



Analysis of Urban Sprawl Impacts on Surface Temperature Using Landsat Imageries: Case Study of South Marmara

Res.Ass. Melis INALPULAT

Prof. Dr. Levent GENC

**Canakkale Onsekiz Mart University
College of Architecture and Design
Land Use and Climate Change Laboratory
17020, Canakkale, TURKEY**

OBJECTIVE

- ✓ ..is to investigate LULC changes due to the urban sprawl between 1984 & 2014 and its relations with LST in South Marmara Watershed, Turkey.

The area was chosen due to its key role in agricultural production. A great deal of agricultural products are exported to meet the demands of cosmopolitan cities such as Istanbul and Bursa.

The importance of area is expected to increase due to the highway and bridge projects that will dramatically effect transportation within the region while effects of urbanization would be more severe..



STUDY AREA

- ✓ South Marmara Watershed located at South West part of Marmara Sea, Turkey.
- ✓ Covers over 600 thousand ha including :



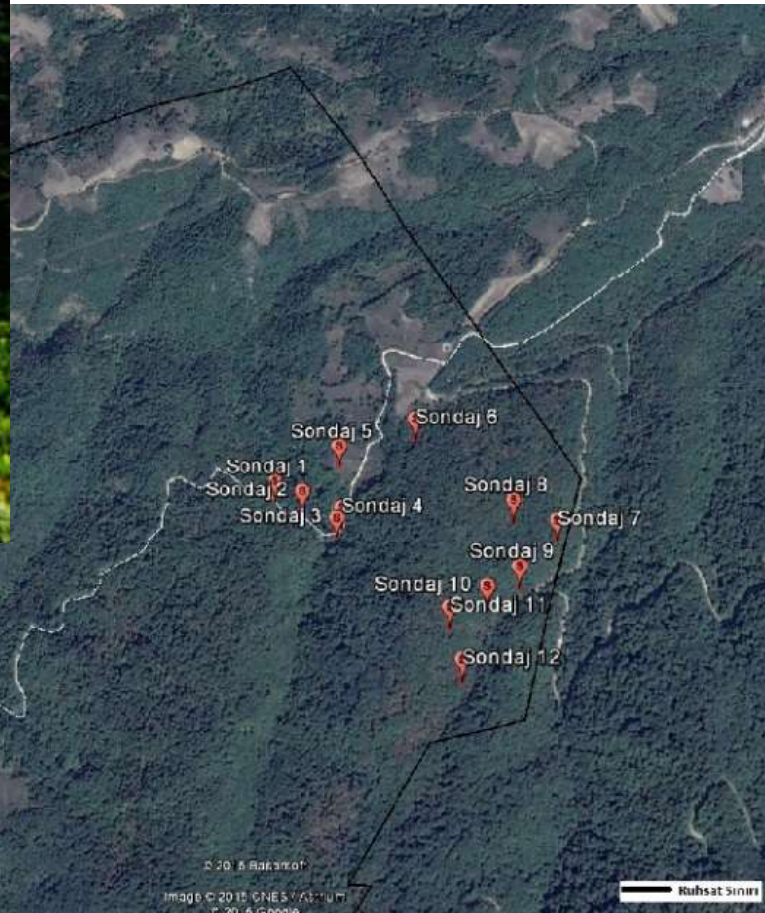
- 5 districts of Çanakkale province
 - Çanakkale Provincial Center,
 - Biga,
 - Can,
 - Lapseki,
 - Yenice
- 1 district of Balıkesir province
 - Gonen



Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat

Main LULC Types

FOREST



Canakkaleruhu.org

Yeniceormansondaj.com

© 2015 Baktinof
Image © 2015 GNE S Y Kartum
© 2015 Google

Ruhbat siniri

Main LULC Types

**GRAZING
LAND**



OTHER



Main LULC Types

AGRICULTURAL LAND



Main LULC Types



Canakkaleili.com

**WATER
SURFACES**



Biga Kaynarca Göleti İnşaatı

Dsi.gov.tr

Main LULC Types



Wikipedia.com

**RESIDENTIAL
AREA
BARE SOIL**



Canakkaetravel.com



Bayramicbel.tr

DATA

✓ Landsat data (USGS) : 21.07.1984 (TM), 21.05.2014 (OLI-TIRS)

7am to 16 pm average Air Temperature : 27 C, 26 C

from local meteorological station

✓ Projection, Path/Row : UTM, 181/32

✓ Number of Bands : 7 (TM), 11 (OLI)

✓ Used Bands : Visible (3), NIR (1), Mid-IR (2)

✓ Supervised Classification Maximum Likelihood Alg.

