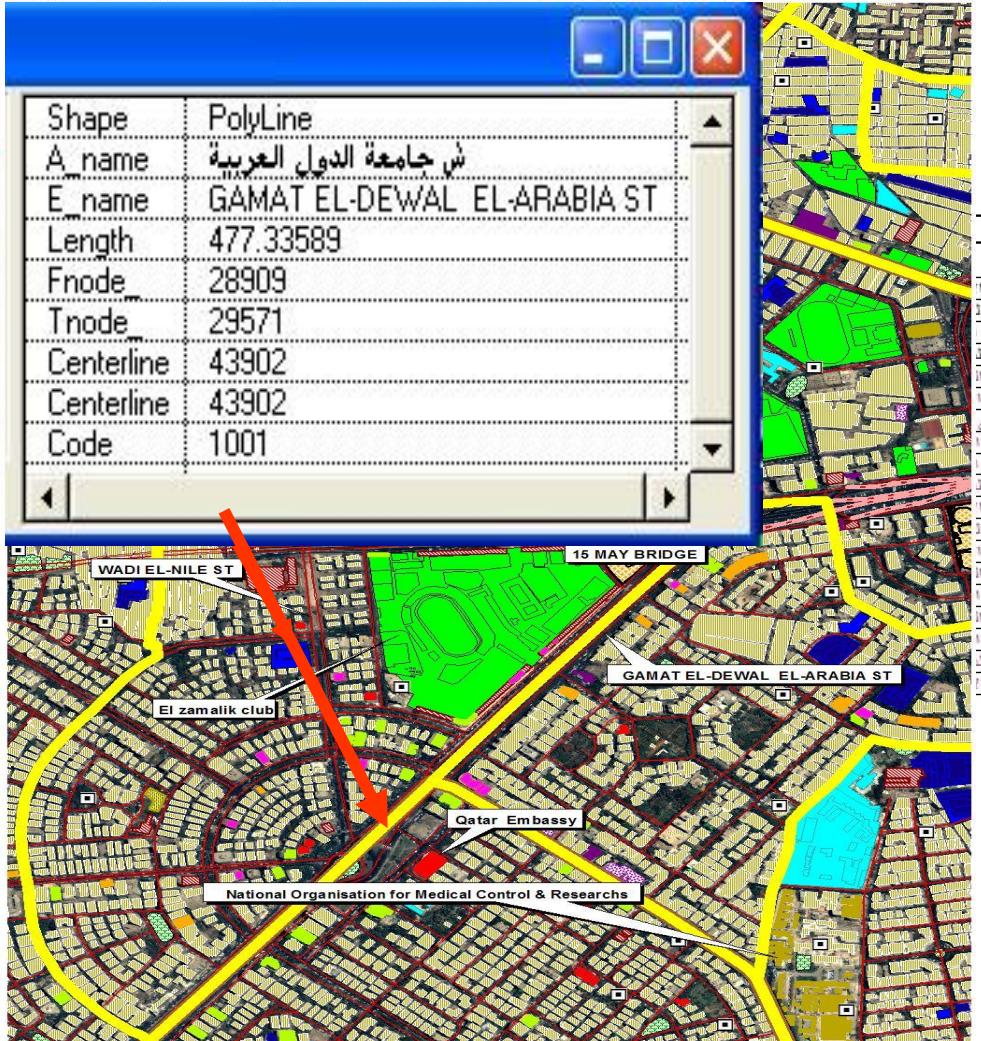
Link ID	FLOW	FUEL	CO	NO _x	VOC	SPEED
	PCU/hr.	l/Link	g/km	g/km	g/km	km/hr.
1	1783.81	112.50	22505.00	4421.05	2077.34	109.23
2	283.66	181.37	3335.67	447.92	447.32	44.64
3	409.69	149.91	3708.27	795.41	468.87	79.20
4	630.68	661.82	5708.54	1224.46	721.78	79.20
5	3000.85	189.23	26968.49	5748.44	3458.26	77.38
6	3961.87	662.35	36073.10	7762.00	4515.73	81.60
7	129.81	86.36	1175.00	252.03	148.57	79.20
8	866.20	341.21	8999.14	1429.57	1242.40	54.00
9	10.56	0.71	114.28	17.11	15.64	50.40
10	1064.58	384.27	11375.22	1734.45	1561.57	51.48

https://windows-cdn.softpedia.com/screenshots/AutoCAD-Map-3D_7.png

<https://i.stack.imgur.com/ZVOJF.png>

METHODS FOR GEO DATA MAPPING

Satellite Image and GIS



- Road
- Bridges
- Schools
- Universities & Institutes
- Hotels
- Banks
- Restaurants
- Embassies
- Postal offices
- Security services
- Commercial
- Petrol stations
- Postal offices
- Mosques

Expensive Satellite

- Churches
- Parks & Open spaces
- Clubs & Youth centers
- Cinemas & theaters
- Factories
- Utilities
- Air ports
- Residential

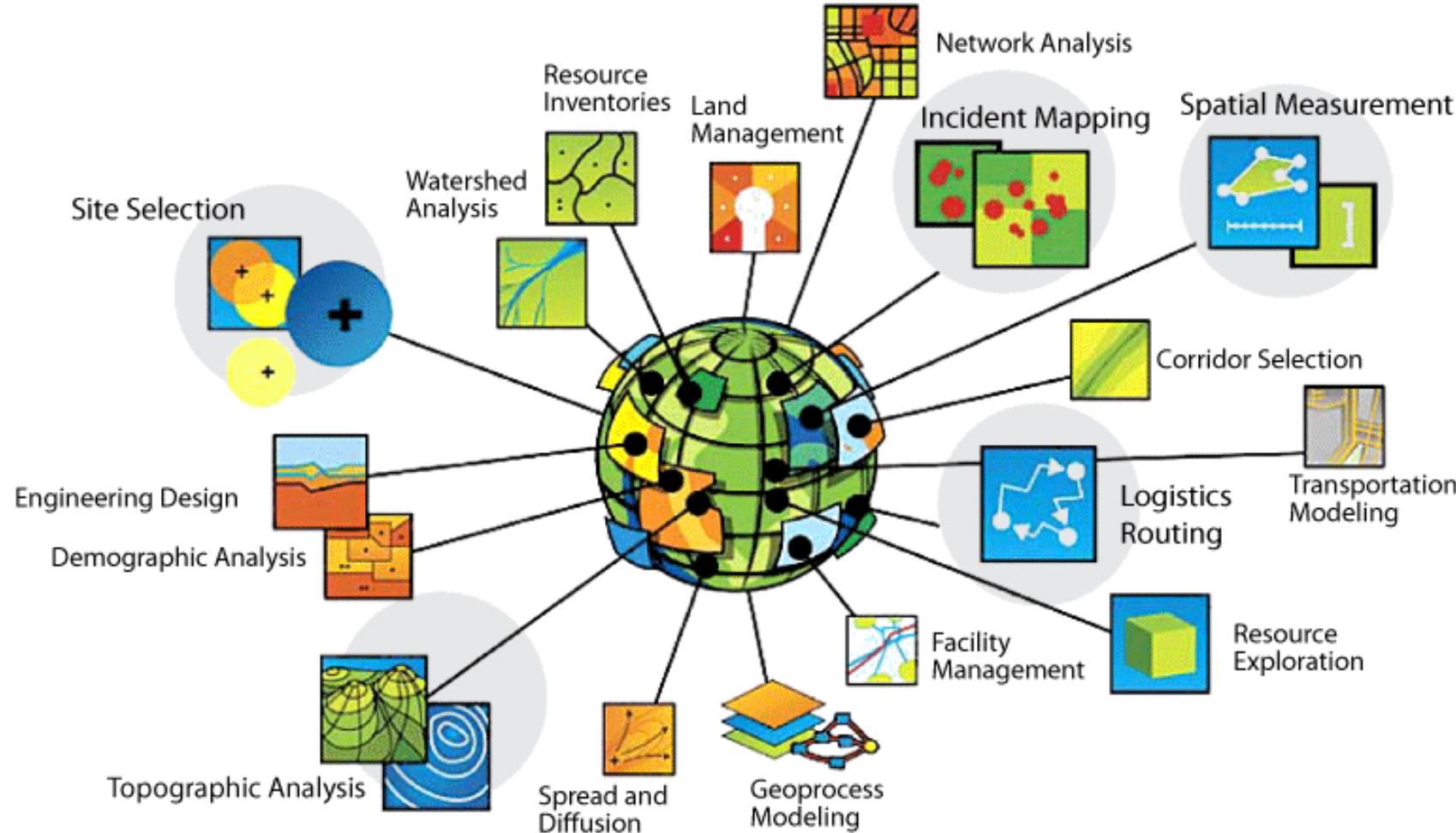
- You can also identify the admin., boundaries & its census
- You can identify the schools locations & class names &.....
- You can identify the streets names & Lengths &...

INTRODUCTION TO GIS

Geo-based Analysis Methods

GIS ANALYSIS

GIS is Being Applied Around The World



http://mappa.com.bd/wp-content/uploads/2018/03/GIS_Services.gif

GIS ANALYSIS

Network Analyst

Closest Facility



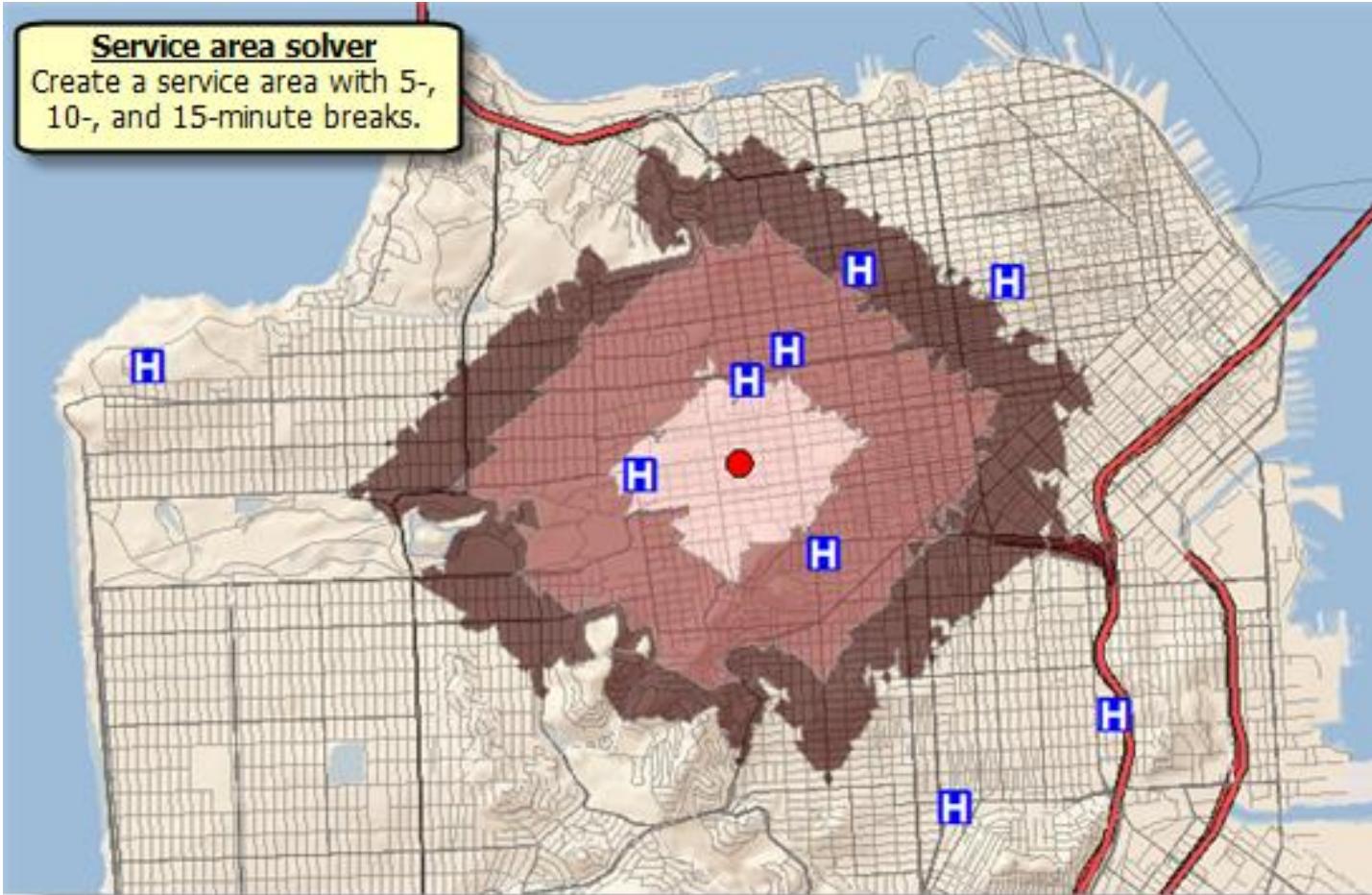
Closest facility finds the closest facility, such as a hospital, fire station, or ATM, to any location on a network.

