جمهورية مصر العربية
وزارة التعليم العالي والبحث العلمي
الهيئة القومية للاستشعار من البعد وعلوم الفضاء
National Authority for Remote Sensing and Space Sciences

Environmental Management of Natural Protectorates and Diseases Transmission Risks using Remote Sensing and Geospatial Techniques

الادارة البيئية للمحميات الطبيعية ومخاطر انتشار الأمراض باستخدام الاستشعار من البعد والتقنيات الجيومكانية

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National Authority for Remote Sensing and Space Sciences (**NARSS**)

May 2023

Presentation Outline

- **Introduction to Environmental Remote Sensing**
- **Potential of RS and GIS in Management of Natural Protectorates**
  - Monitoring Spatiotemporal Environmental Changes
  - Mapping Environmental Quality Characteristics
  - Modeling Quality Characteristics
- **Diseases Transmission and the Associated Risk**
  - Mosquito-Transmitted-Diseases
  - Non-Communicable Diseases (NCDs)
- **Conclusion**

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Introduction

- Environmental applications of remote sensing and GIS include using the electromagnetic radiation for;
  - **Detection,**
  - **Measurement,**
  - **Monitoring**

    At a distance without direct contact

1. Detection

Identifying forms and anomalies

- *Build-up Areas (Commercial, Industrial, recreational, residential, etc.)*
- *Vegetation*
- *Water (Sea, Lake, River, Canal, Pond, Seepage, etc)*
- *Sand dunes*
- *Salt covered regions (Sabhkas, Salt production lands, Logged areas)*
- *Coastal Areas (Shoreline)*

Qualitative study

- *Water bodies (shallow, deep, etc.)*
- *Vegetation (Sparse natural, dense cultivated land)*

2. Measurement

- ***Determining quantitative properties:***

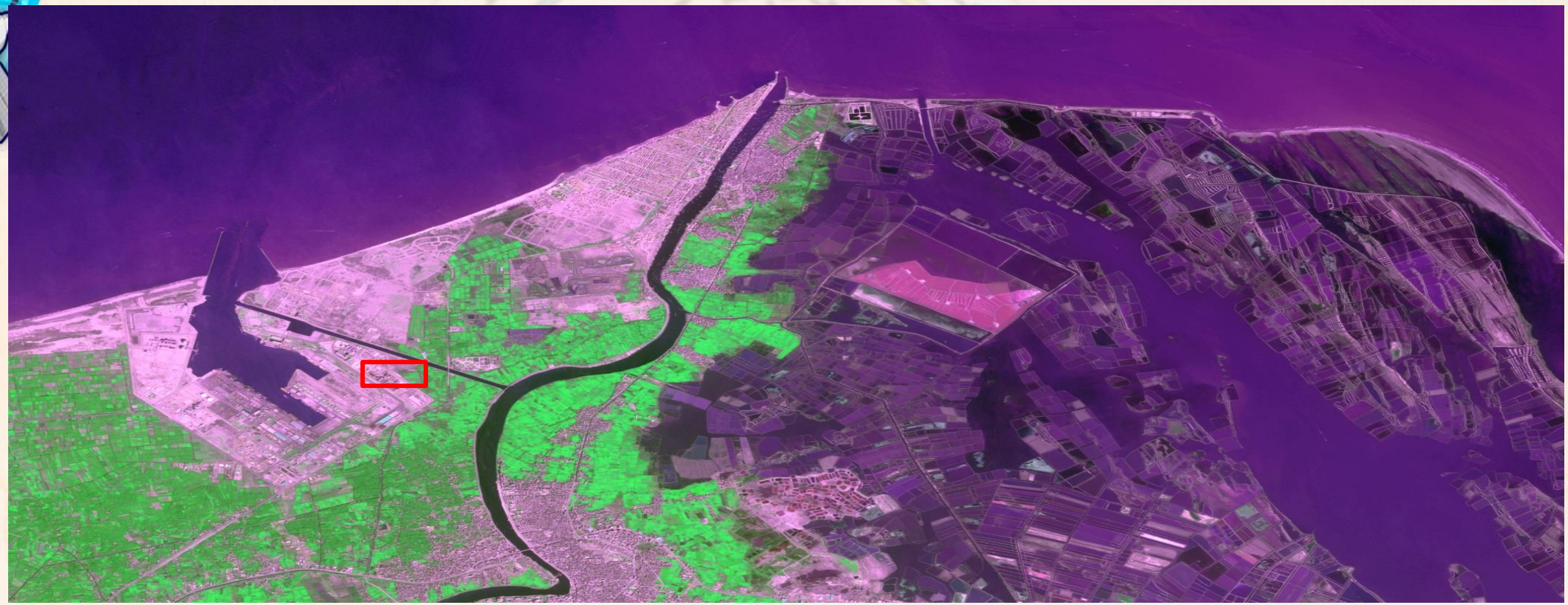
  - *Determining areas and lengths of land cover units*
  - *Measuring some important water parameters through applying some models on the satellite image;*

    - ❑ *Surface temperature (° C or Kelvin)*
    - ❑ *Turbidity (NTU)*
    - ❑ *Total phosphorus (T.P. mg/L)*
    - ❑ *Totals nitrogen (T.N. mg/L)*
    - ❑ *Dissolved Oxygen (DO mg/L)*
    - ❑ *Biological Oxygen Demand (BOD mg/L)*
    - ❑ *Chemical Oxygen Demand (COD mg/L)*

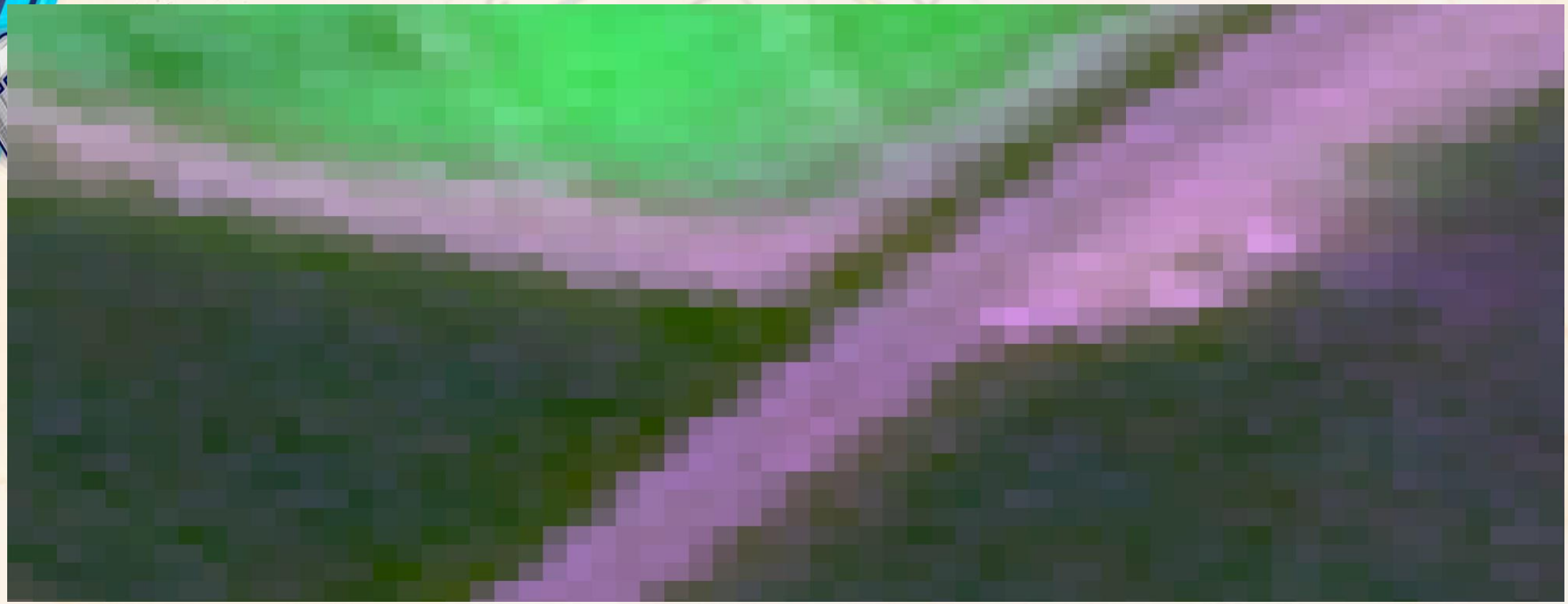
3. Monitoring

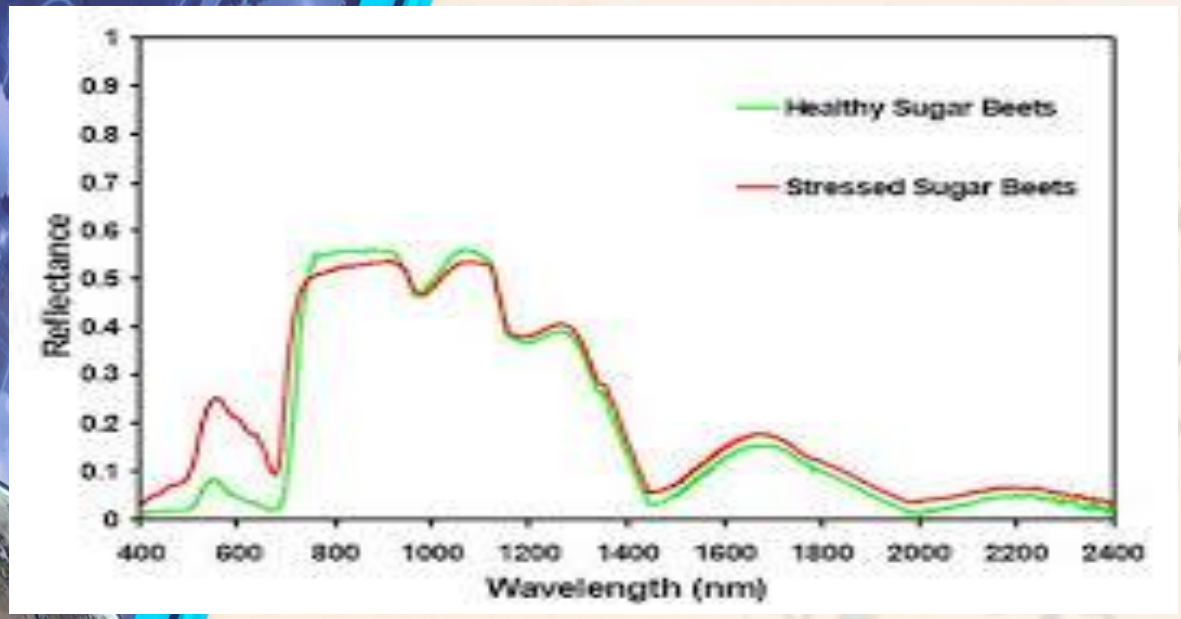
- ***Repeating observation to assess change:***
  - ✓ *Coastline (Erosion, accretion)*
  - ✓ *Urban Sprawl (LULC changes, NDBI)*
  - ✓ *Loss in vegetated areas (LULC changes, NDVI)*
  - ✓ *Lake area (LULC changes, MNDWI)*
  - ✓ *Water quality (Empirical Models)*
  - ✓ *Urban heat islands (LST)*

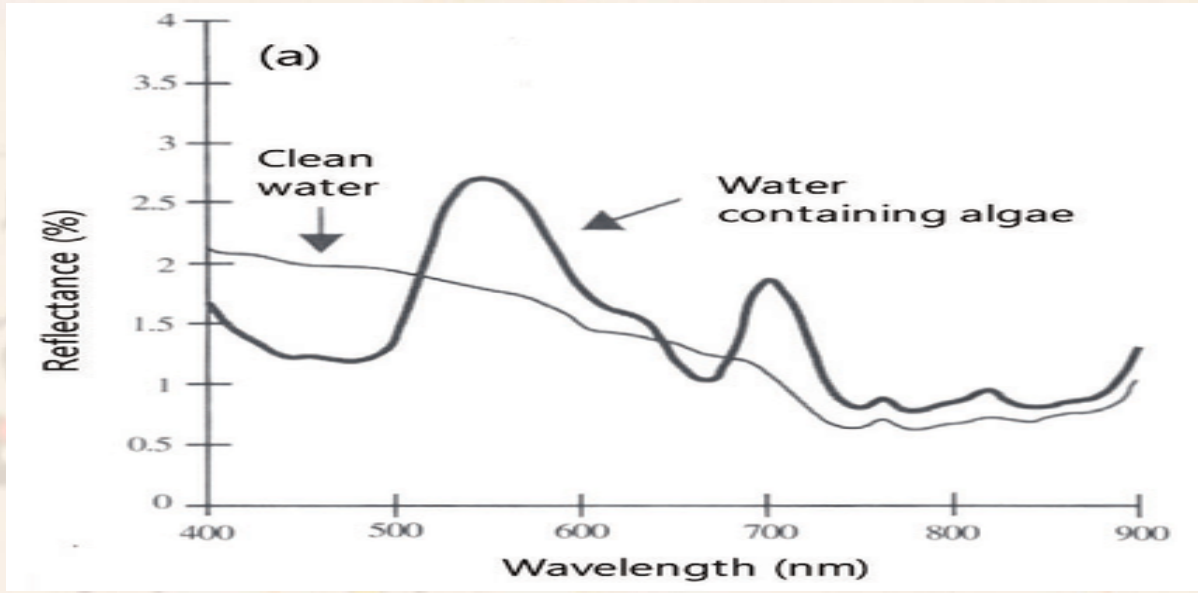
Satellite Image (SPOT 5)

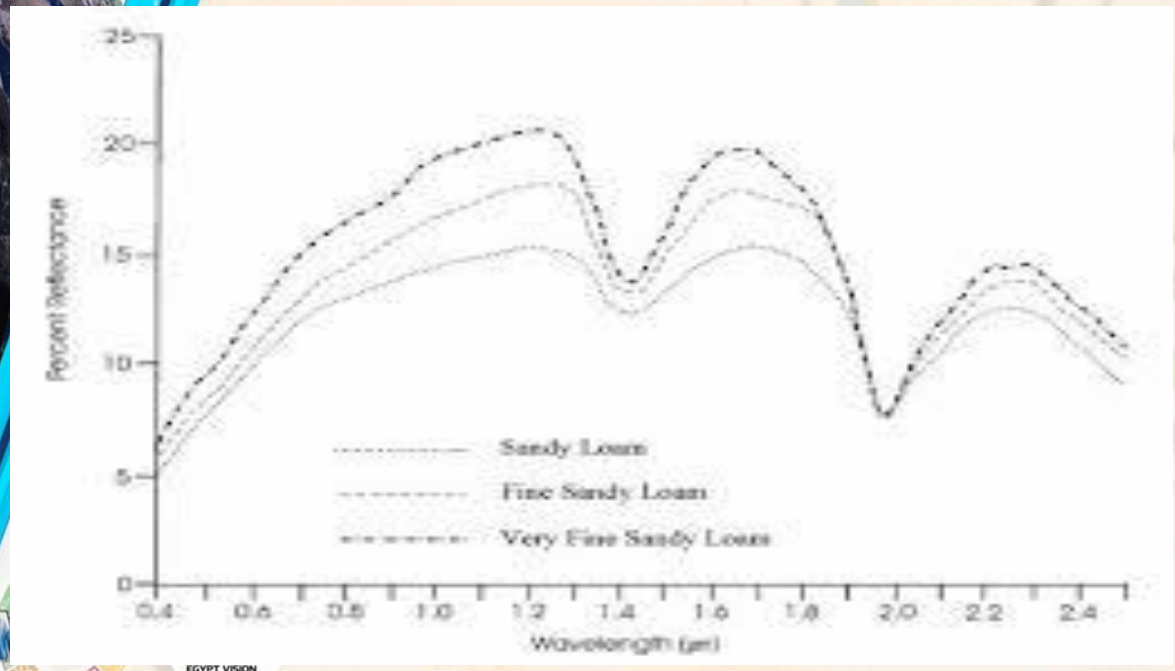


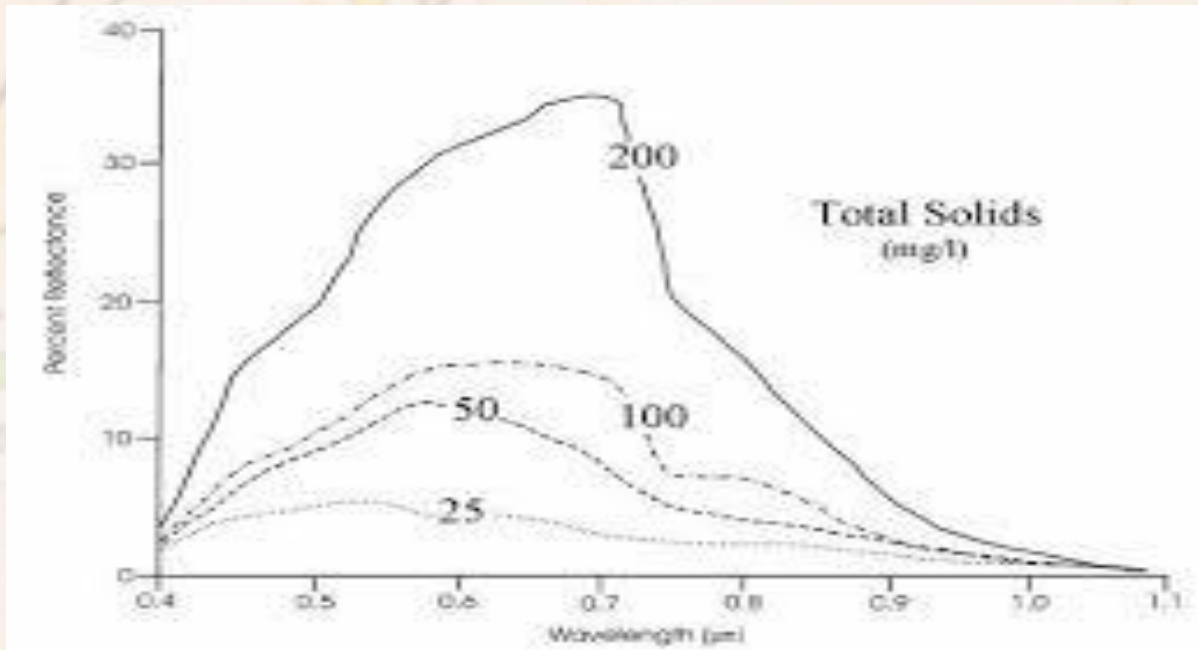
Zoom




Healthy Sugar Beets
Stressed Sugar Beets
Reflectance
Wavelength (nm)

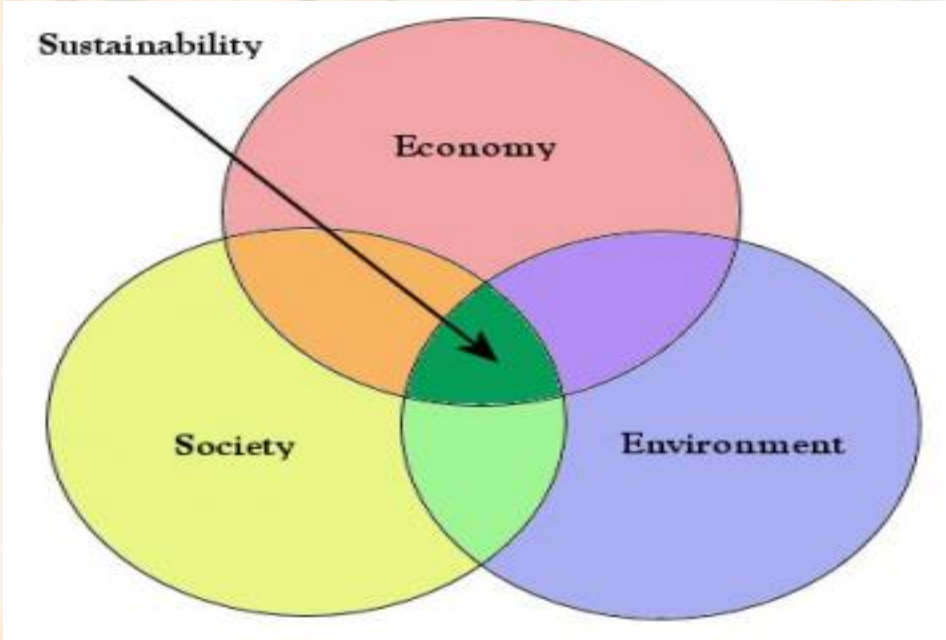

(a)
Clean water
Water containing algae
Reflectance (%)
Wavelength (nm)

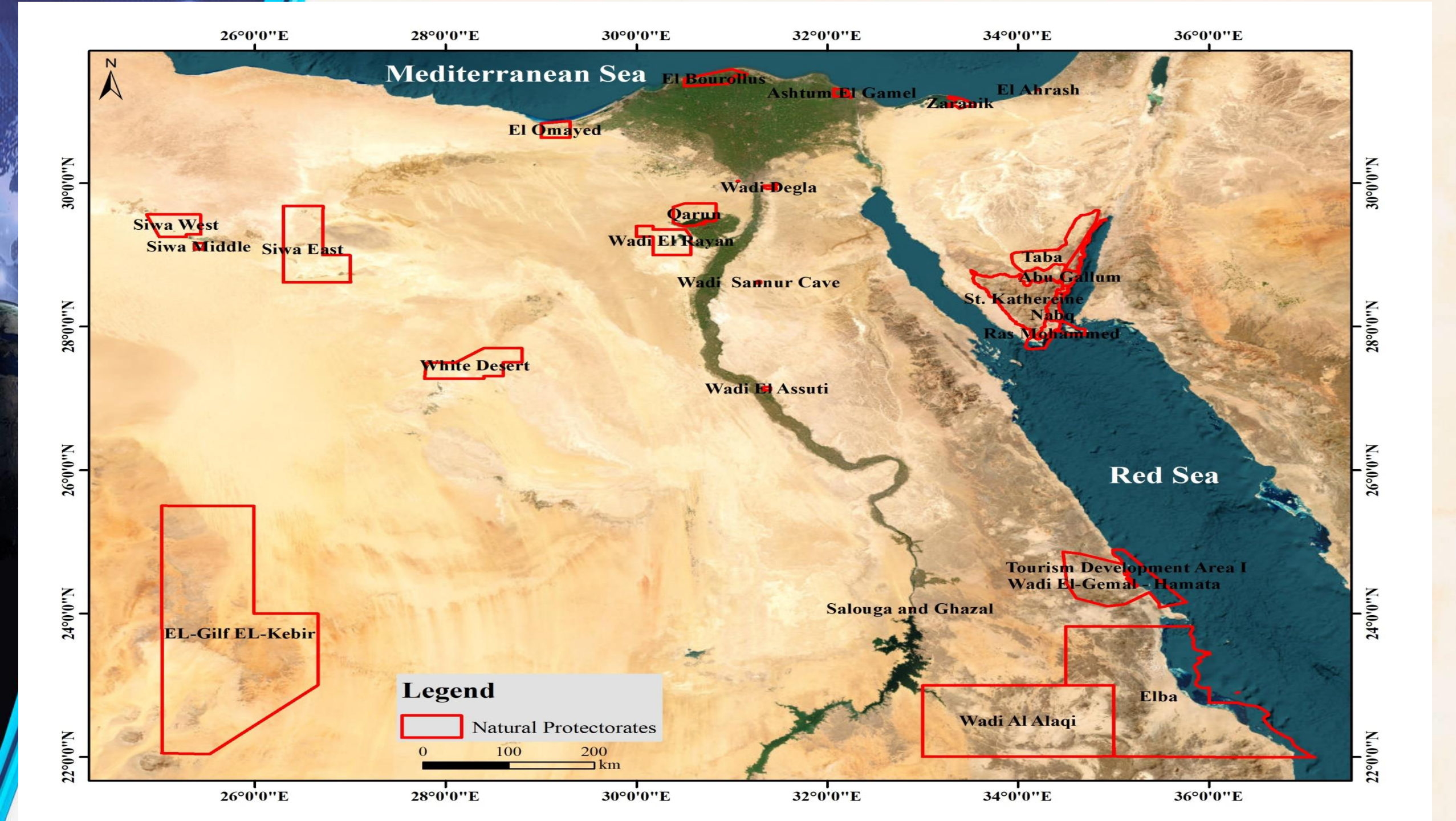

Sandy Loam
Fine Sandy Loam
Very Fine Sandy Loam
Wavelength (μm)


200
100
50
25
Total Solids
(mg/l)
Wavelength (μm)

Background

- Addressing environmental problems and finding out practical solutions are urgent for sustaining environmental resources and promoting sustainable development strategies for a region.
- The lecture addresses some examples on the environmental applications of remote sensing and GIS in Egypt.




26°0'0"E
28°0'0"E
30°0'0"E
32°0'0"E
34°0'0"E
36°0'0"E
N
Mediterranean Sea
El Bourollus
Ashtum El Gamel
El Ahrash
Zaranik
El Omayed
Wadi Degla
Qarun
Wadi El Rayan
Siwa West
Siwa Middle
Siwa East
Wadi Sannur Cave
Taba
Abu Gallum
St. Katherine
Nabq
Ras Mohammed
White Desert
Wadi El Assuti
Red Sea
Tourism Development Area I
Wadi El-Gemal - Hamata
Salouga and Ghazal
EL-Gilf EL-Kebir
Elba
Wadi Al Alaqi
Legend
Natural Protectorates
0
100
200
km
30°0'0"N
28°0'0"N
26°0'0"N
24°0'0"N
22°0'0"N

Abu Galum Protectorate

Ashtum El-Gamil Protectorate

El Hassana Dome Protectorate

Lake Burullus Protectorate

Lake Qarun Protectorate

Nabq Protectorate

Ras Mohammed Protectorate

Sannur Valley Cave Protectorate

Siwa Oasis Protectorate

Taba Protectorate

The Petrified Forest Protectorate

Wadi Al-Allaqi Protectorate

Wadi Al-Assiut Protectorate

Wadi Degla Protectorate

Wadi El-Gemal National Park

Wadi El-Rayan Protectorate

White Desert Protectorate

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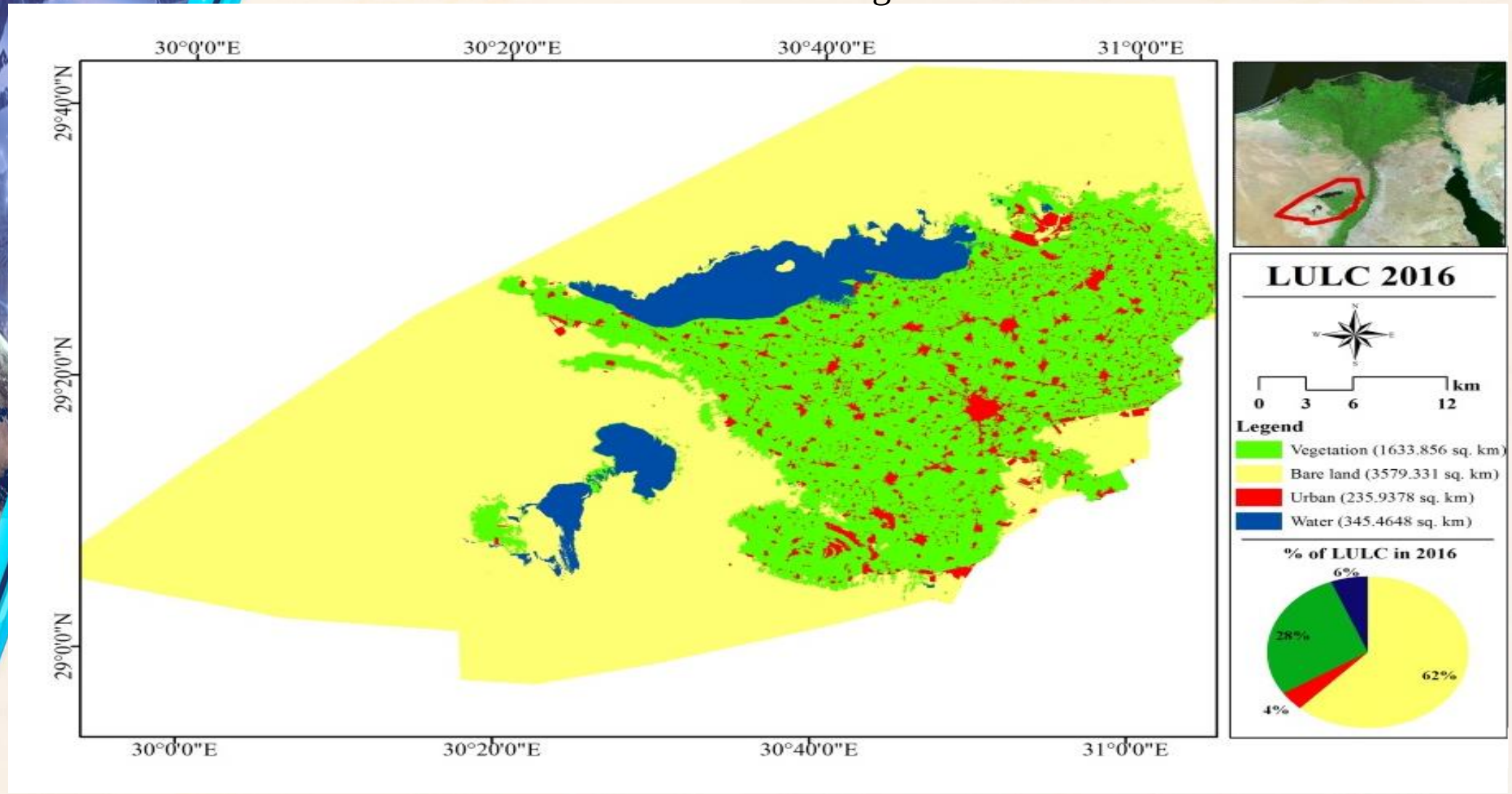
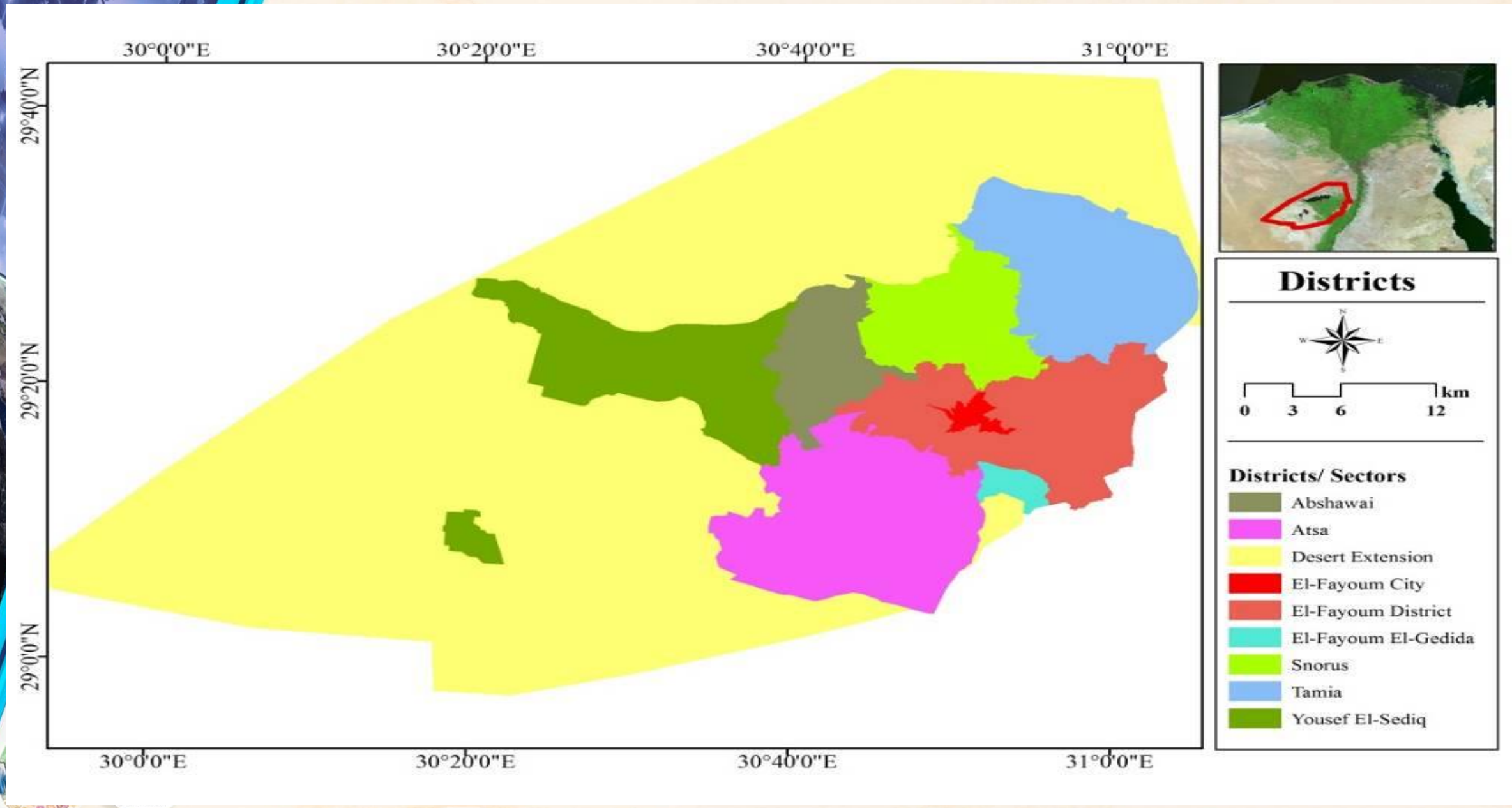
Classification (Supervised or unsupervised)
To detect the changes in LULC