(Erdas Imagine 2011)

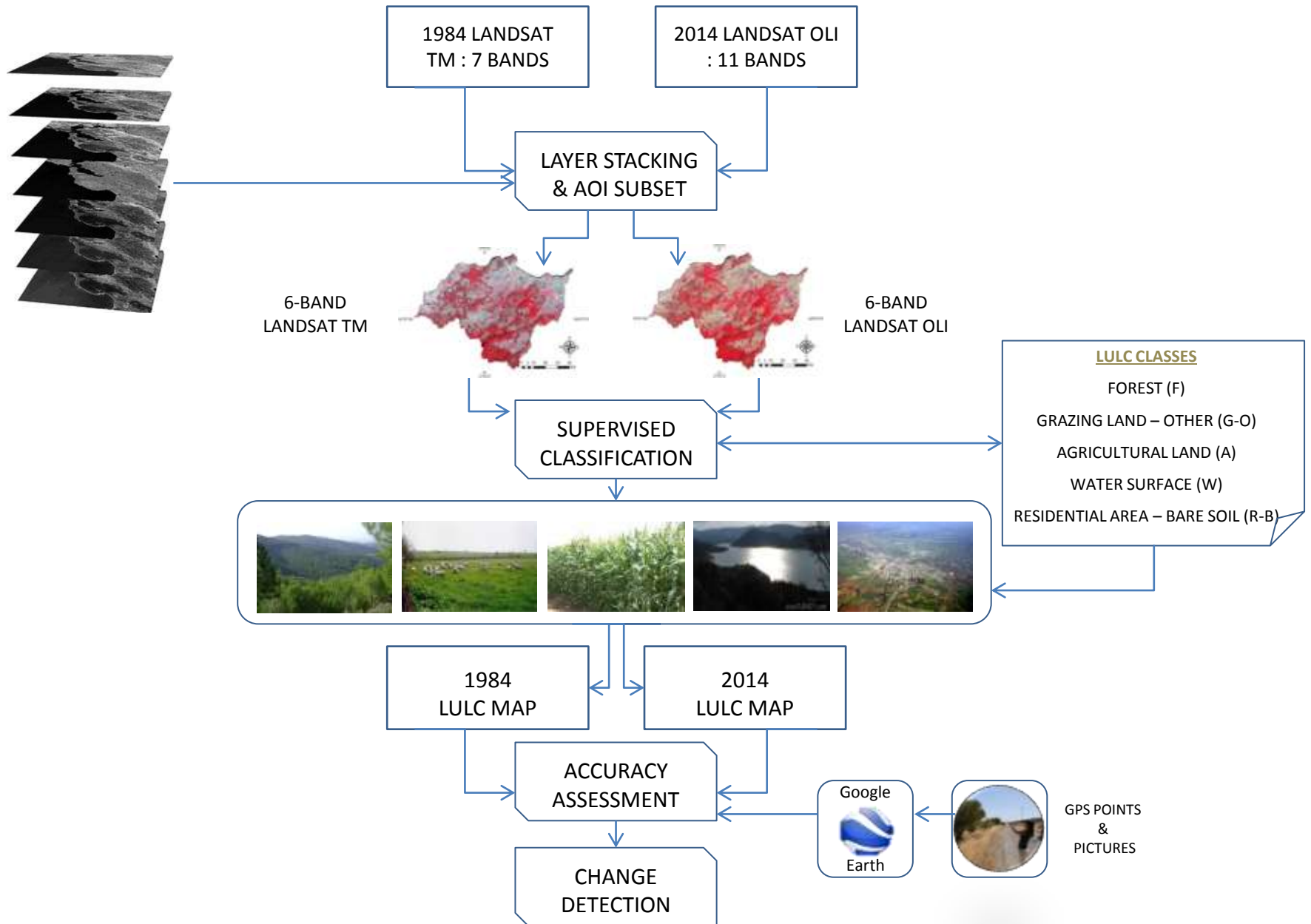
✓ Used Bands : TM (B_6), OLI-TIRS (B_{10} & B_{11})