<https://desktop.arcgis.com/en/arcmap/latest/extensions/network-analyst/GUID-DAB5714C-D38F-4514-8C39-5EA5E663D4B4-web.png>

GIS ANALYSIS

Network Analyst

Service Area Solver



<https://pro.arcgis.com/en/pro-app/tool-reference/ready-to-use/GUID-0561B7FB-99CF-4119-B961-E28ECB19437D-web.png>

GIS ANALYSIS

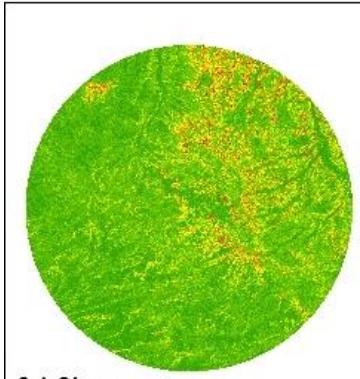
Calculate Solar Radiation



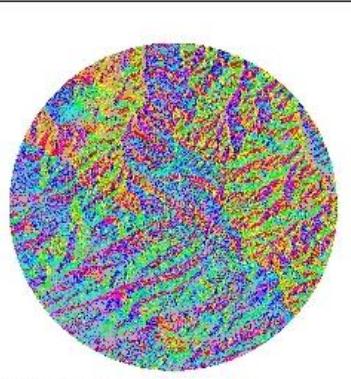
<https://solutions.arcgis.com/local-government/help/solar-radiation-maps/>