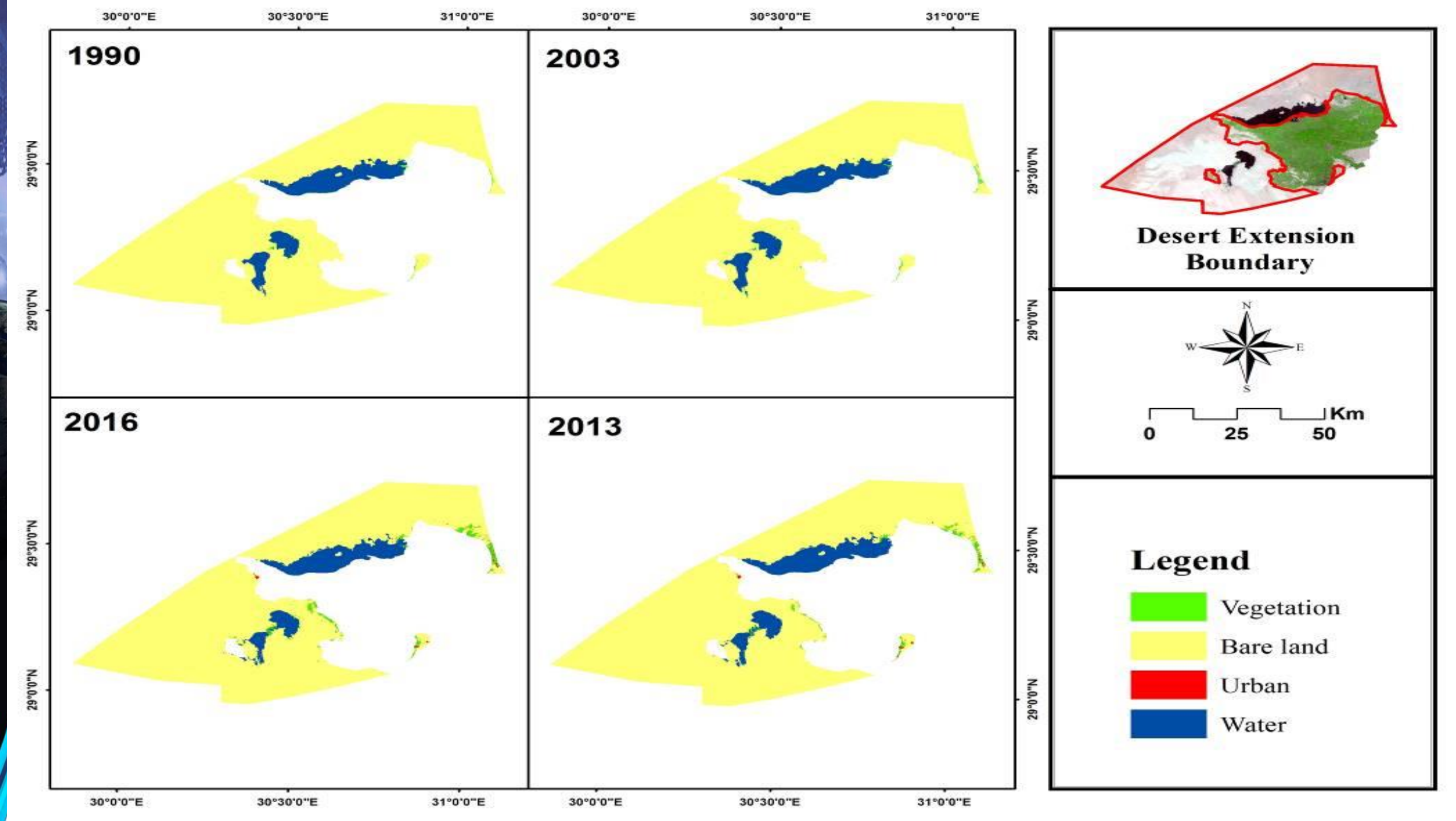


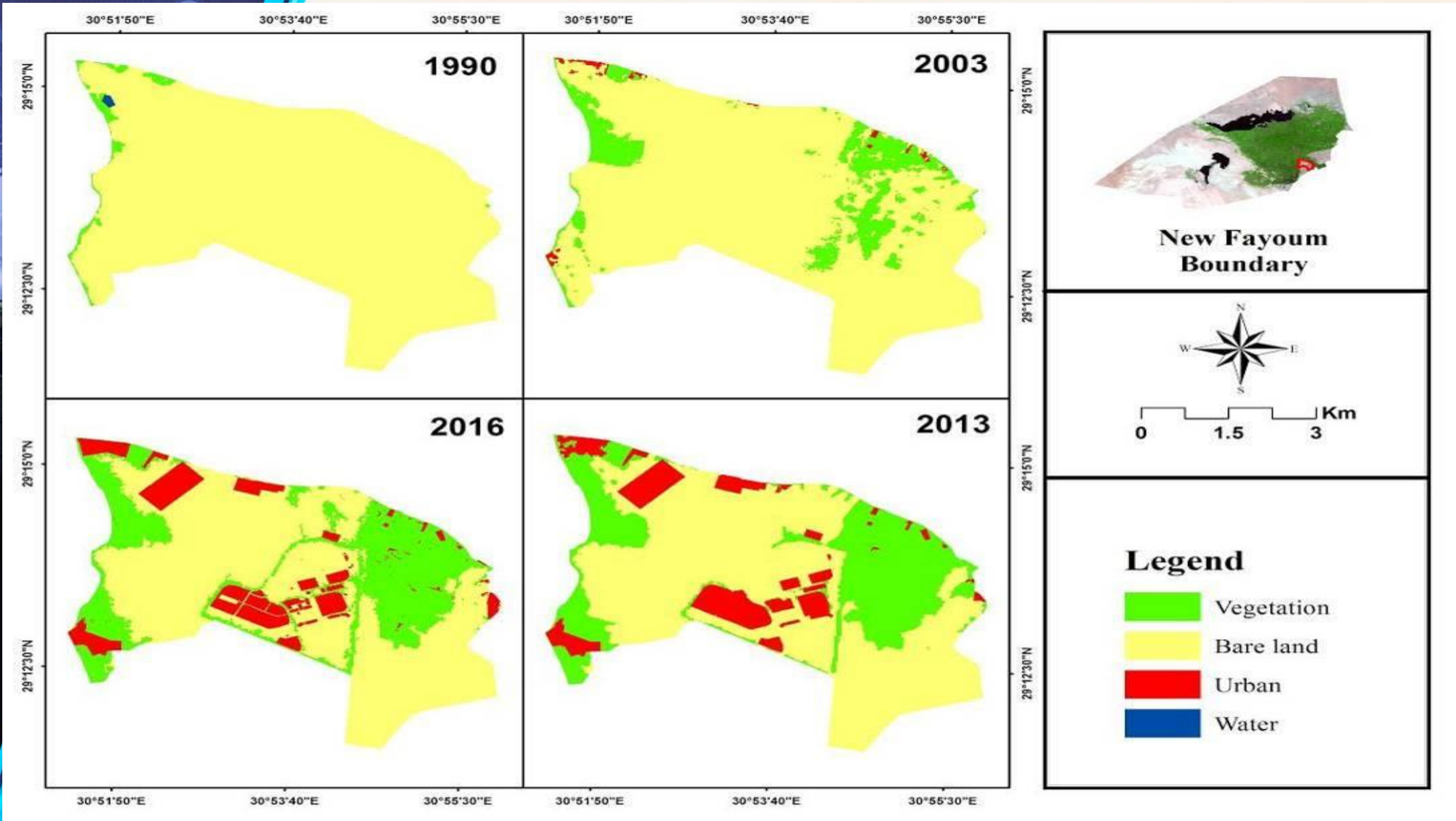
Annual increase/decrease in LULC classes (Sq. km)

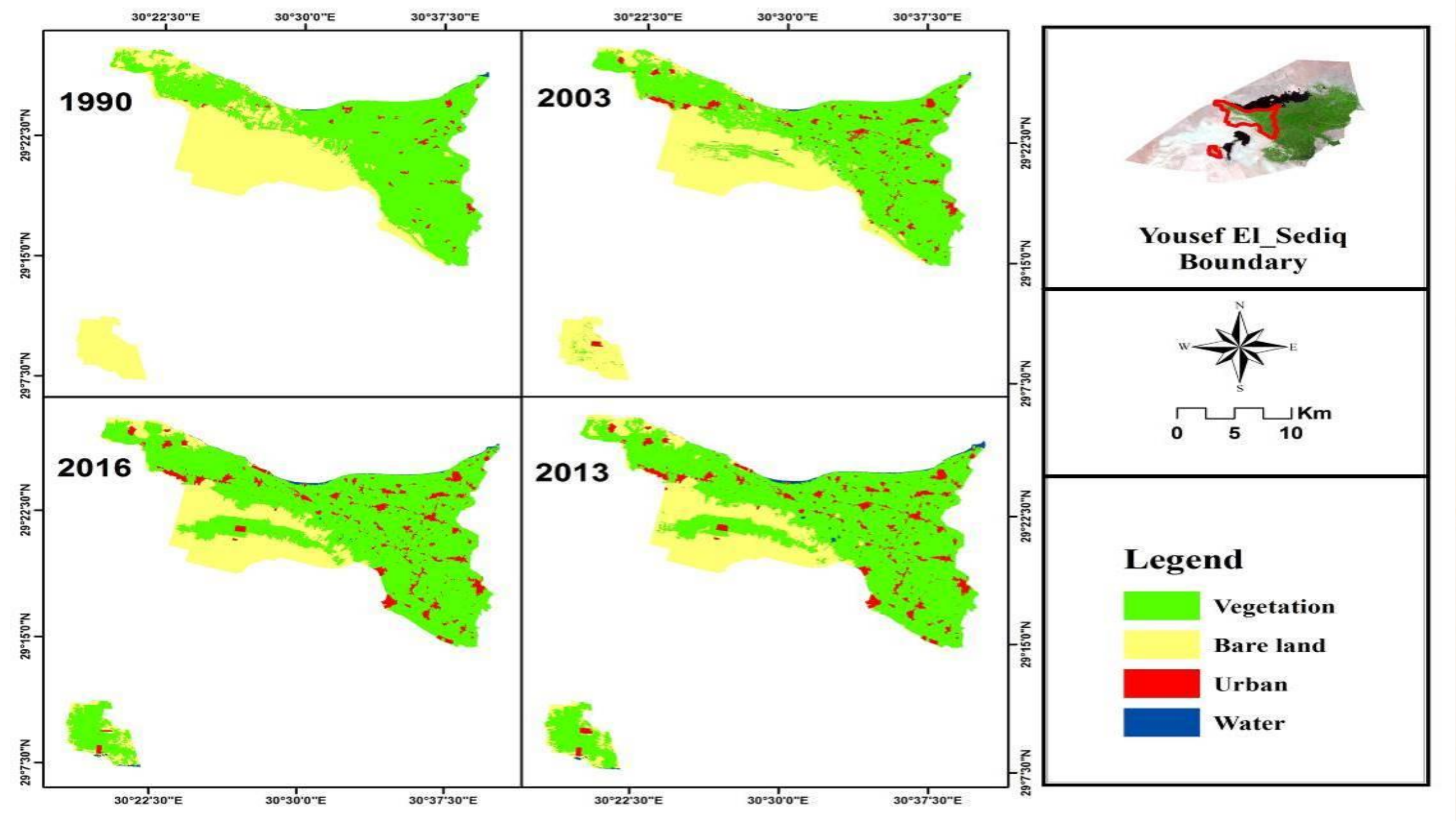
Class	Period 1990-2003	Period 2003-2013	Period 2013-2016
Bare Land	-5.50	-16.26	-7.72
Urban	5.32	8.87	6.31
Vegetation	0.36	5.78	5.88
Water	-0.18	1.61	-4.49

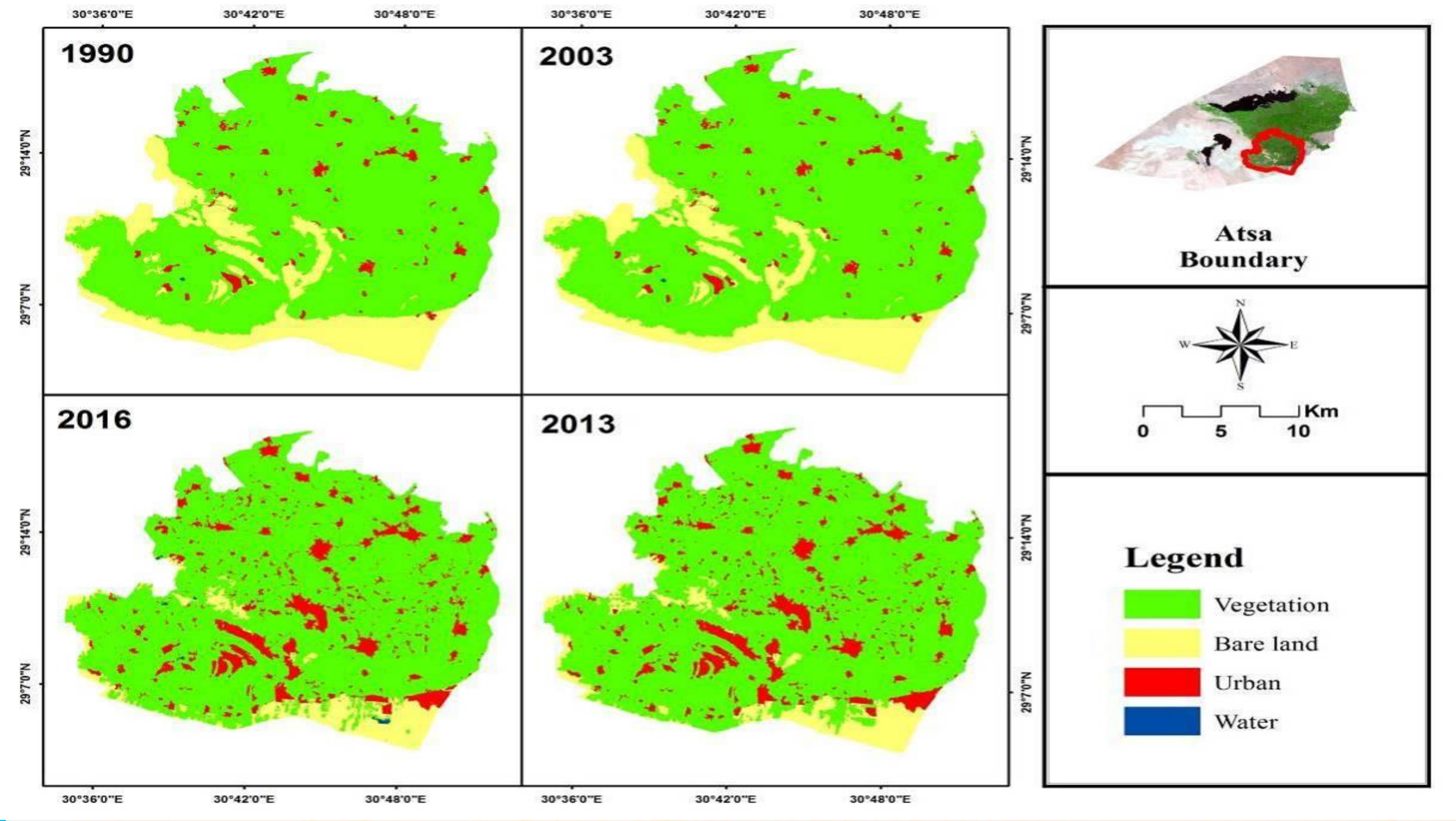
Districts

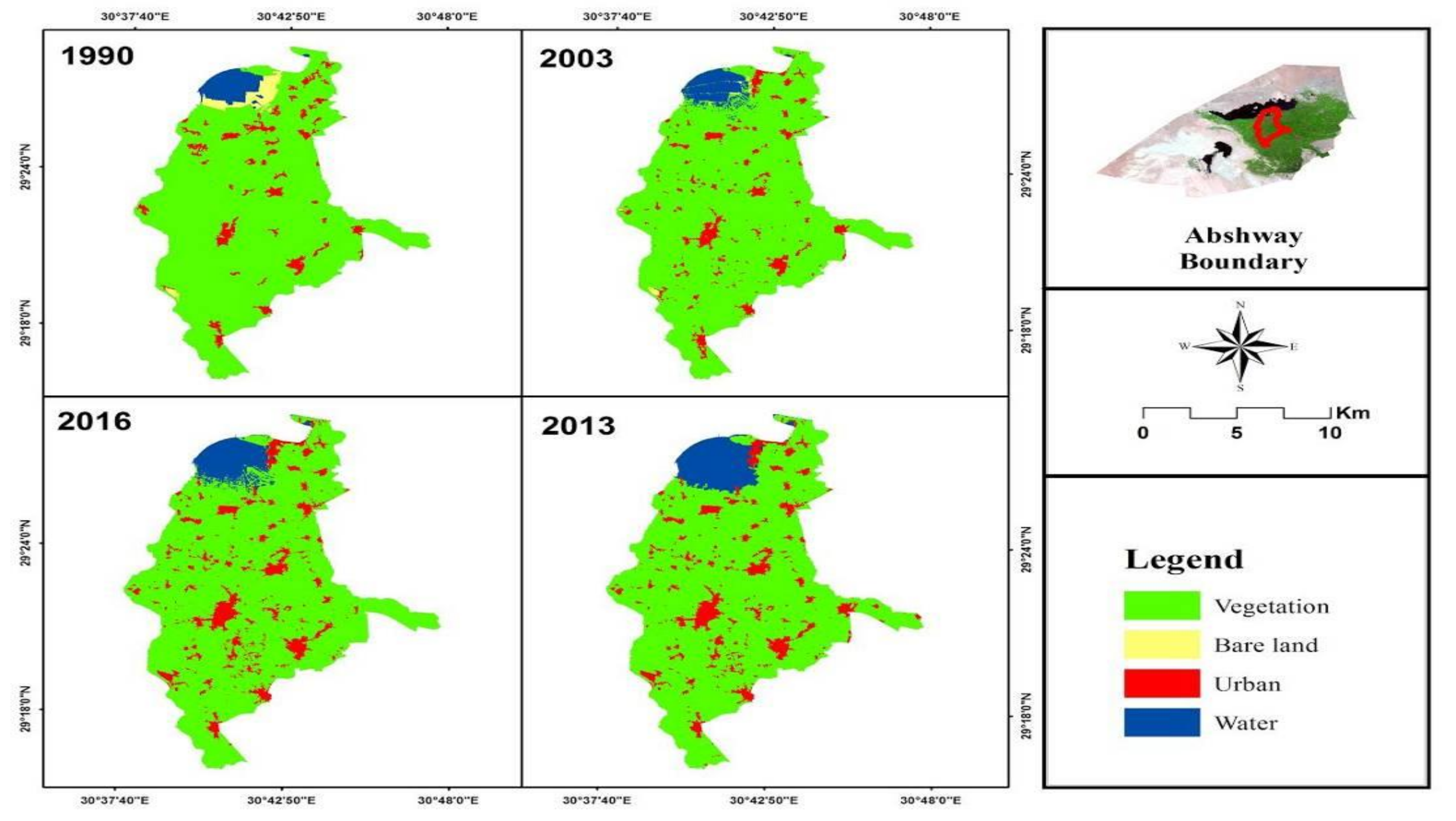

30°0'0"E
30°20'0"E
30°40'0"E
31°0'0"E
29°40'0"N
29°20'0"N
29°0'0"N
Districts
km
0 3 6 12
Districts/ Sectors
Abshawai
Atsa
Desert Extension
El-Fayoum City
El-Fayoum District
El-Fayoum El-Gedida
Snorus
Tamia
Yousef El-Sediq

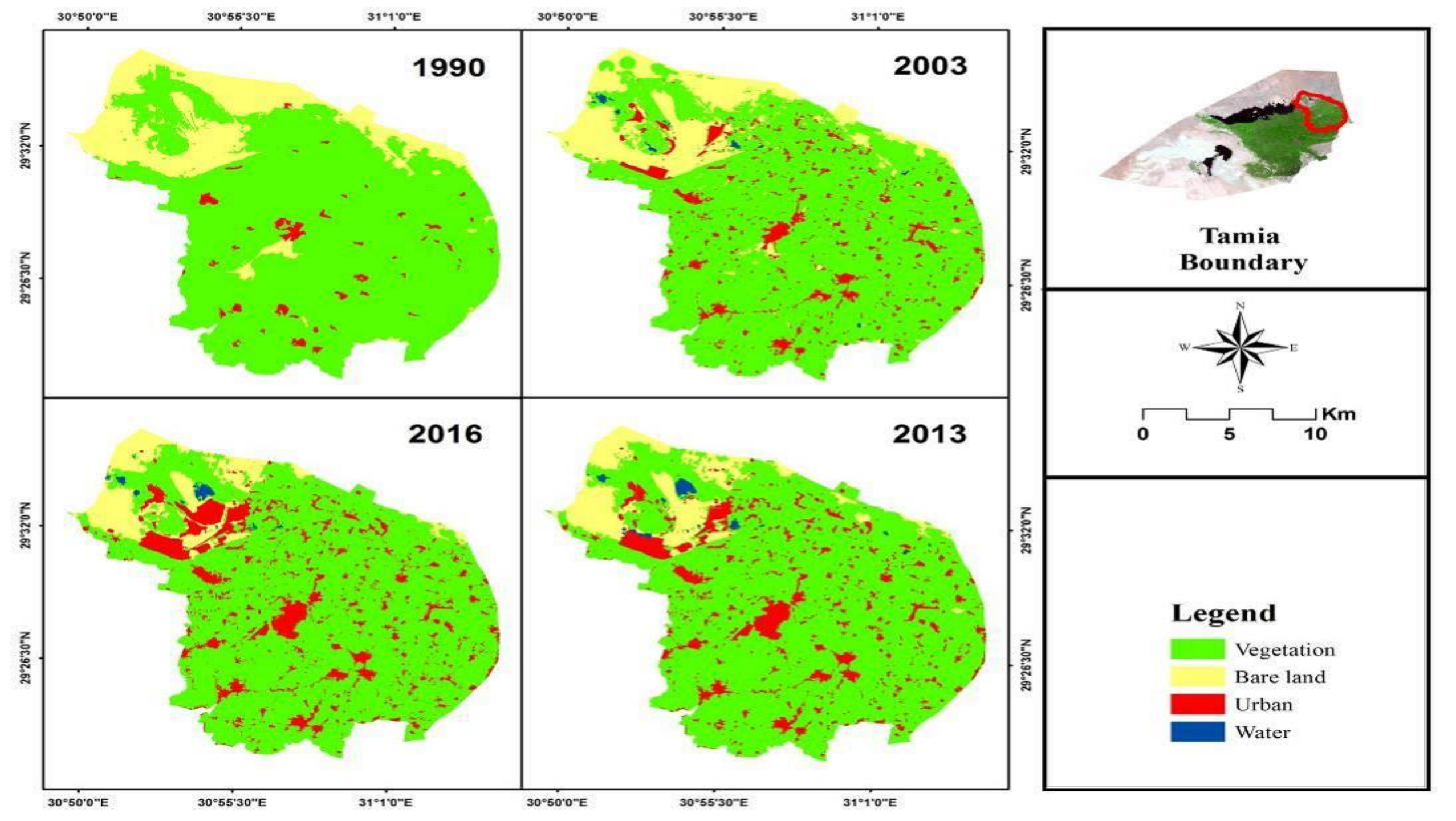

1990
2003
2016
2013
30°0'0"E
30°30'0"E
31°0'0"E
29°30'0"N
29°0'0"N
Desert Extension Boundary
N
W
E
S
0
25
50
Km
Legend
Vegetation
Bare land
Urban
Water

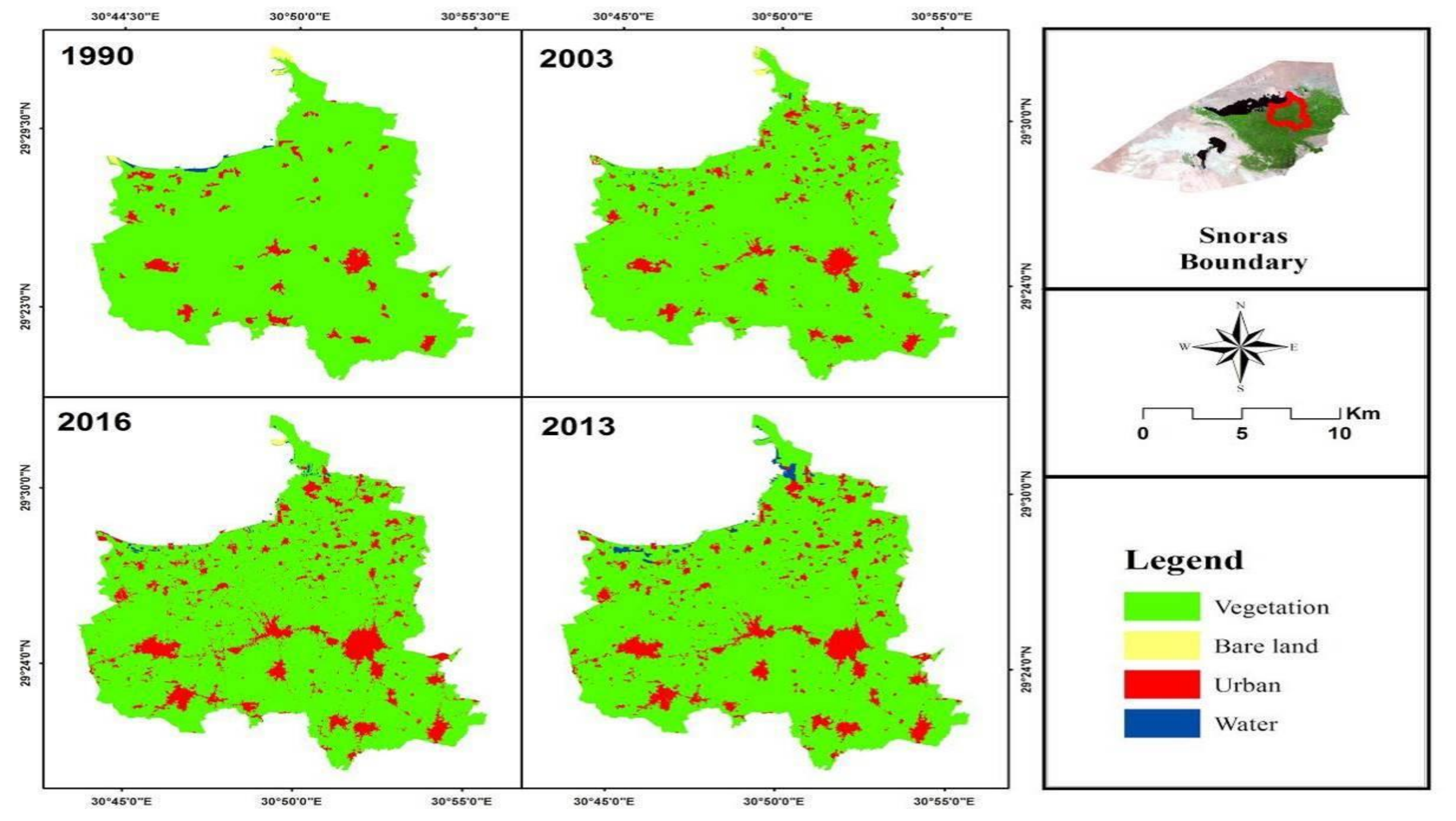

30°51'50"E
30°53'40"E
30°55'30"E
29°15'0"N
29°12'30"N
1990
2003
2016
2013
New Fayoum
Boundary
N
W
E
S
Km
0
1.5
3
Legend
Vegetation
Bare land
Urban
Water