✓ LST Retrieval Algorithms

- LST for each pixel was computed from thermal bands (Erdas Imagine 2011),
- Zonal statistics and changes between 1984-2014 of LST for each LULC classes were calculated (ArcGIS Software 10.3)



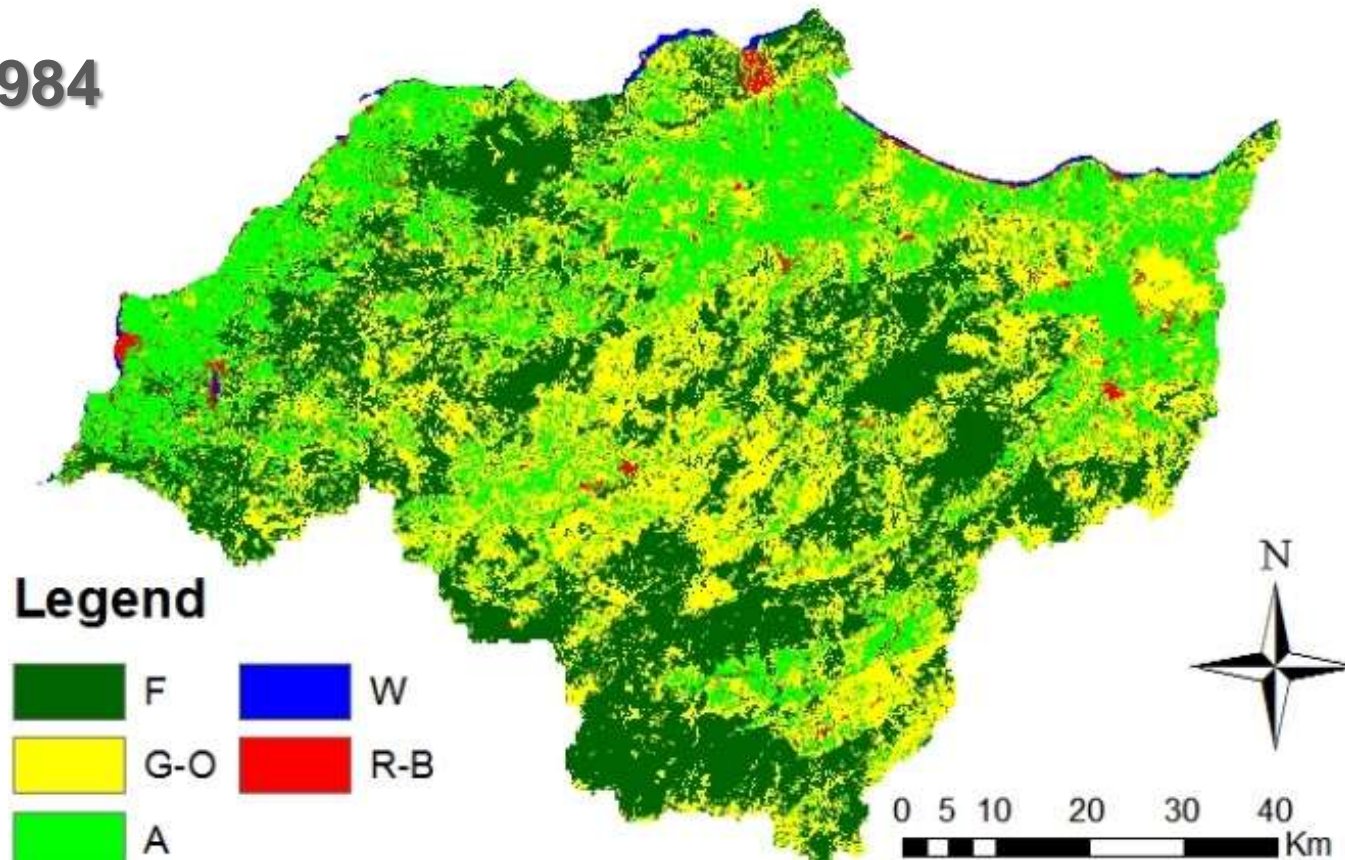
LULC CHANGES



Results

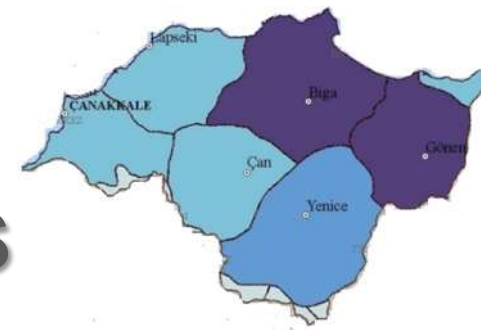
1984 LULC STATUS OF SOUTH MARMARA

1984

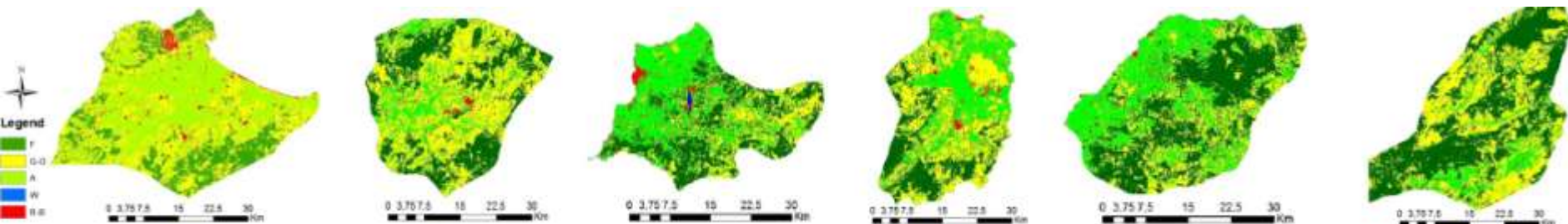


OA: 81%

1984 LULC Status of Districts

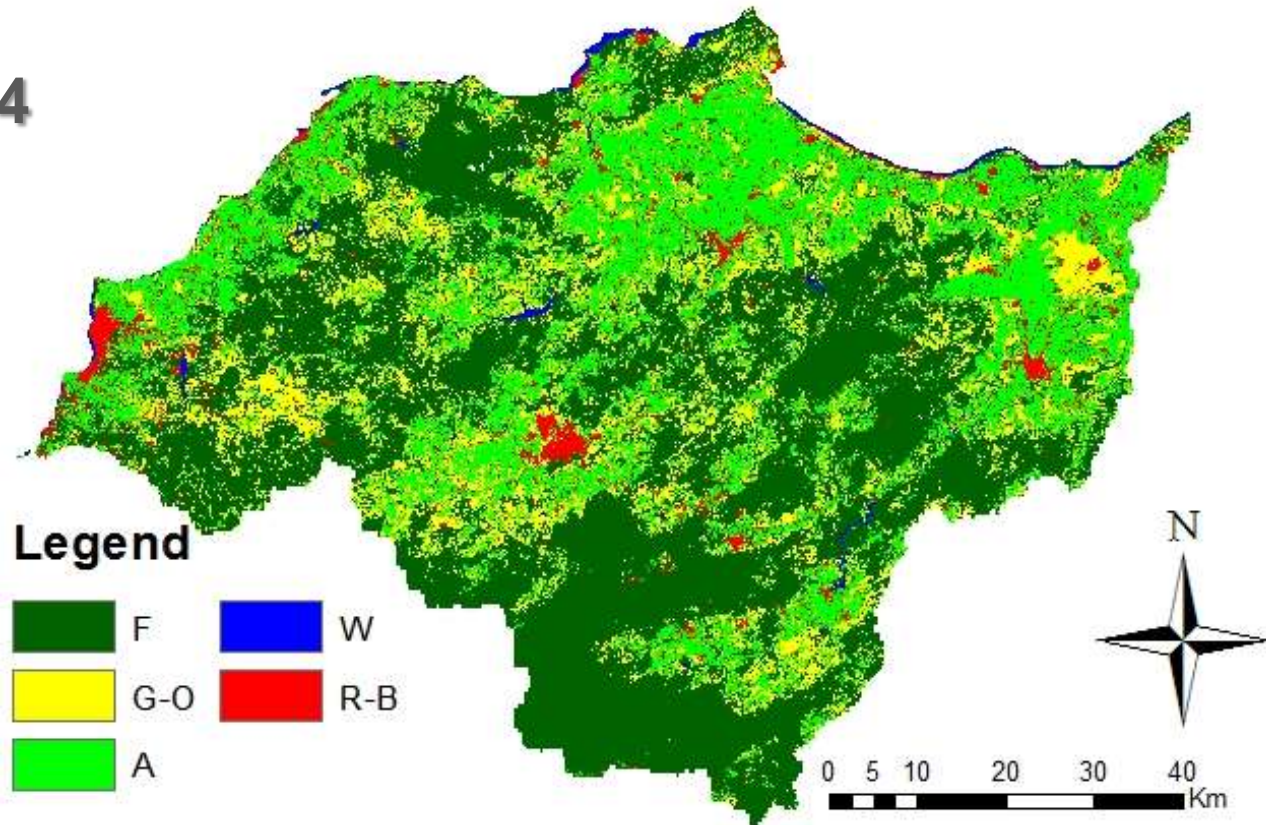


District / Class	F			G-O			A			W			R-B		
	ha	%	% OF TOTAL	ha	%	% OF TOTAL	ha	%	% OF TOTAL	ha	%	% OF TOTAL	ha	%	% OF TOTAL
Biga	33972	25,0	15,8	47886	35,1	21,6	51065	37,5	31,4	49	0,1	18,5	3187	2,3	26,8
Can	31803	36,0	14,8	43405	49,0	19,5	12327	13,9	7,6	4	0,1	1,5	882	1,0	7,4
Canakkale	27854	37,2	12,9	18614	24,8	8,4	25773	34,4	15,8	169	0,2	63,5	2527	3,4	21,3
Gonen	30573	28,1	14,2	42804	39,3	19,3	32540	29,9	20,0	0	0,0	0,0	2805	2,6	23,6
Lapseki	31141	38,5	14,4	21508	26,5	9,7	26881	33,2	16,5	40	0,1	15,0	1419	1,8	12,0
Yenice	60254	48,8	27,9	47853	38,7	21,5	14285	11,6	8,8	4	0,1	1,5	1051	0,9	8,9
TOTAL	215597		100	222070		100	162871		100	266		100	11871		100