GIS ANALYSIS

Digital Elevation Model (DEM) based Analysis



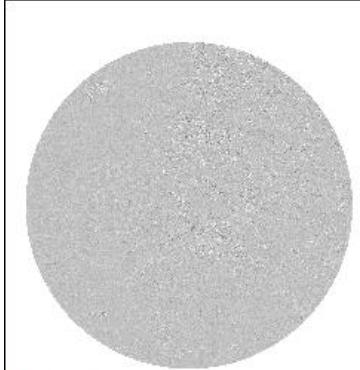
2.1 Slope



2.2 Aspect



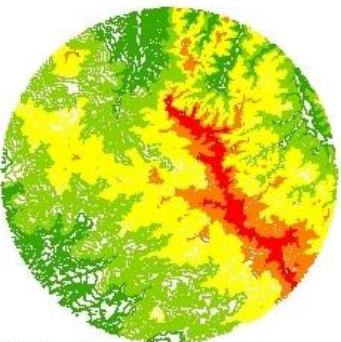
2.3 Hillshade



2.4 Curvature



Original DEM

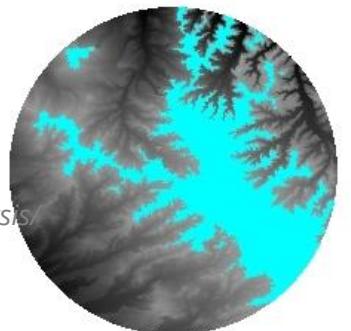


2.5 Contour

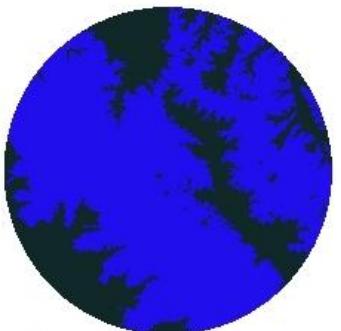


http://rgis.unm.edu/dem_analysis/

2.6 Viewshed



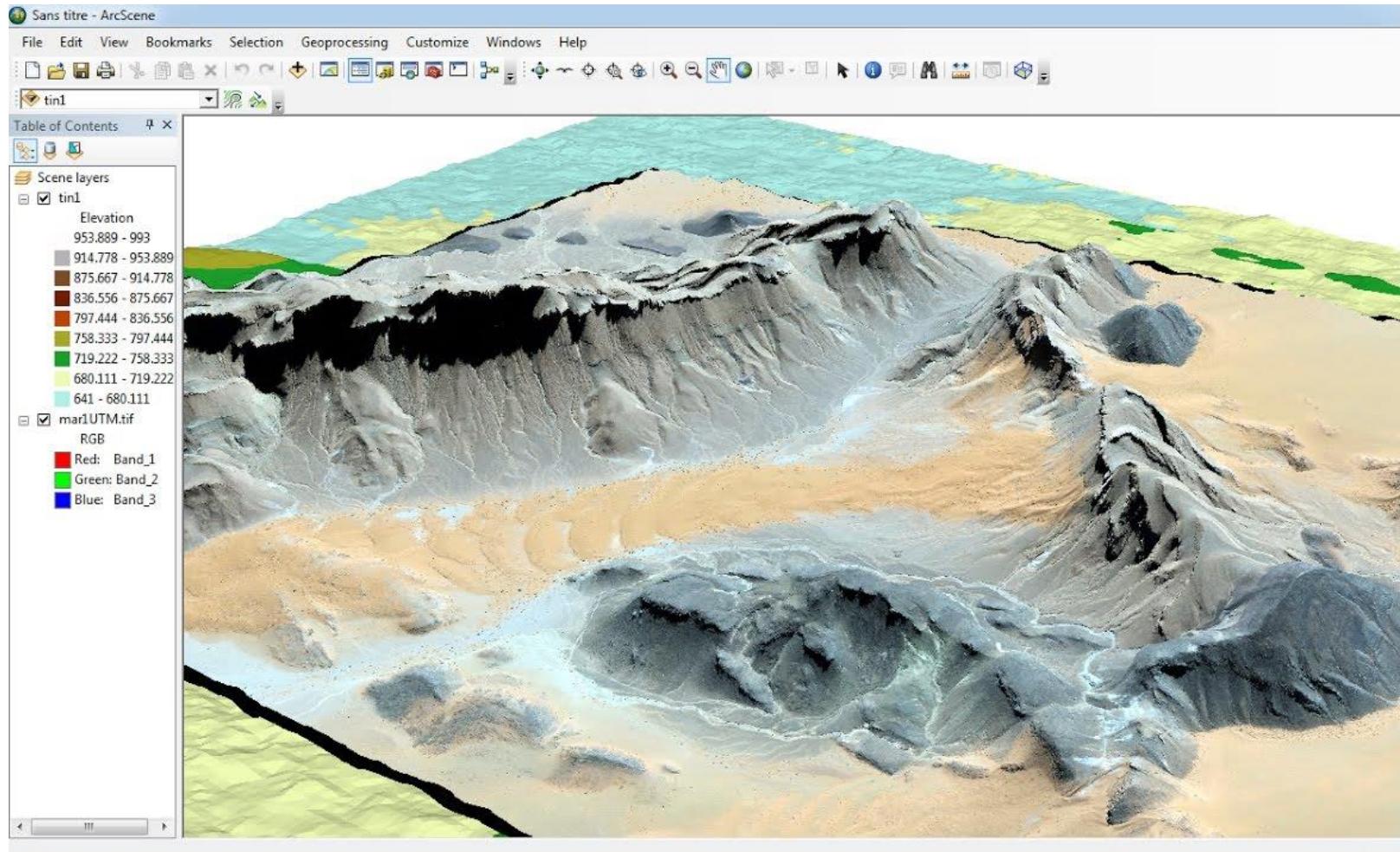
2.7 DEM based on Threshold



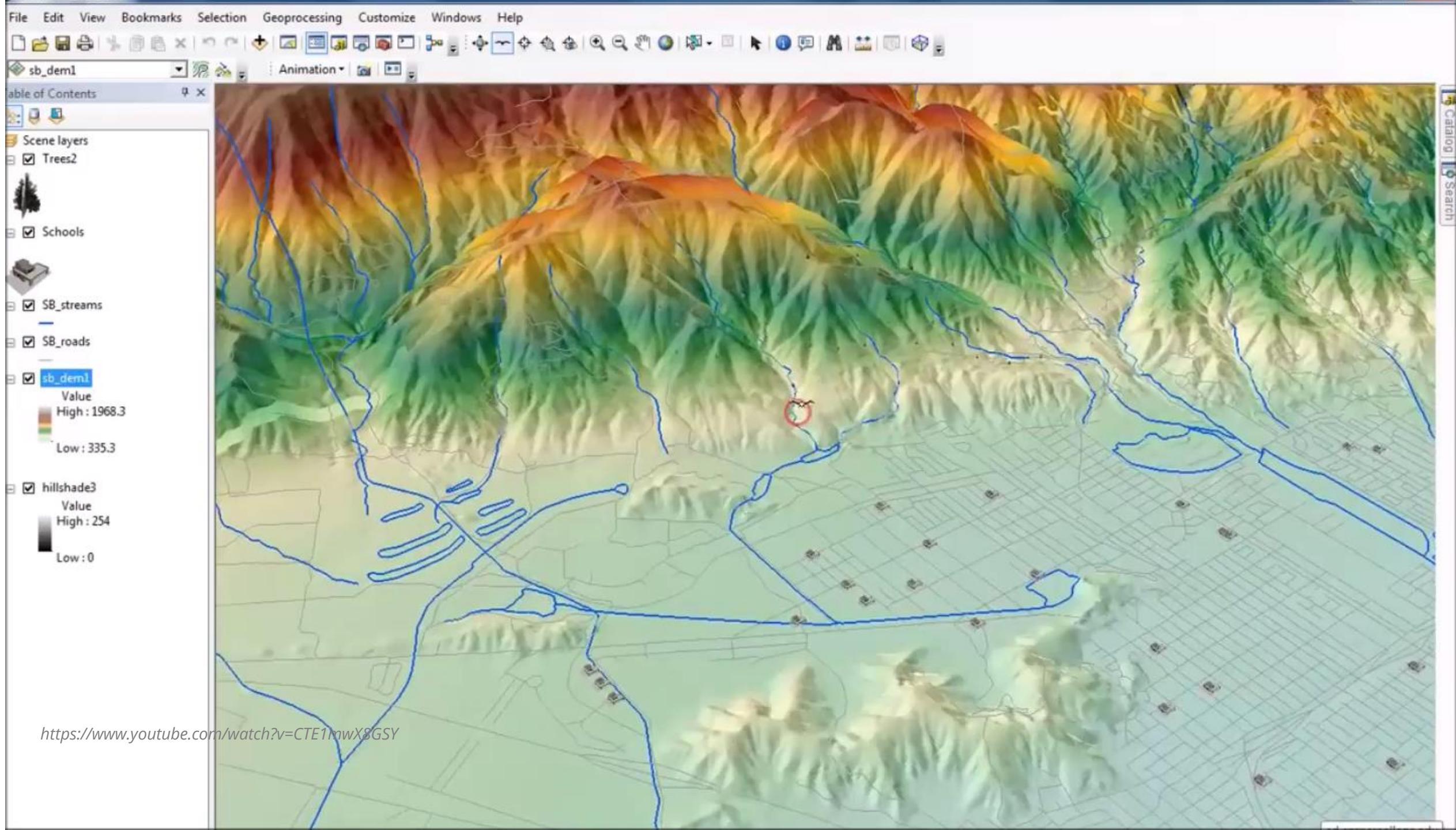
2.8 Reclassified DEM

GIS ANALYSIS

3D Analyst

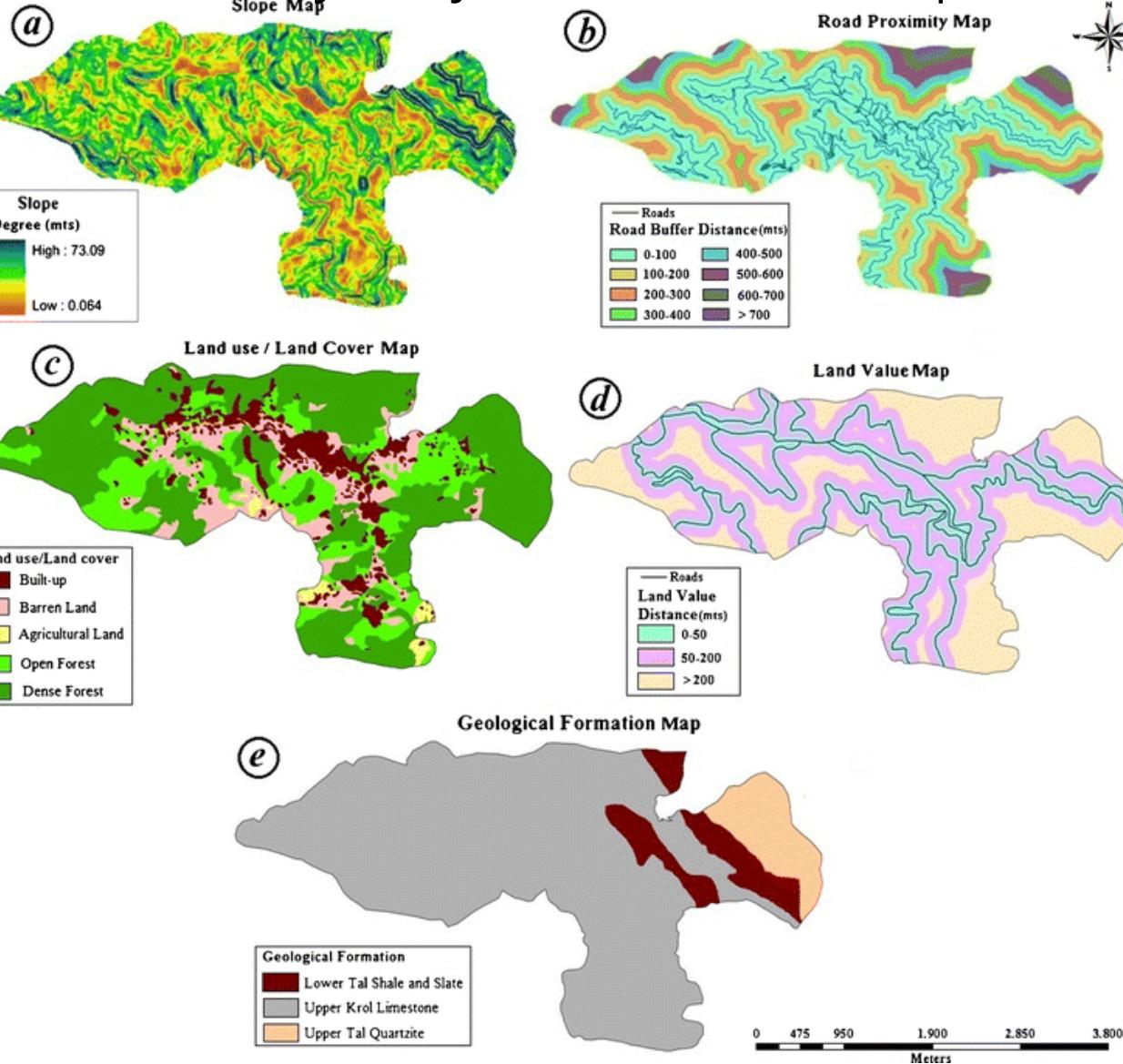


https://i.ytimg.com/vi/-s_nOQgZEsk/maxresdefault.jpg



GIS ANALYSIS

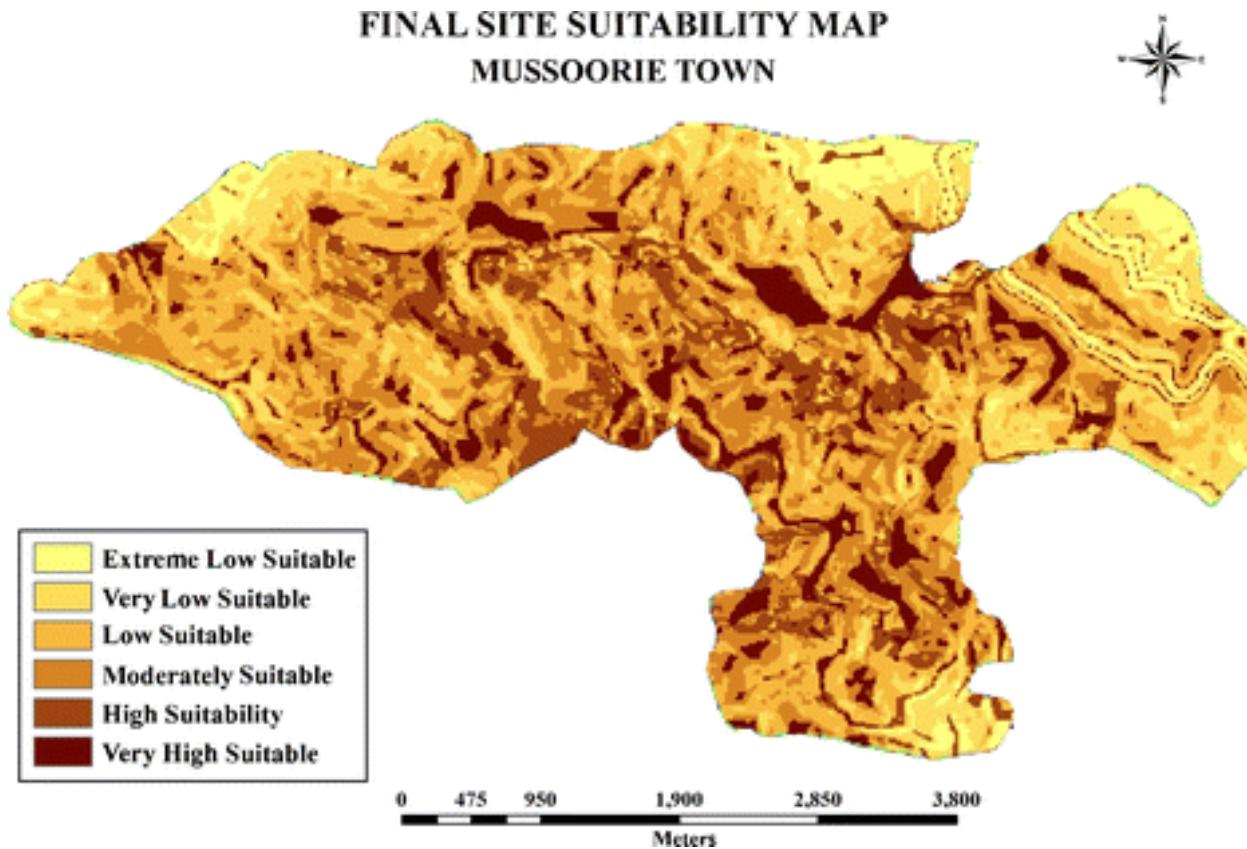
Site Suitability Analysis for Urban Development Based Multicriteria Evaluation Technique



Manish Kumar and Vasim Riyasat Shaikh. (2012) Site Suitability Analysis for Urban Development Using GIS Based Multicriteria Evaluation Technique [Online] Available from > <https://link.springer.com/article/10.1007/s12524-012-0221-8> [15 September 2019]

GIS ANALYSIS

Site Suitability Analysis for Urban Development Based Multicriteria Evaluation Technique



Manish Kumar and Vasim Riyasat Shaikh. (2012) Site Suitability Analysis for Urban Development Using GIS Based Multicriteria Evaluation Technique [Online] Available from > <https://link.springer.com/article/10.1007/s12524-012-0221-8> [15 September 2019]

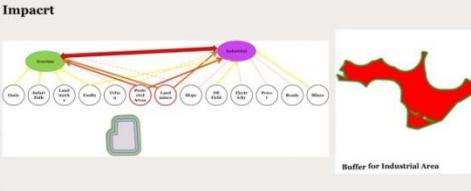
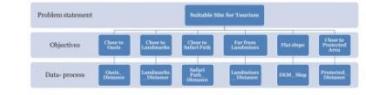
GIS ANALYSIS

Site Suitability for Tourism and Industrial area Egypt

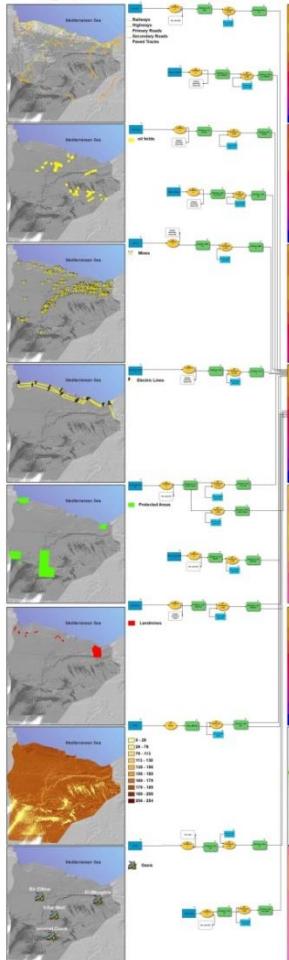
suitability analysis for Matruh (Tourism- Industrial sites)