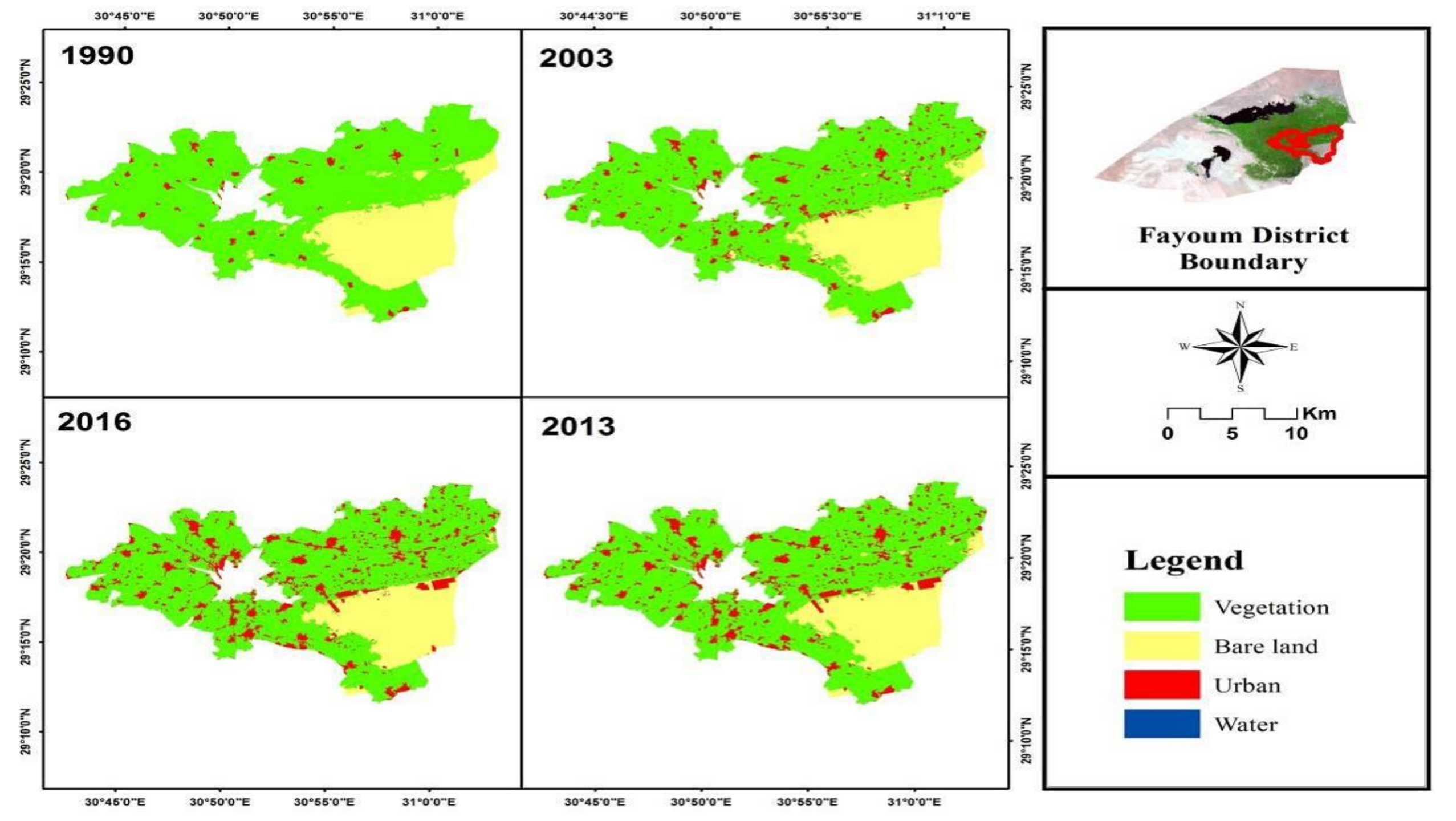

1990
2003
2016
2013
30°22'30"E
30°30'0"E
30°37'30"E
29°22'30"N
29°15'0"N
29°7'30"N
Yousef El_Sediq
Boundary
N
W
E
S
Km
0
5
10
Legend
Vegetation
Bare land
Urban
Water

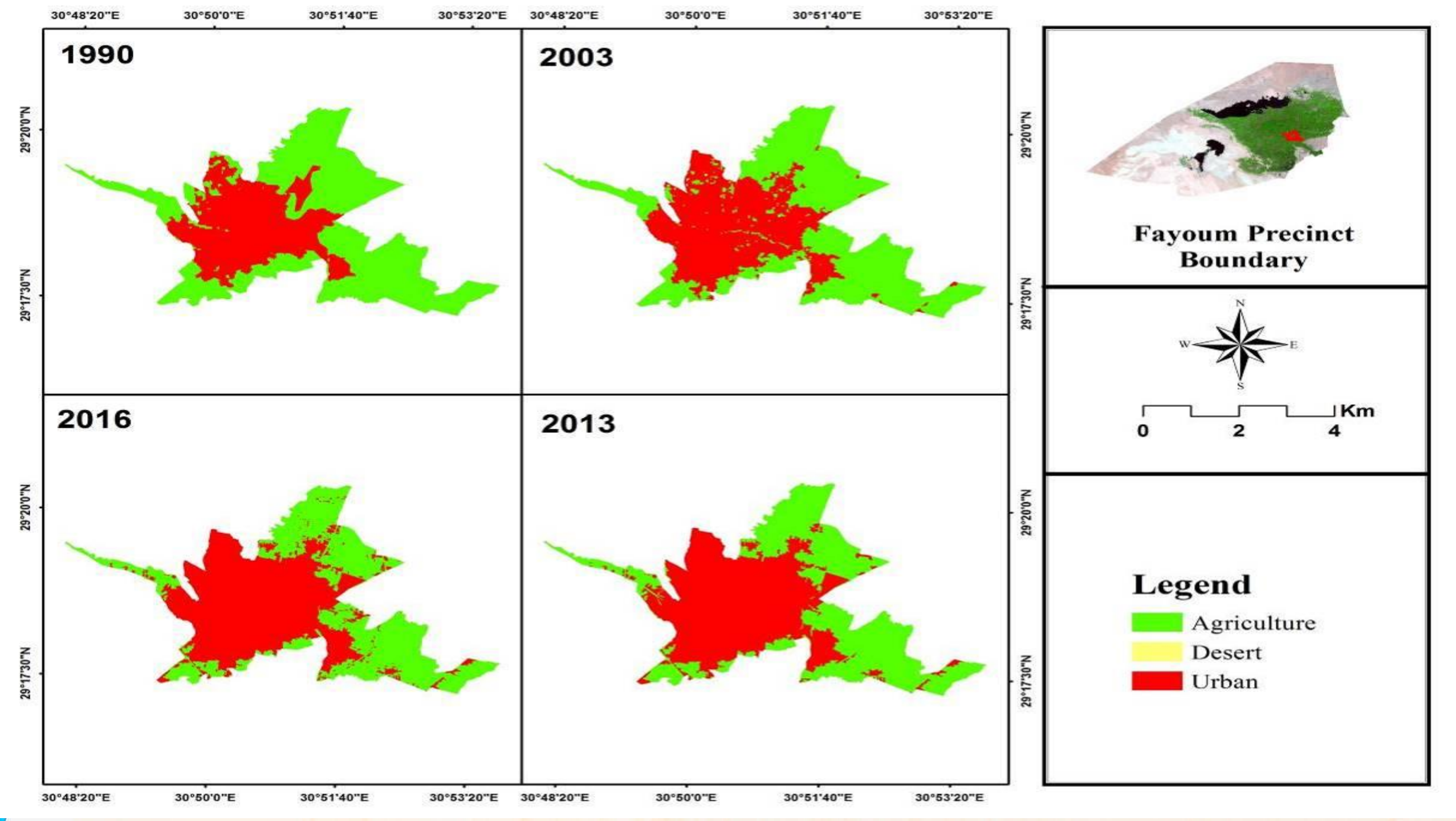

1990
2003
2016
2013
30°36'0"E
30°42'0"E
30°48'0"E
29°14'0"N
29°7'0"N
Atsa
Boundary
N
W
E
S
0
5
10
Km
Legend
Vegetation
Bare land
Urban
Water


1990
2003
2016
2013
30°37'40"E
30°42'50"E
30°48'0"E
29°24'0"N
29°18'0"N
Abshway
Boundary
N
W
E
S
0
5
10
Km
Legend
Vegetation
Bare land
Urban
Water


30°50'0"E
30°55'30"E
31°1'0"E
29°32'0"N
29°26'30"N
1990
2003
2016
2013
Tamia
Boundary
N
W
E
S
0
5
10
Km
Legend
Vegetation
Bare land
Urban
Water


1990
2003
2016
2013
30°44'30"E
30°50'0"E
30°55'30"E
30°45'0"E
30°50'0"E
30°55'0"E
29°29'30"N
29°23'0"N
29°30'0"N
29°24'0"N
Snoras
Boundary
N
W
E
S
0
5
10
Km
Legend
Vegetation
Bare land
Urban
Water


1990
2003
2016
2013
30°45'0"E
30°50'0"E
30°55'0"E
31°0'0"E
30°44'30"E
30°55'30"E
31°1'0"E
29°25'0"N
29°20'0"N
29°15'0"N
29°10'0"N
Fayoum District Boundary
N
W
E
S
Km
0
5
10
Legend
Vegetation
Bare land
Urban
Water

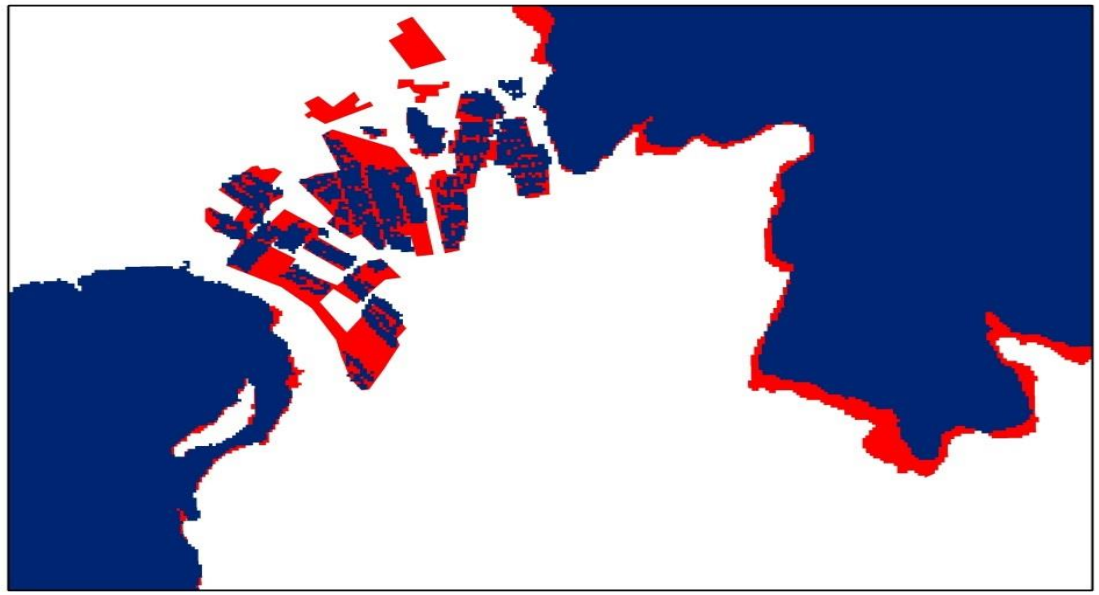

1990
2003
2016
2013
30°48'20"E
30°50'0"E
30°51'40"E
30°53'20"E
29°20'0"N
29°17'30"N
Fayoum Precinct Boundary
N
W
E
S
0
2
4
Km
Legend
Agriculture
Desert
Urban

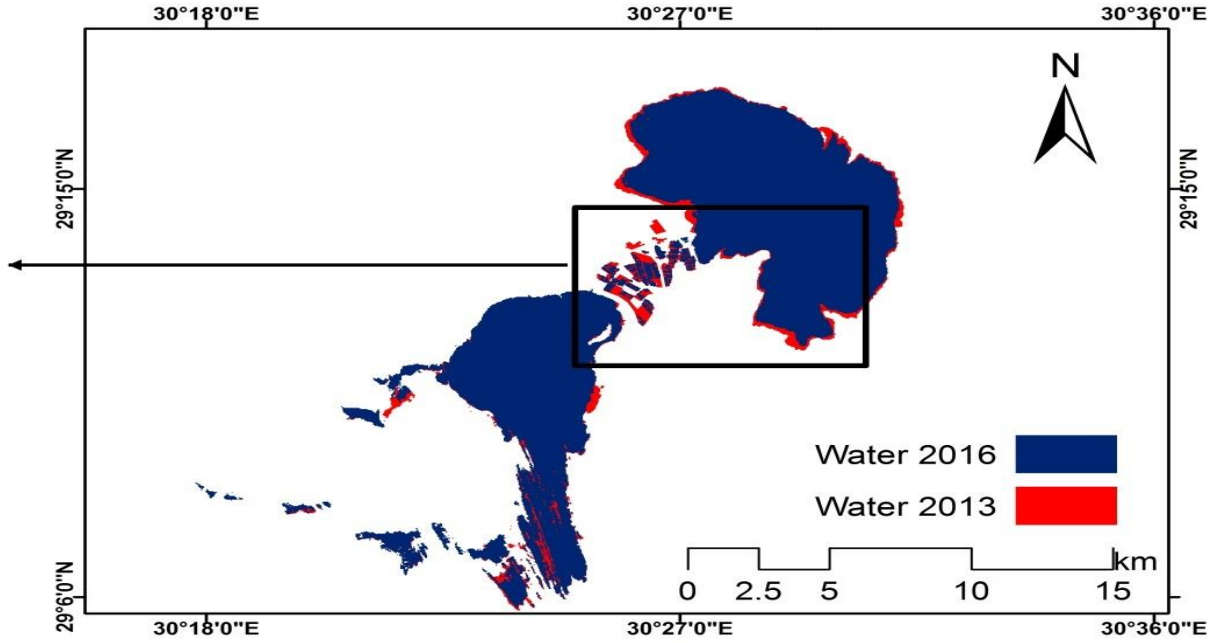
Annual rate of change in LULC

Activity	District	Time Period	Bare Land	Urban	Vegetation	Water
Development	Desert Extension	1990-2003	-0.19	0.01	0.52	-0.35
		2003-2013	-2.81	0.46	1.63	0.71
		2013-2016	-4.78	0.19	7.66	-3.08
	El-Fayoum El-Gedida	1990-2003	-0.26	0.02	0.24	0
		2003-2013	-0.72	0.3	0.42	0
		2013-2016	-0.04	-0.01	0.05	0
	Yousef El-Sediq	1990-2003	-2.01	0.89	1.1	0.02
		2003-2013	-4.87	0.78	3.89	0.2
		2013-2016	-1.69	0.18	1.75	-0.24
Urban Sprawl & Development	Atsa District	1990-2003	-0.98	1.07	-0.13	0.04
		2003-2013	-4.26	2.3	2.02	-0.05
		2013-2016	-0.1	0.89	-0.98	0.19
	Abshawai District	1990-2003	-0.27	0.15	0.05	0.07
		2003-2013	-0.06	0.59	-1	0.47
		2013-2016	0	0.1	0.72	-0.82
	Tamia	1990-2003	-0.97	1.5	-0.61	0.08
		2003-2013	-2.23	1.46	0.64	0.14
		2013-2016	-1.03	2.37	-1.11	-0.23
Urban Sprawl	Snorus	1990-2003	-0.04	0.47	-0.41	-0.03
		2003-2013	-0.08	0.91	-0.97	0.14
		2013-2016	0.08	1	-0.75	-0.34
	El-Fayoum City	1990-2003	0	0.09	-0.09	0
		2003-2013	0	0.18	-0.18	0
		2013-2016	0	0.11	-0.11	0
	El-Fayoum District	1990-2003	-0.79	1.11	-0.32	0
		2003-2013	-1.25	1.92	-0.67	0
		2013-2016	-0.15	1.47	-1.37	0.04

Urban Sprawl

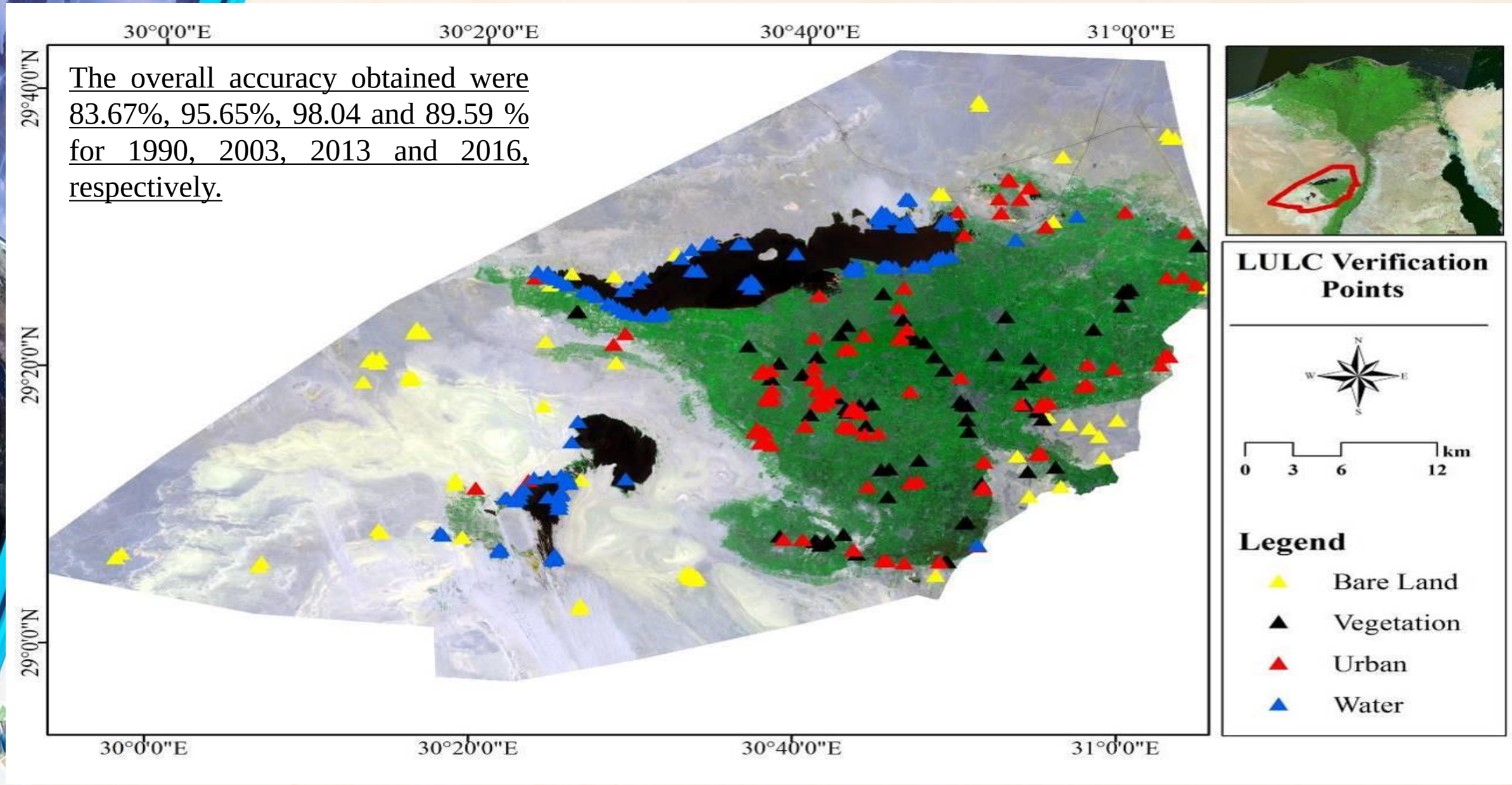

2013
2013
Loss in water area,
Qaroun
2016
2016



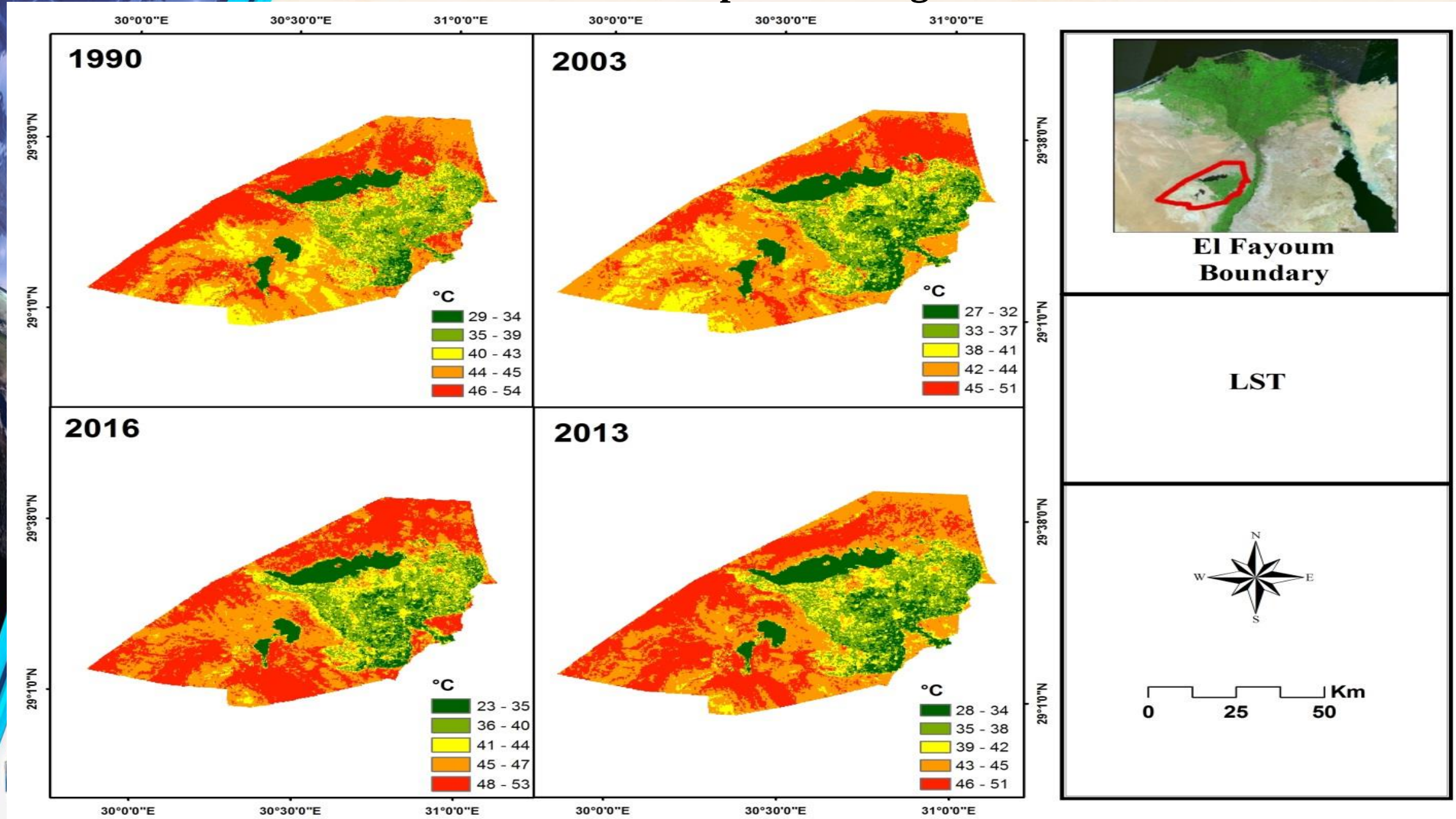

30°18'0"E
30°27'0"E
30°36'0"E
29°15'0"N
29°6'0"N
N
Water 2016
Water 2013
km
0 2.5 5 10 15

Field Validation

The overall accuracy obtained were 83.67%, 95.65%, 98.04 and 89.59 % for 1990, 2003, 2013 and 2016, respectively.

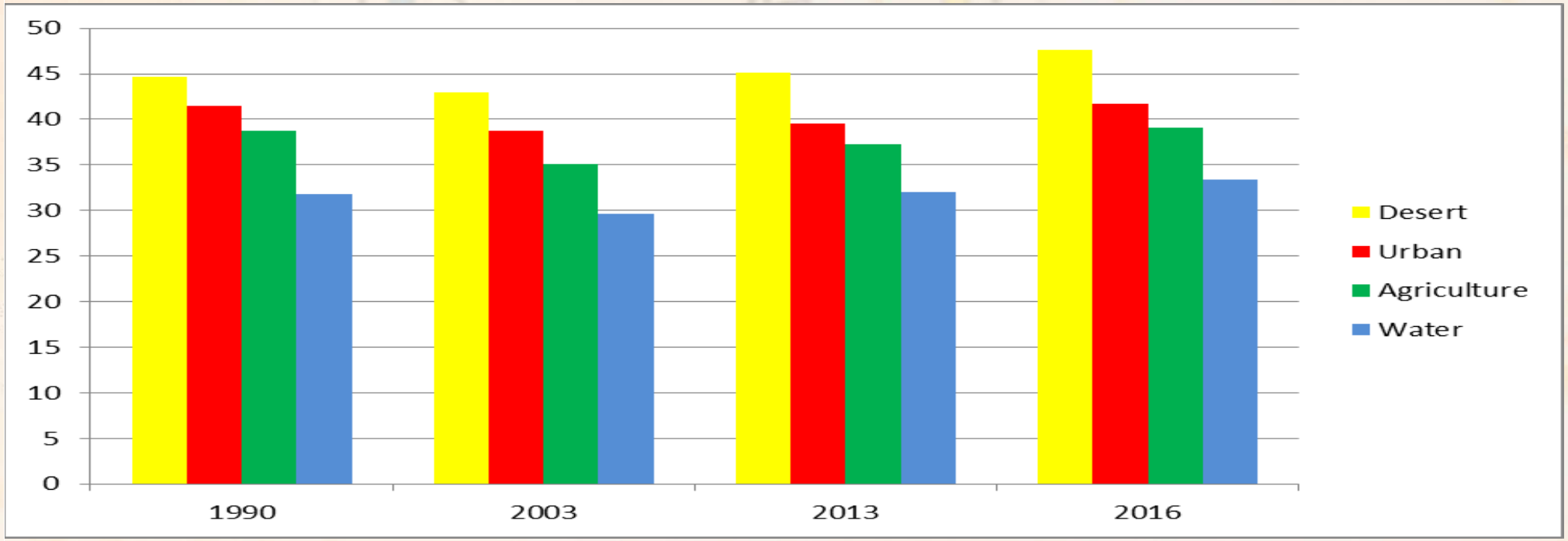


LST & UHI Temporal Changes

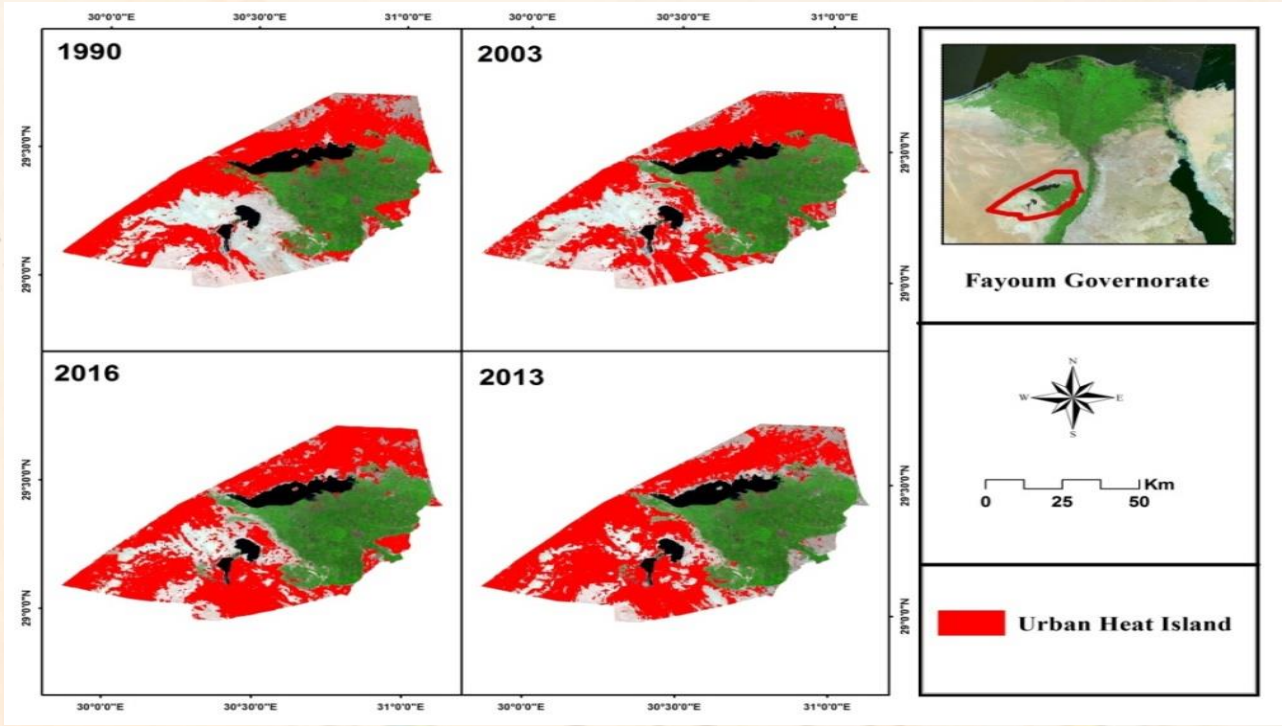


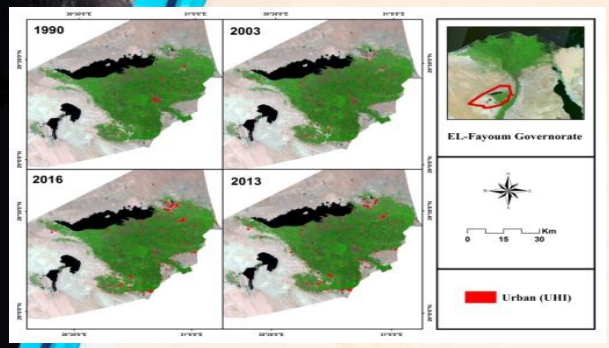
Average LST (degree Celsius)

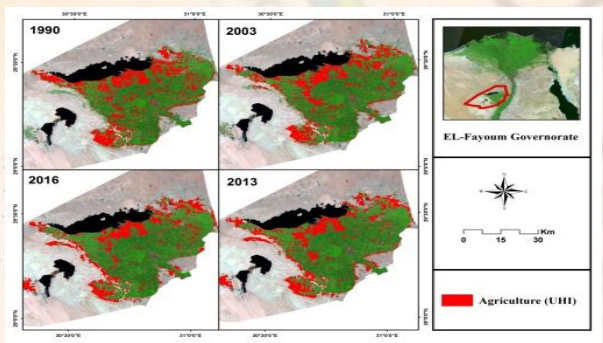
LST	1990		2003		2013		2016	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Desert	44.61	2.01	42.91	1.97	45.1	1.68	47.62	1.74
Urban	41.44	3.18	38.76	3.09	39.5	3.15	41.73	3.26
Agri.	38.74	3.8	35.14	3.81	37.3	3.7	39.12	3.8
Water	31.8	3.18	29.65	1.95	31.97	3.58	33.41	3.28