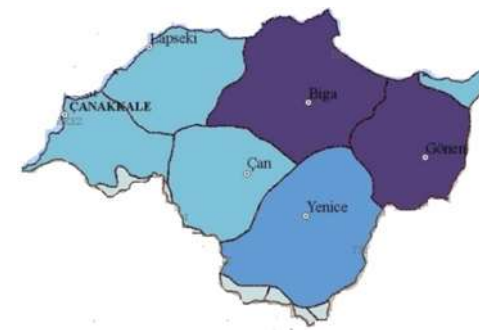
2014 LULC Status of South Marmara

2014

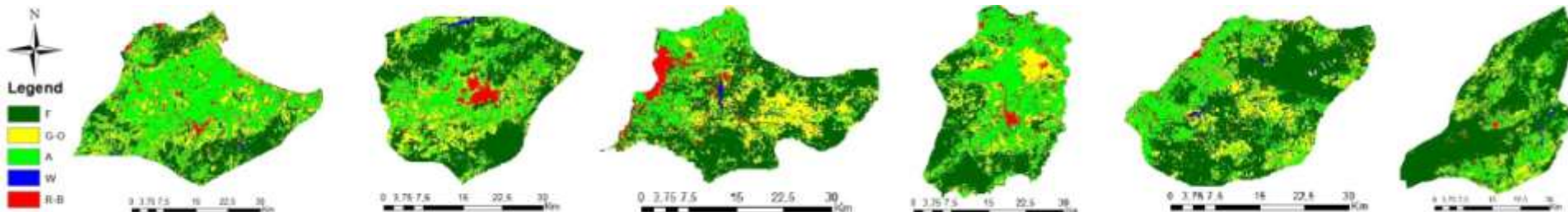


OA:87%

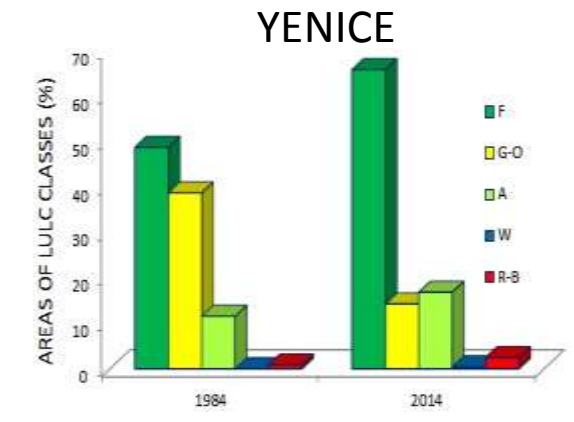
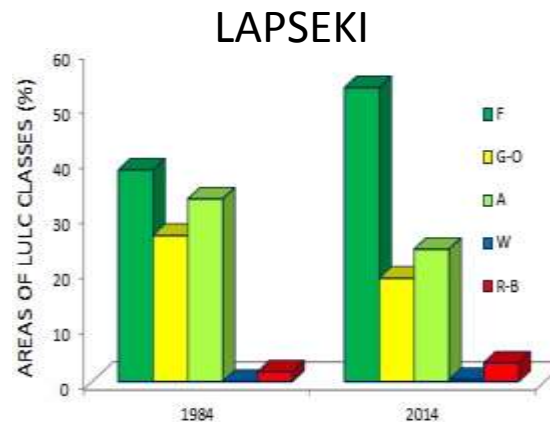