G

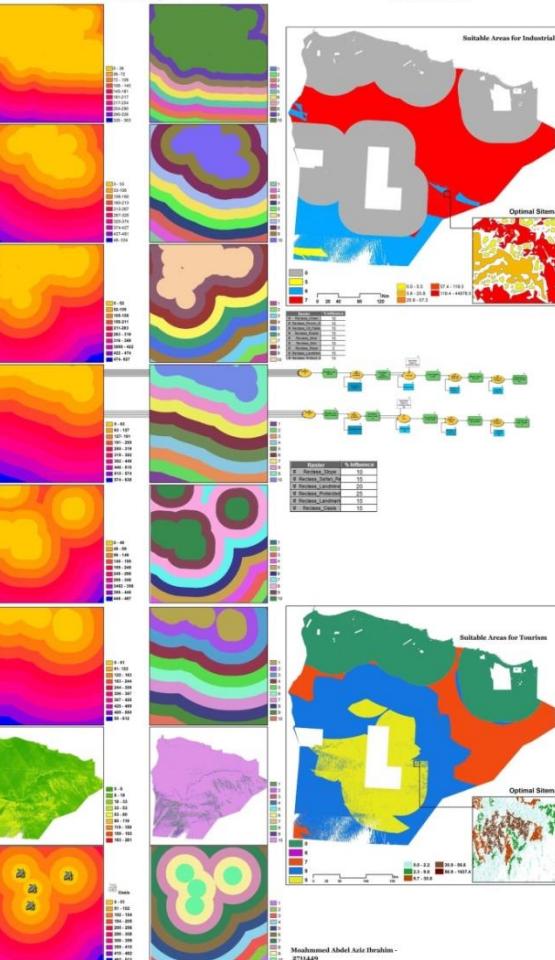
Problem Statement



Inputs



Process



Initial output

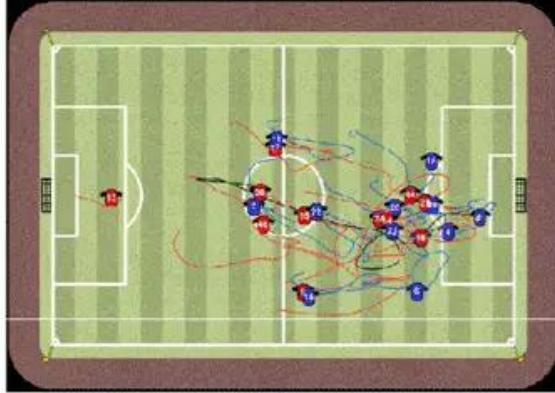
Final Results

GIS ANALYSIS

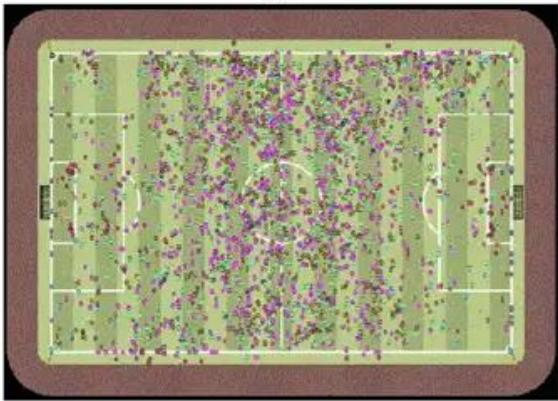
Sports Geo-Tech



a



b



<https://www.gislounge.com/game-analysis-gis-football-soccer/>

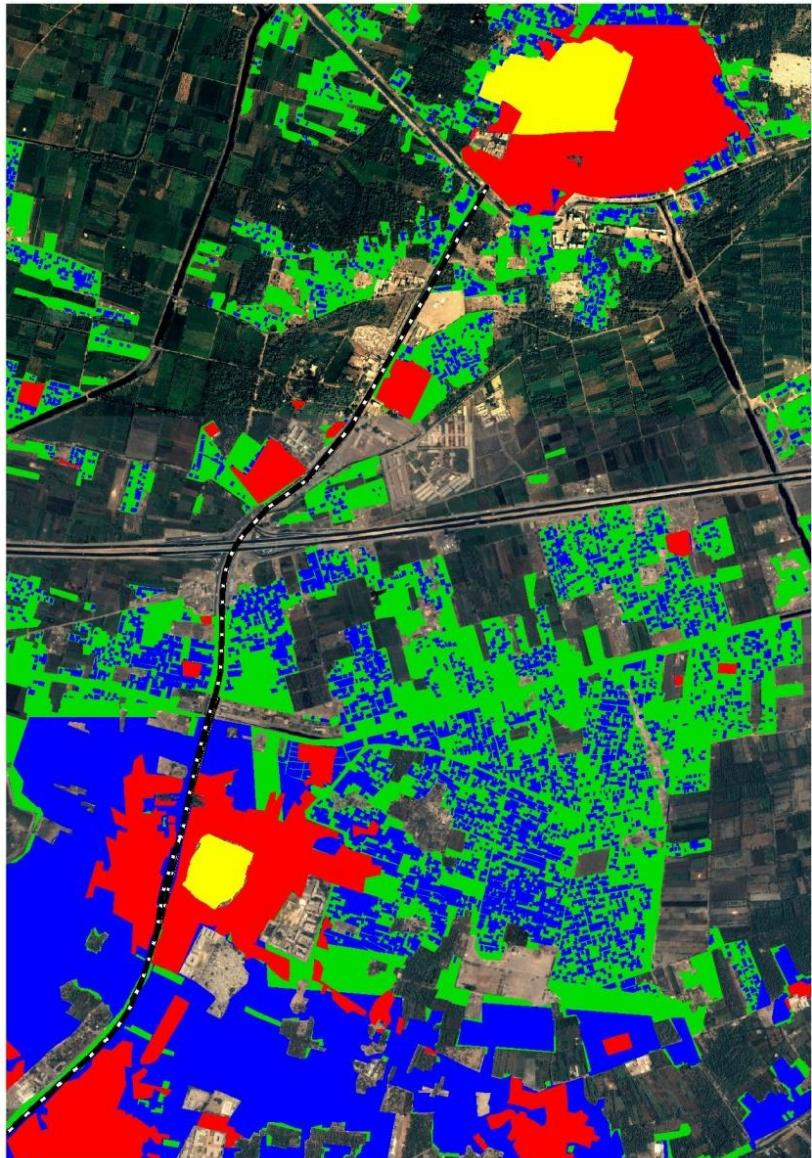
<https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcTiqYKXvde0LRq4LJ2lrH0Z1IUwpTGAh97zNIXOd2gO7U0wRhl0iw> & <https://www.gislounge.com/game-analysis-gis-football-soccer/>

INTRODUCTION TO GIS

GIS Applications

GIS APPLICATIONS

Historical development of Informal Areas (IAs) -Egypt



Core Villages 1950 (Yellow)

Area= 6.7 km²

Population= 0.4 million

Growth 1950 – 1977 (Red)

Area = 45.7 km²

Population = 2.7 million

Growth 1977 – 1991 (Blue)

Area = 106.9 km²

Population= 6.33 million

Growth 1991 – 2000 (Green)