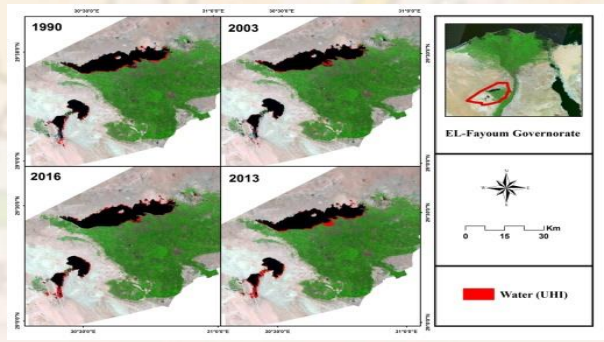


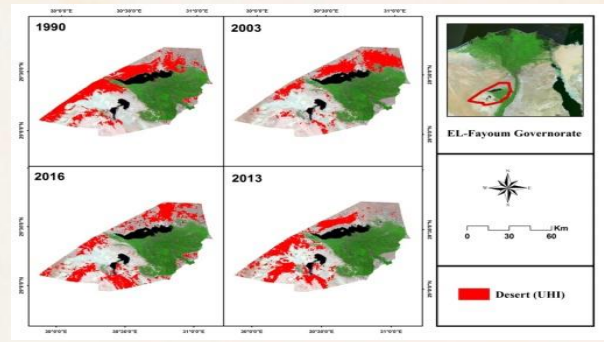
Heat Islands

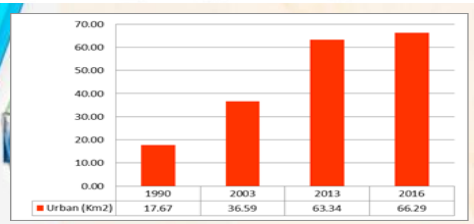


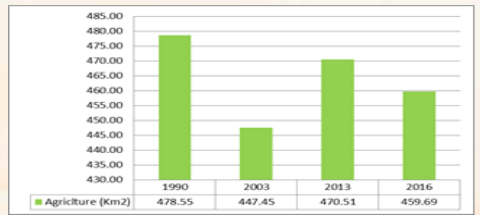


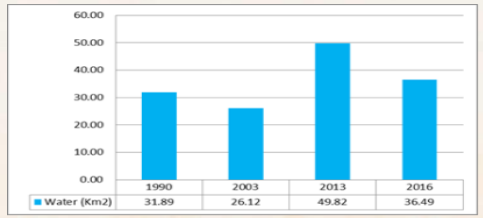


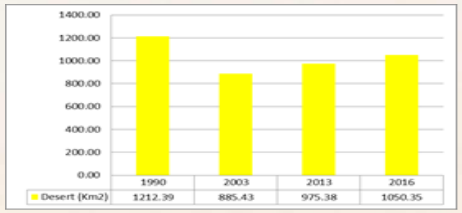










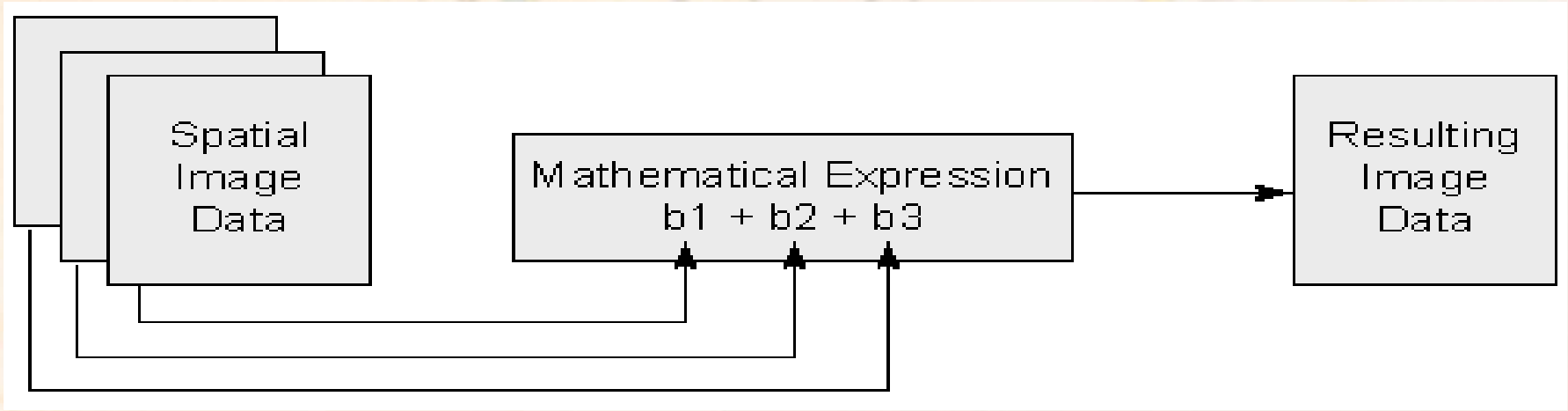


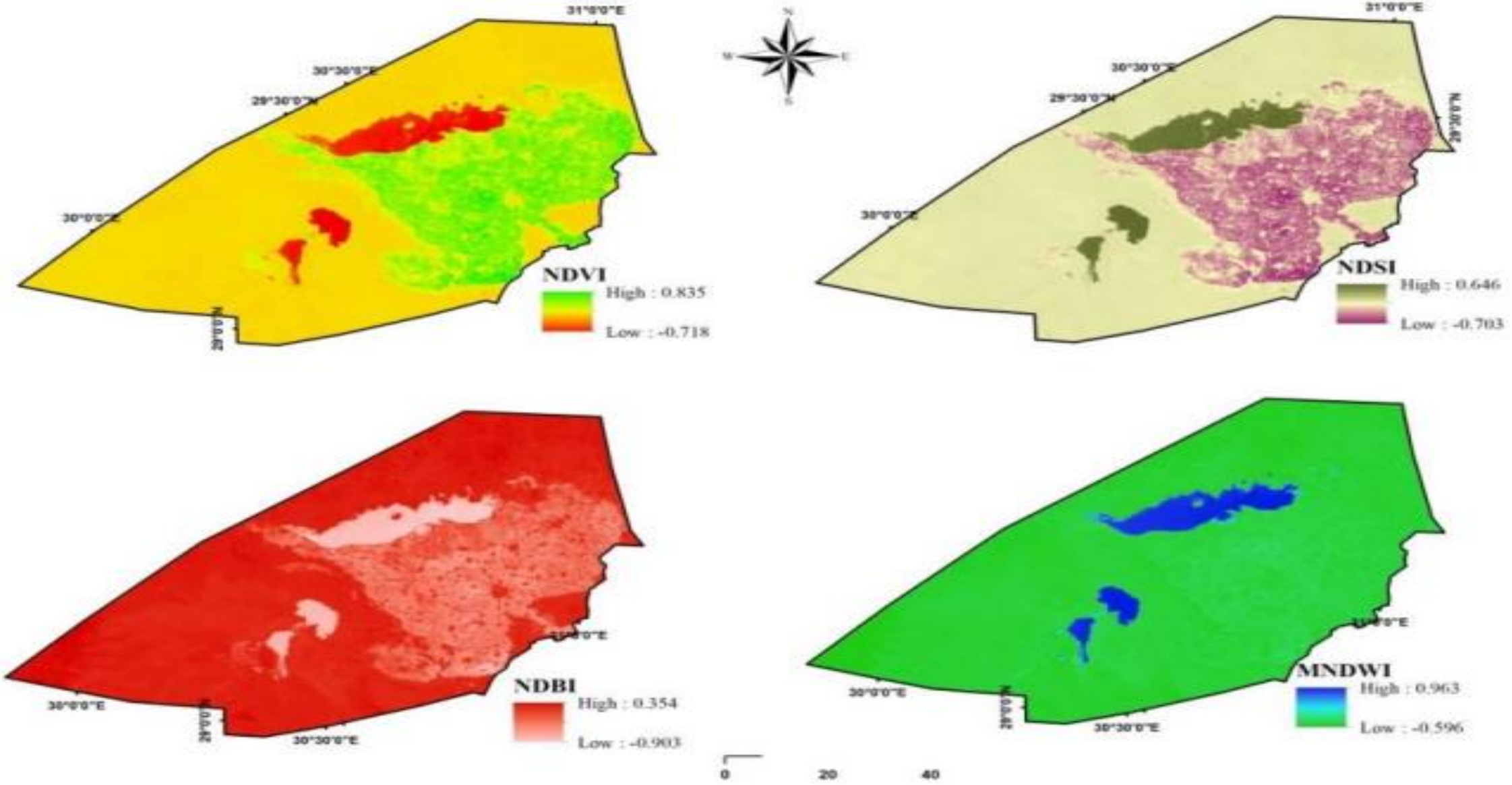
Spectral Retrieved Indices to detect environmental changes

- Normalized Difference Vegetation Index (NDVI)
- Normalized Difference Moisture Index (NDMI)
- Normalized Difference Built-Up Index (NDBI)
- Normalized Difference Salinity Index (NDSI)
- Burn Area Index (BAI)
- Iron Oxide Ratio
- Modified Normalized Difference Water Index (MNDWI)
- Normalized Difference Mud Index
- Normalized Difference Snow Index

Band Math

- Enter Mathematical Expressions
- Assign Values to Variables
- Map Variables to Multiband Images




NDVI
High : 0.835
Low : -0.718
NDSI
High : 0.646
Low : -0.703
NDBI
High : 0.354
Low : -0.903
MNDWI
High : 0.963
Low : -0.596
0
20
40

Presentation Outline

- Introduction to Environmental Remote Sensing
- Potential of RS and GIS in Management of Natural Protectorates
  - Monitoring Spatiotemporal Environmental Changes
  - **Mapping Environmental Quality Characteristics**
  - Modeling Quality Characteristics
- Diseases Transmission and the Associated Risk
  - Mosquito-transmitted-diseases
  - Non-Communicable Diseases (NCDs)
- Conclusion

Principle of Mapping

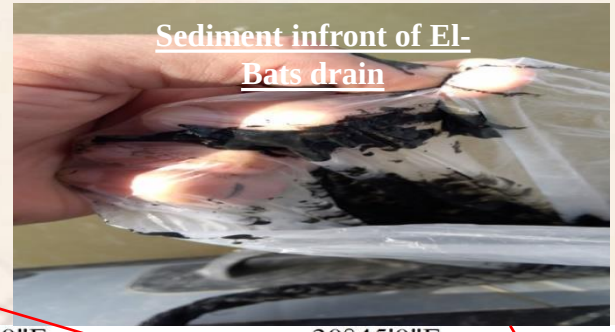
- Surface interpolation techniques in GIS are very powerful tools for predicting surface values and can easily create a continuous surface, or map, from measured sample points stored in a point feature layer or raster layer.
- The interpolation techniques commonly used include inverse distance weighting (IDW) and kriging
- IDW: distance
- Kriging: distance + statistical

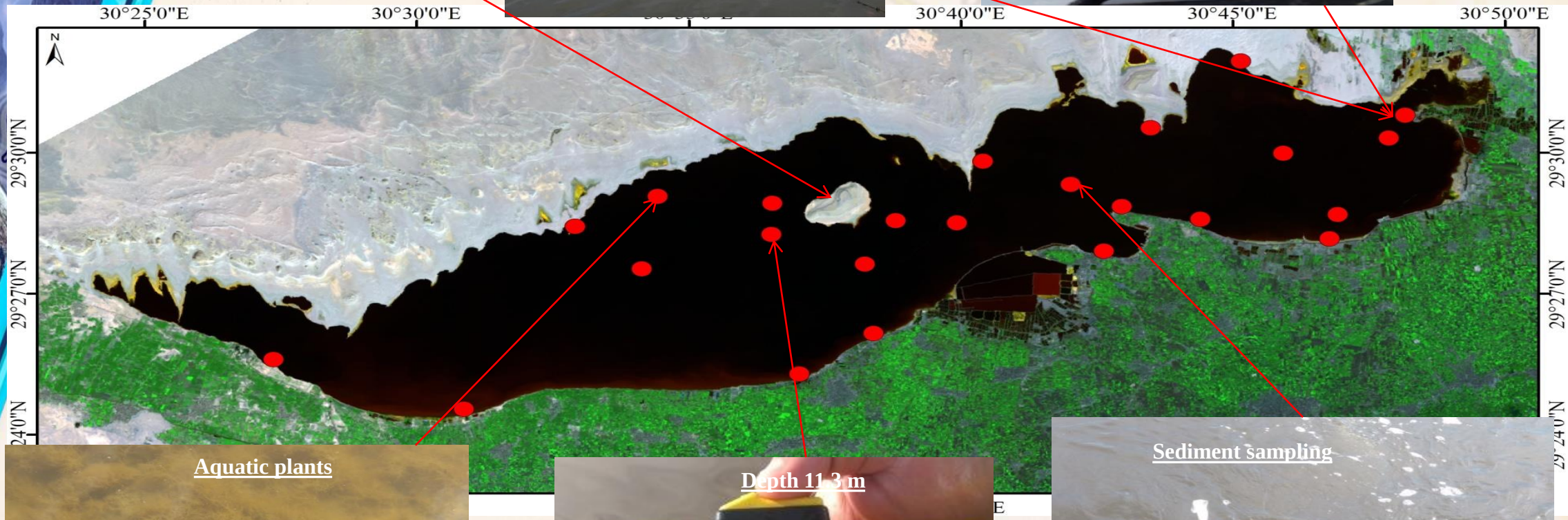
It could be confident that the prediction standard errors were appropriate:

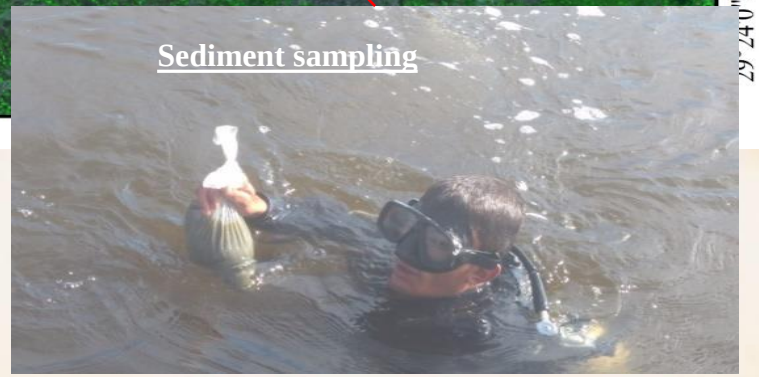
- *Mean standardized was close to zero*
- *RMSS values were close to 1.*
- *Average standard errors were close to the root-mean-square prediction errors*

Water Parameters	Transformation	Trend Type	Model Type	Mean	Root Mean Square	Mean Standardized	Root-Mean-Square Standardized	Average Standard Error
Temperature	None	First	Stable	-0.0726	1.2949	-0.0369	0.9990	1.2686
pH	Log	None	Stable	0.0106	0.2751	0.0315	1.1666	0.2310
Turbidity	Log	Second	Spherical	0.3879	9.1615	-0.0513	0.8868	12.7270
TDS	None	First	Stable	-0.7869	9.7567	-0.0555	0.9313	10.2743
Salinity	None	First	Stable	-0.7625	10.2134	-0.0520	0.9452	10.5750
Ammonia	None	None	Spherical	0.0146	4.5998	0.0080	1.1122	4.1641
DO	None	Constant	Spherical	-0.1929	3.0944	-0.0524	1.2712	2.4812
BOD	None	First	Spherical	0.3487	3.8477	0.0874	1.3607	2.8423
COD	None	None	Spherical	-1.5128	54.4194	-0.0177	0.9574	56.6681
Fe	None	None	Spherical	-0.0090	0.4974	-0.0133	1.0182	0.4832
Mn	None	None	Spherical	0.0014	0.5561	0.0480	1.0112	0.6641
Zn	None	None	Spherical	-0.0008	0.0162	-0.0617	1.3254	0.0202
Cu	None	None	Spherical	-0.0011	0.0239	-0.0418	1.2356	0.0195
Cd	None	None	Spherical	-0.0021	0.0370	-0.0345	0.9359	0.0410
Ni	None	None	Spherical	-0.0064	0.0799	-0.0530	1.0240	0.0789
Pb	None	None	Spherical	0.0106	0.3562	0.0217	0.9829	0.3633
Cr	None	None	Stable	-0.0084	0.1079	-0.0511	1.0295	0.1180

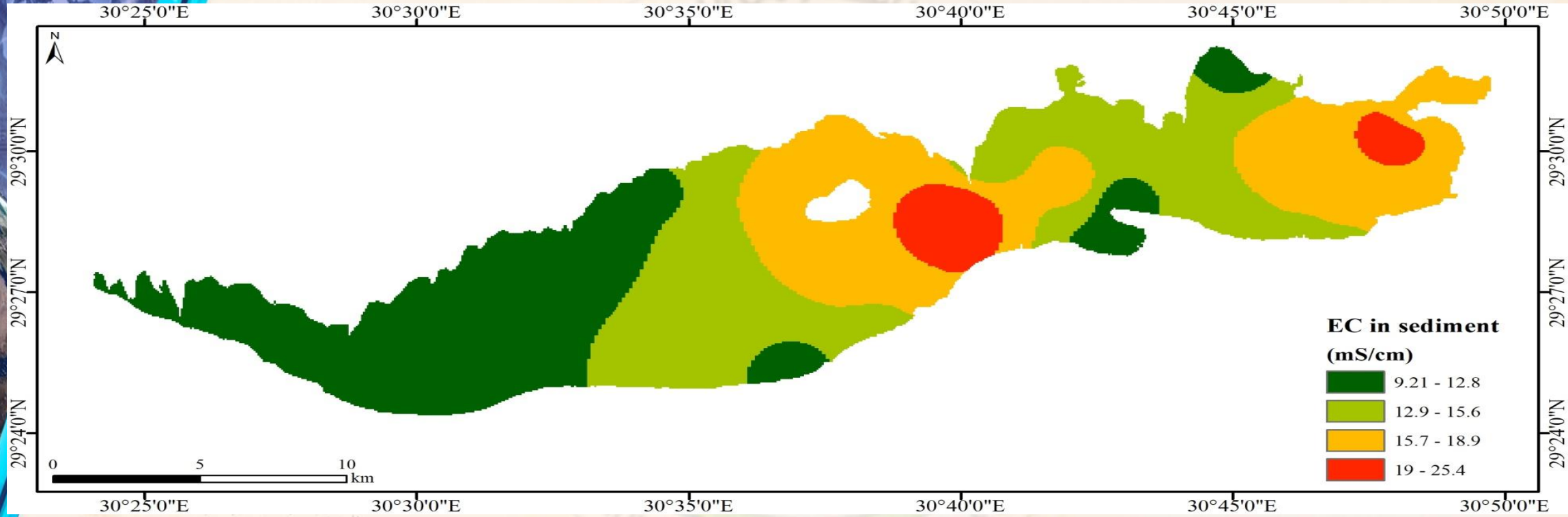
Sampling sites



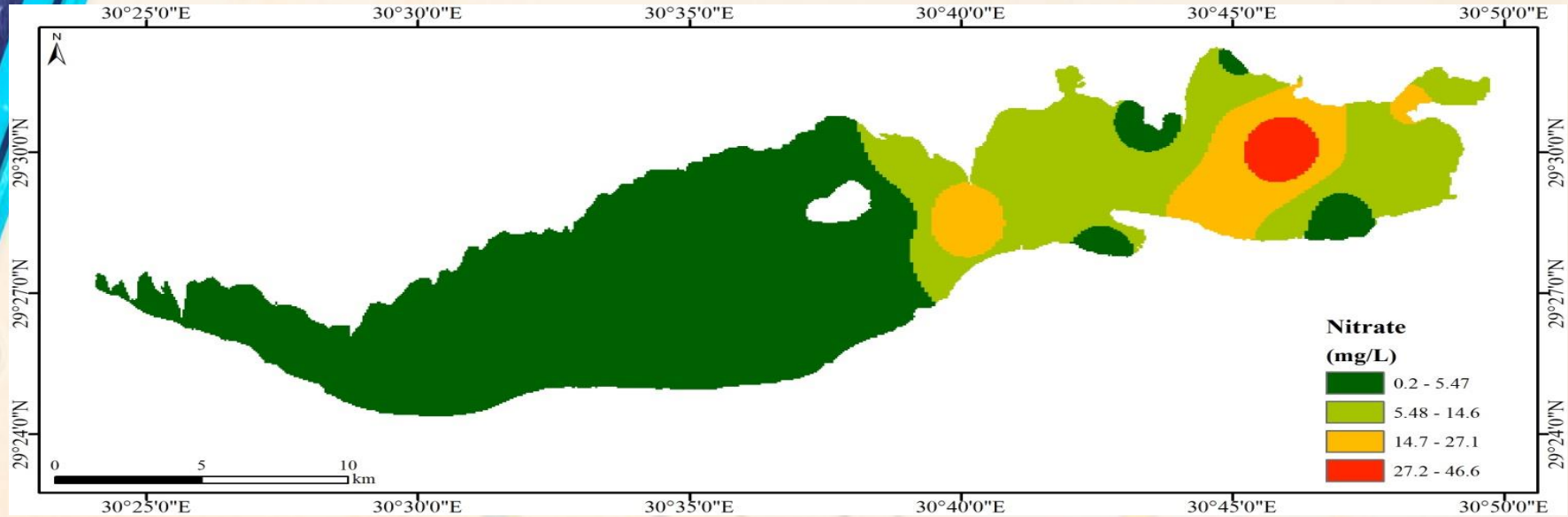


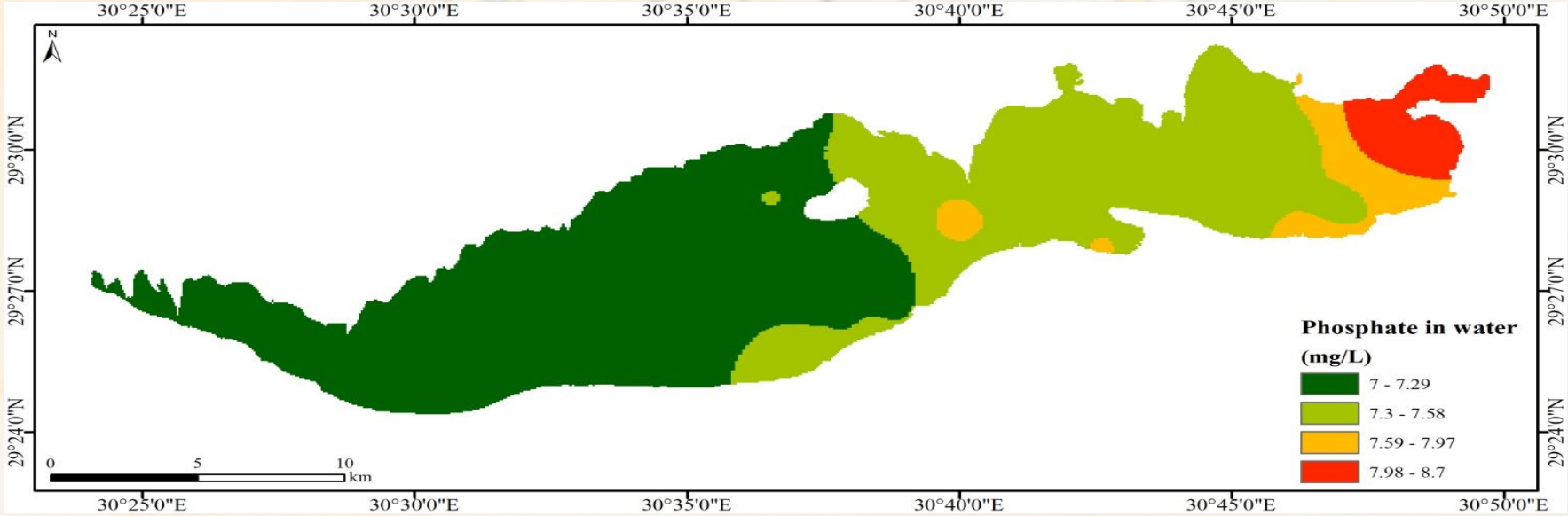


Sediment Salinity



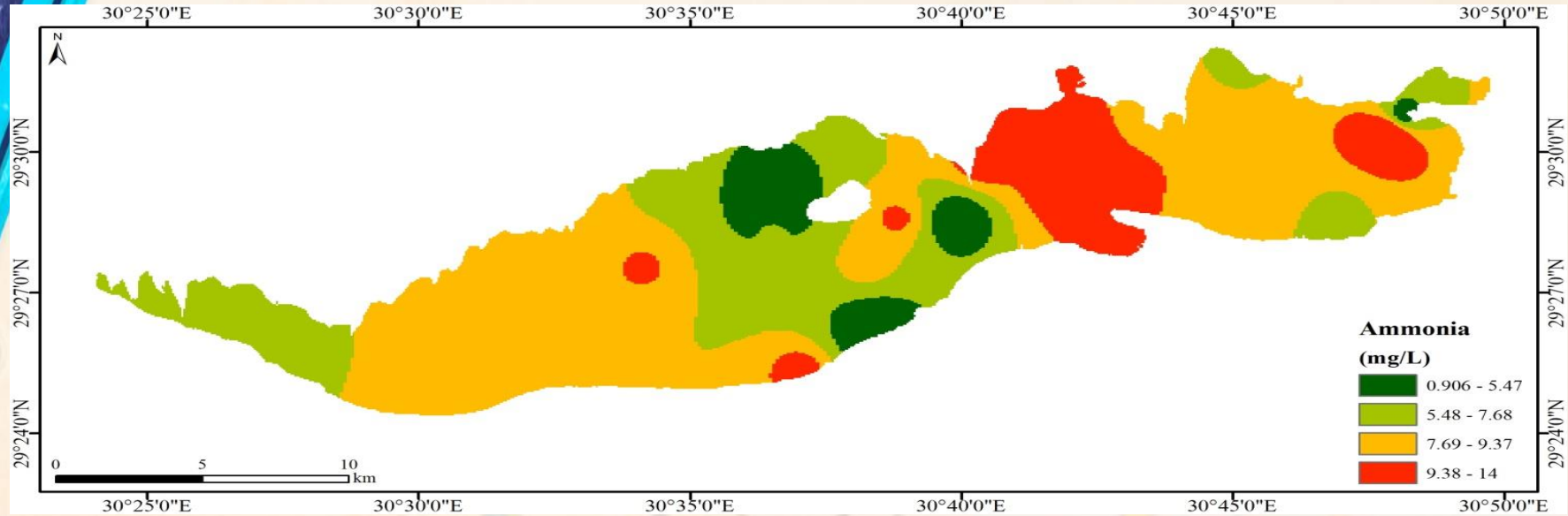
Assessing nutrient levels in water

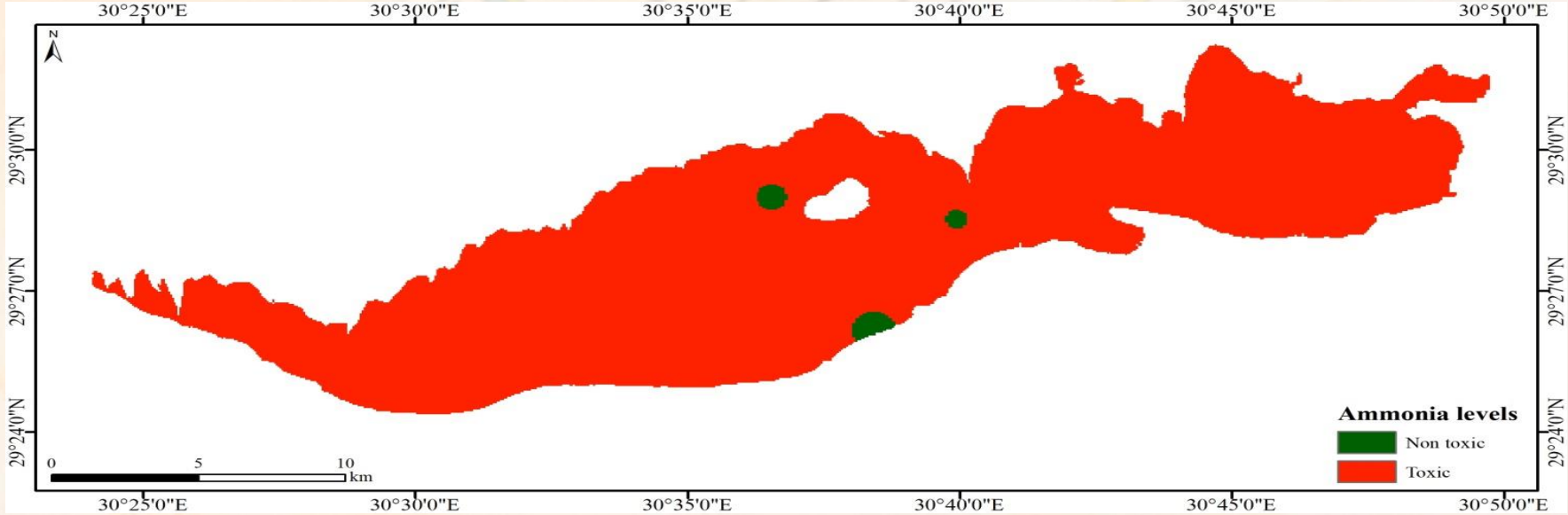




Assessing levels of Ammonia in water

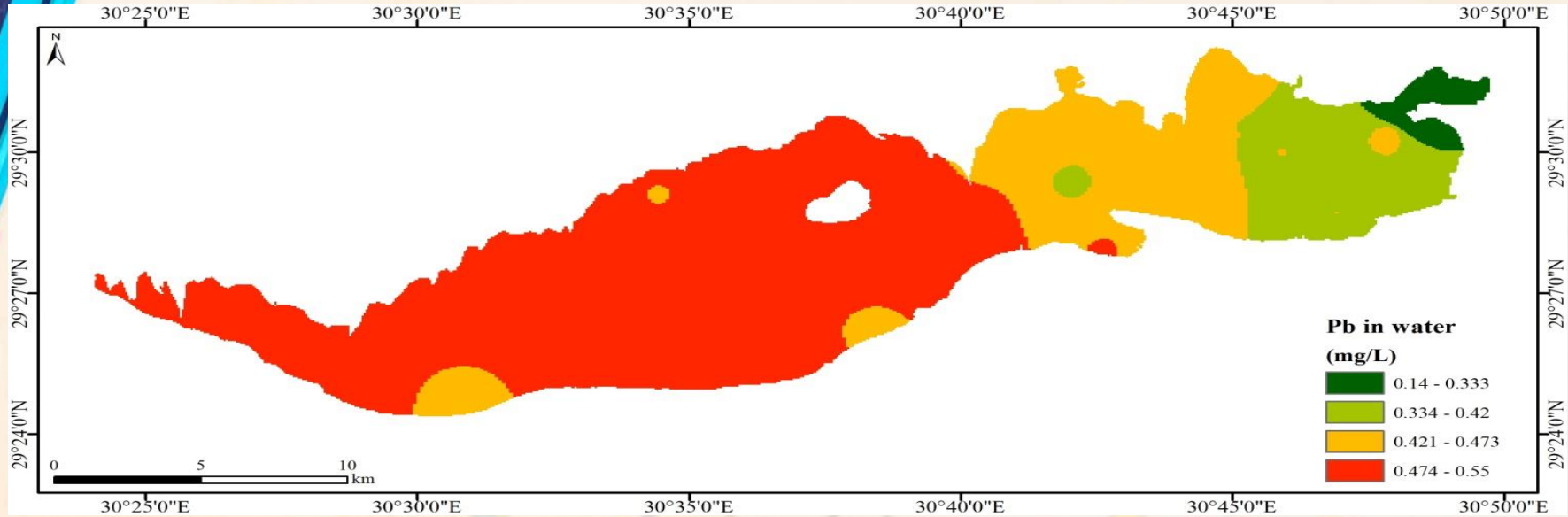
(based on recommendations of research studies)