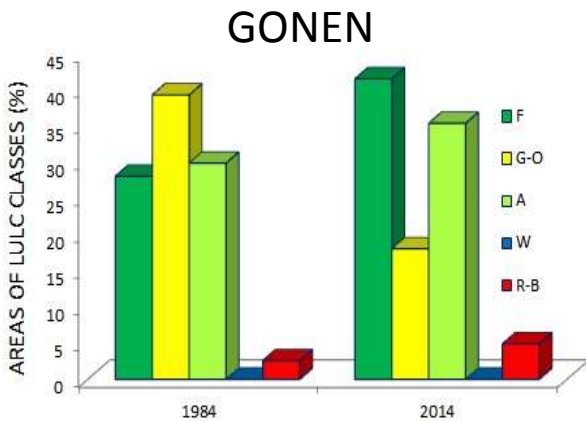
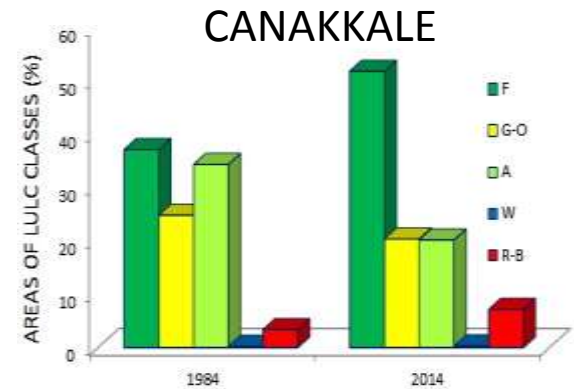
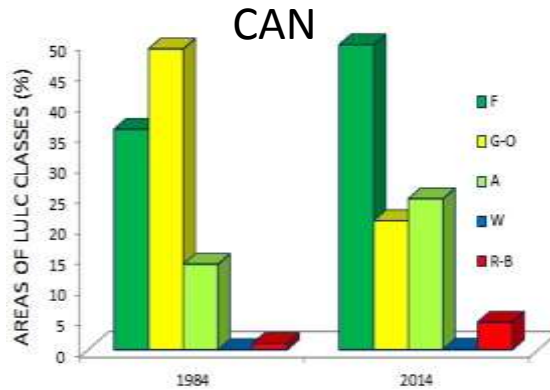
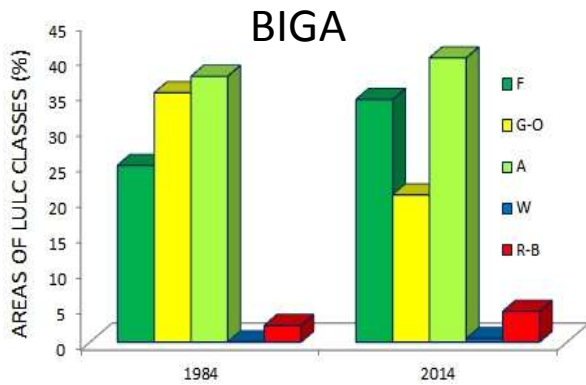
2014 LULC Status of Districts