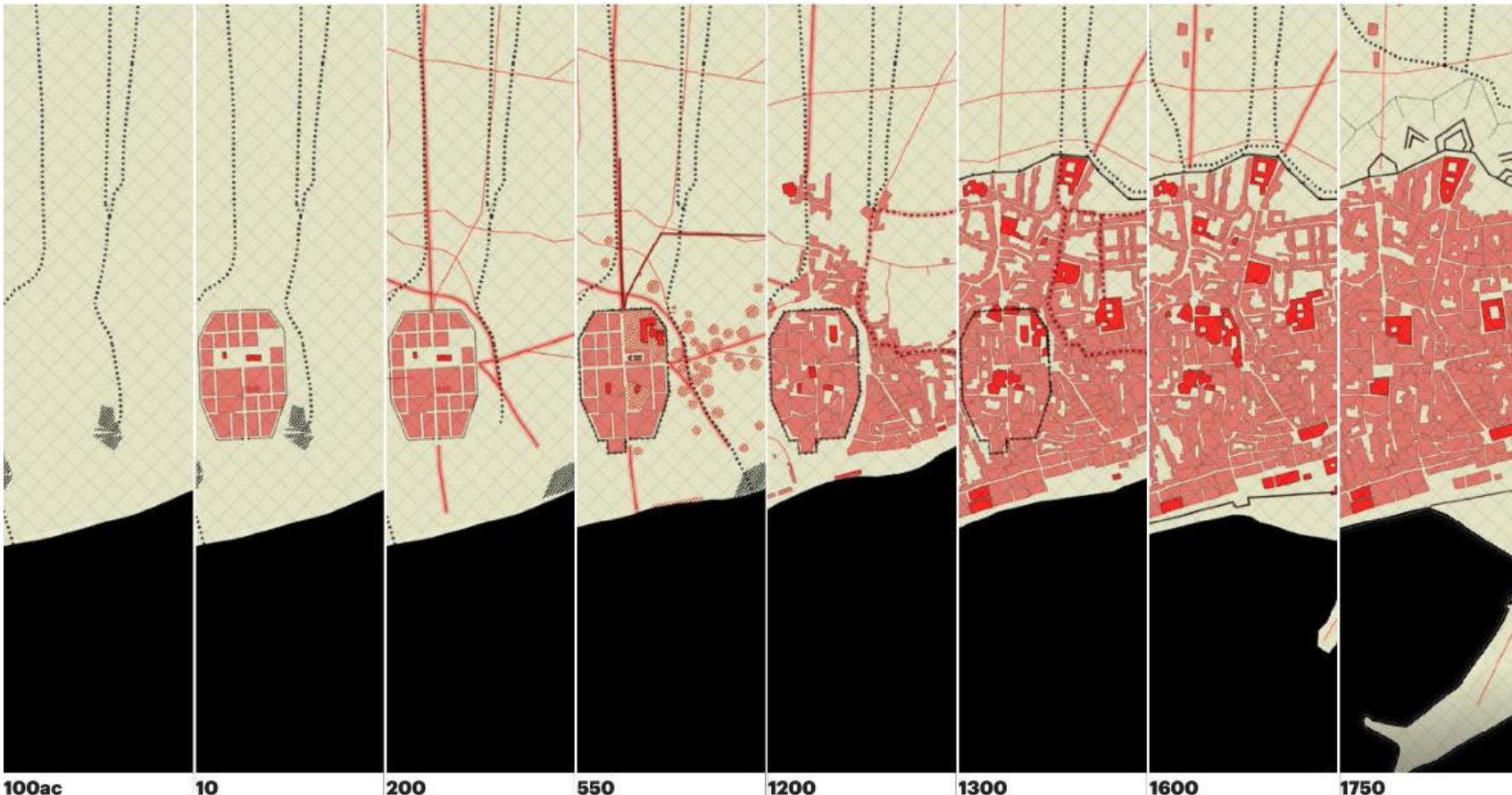
Area = 140.1 km²

Population= 8.3 million

GIZ-PDP

GIS APPLICATIONS

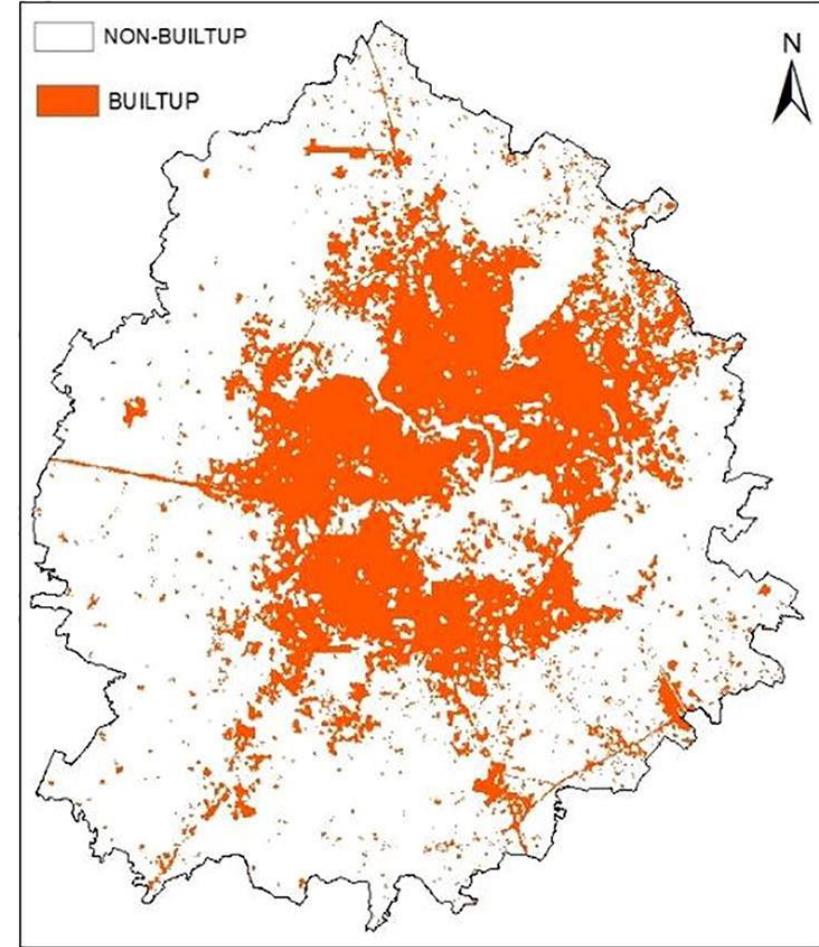
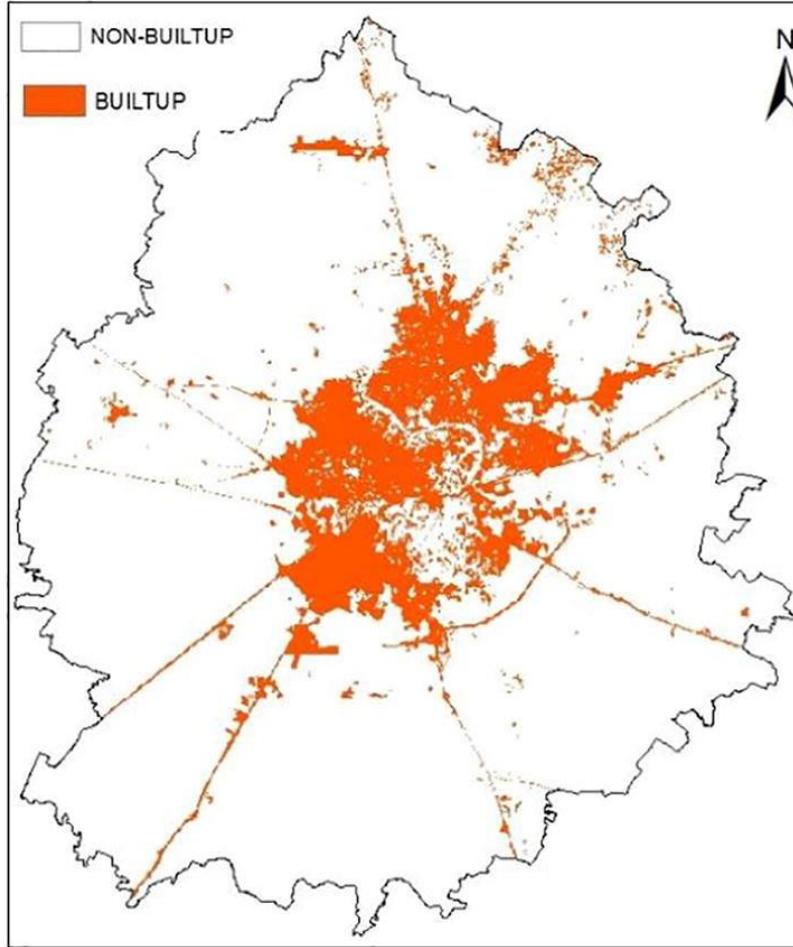
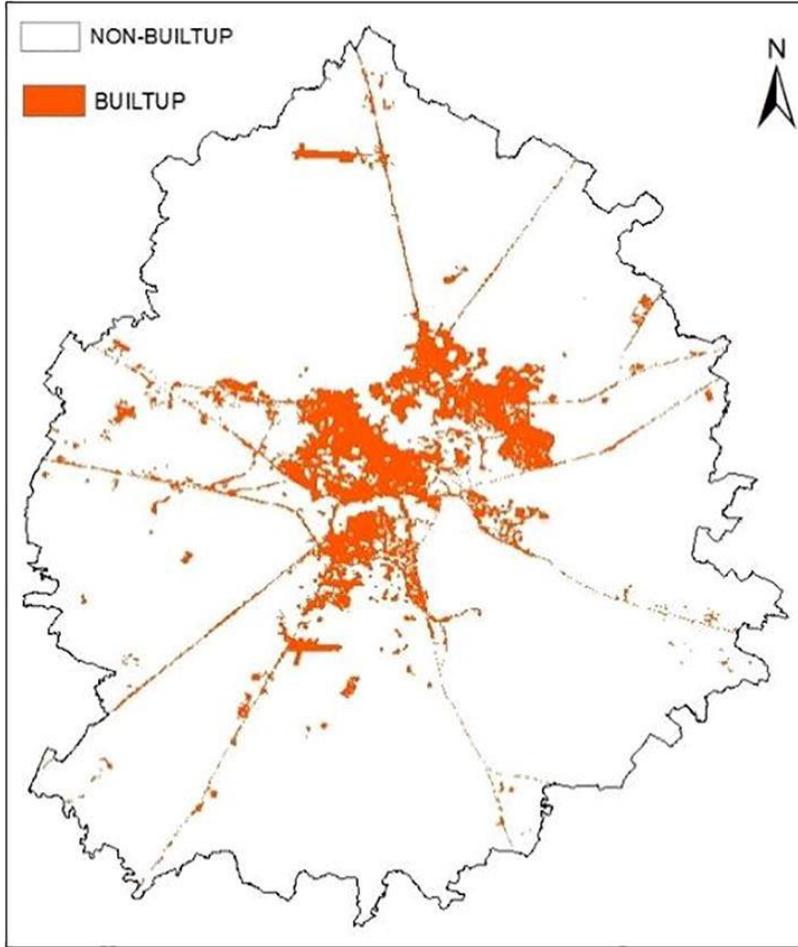
Historic Charter of Barcelona



https://cityvis.io/assets/img/project_images/73_4.jpg

GIS APPLICATIONS

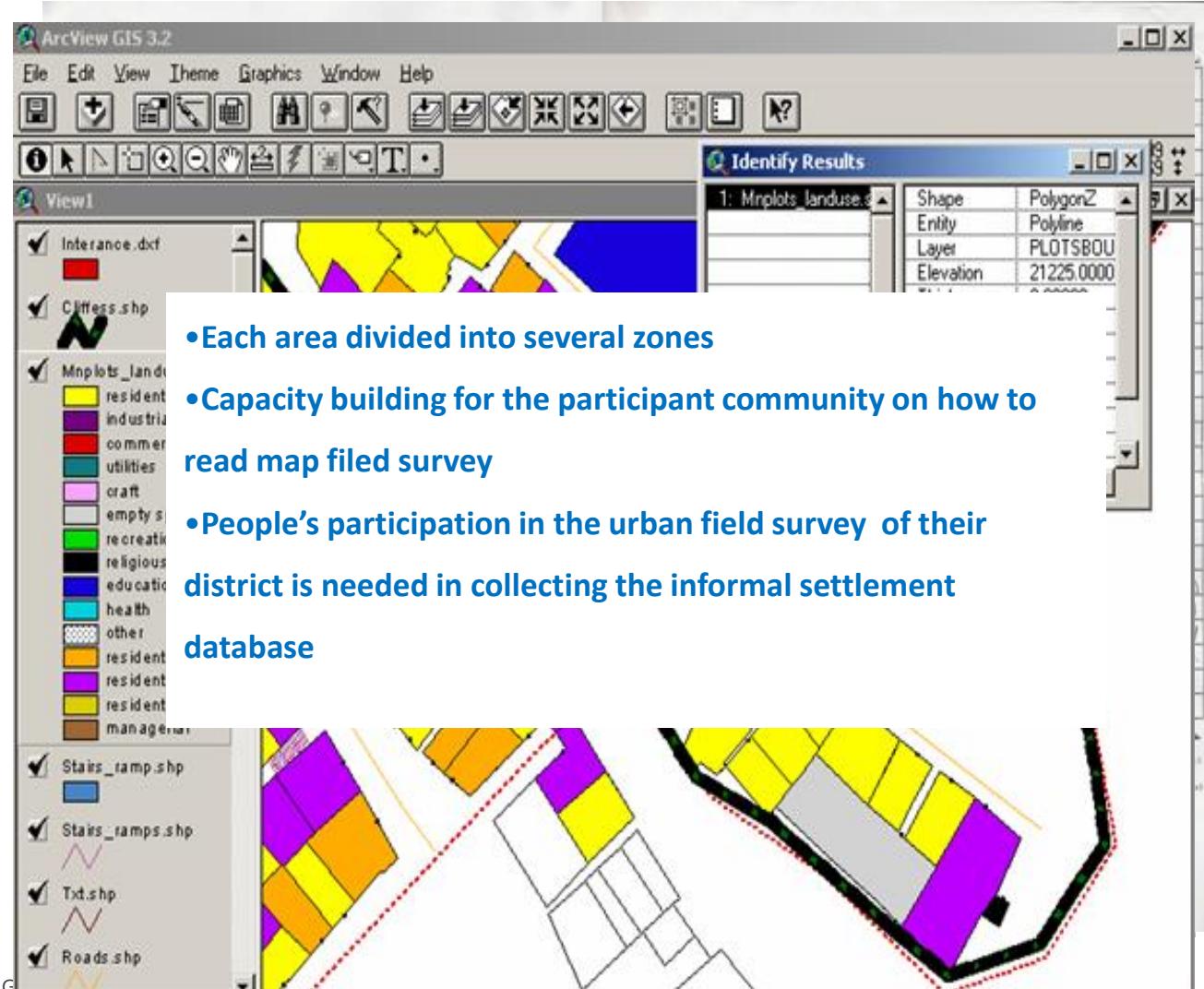
Extracted built-up/non built-up map of 1993, 2003 and 2013, Lucknow



Asfa Siddiqui, Almas Siddiqui, Sandeep Maithani, A.K. Jha, Pramod Kumar, S.K. Srivastav. (2018)
Urban growth dynamics of an Indian metropolitan using CA Markov and Logistic Regression
[Online] Available from >
<https://www.sciencedirect.com/science/article/pii/S1110982316300953?via%3Dihub#b0010> [9
GIS COURSE 1 INTRODUCTION
October 2019]

GIS APPLICATIONS

Recognize the existing situation & supporting Participatory Rapid Appraisal (PRA)-Manshiat Naser



- Each area divided into several zones
- Capacity building for the participant community on how to read map filed survey
- People's participation in the urban field survey of their district is needed in collecting the informal settlement database

- Stairs.
- Ramps.
- Buildings. Entrances.
- Mountainous edges & its heights
- Boundaries of area.

GIZ-PDP

GIS APPLICATIONS

Enable local community to allocate their Problems- Manshiat naser

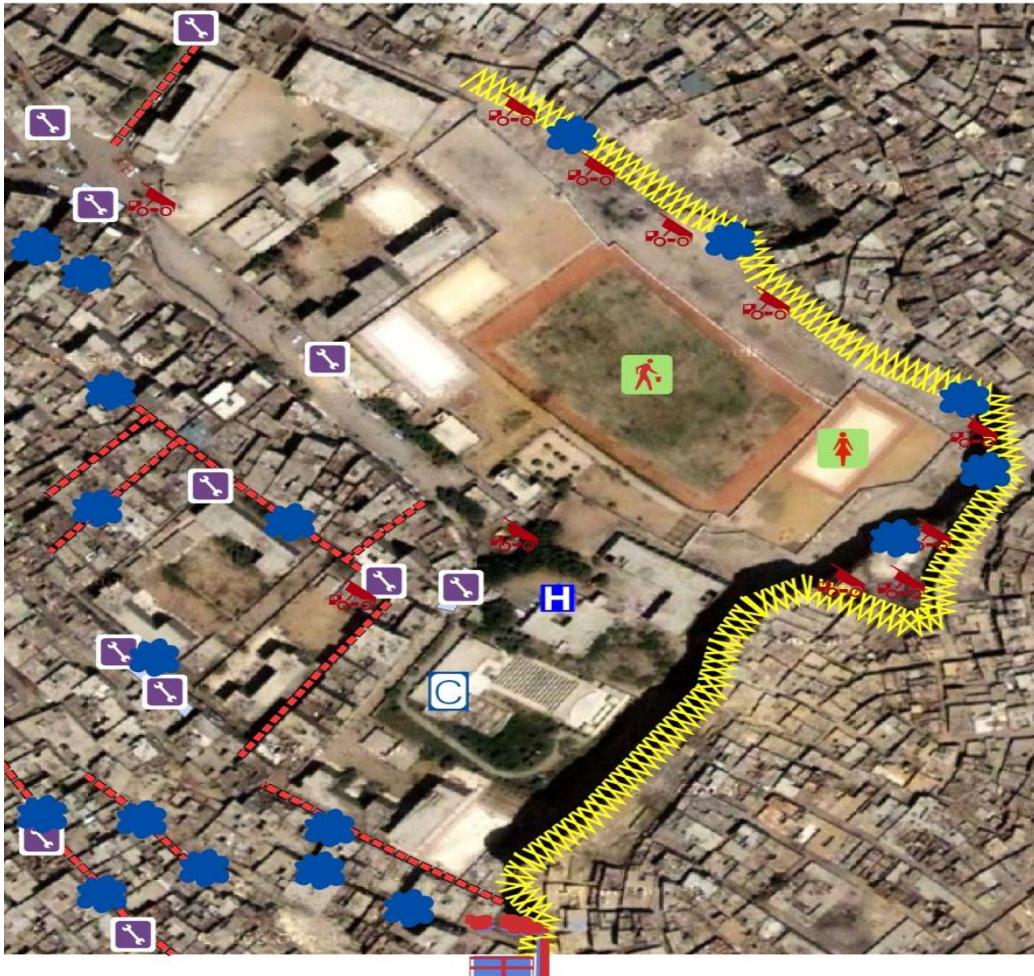
Helping the local community to present their problems & potentials in the informal settlement and come up with planning recommendations in the strategic planning sessions