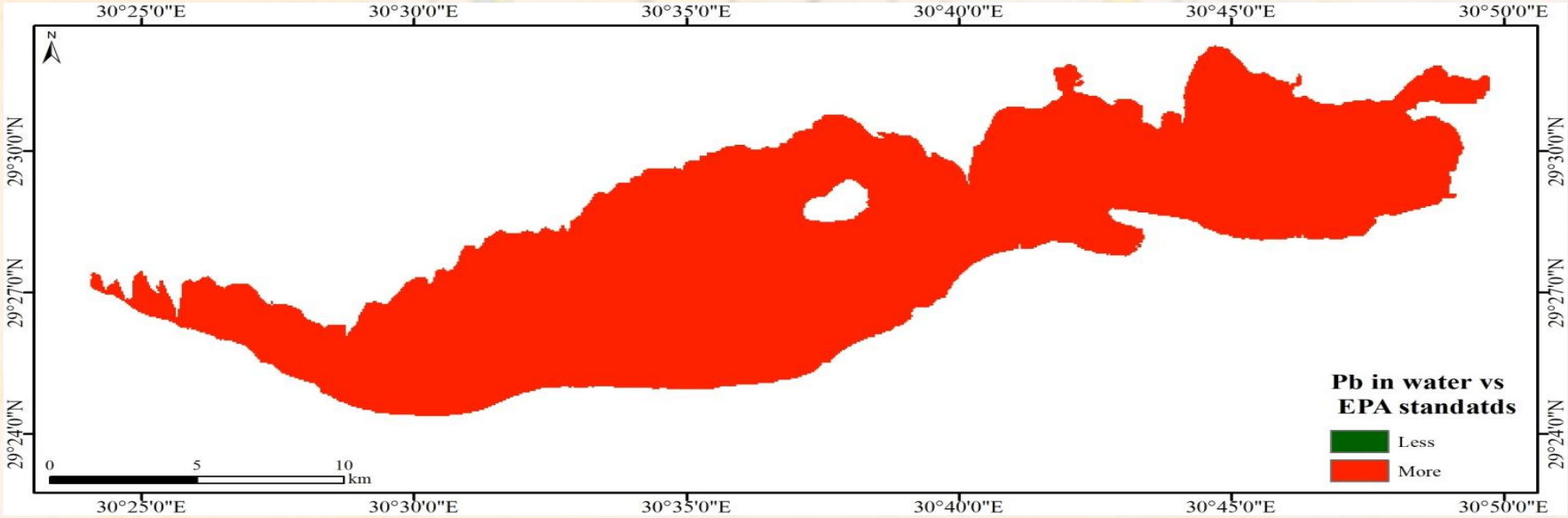




Assessing levels of Pb in water

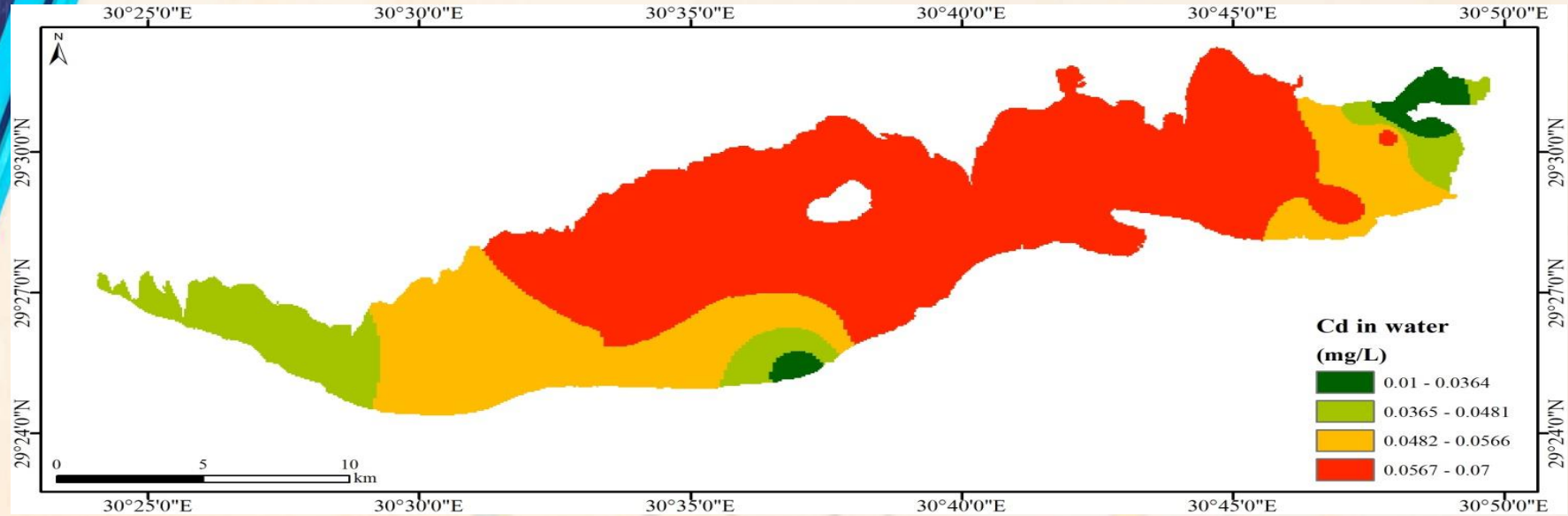
(based on EPA Standards for protection of aquatic life)

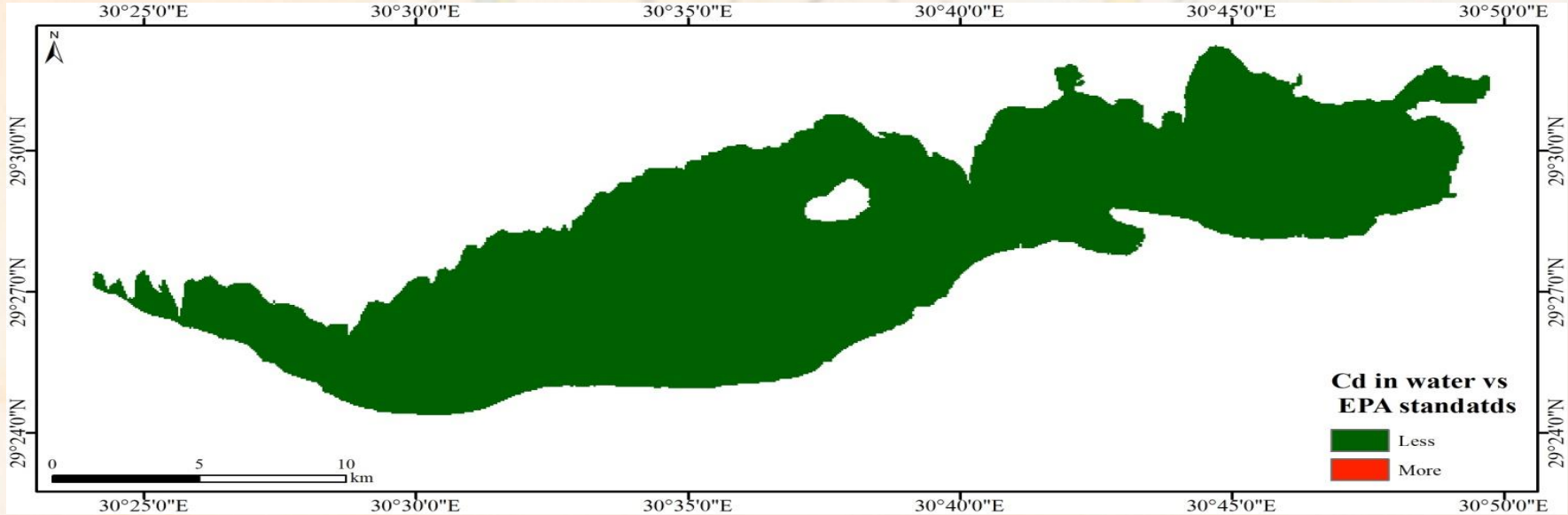




Assessing levels of Cd in water

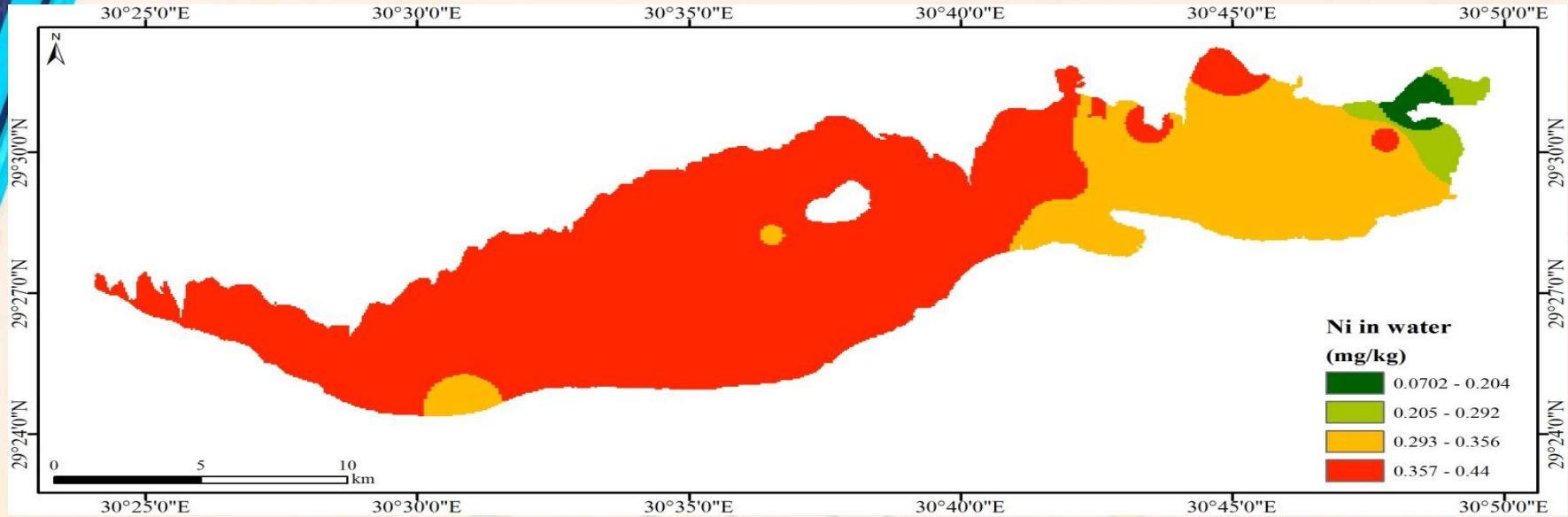
(based on EPA Standards for protection of aquatic life)

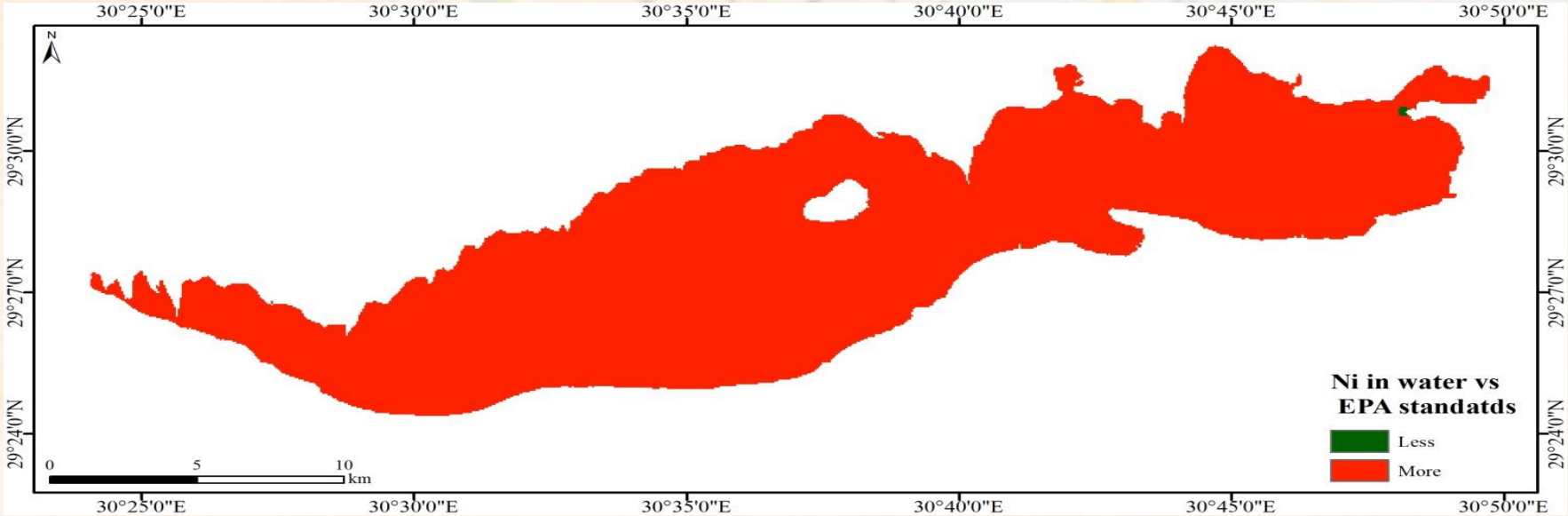




Assessing levels of Ni in water

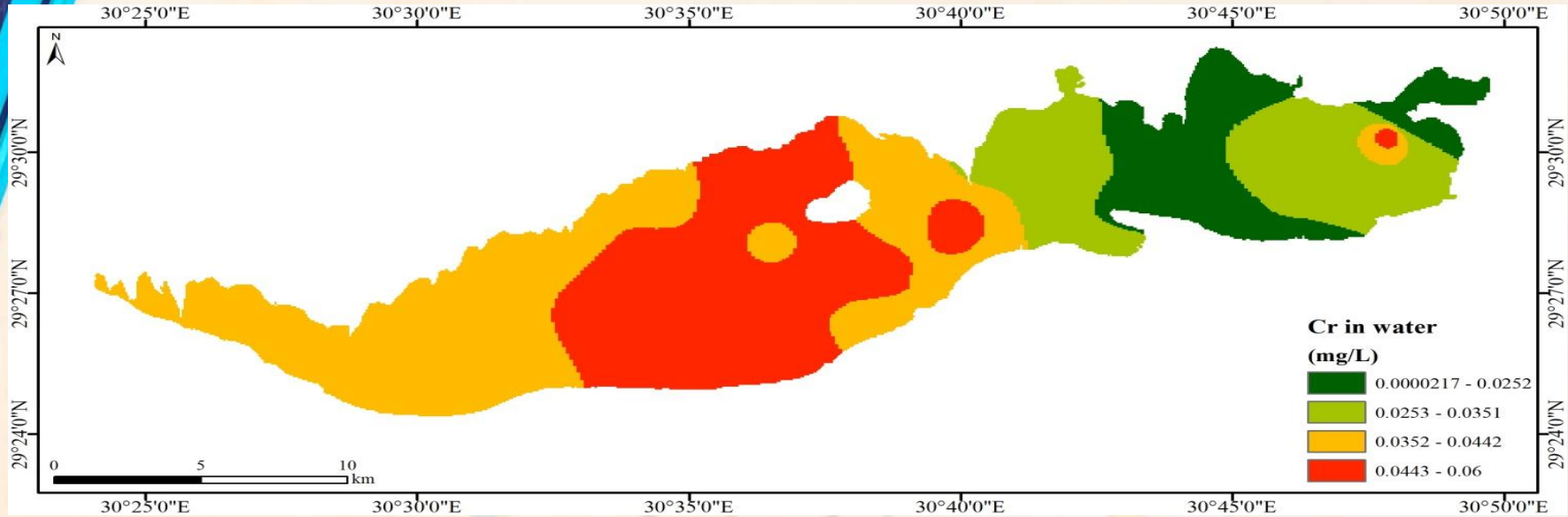
(based on EPA Standards for protection of aquatic life)

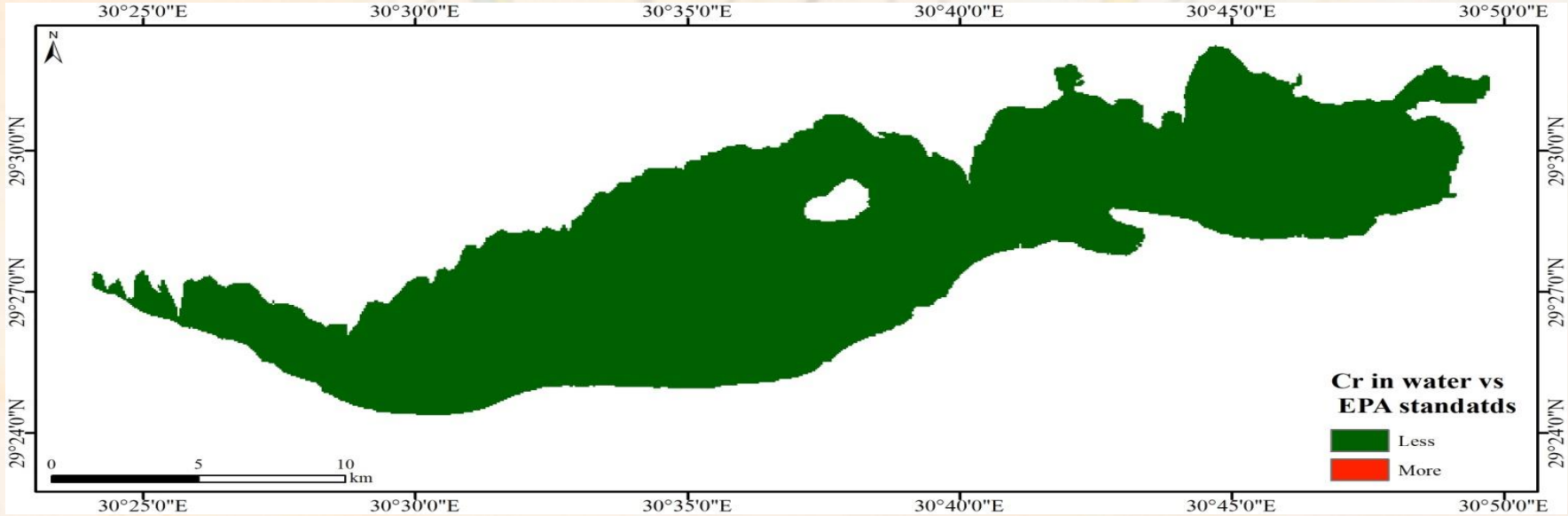




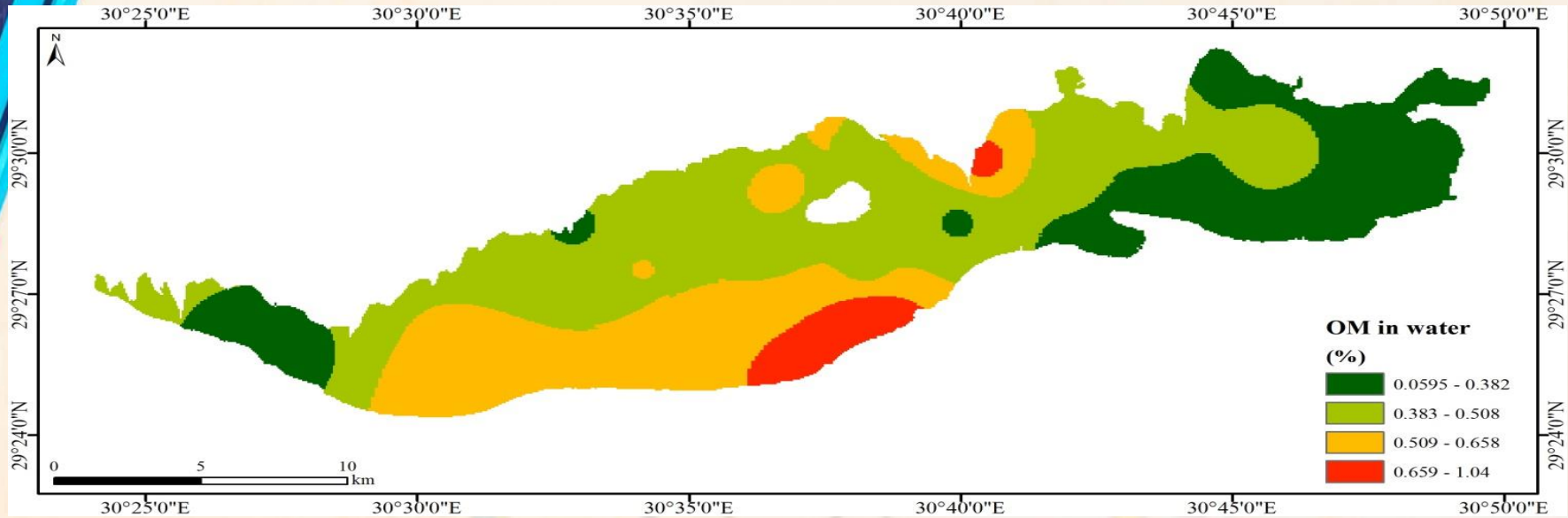
Assessing levels of Cr in water

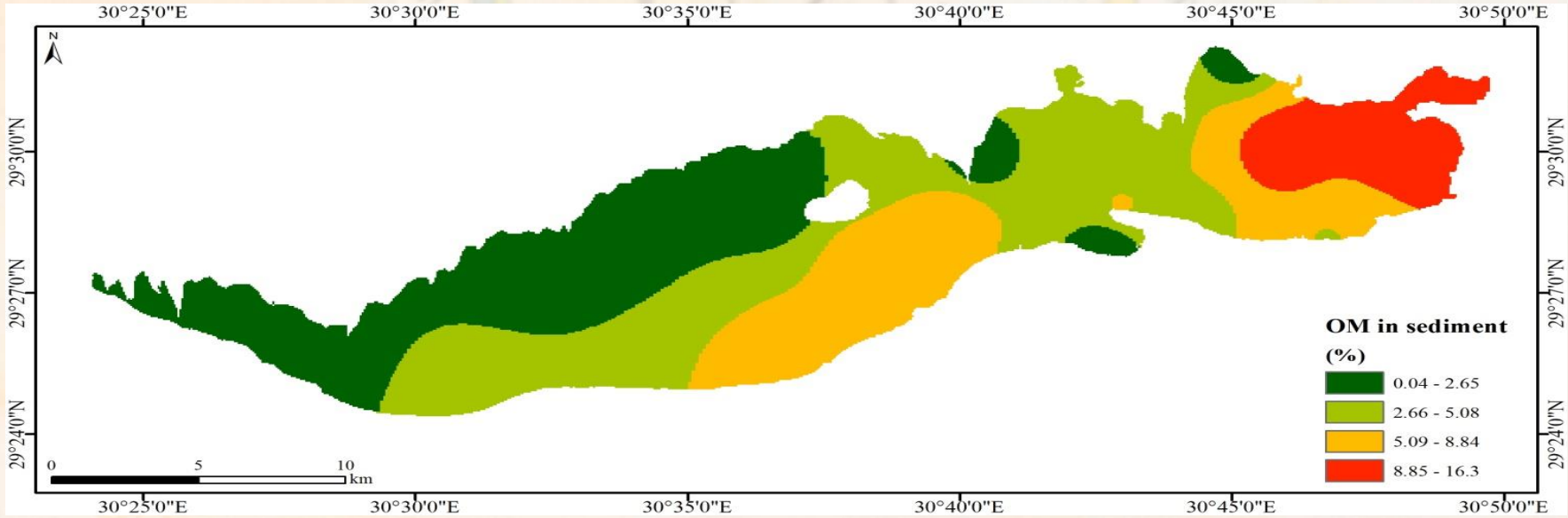
(based on EPA Standards for protection of aquatic life)





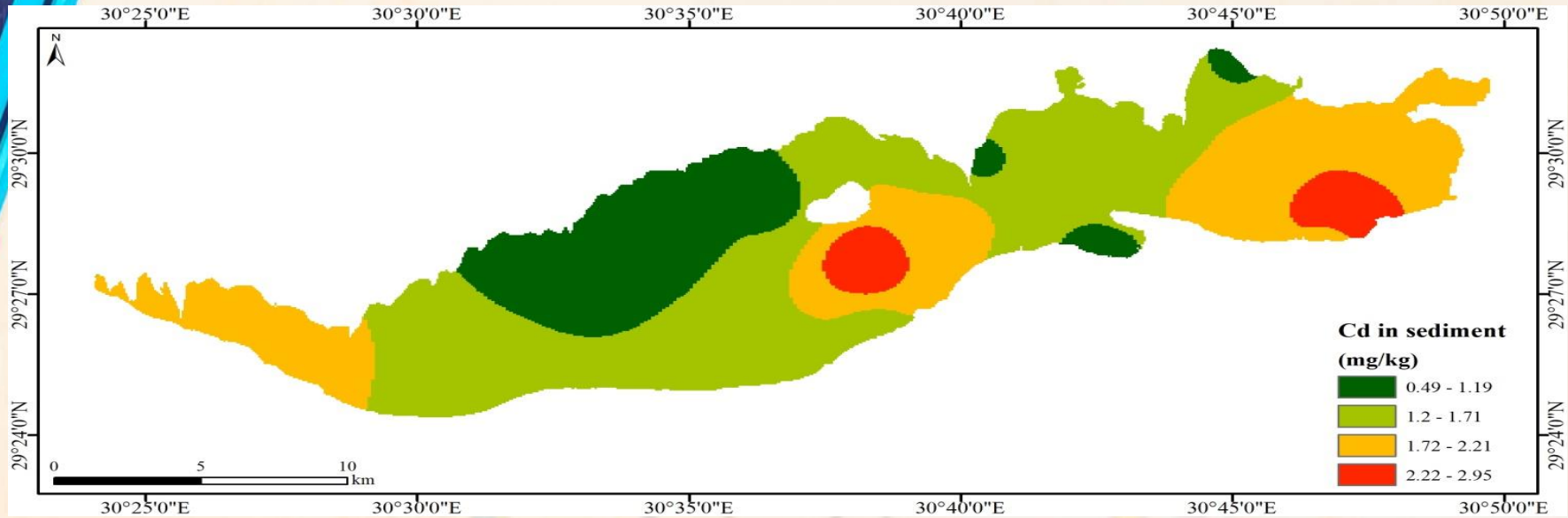
OM levels in water & sediment

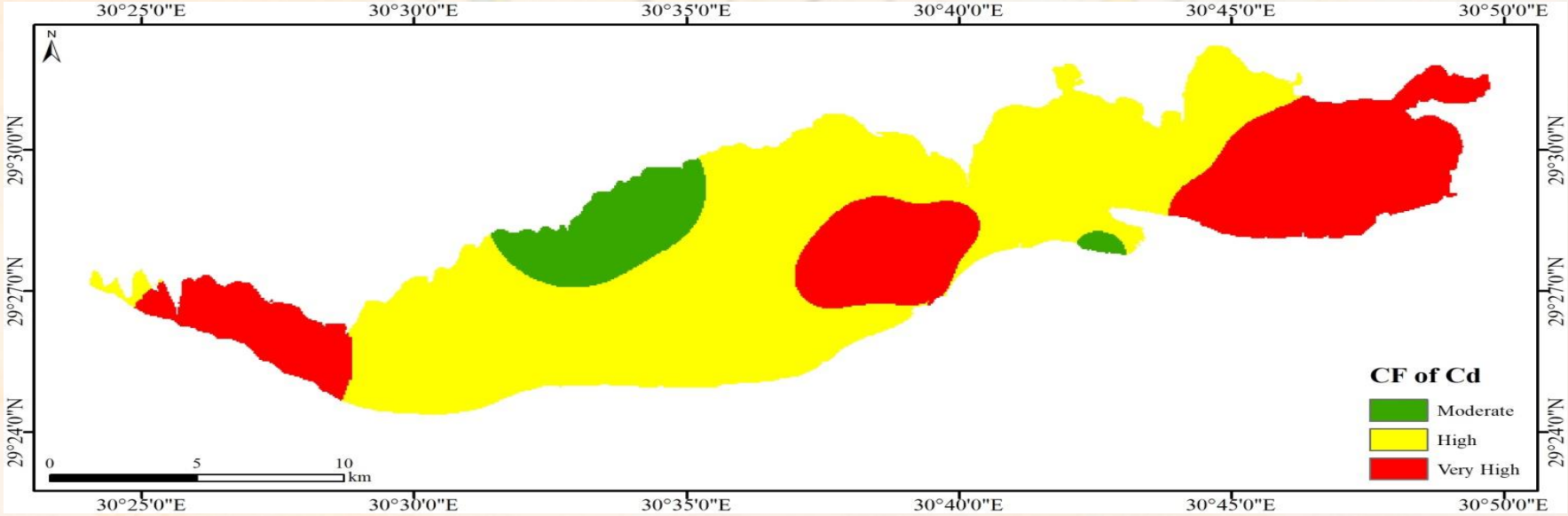




Assessing Cd levels in sediments

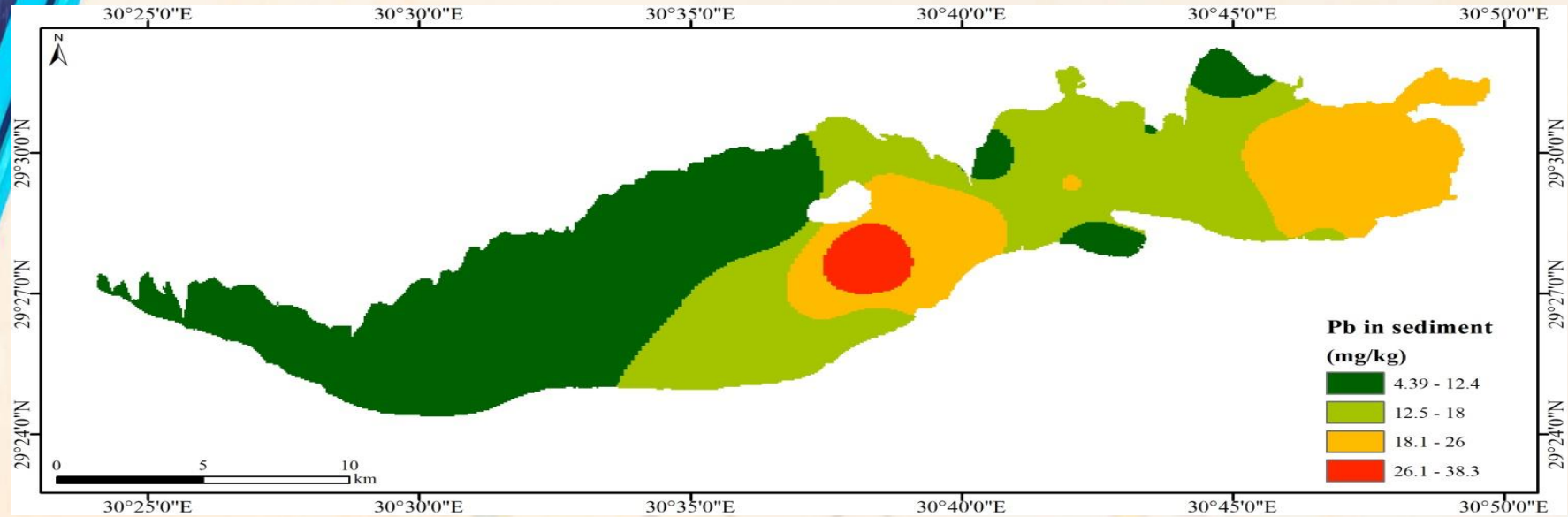
(Contamination factor)