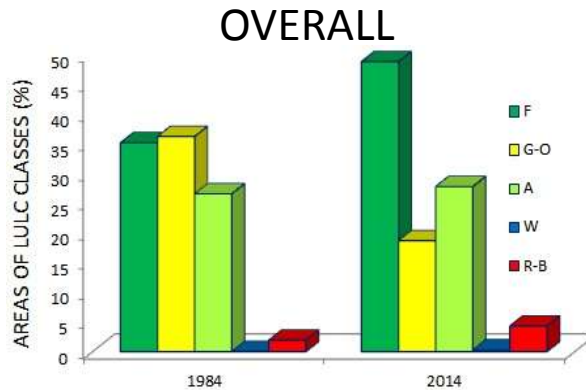
District / Class	F			G-O			A			W			R-B		
	ha	%	% OF TOTAL	ha	%	% OF TOTAL	ha	%	% OF TOTAL	ha	%	% OF TOTAL	ha	%	% OF TOTAL
Biga	46635	34,3	16	28314	20,8	25	54602	40,1	32	697	0,5	38	5910	4,3	22
Can	43996	49,8	15	18605	21,0	16	21781	24,6	13	60	0,1	3	3978	4,5	15
Canakkale	38908	51,9	13	15284	20,4	13	15143	20,2	9	240	0,3	13	5362	7,2	20
Gonen	45230	41,6	15	19638	18,1	17	38522	35,4	23	9	~0	0	5323	4,9	20
Lapseki	43255	53,4	14	15220	18,8	13	19468	24,0	11	300	0,4	16	2747	3,4	10
Yenice	81394	65,9	27	17603	14,3	15	20838	16,9	12	526	0,4	29	3086	2,5	12
TOTAL	299418		100	114665		100	170354		100	1832		100	26406		100



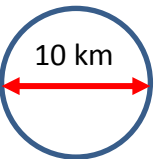
1984 - 2014 LULC Changes



Legend



URBAN SPRAWL



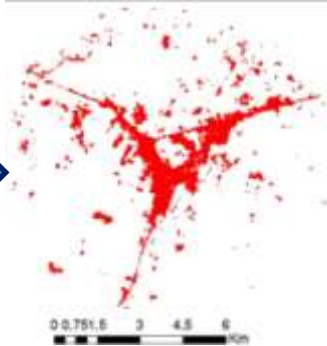
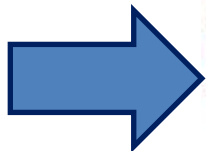
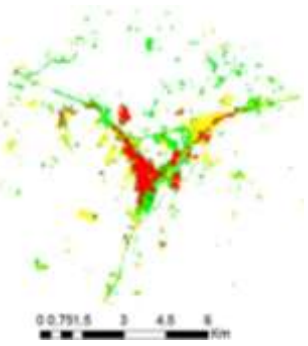
1984