GIZ-PDP

GIS APPLICATIONS

Enable local community to allocate their Problems



GIZ-PDP

GIS APPLICATIONS

GIS Activities in Solid Waste Management- Khousus Area- Egypt

1. Dump sites:



GIZ-PDP

GIS APPLICATIONS

GIS Activities in Solid Waste Management- Khousus Area- Egypt

1. Dump sites:



GIZ-PDP

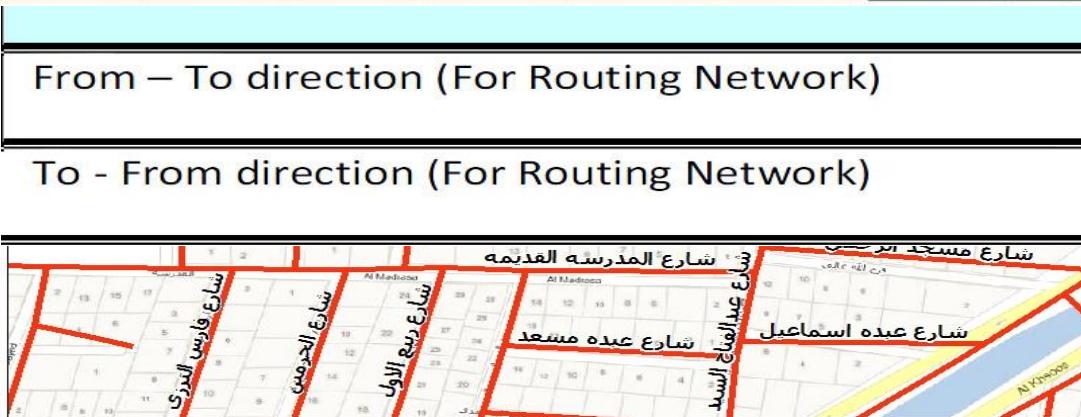
GIS APPLICATIONS

GIS Activities in Solid Waste Management- Khousus Area- Egypt

2. Streets:



ID	نطير الوقت	Time
1	00:06	13/01/2013 08:29
2	00:09	13/01/2013 08:35
3	00:11	13/01/2013 08:47
4	00:05	13/01/2013 09:02
5	00:05	13/01/2013 09:17
6	00:13	13/01/2013 09:27
7	00:05	13/01/2013 10:09
8	00:16	13/01/2013 10:17
9	01:05	13/01/2013 10:43
10	00:19	13/01/2013 12:01
11	00:07	13/01/2013 12:22
12	00:09	13/01/2013 12:58
13	00:05	13/01/2013 13:15



GIZ-PDP

GIS APPLICATIONS

GIS Activities in Solid Waste Management- Khousus Area- Egypt

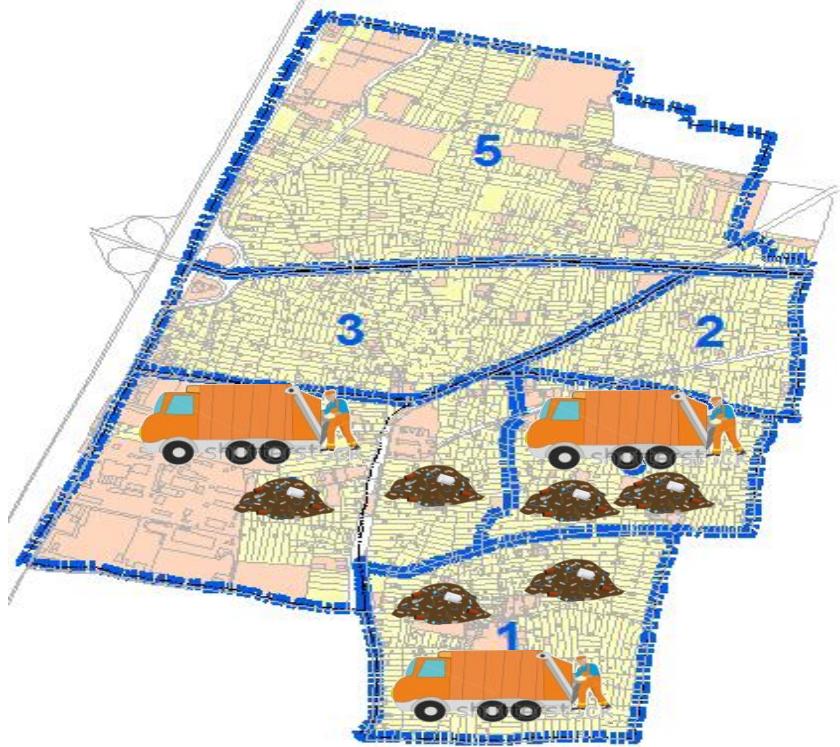
3.Residential building

Field Name	Data Type	Description
Addr1	Number	Building Number.
Addr2	Char	Building Letter
Addr3	Char	Street Name
Name	Char	Land Mark Name
Landuse	Number	Land use = 1 { all the building is land use }
Bldg_name	Char	Housing Names
NOTE	Char	Building Notes
Corner	Number	Corner = 1 { the building is at the intersection of two streets }
Second No	Number	Another number for the building
Second_St	Char	The name of the intersected street for the corner buildings
Ojsrn	Char	Ojsrn Name
Area Name	Char	The Name of certain region
Distict	Char	The agriculture district's Name
Floor	Number	Number of floors
Units	Number	Number of Units
Unocc_units	Number	Number of unoccupied Units
Occ_units	Number	Number of occupied Units
Floor_uc	Number	Number of under construction floors
Temp_units	Number	Number of Temporary occupied Units
Act_units	Number	Number of Units used as activity

GIZ-PDP

GIS APPLICATIONS

GIS Activities in Solid Waste Management- Khousus Area- Egypt



Sector	Apartment_no	Family_size	Population	Weight_Ton
Sec_1	33394	5.3	176,801	106.1
Sec_2	21456	4.15	89,136	53.5
Sec_3	26553	4	106,212	63.7
Sec_4	18453	3.95	88,310	53.0
Sec_5	18261	4.7	85,777	51.5
Sec_6	22901	5.3	121,284	72.8
Total	140592	4.42	665,673	399.4

GIZ-PDP

GIS APPLICATIONS

Smart Solid Waste Management



<http://innosoftsolutions.com/wp-content/uploads/2018/01/integrating-monitor.png>

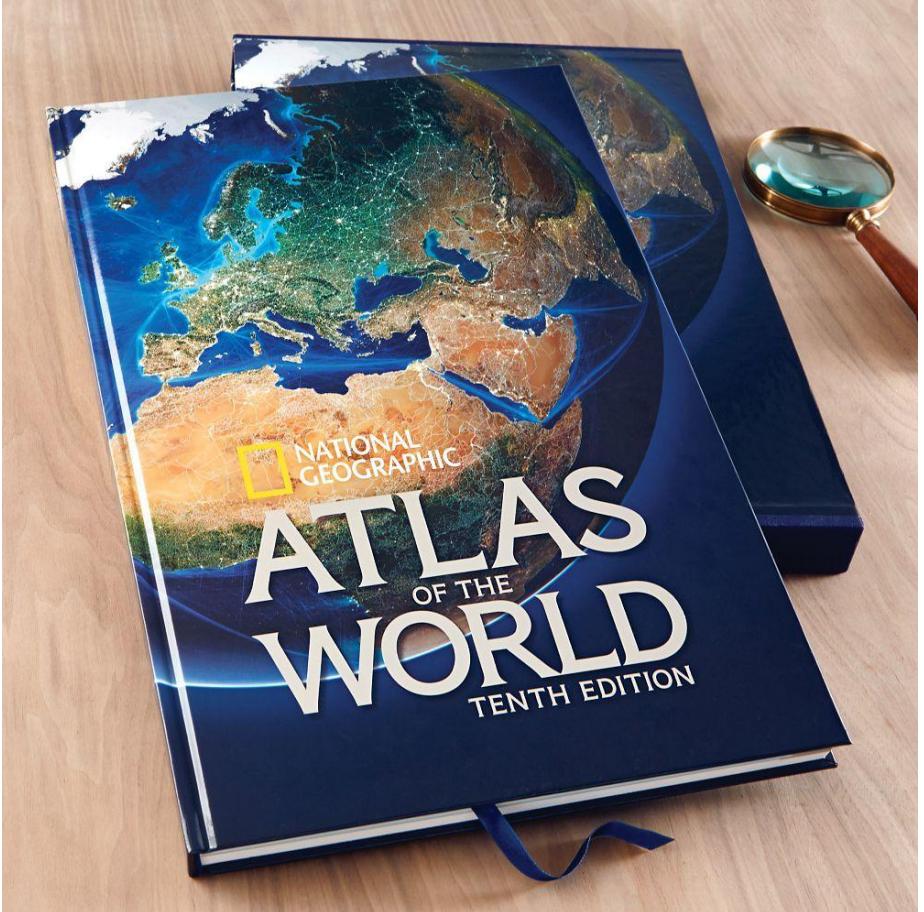


<https://iotbusinessnews.com/WordPress/wp-content/uploads/smartbin.jpg>

GIS APPLICATIONS

Atlas of Maps: Hard copy GIS Atlas

Recognize the existing situation &
supporting urban development process

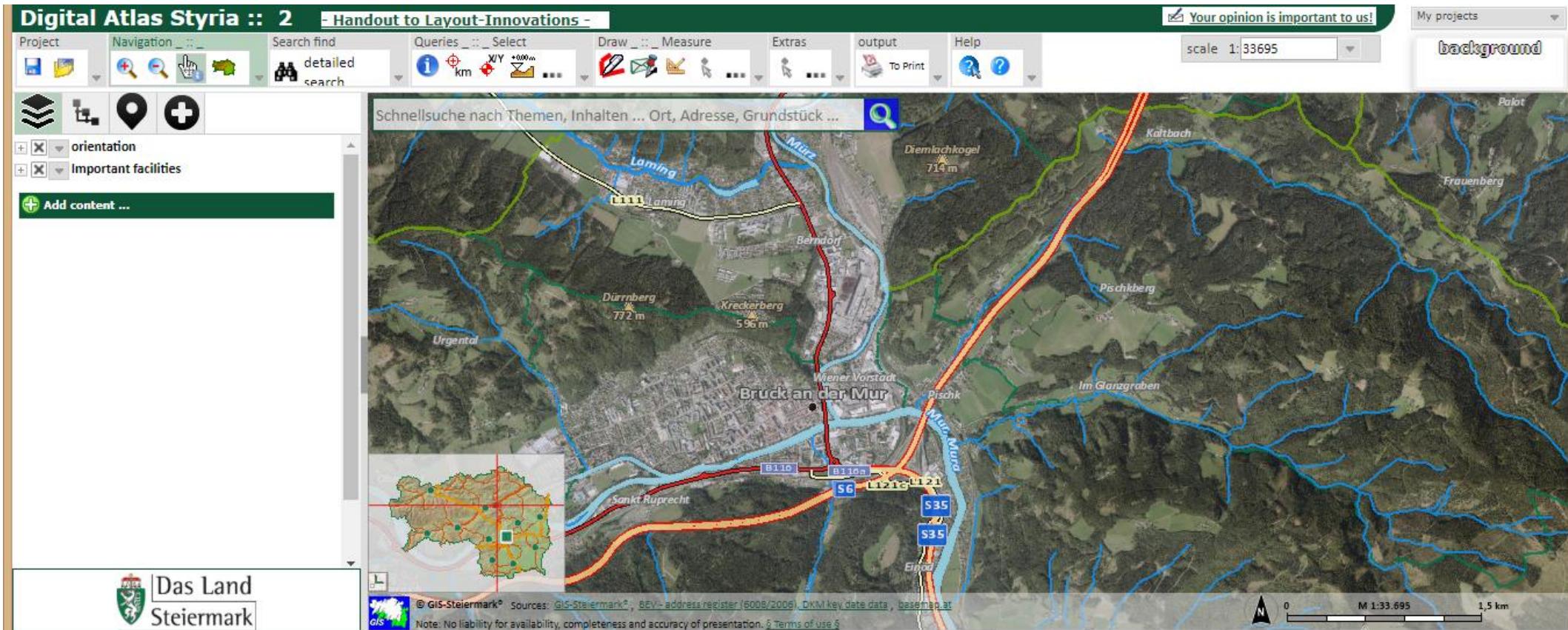


https://cdn.shopify.com/s/files/1/2959/2384/products/ngogeobkaow10hc_1024x1024.jpg?v=1524988459