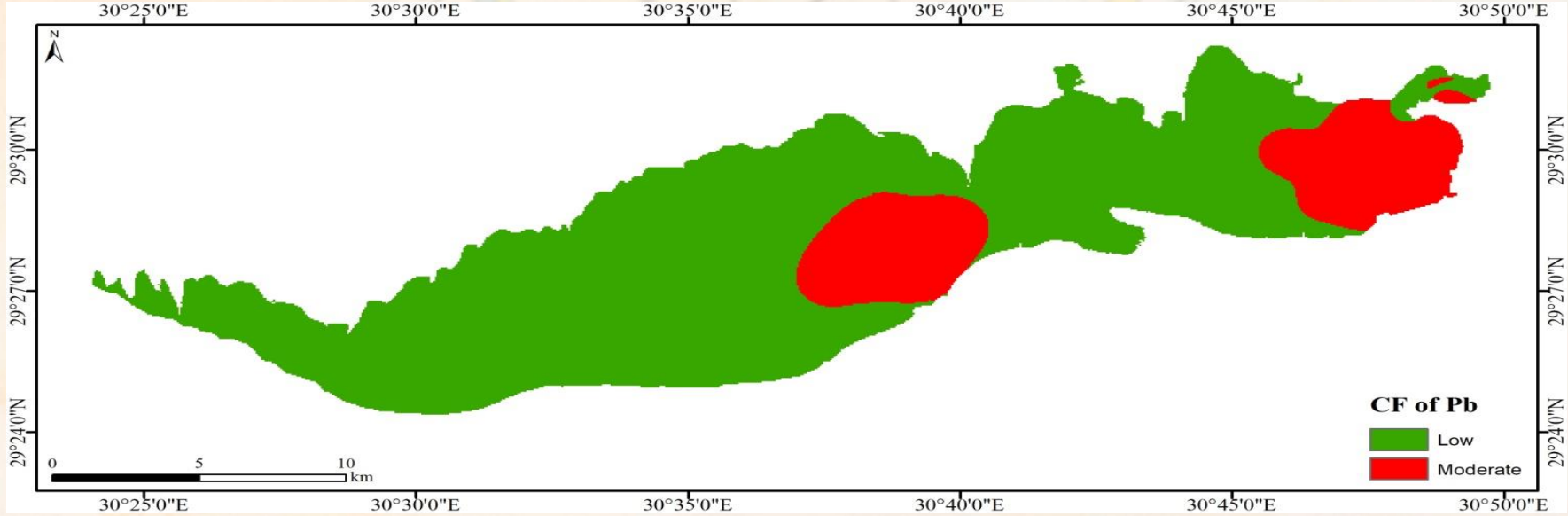




Assessing Pb levels in sediments

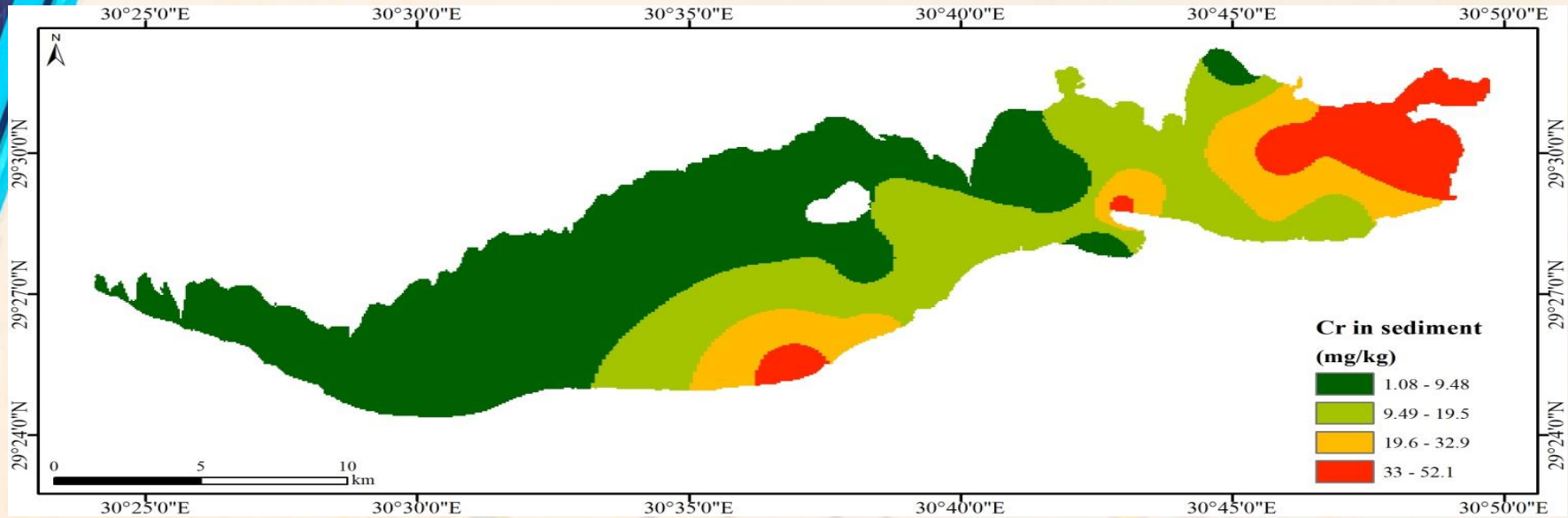
(Contamination factor)

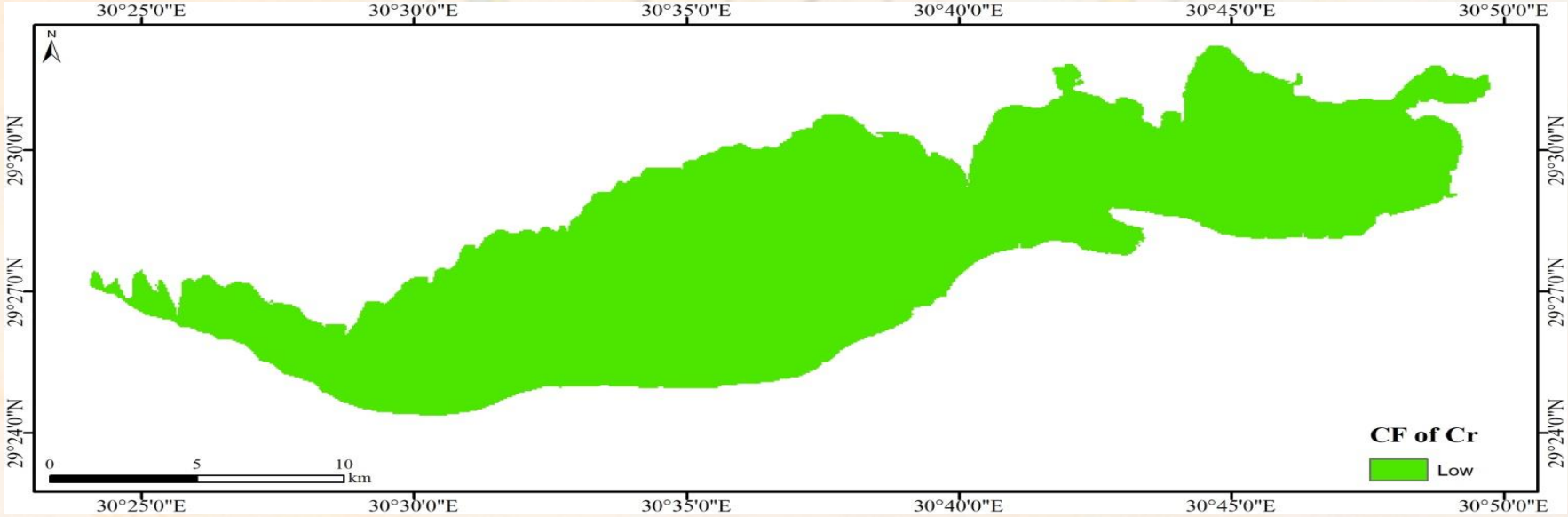




Assessing Cr levels in sediments

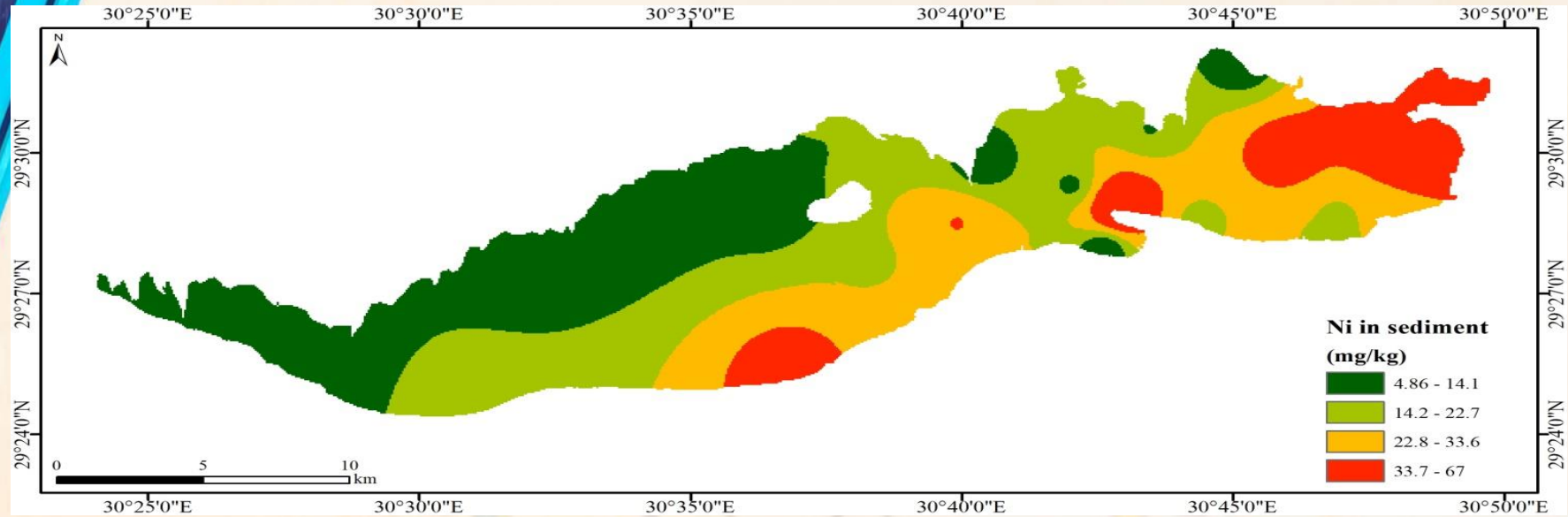
(Contamination factor)

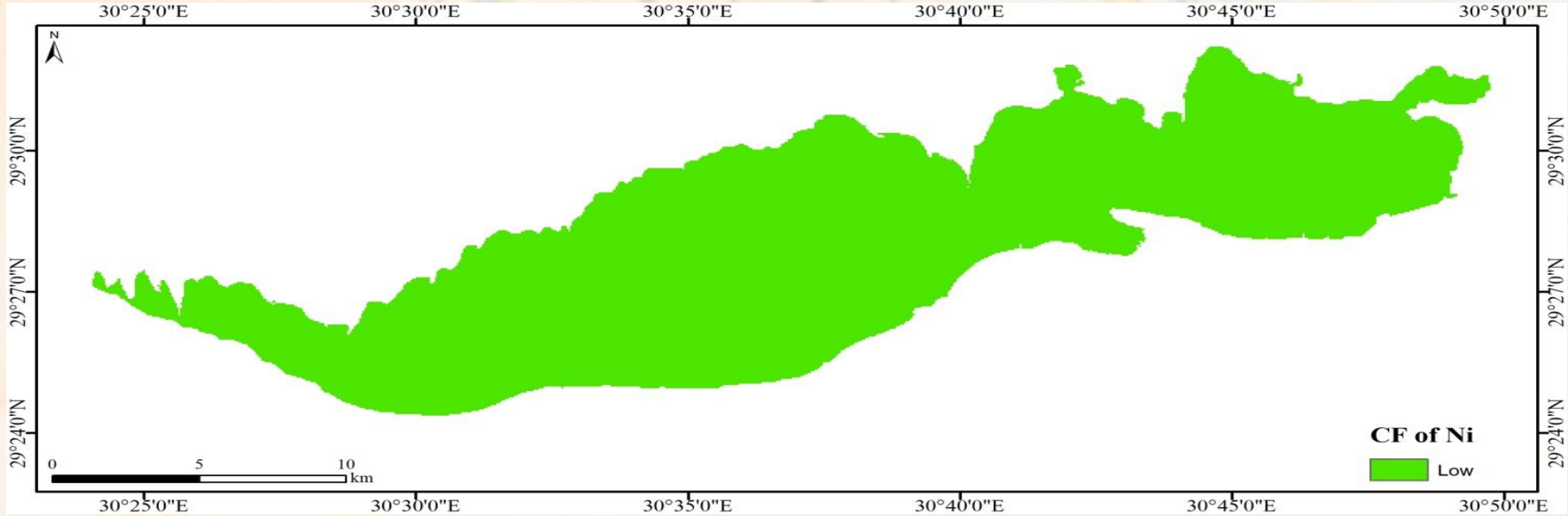




Assessing Ni levels in sediments

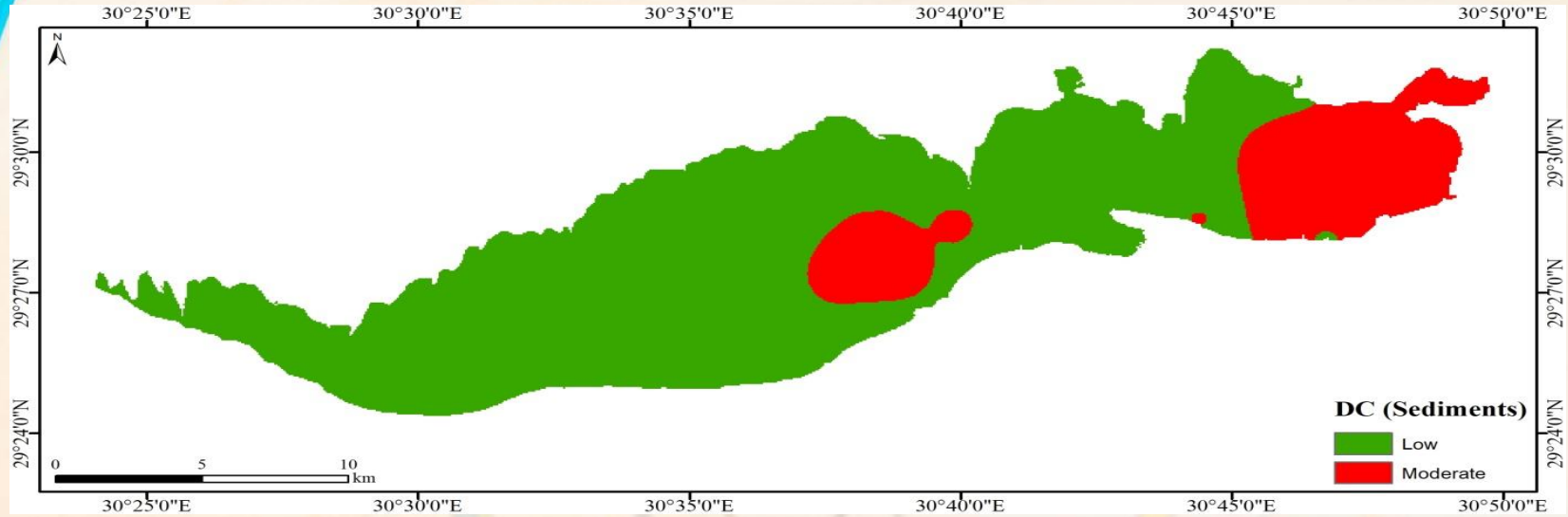
(Contamination factor)



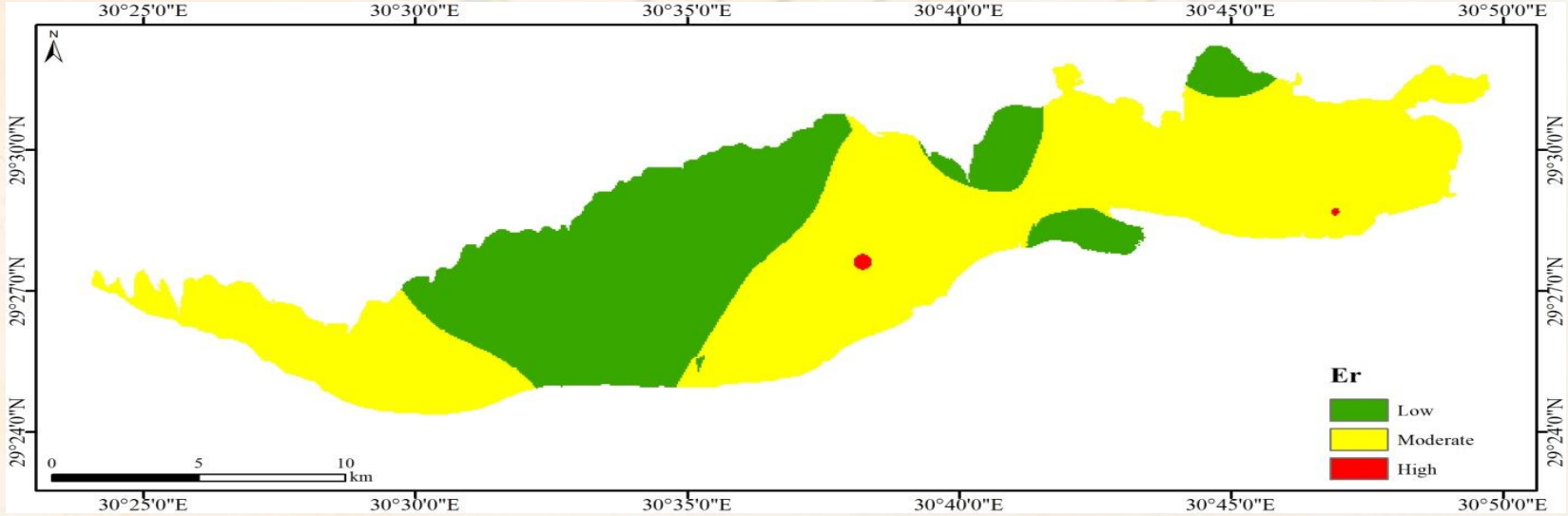


Environmental Assessment of Sediment Pollution

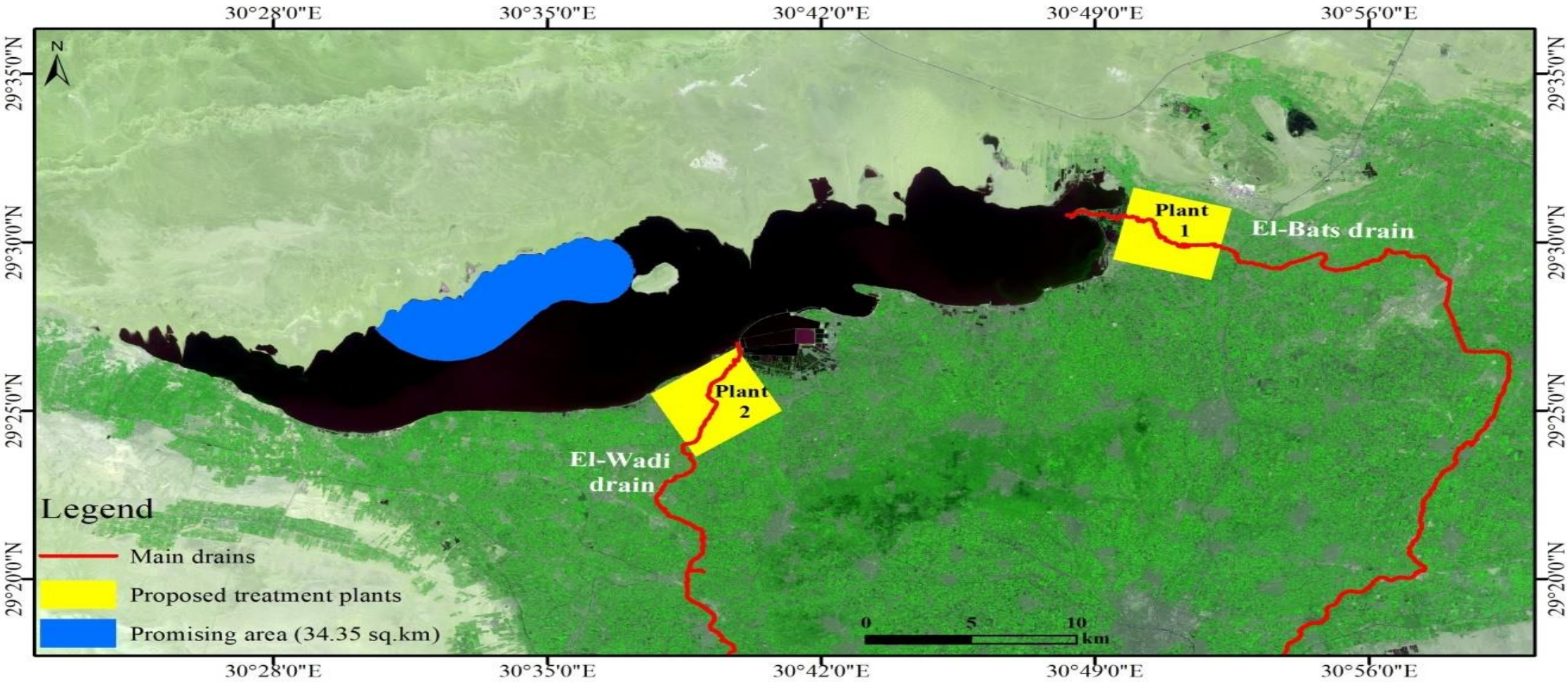
Degree of Contamination (based on contamination factor of HM)



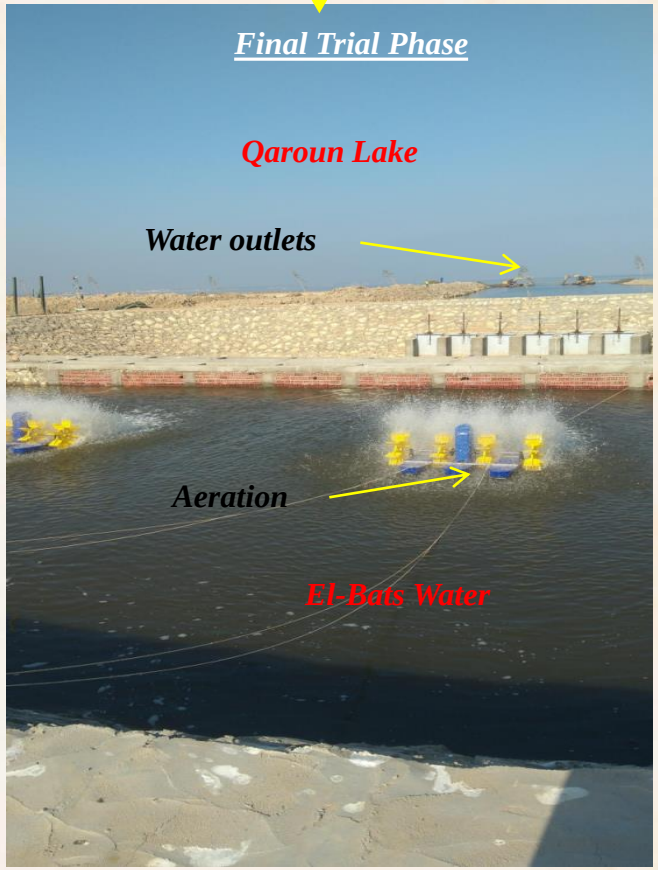
Ecological Risk Index (based on contamination factor of HM)



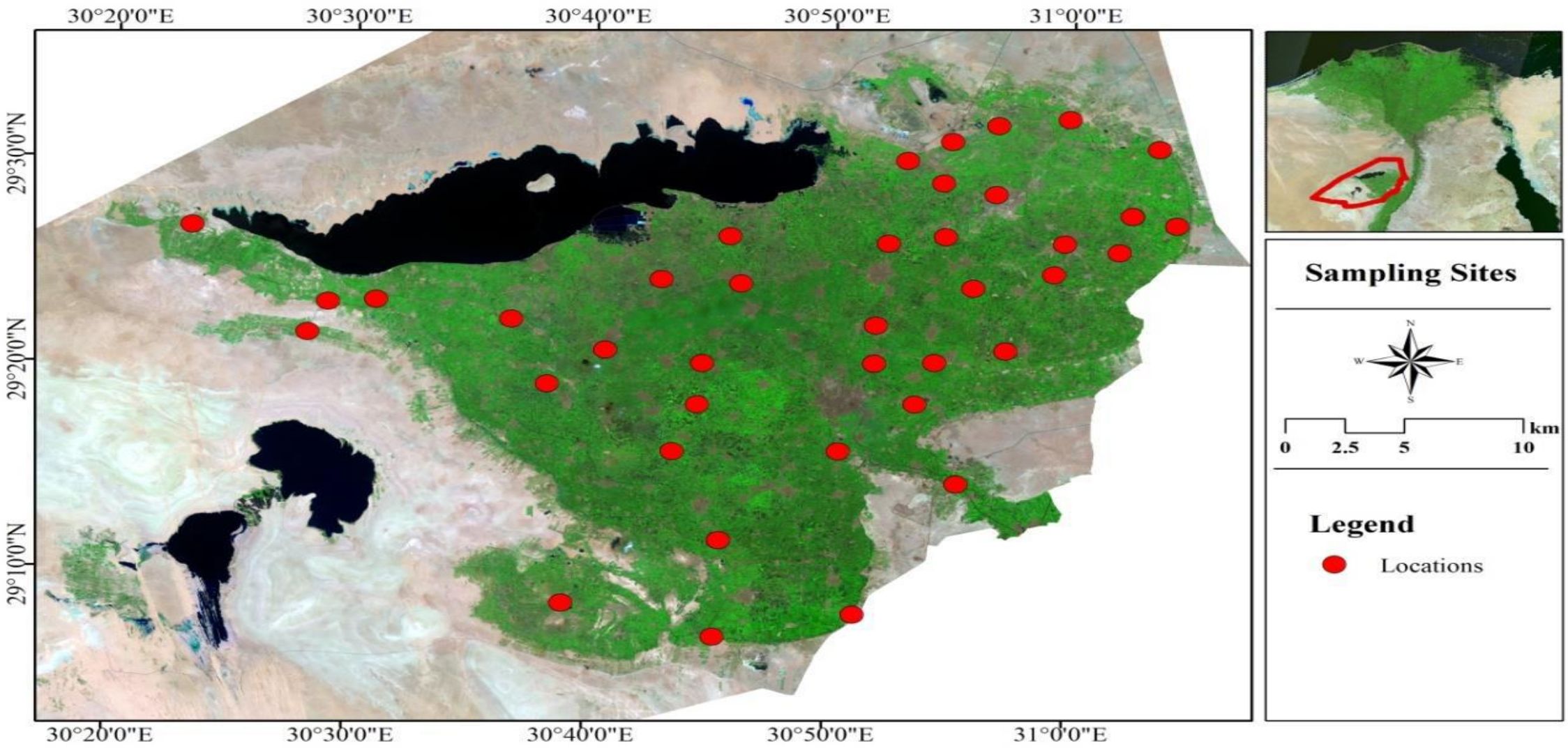
Proposed solutions to mitigate pollution



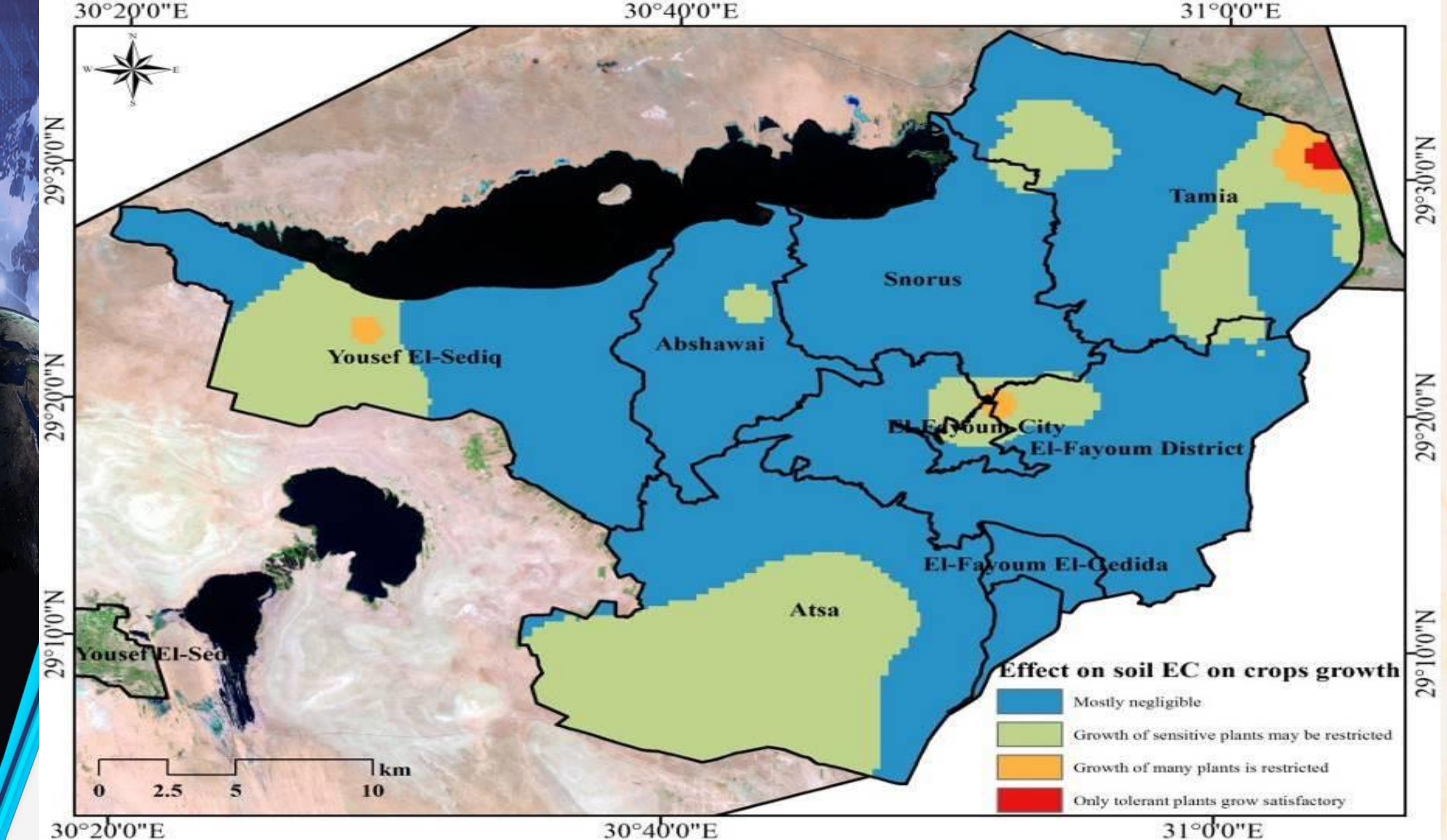
Mechanical treatment of El-Bats wastewater



Soil Parameters Mapping



Statistics	Min	Max	Average	SD
pH	7.83	8.71	8.31	0.20
EC mS/cm	0.04	9.59	1.71	1.78
Ca mg/g	0.81	98.58	20.71	19.92
K mg/g	0.5	34.38	6.07	6.82
Mg mg/g	0.56	31.50	10.65	6.45
Na mg/g	1.65	131.48	24.58	26.16
TP mg/g	0.111	1.71	0.50	0.30
TN mg/g	0.05	2.44	0.74	0.50
% OC	0.1	6.87	2.43	1.45