GIS APPLICATIONS

Atlas of Maps: Digital Atlas

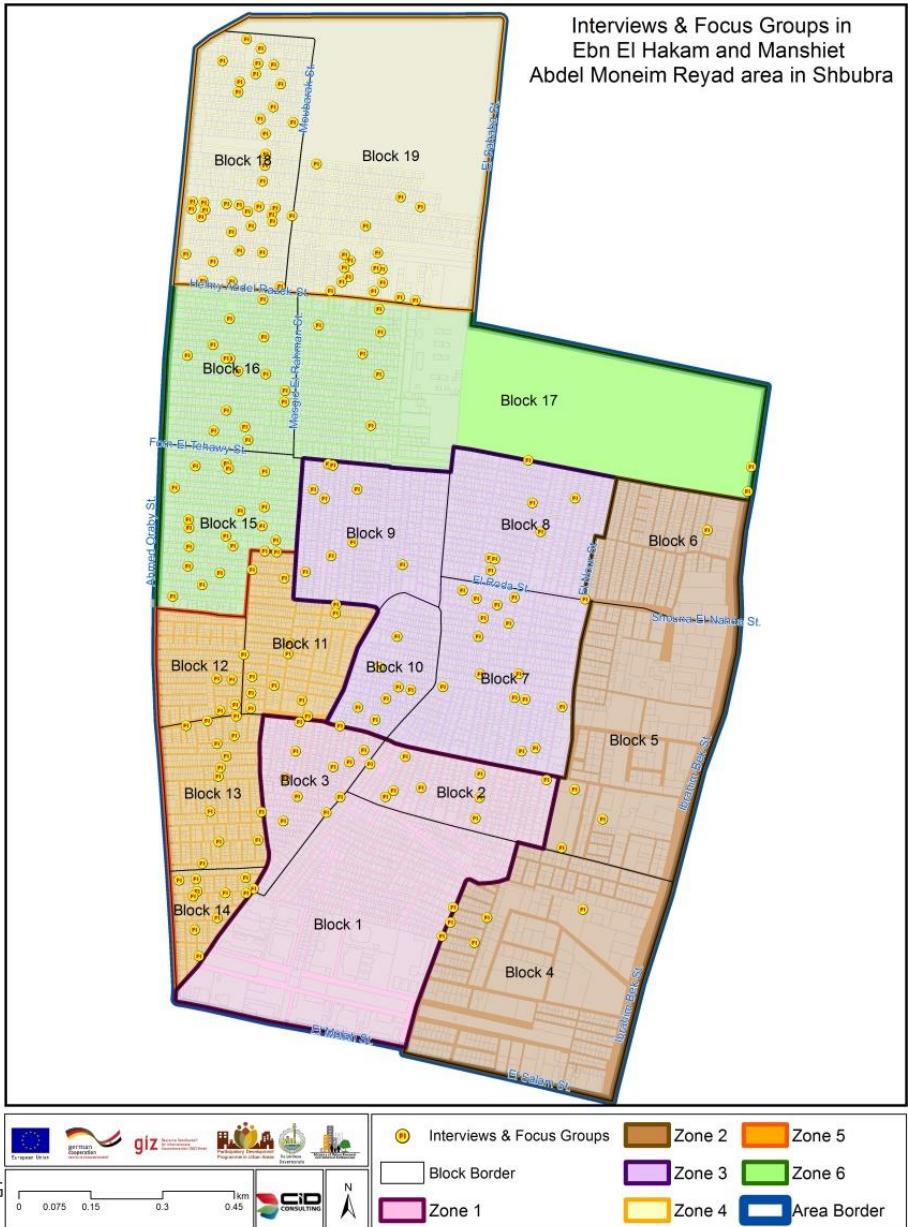
Free access web based Atlas



<https://gis.stmk.gv.at/atlas/>

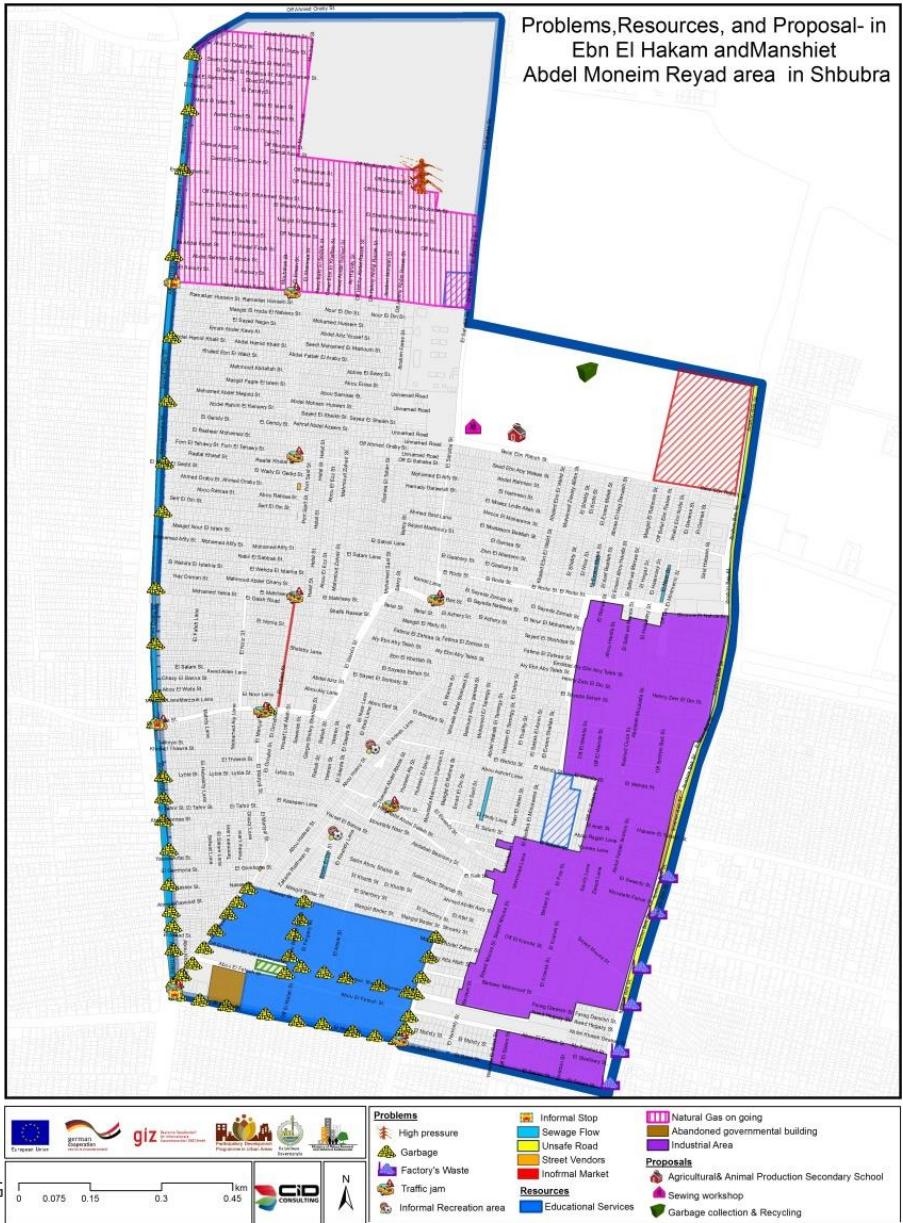
GIS APPLICATIONS

Participatory Needs Assessment



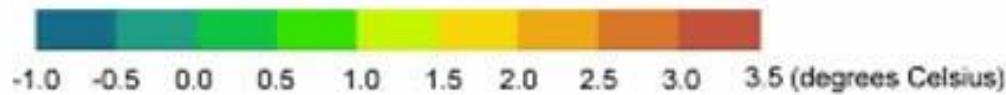
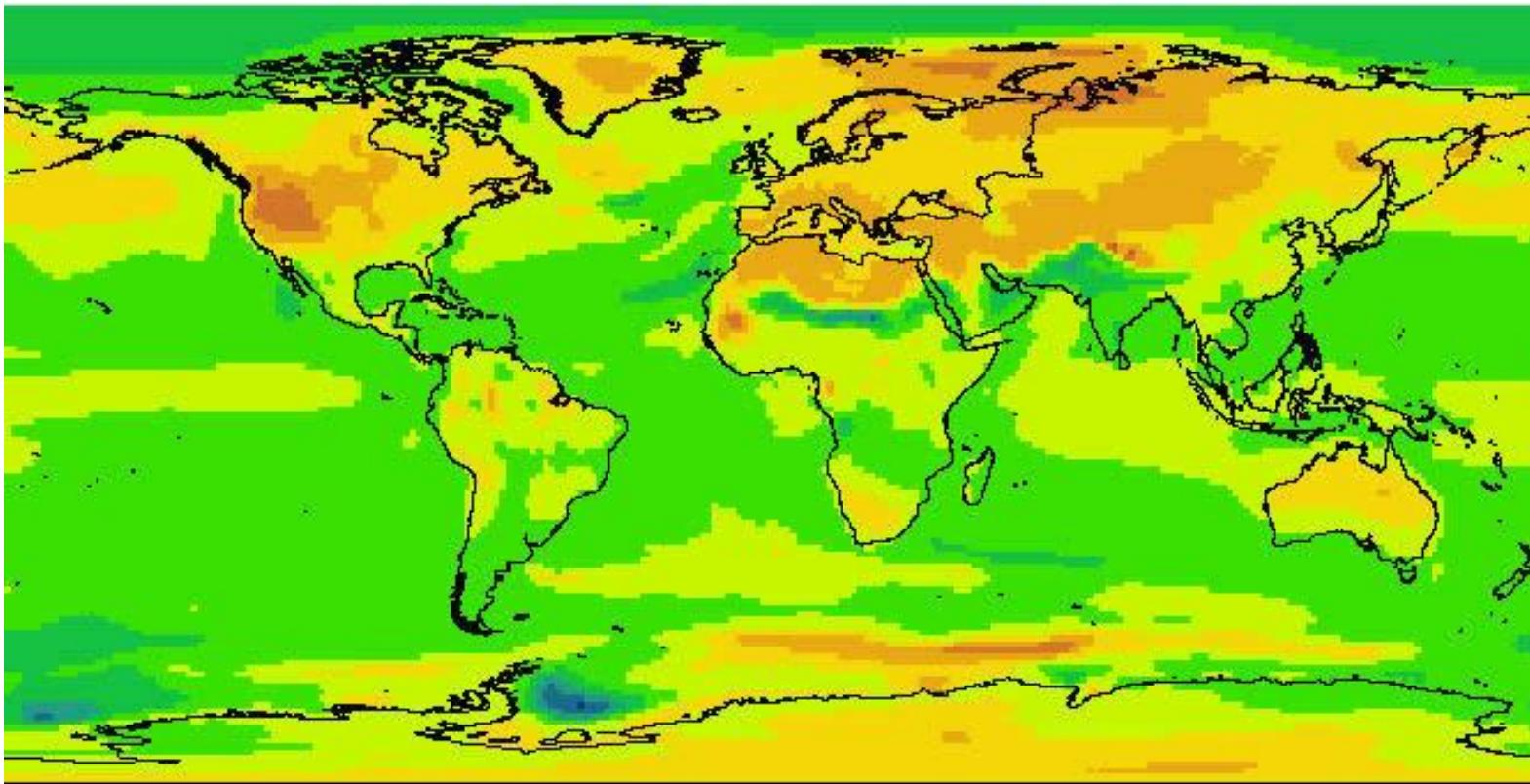
GIS APPLICATIONS

Participatory Needs Assessment



GIS APPLICATIONS

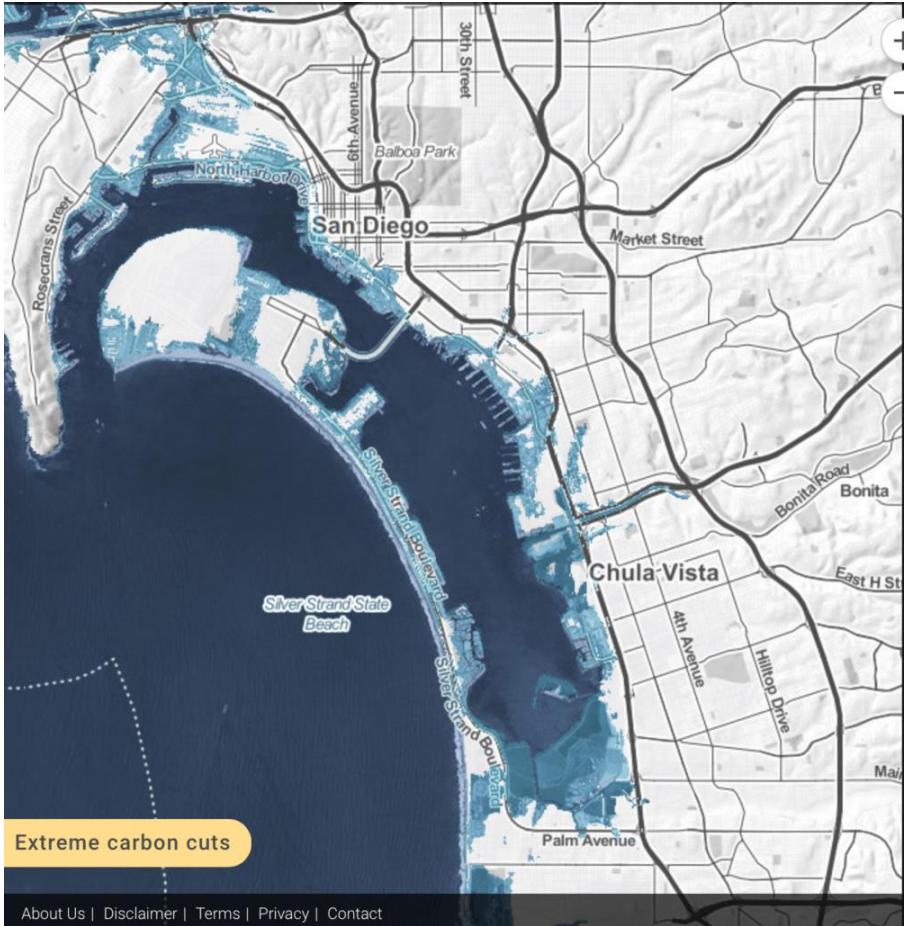
Climate Change Air temperature in the year 2030 as compared to a 1990 baseline map



<https://serc.carleton.edu/eet/ncardatagis/index.html>

GIS APPLICATIONS

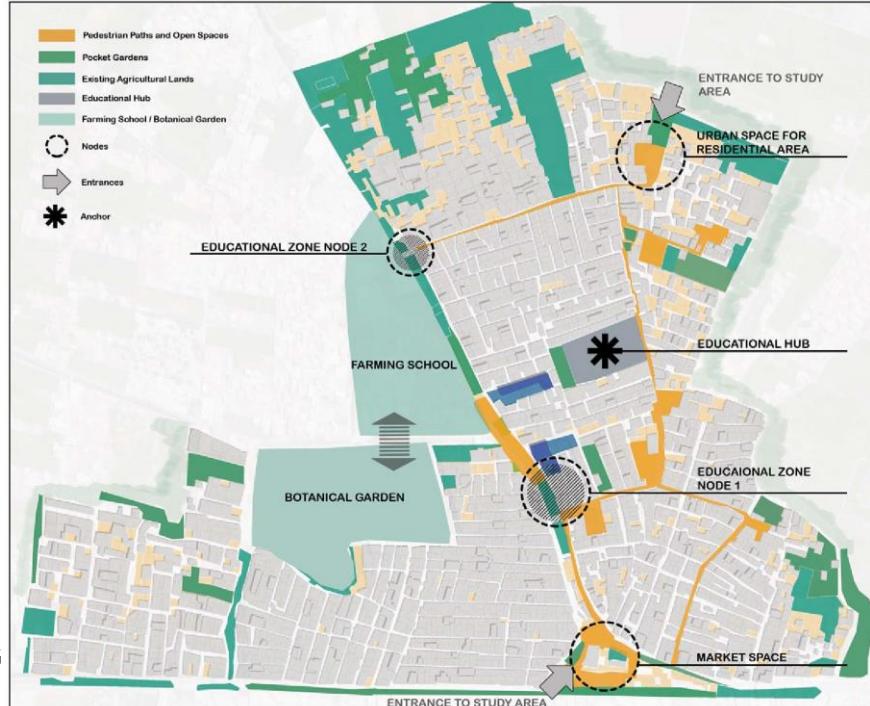
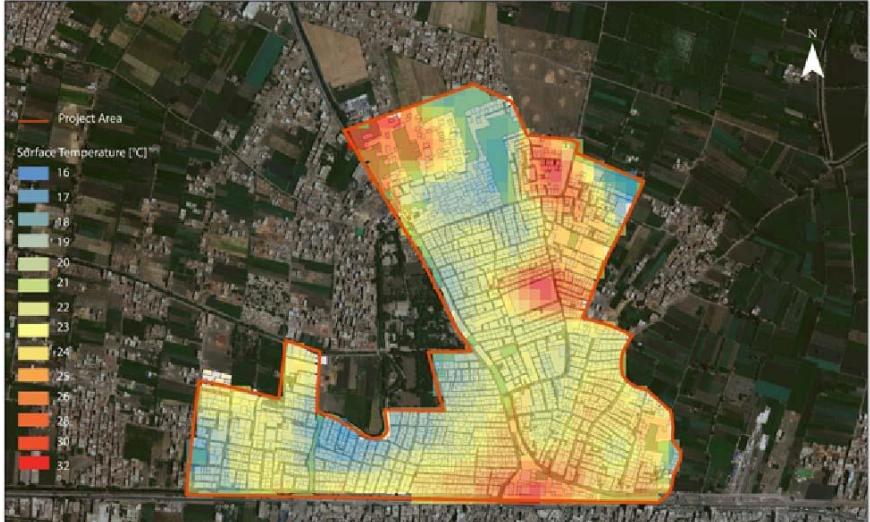
Climate Change: San Diego's Future Flooding Scenarios



<https://inewssource.org/2016/12/05/future-sea-level-rise-flood-san-diego/>

GIS APPLICATIONS

Climate Change: Cultural Landscapes & Urban Resilience



GIS ANALYSIS

Security and Safety

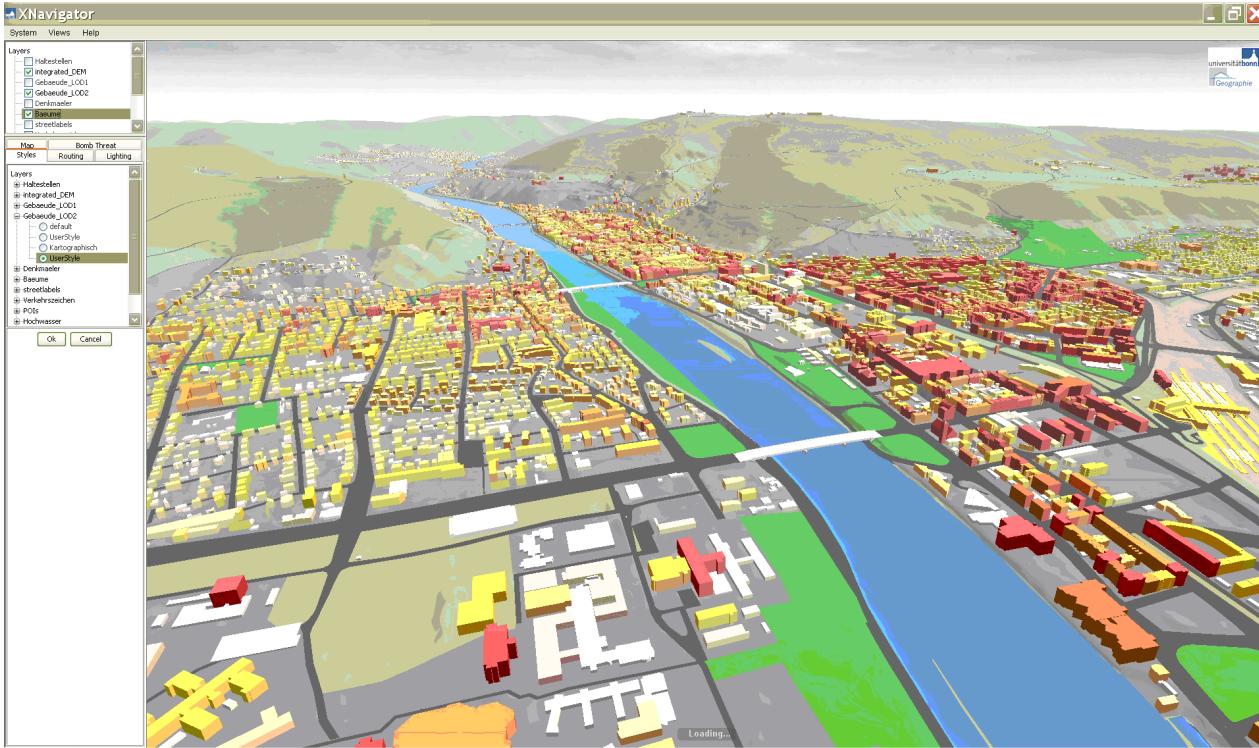


<https://www.caliper.com/maptitude/crime/xmaptitude-crime-mapping-public-safety-software.jpg.pagespeed.ic.7i-K2PjgUg.webp>

GIS ANALYSIS

Heidelberg-3D – Interactive 3D City Mapping

The main goal of the project is to build and evaluate a whole 3D spatial data infrastructure (3D-SDI) based on Open Geospatial Consortium (OGC) services



<https://www.gislounge.com/heidelberg-3d-interactive-3d-city-mapping-based-on-ogc-standards/>

SUMMARIZE

GIS Everyday



<https://www.gisworx.ae/gis-everyday#modal-8>

INTRODUCTION TO GIS

Challenges and Overcoming

CHALLENGES AND OVERCOMING DATA

- Availability
- Accuracy
- Verification
- Updates
- Sharing information
- Data security



<https://www.vectorstock.com/royalty-free-vector/blockchain-cryptocurrency-cryptography-and-data-vector-18078402>

CHALLENGES AND OVERCOMING

Software

- Commercial
- Open Source



https://image.freepik.com/free-vector/software-development-background_1302-14608.jpg

CHALLENGES AND OVERCOMING

Transformation into Digitalization

- Welling of the decision makers to change
- Capacity building
- Time consuming
- Cost



<https://www.constructionbusinessowner.com/technology/understanding-effect-digitalization-construction>

Grazie

ありがとうございました

Gracias

Спасибо

Дякую

ধন্যবাদ

Thank You!

خوخيوبڻي

Dziękuję Ci

Mercie

يعيشك

ευχαριστώ

Danke

شکرًا

Teşekkür ederim

آپ کا شکریہ

Hvala vam