30°20'0"E
30°40'0"E
31°0'0"E
29°30'0"N
29°20'0"N
29°10'0"N
Tamia
Snorus
Abshawai
Yousef El-Sediq
El-Fayoum City
El-Fayoum District
El-Fayoum El-Gedida
Atsa
Yousef El-Sed
0
2.5
5
10
km
Effect on soil EC on crops growth
Mostly negligible
Growth of sensitive plants may be restricted
Growth of many plants is restricted
Only tolerant plants grow satisfactory

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- Introduction to Environmental Remote Sensing
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  - **Modeling Environmental Quality Characteristics**
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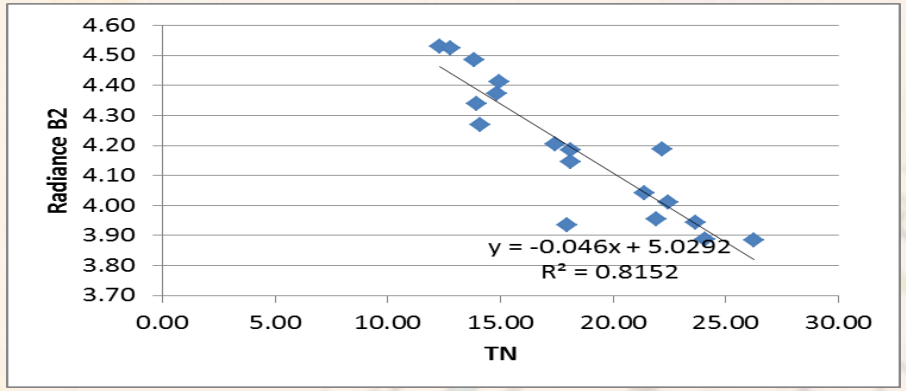
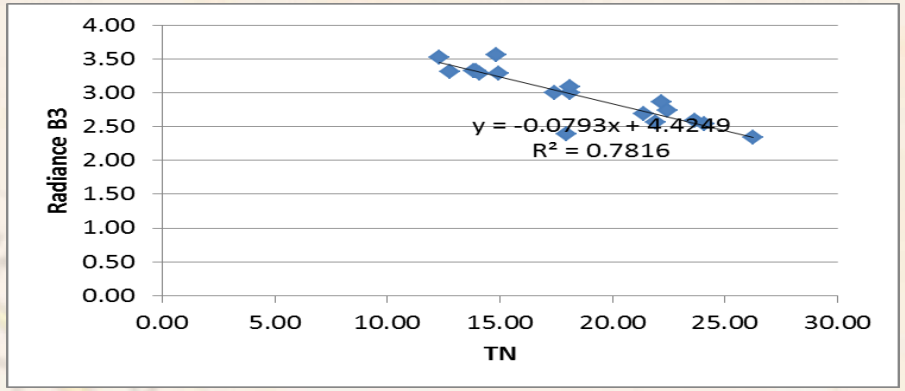
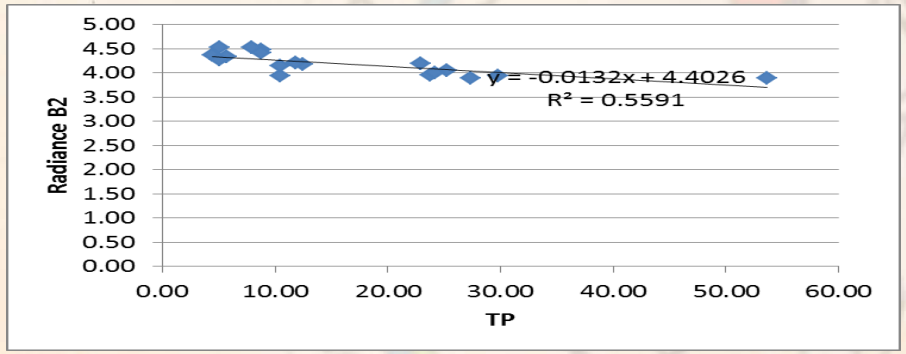
  - Mosquito-transmitted-diseases
  - Non-Communicable Diseases (NCDs)
- Conclusion

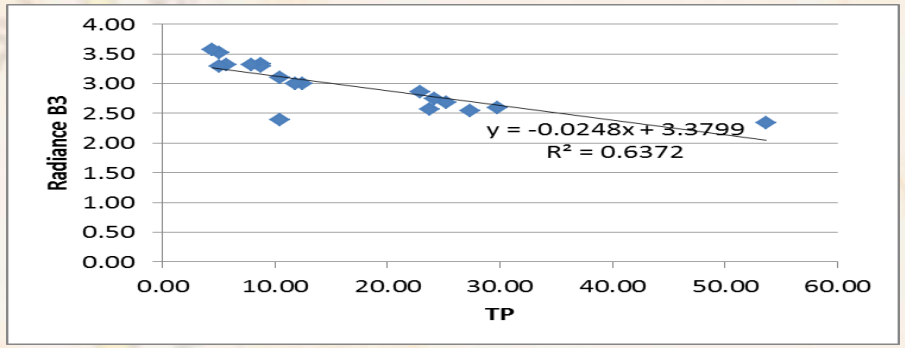
Points	Geographic Location		Water Parameters (mg/L)			Spectral Data (Radiance) / Band Combinations				
	X	Y	TN	TP	BOD	B2	B3	B3/B2	B2+B3	B2-B3
1	30.9723	31.5082	24.0822	27.3994	6.4591	3.8876	2.5390	0.6531	6.4267	1.3486
2	30.7478	31.4088	21.3826	25.2682	6.2068	4.0430	2.6883	0.6649	6.7313	1.3547
3	30.8407	31.5055	18.1189	12.4413	4.1522	4.1837	3.0040	0.7180	7.1878	1.1797
4	30.9956	31.5406	13.8628	8.8234	3.2696	4.4865	3.3319	0.7427	7.8184	1.1545
5	31.0307	31.5710	12.3219	5.1045	2.0473	4.5303	3.5240	0.7779	8.0543	1.0063
6	31.0071	31.5487	14.8285	4.4203	1.7673	4.3736	3.5656	0.8153	7.9393	0.8080
7	30.6401	31.4013	22.1928	22.9185	5.9071	4.1877	2.8633	0.6837	7.0510	1.3244
8	30.6213	31.3976	26.2394	53.6901	8.6678	3.8850	2.3396	0.6022	6.2246	1.5454
9	30.8468	31.4862	17.9718	10.4486	3.6936	3.9354	2.3873	0.6066	6.3228	1.5481
10	30.7649	31.4262	21.9330	23.7551	6.0166	3.9540	2.5672	0.6493	6.5212	1.3868
11	30.8915	31.4867	13.9690	5.6928	2.2715	4.3404	3.3221	0.7654	7.6626	1.0183
12	30.7707	31.4278	23.6443	29.7629	6.7201	3.9421	2.5904	0.6571	6.5325	1.3516
13	30.9920	31.5007	22.4207	24.1613	6.0687	4.0098	2.7458	0.6848	6.7556	1.2640
14	31.0045	31.5757	14.0846	5.0856	2.0399	4.2700	3.2903	0.7706	7.5604	0.9797
15	30.9909	31.5688	18.0947	10.4370	3.6908	4.1466	3.0970	0.7469	7.2436	1.0496
16	30.8222	31.4613	14.9524	8.8041	3.2643	4.4135	3.2879	0.7450	7.7013	1.1256
17	30.8535	31.5193	17.4274	11.8605	4.0246	4.2037	3.0016	0.7140	7.2052	1.2021
18	30.9858	31.5409	12.7610	7.9717	3.0251	4.5237	3.3148	0.7328	7.8385	1.2089

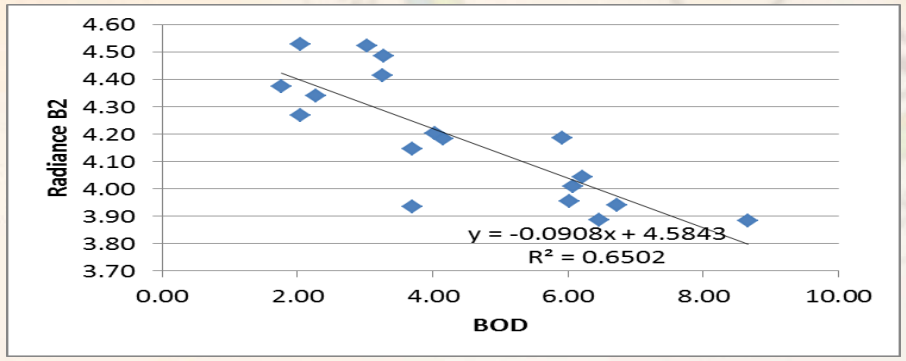
Parameters	TN	TP	BOD	B2	B3	B3/B2	B2+B3	B2-B3
TN	1.0000							
TP	0.9094	1.0000						
BOD	0.9594	0.9605	1.0000					
B2	-0.9029	-0.7477	-0.8063	1.0000				
B3	-0.8841	-0.7982	-0.8647	0.9414	1.0000			
B3/B2	-0.8146	-0.7860	-0.8460	0.8453	0.9755	1.0000		
B2+B3	-0.9032	-0.7907	-0.8552	0.9760	0.9923	0.9411	1.0000	
B2-B3	0.7373	0.7422	0.8082	-0.7416	-0.9244	-0.9845	-0.8700	1.0000

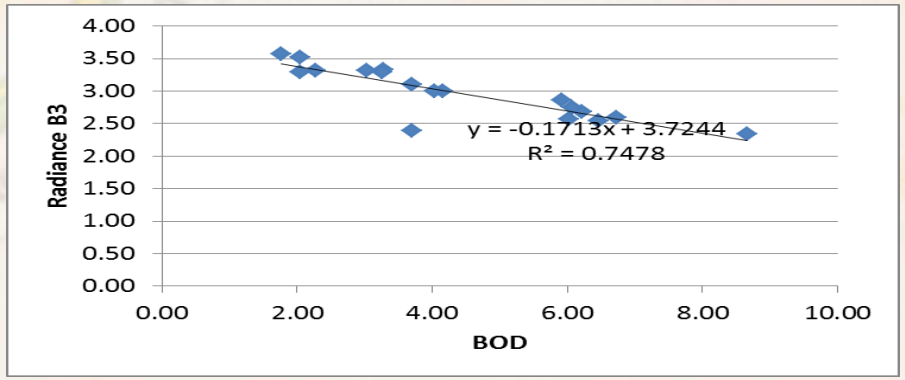

Radiance B2
TN
y = -0.046x + 5.0292
R² = 0.8152


Radiance B3
TN
y = -0.0793x + 4.4249
R² = 0.7816


Radiance B2
TP
y = -0.0132x + 4.4026
R² = 0.5591


Radiance B3
TP
y = -0.0248x + 3.3799
R² = 0.6372


Radiance B2
BOD
y = -0.0908x + 4.5843
R² = 0.6502

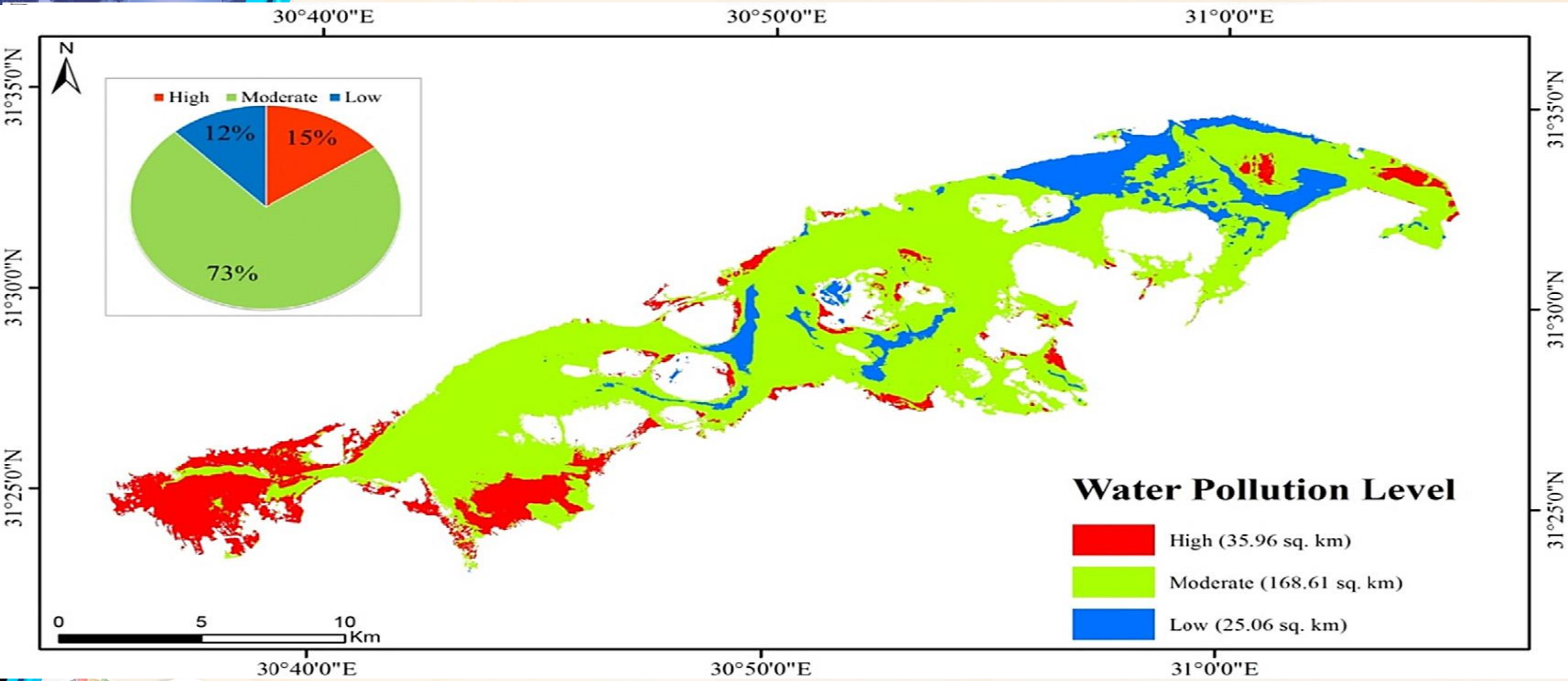

Radiance B3
BOD
y = -0.1713x + 3.7244
R² = 0.7478

Empirical Models for Water Quality Parameters using Landsat Radiance Data

$$TP(mg/l) = e^{(-0.4081 - 8.659 * Ln(B3/B2))}$$

$$TN(mg/l) = e^{(8.228 - 2.713 * Ln(B2+B3))}$$

$$BOD(mg/l) = e^{(4.2380 + 2.2546 * Ln((B2-B3)/B2))}$$


30°40'0"E
30°50'0"E
31°0'0"E
31°35'0"N
31°30'0"N
31°25'0"N
N
High
Moderate
Low
12%
15%
73%
0
5
10
Km
Water Pollution Level
High (35.96 sq. km)
Moderate (168.61 sq. km)
Low (25.06 sq. km)

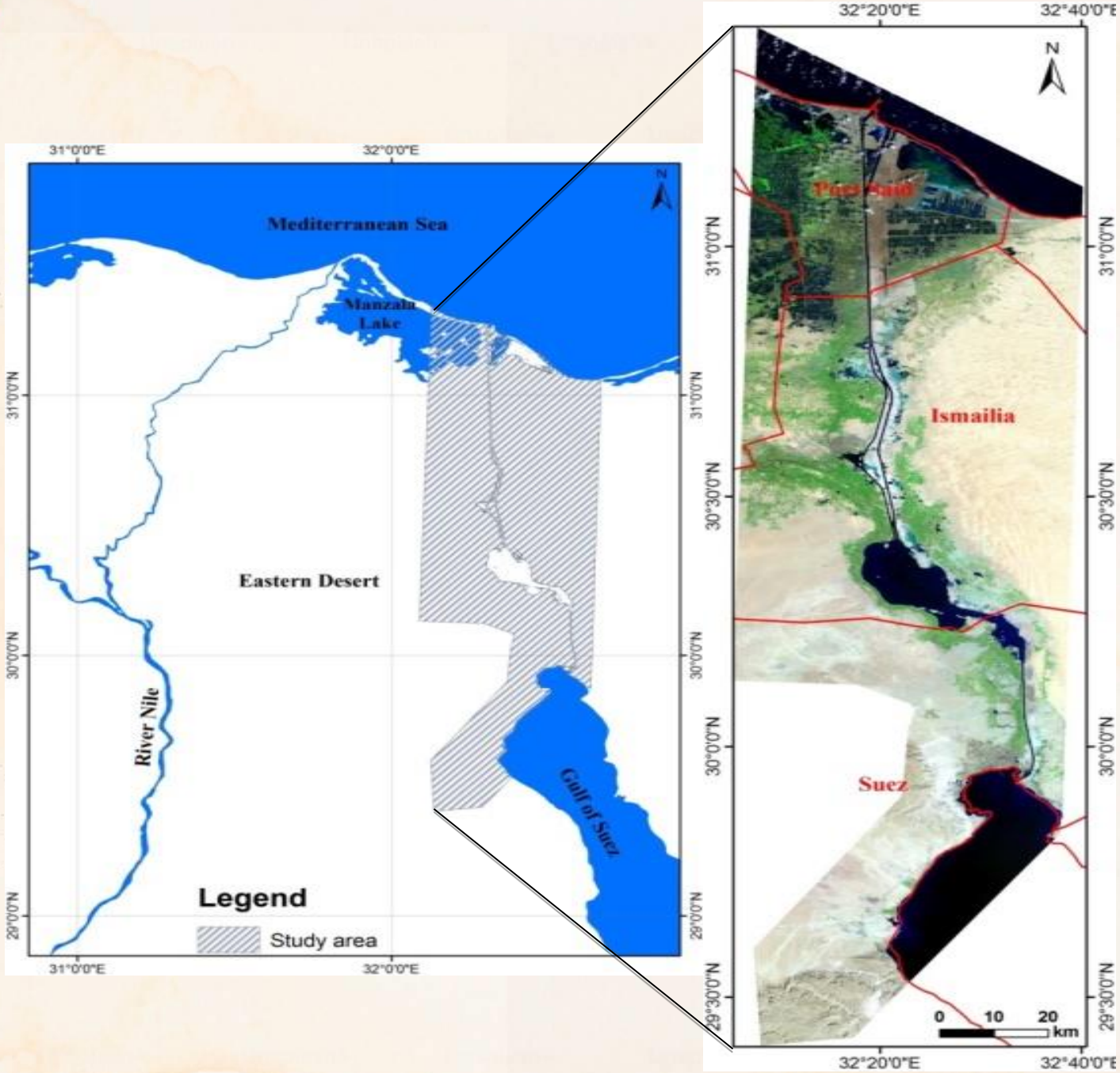
Presentation Outline

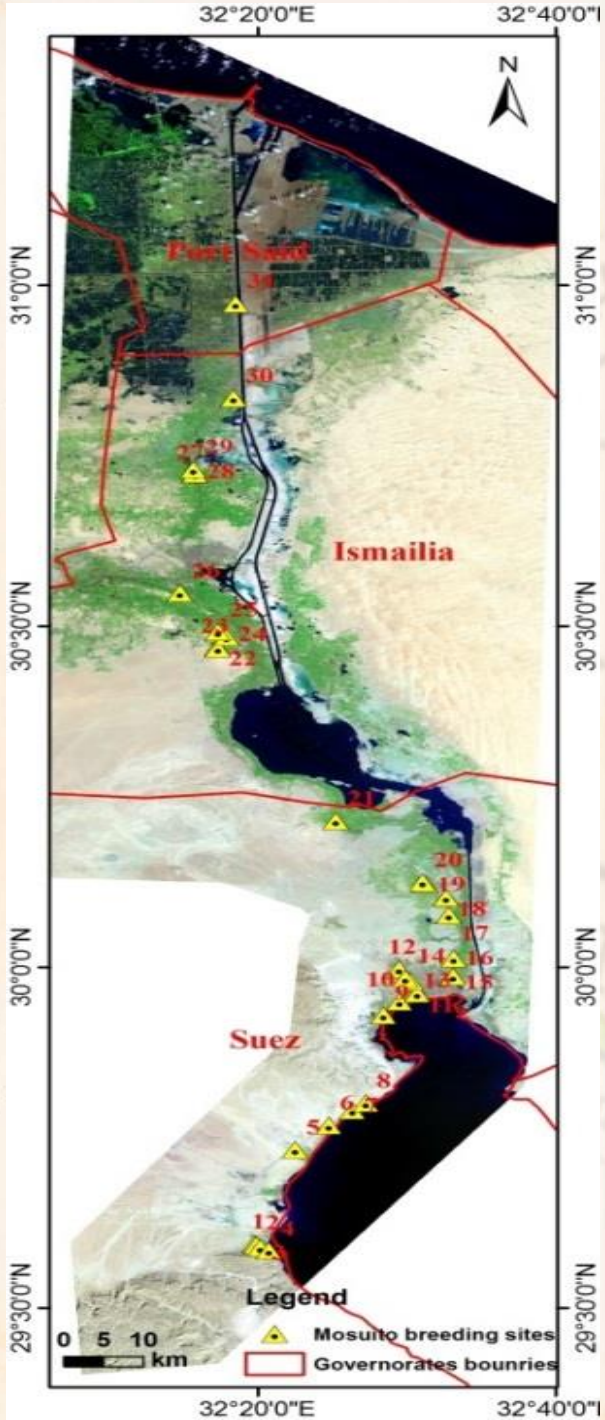
- Introduction to Environmental Remote Sensing
- Potential of RS and GIS in Management of Natural Protectorates
  - Monitoring Spatiotemporal Environmental Changes
  - Mapping Environmental Quality Characteristics
  - Modeling Environmental Quality Characteristics
- Diseases Transmission and the Associated Risk
  - **Mosquito-transmitted-diseases**
  - Non-Communicable Diseases (NCDs)
- Conclusion

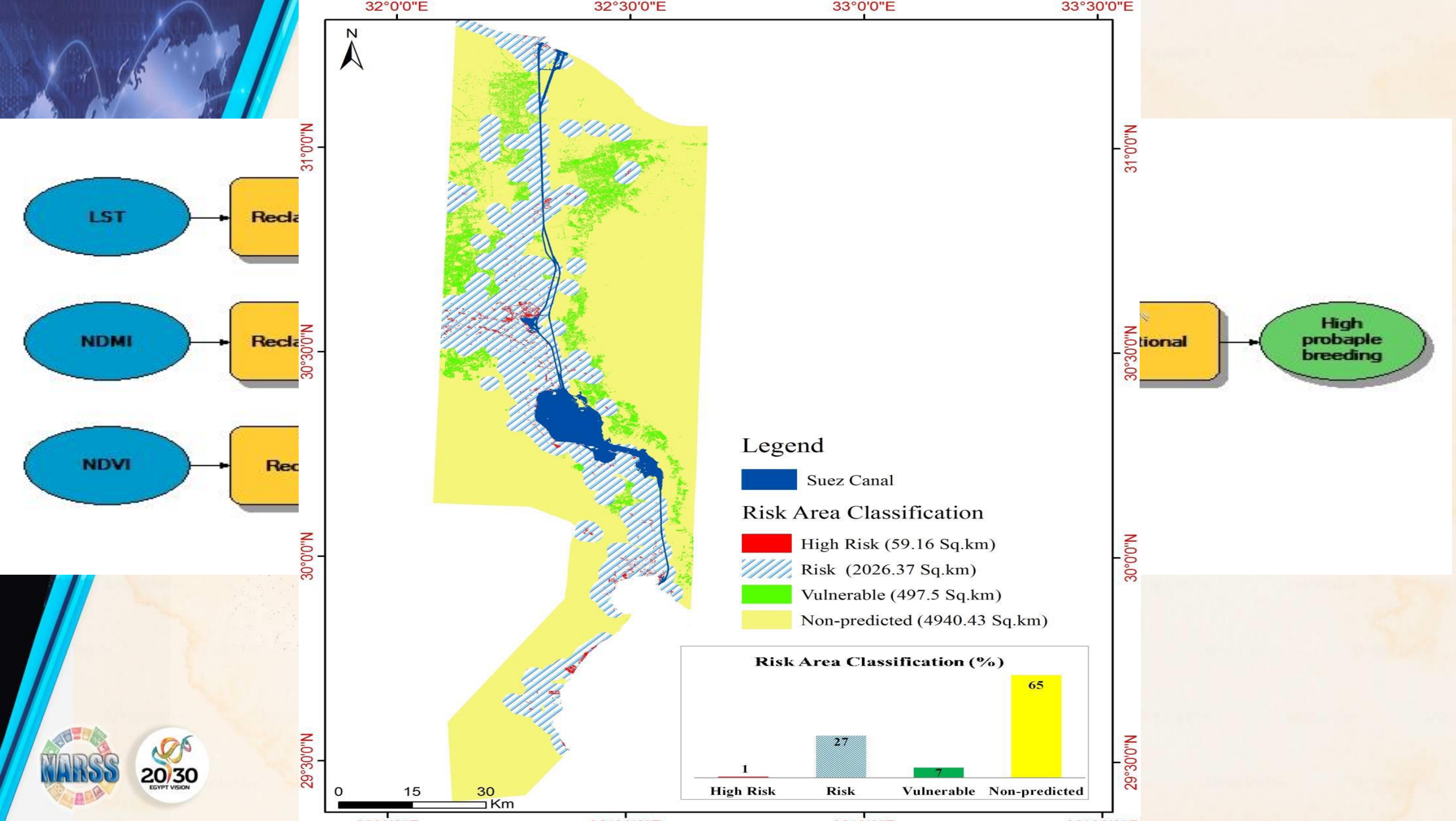
Environmental Modeling of Areas Vulnerable to Mosquito-Transmitted-Diseases

Principle

- Identify mosquito localities (X,Y)
- Identify environmental characteristics associated with these areas (NDVI, NDMI, LST)
- Reclassify raster images based on the corresponding values of NDVI, NDMI and LST
- Generate a simple GIS model to identify areas vulnerable to mosquito proliferation and diseases transmission
- Model validation


31°0'0"E
32°0'0"E
N
Mediterranean Sea
Manzala Lake
Eastern Desert
River Nile
Gulf of Suez
Legend
Study area
29°0'0"N
30°0'0"N
31°0'0"N
32°20'0"E
32°40'0"E
29°30'0"N
30°30'0"N
Port Said
Ismailia
Suez
0 10 20
km


32°20'0"E
32°40'0"E
N
31°0'0"N
30°30'0"N
30°0'0"N
29°30'0"N
Port Said
Ismailia
Suez
Legend
Mosuito breeding sites
Governorates bounries
0 5 10
km


LST
NDMI
NDVI
tional
High probaple breeding
32°0'0"E
32°30'0"E
33°0'0"E
33°30'0"E
31°0'0"N
30°30'0"N
30°0'0"N
29°30'0"N
N
0
15
30
Km
Legend
Suez Canal
Risk Area Classification
High Risk (59.16 Sq.km)
Risk (2026.37 Sq.km)
Vulnerable (497.5 Sq.km)
Non-predicted (4940.43 Sq.km)
Risk Area Classification (%)
1
27
7
65
High Risk
Risk
Vulnerable
Non-predicted

Presentation Outline

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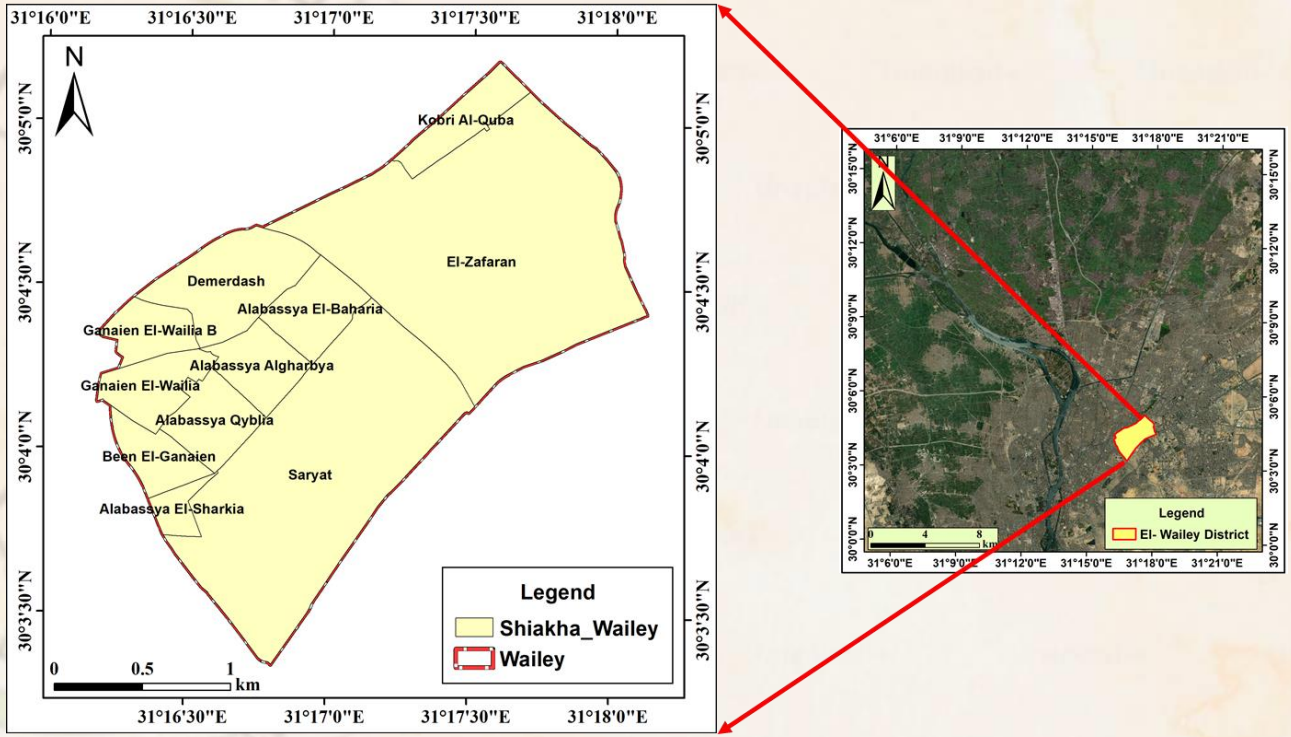
  - Mosquito-transmitted-diseases
  - **Non-Communicable Diseases (NCDs)**
- Conclusion

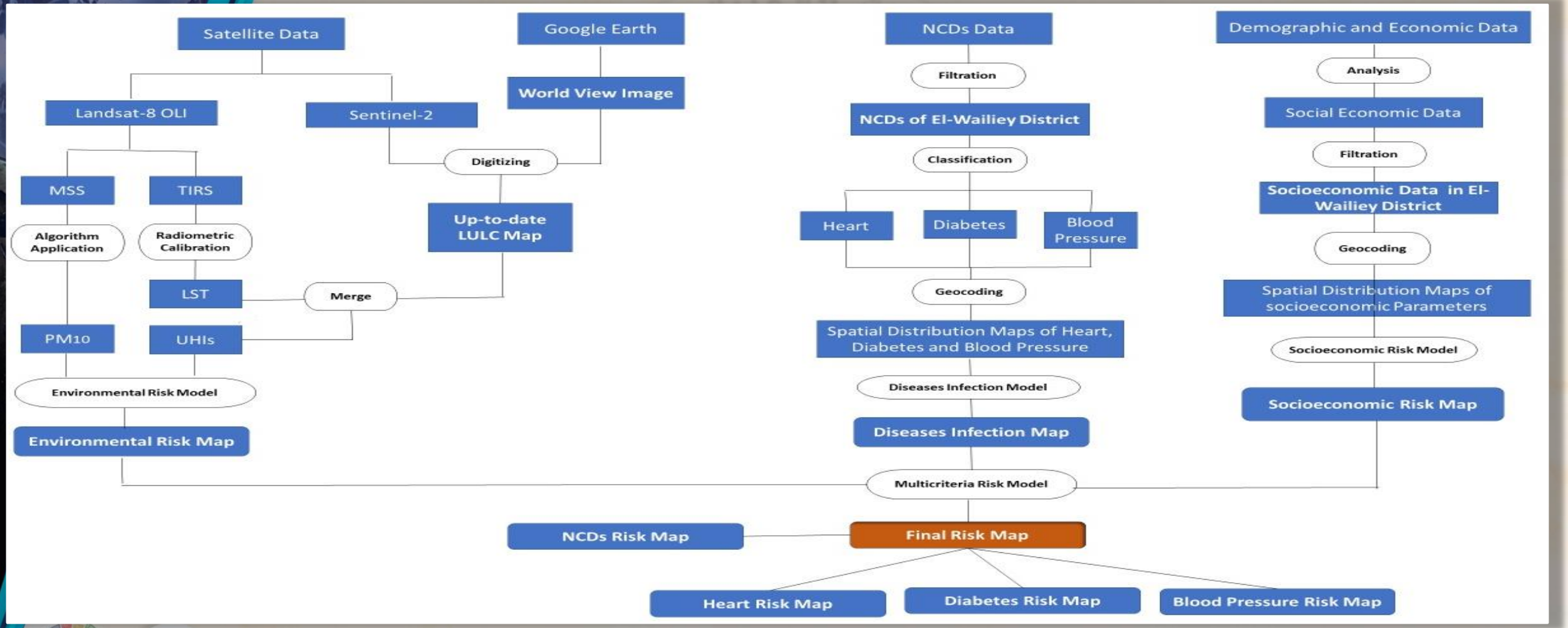
NCDs Risk Analyses

Principle

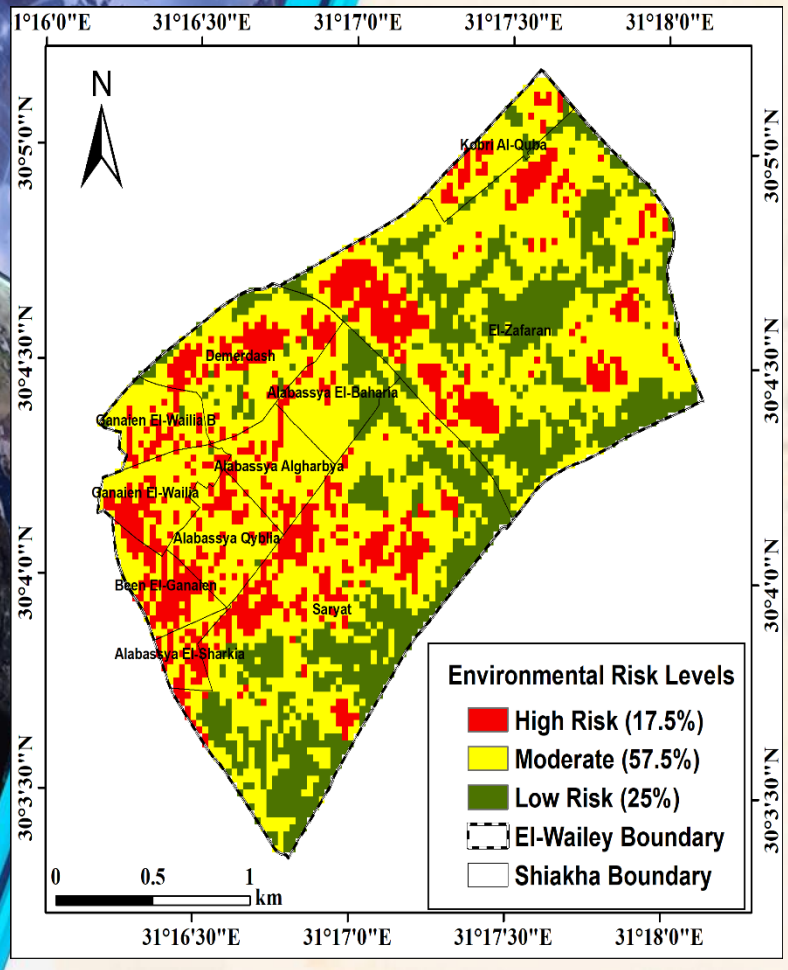
- ✓ Site selection of the most impacted areas by creating a risk map for NCDs in Wailey Area on a local scale by using GIS and remote sensing techniques.
- ✓ Design a website to provide information about the project, display results and to make it easier to understand the importance of the project.

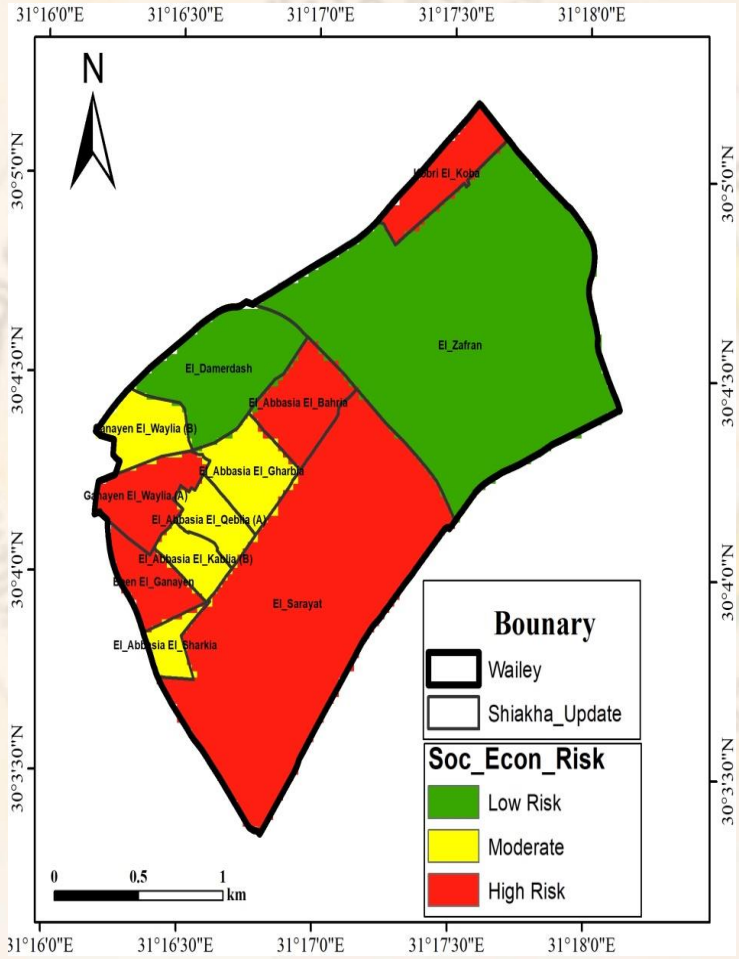


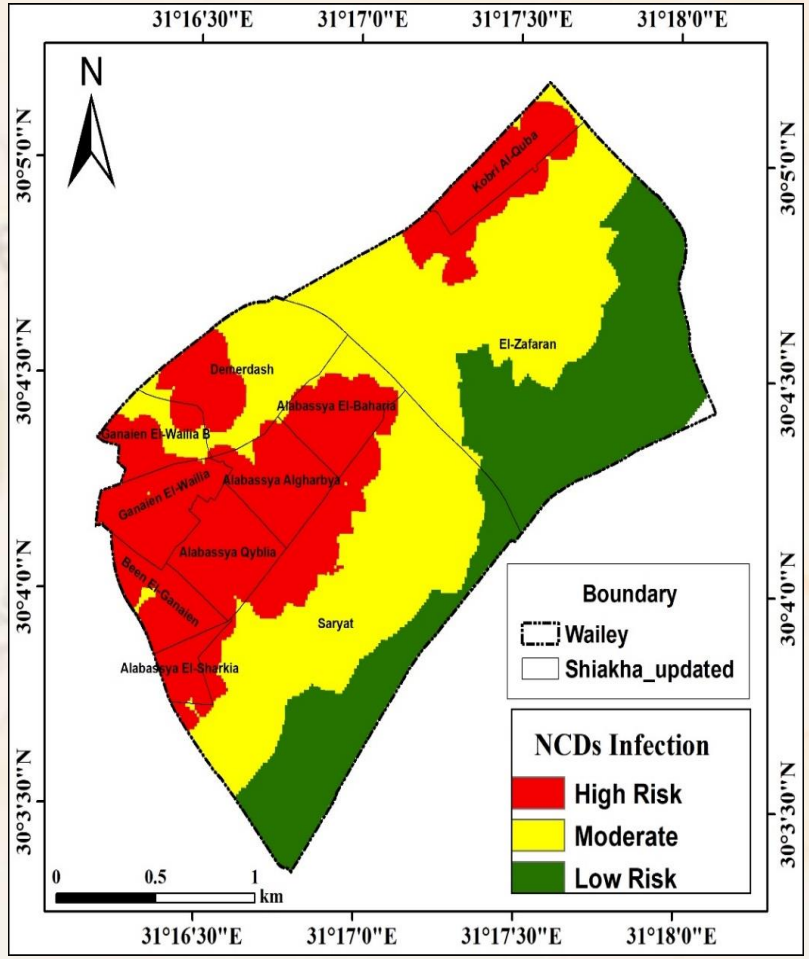
NCDs Risk Methodology Flow Chart



Risk Maps

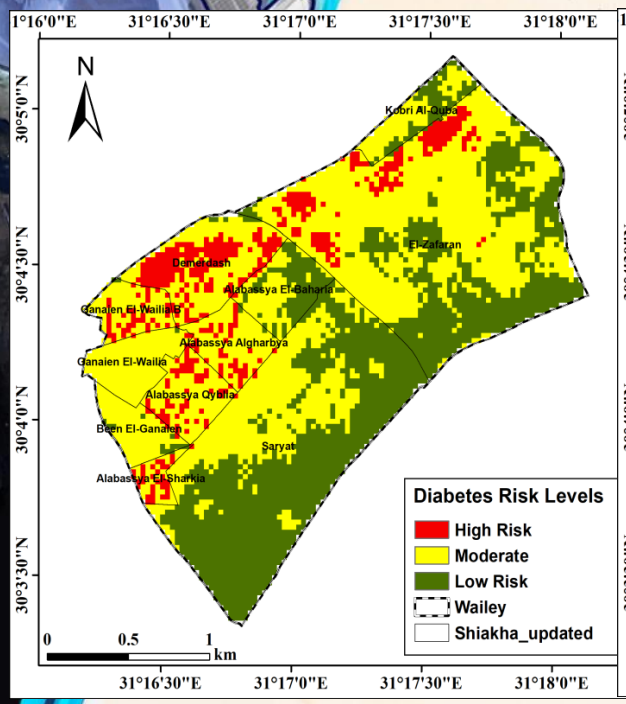

N
Kobri Al-Quba
El-Zafaran
Demerdash
Alabassya El-Baharia
Ganaien El-Wailia B
Alabassya Algharbya
Ganaien El-Wailia
Alabassya Qyblia
Been El-Ganaien
Saryat
Alabassya El-Sharkia
Environmental Risk Levels
High Risk (17.5%)
Moderate (57.5%)
Low Risk (25%)
El-Wailey Boundary
Shiakha Boundary
0 0.5 1 km
31°16'0"E
31°16'30"E
31°17'0"E
31°17'30"E
31°18'0"E
30°5'0"N
30°4'30"N
30°4'0"N
30°3'30"N


N
El_Damerdash
El_Zafran
El_Abbasia El_Bahria
El_Abbasia El_Gharbia
El_Abbasia El_Qebria (A)
El_Abbasia El_Kablia (B)
El_Sarayat
El_Abbasia El_Sharkia
Bounary
Wailey
Shiakha_Update
Soc_Econ_Risk
Low Risk
Moderate
High Risk
0 0.5 1 km
31°16'0"E
31°16'30"E
31°17'0"E
31°17'30"E
31°18'0"E
30°5'0"N
30°4'30"N
30°4'0"N
30°3'30"N

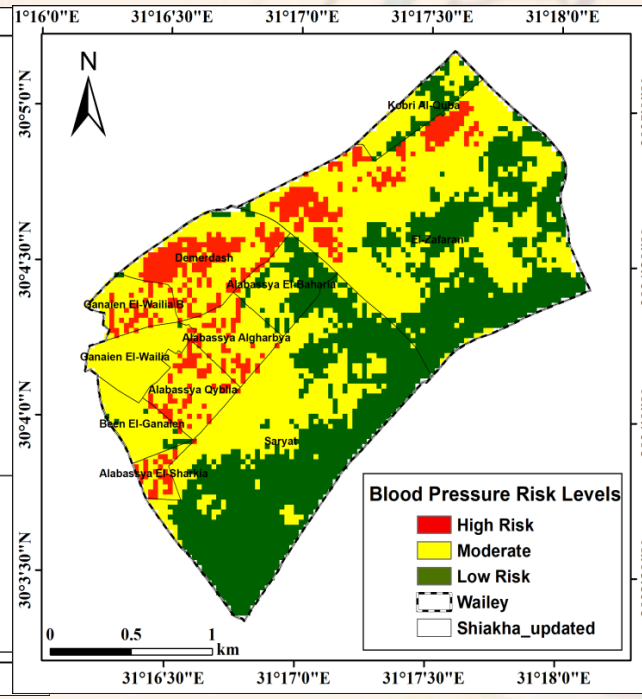

N
Kobri Al-Quba
El-Zafaran
Demerdash
Alabassya El-Baharia
Ganaien El-Walia B
Ganaien El-Wailia
Alabassya Algharbya
Alabassya Qyblia
Been El-Ganaien
Saryat
Alabassya El-Sharkia
Boundary
Wailey
Shiakha_updated
NCDs Infection
High Risk
Moderate
Low Risk
0 0.5 1 km
31°16'30"E
31°17'0"E
31°17'30"E
31°18'0"E
30°5'0"N
30°4'30"N
30°4'0"N
30°3'30"N

Health Risk of NCDs

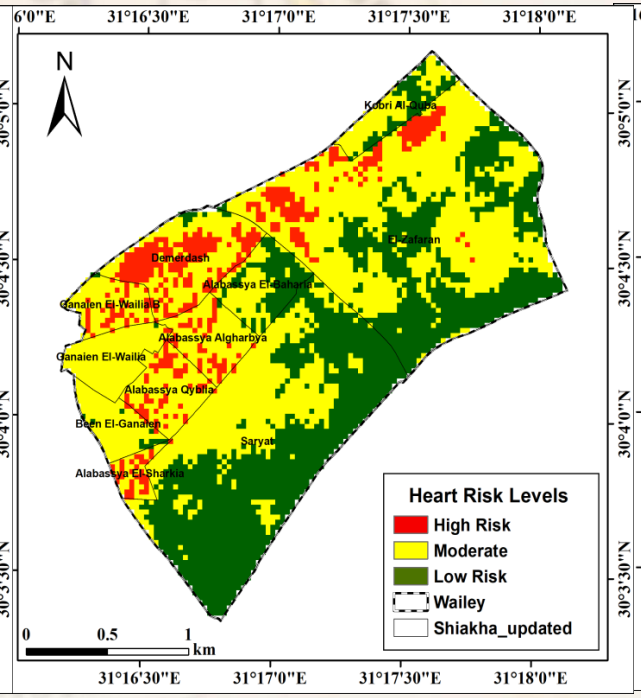
Diabetes Scenario



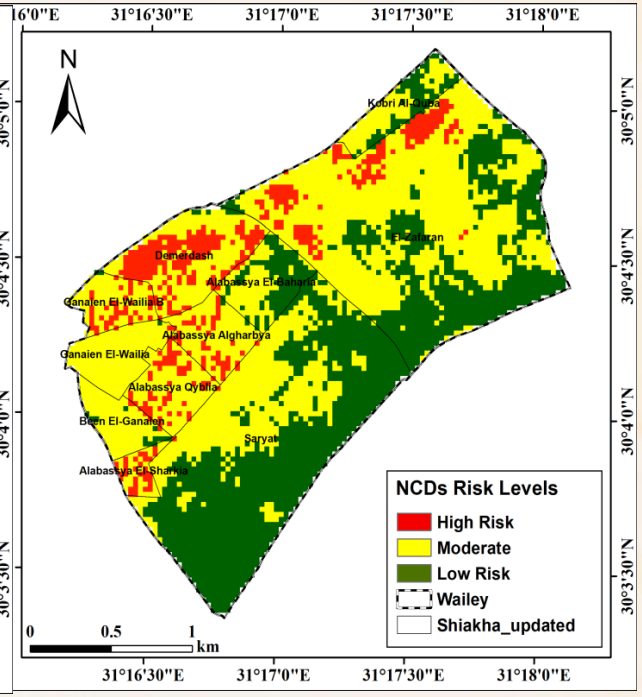
Blood Pressure Scenario



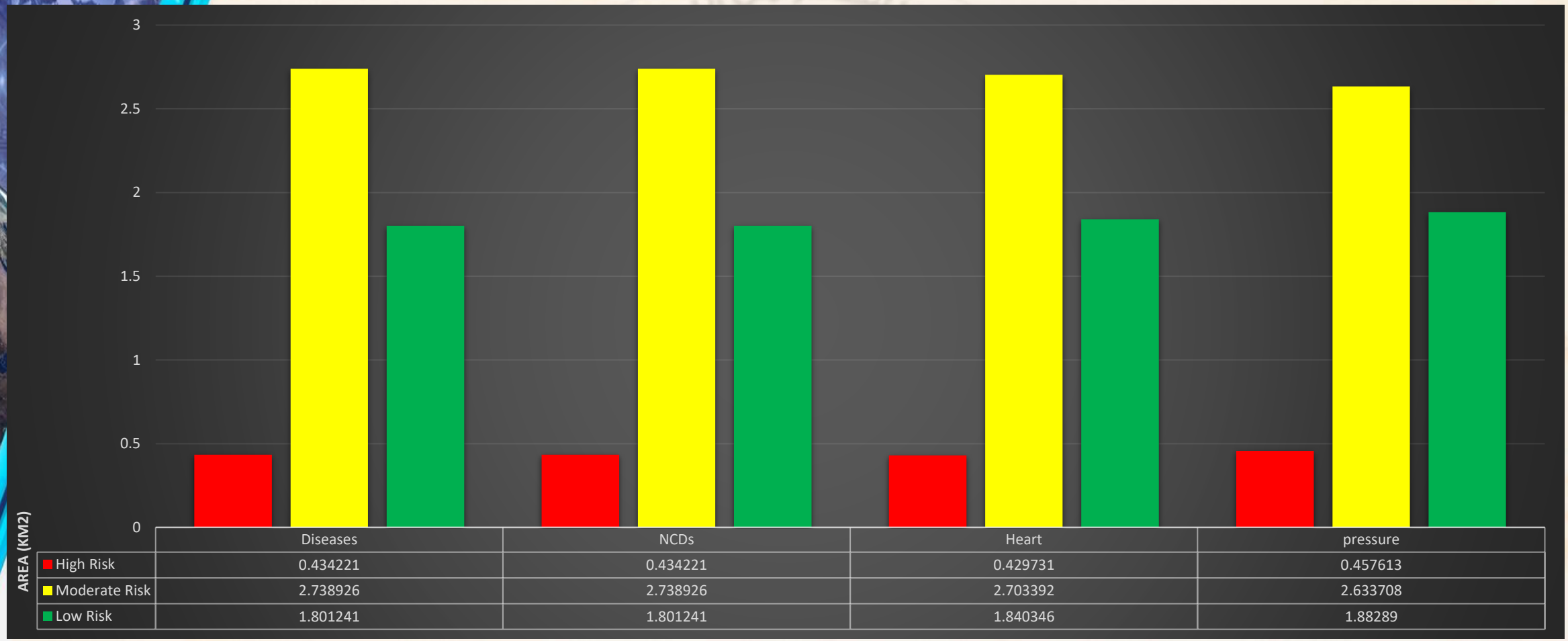
Heart Scenario



NCDs Scenario

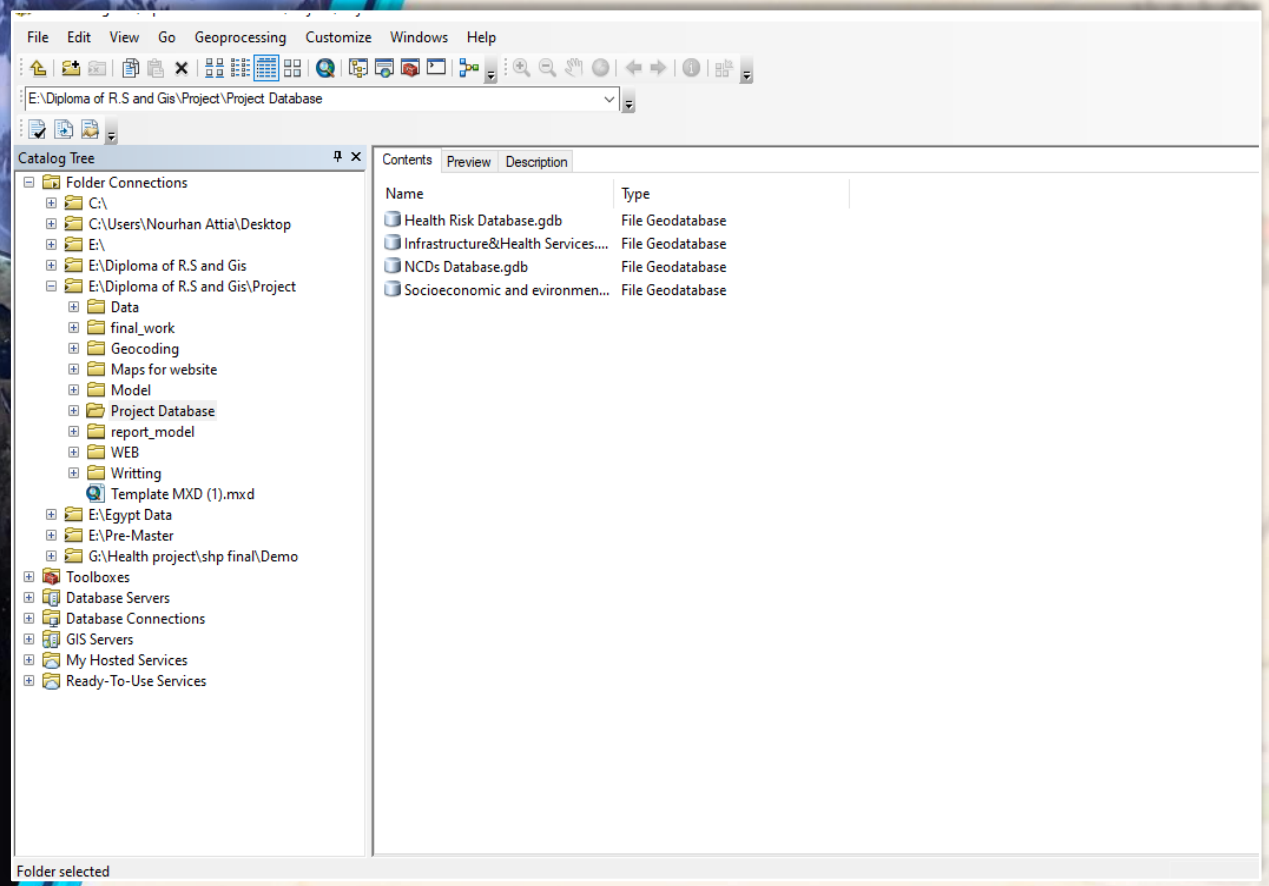


Areas of Different Health Risk Scenarios

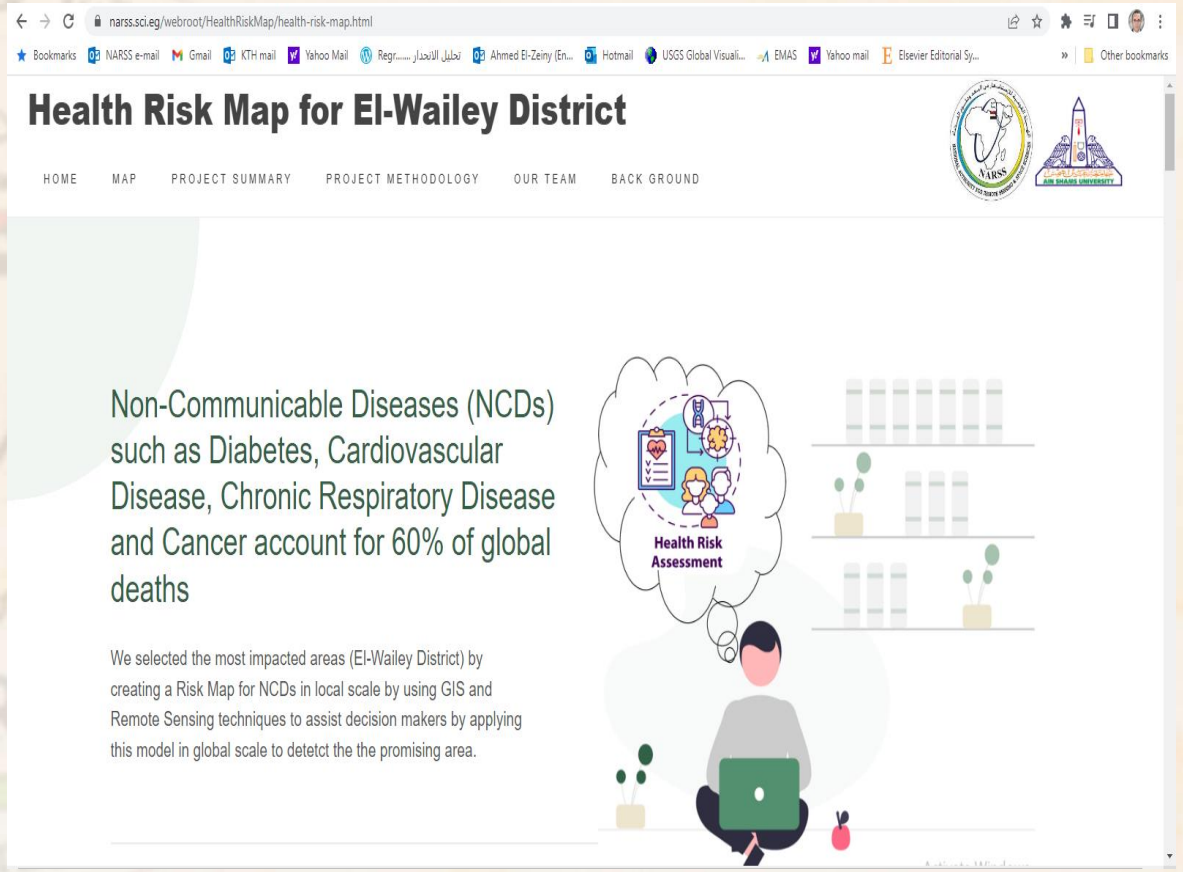


	Diseases	NCDs	Heart	pressure
High Risk	0.434221	0.434221	0.429731	0.457613
Moderate Risk	2.738926	2.738926	2.703392	2.633708
Low Risk	1.801241	1.801241	1.840346	1.88289

Project Deliverable



Health Supportive Geodatabase



Health project website

بناء قواعد بيانات معلوماتية

بناء قاعدة بيانات معلوماتية تحوى كل المعلومات البيئية المتعلقة بالمنطقة

تتألف البيانات من العناصر التالية:

الإحداثيات (Coordinates):

وهي محددات الموقع المكاني للسمات على الأرض، خطي طول وعرض، إحداثيات (x,y,z).

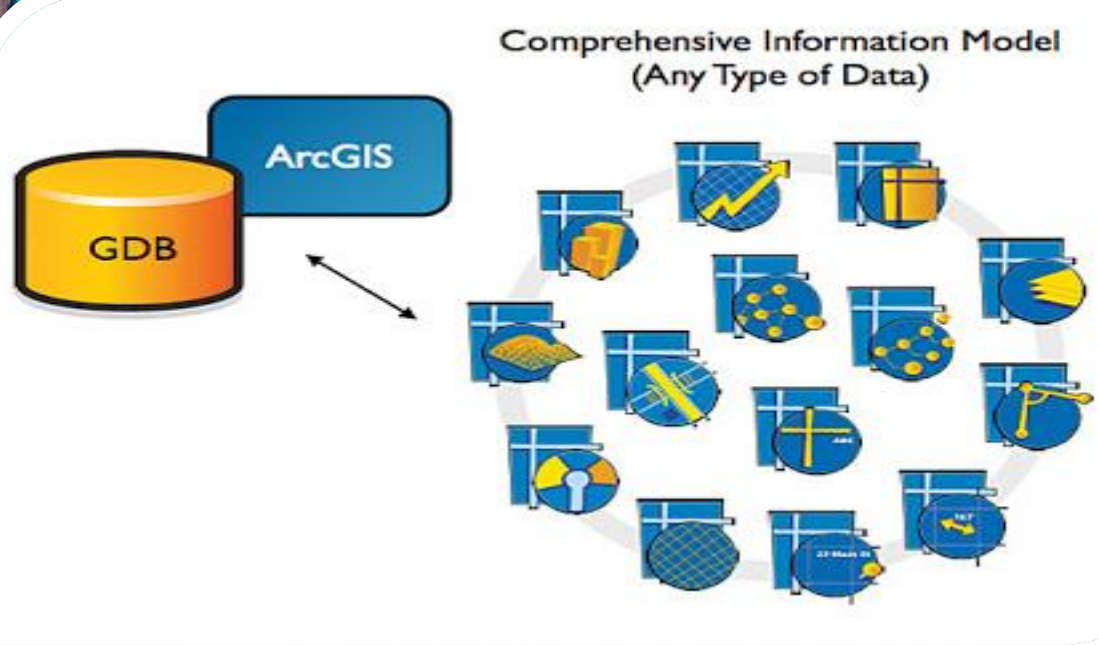
البيانات الوصفية (Attributes):

هي تشمل بيانات و جداول و إحصاءات مختلفة يمكن تمثيلها بالطبيعة .

البيانات المكانية (Spatial Data):و تشمل البيانات الجغرافية و يمكن تجميعها من الصور الجوية و الأقمار الصناعية و الخرائط الرقمية .

نماذج البيانات :

تخزن نظم المعلومات الجغرافية البيانات المكانية على شكل Vector و Raster



Conclusion

- RS and GIS play an important role in monitoring environmental changes in LULC, LST & Shoreline which help to assess the areas under future risk of climatic changes.
- Temperature, as one of the environmental factors affecting mosquito breeding and NCDs distribution, is greatly impacted by climate changes and LU types which can successfully be monitored and assessed with the help of remote sensing in a GIS environment.
- Investigating the environmental quality of air, soil, and water is facilitated with the help of numerical modelling and remote sensing which is essential to guarantee the sustainability of the available resources.

End of presentation

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National Authority for Remote Sensing and Space Sciences (NARSS)

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Cell Phone: *01007737052*