2014

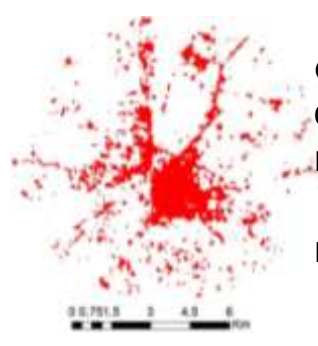
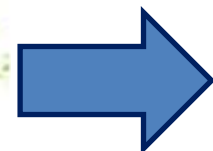
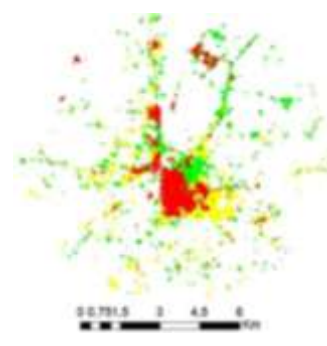
1984

2014

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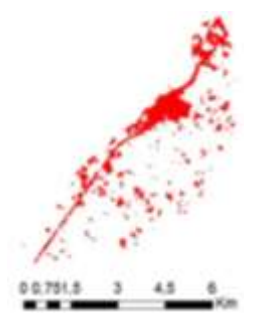
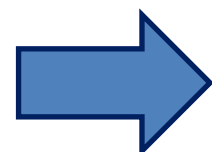
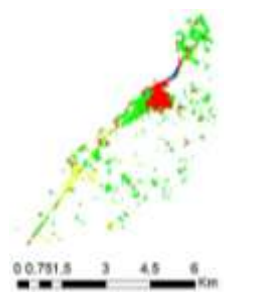
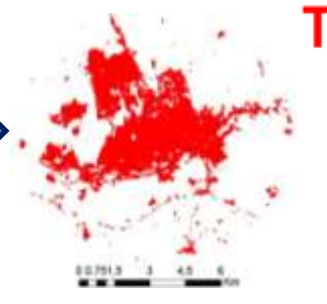
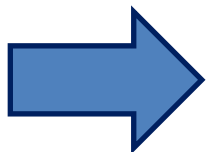
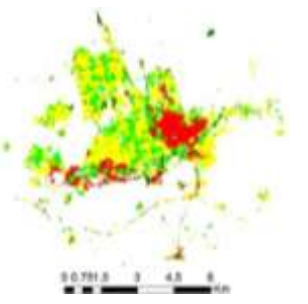


**1984
LULC
TYPES
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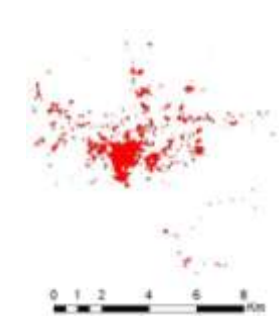
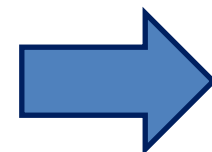
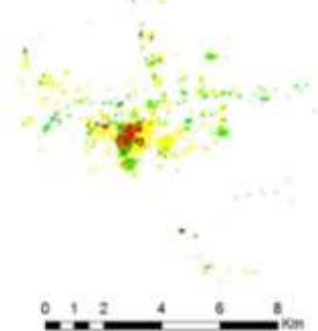
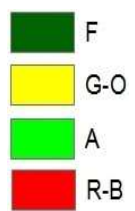
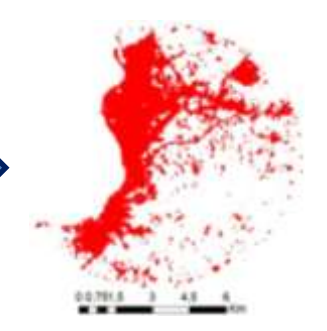
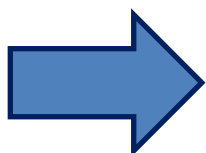
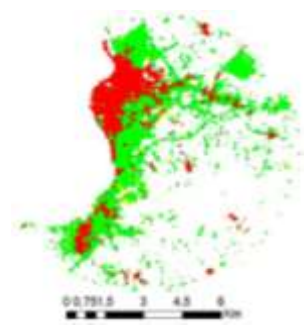
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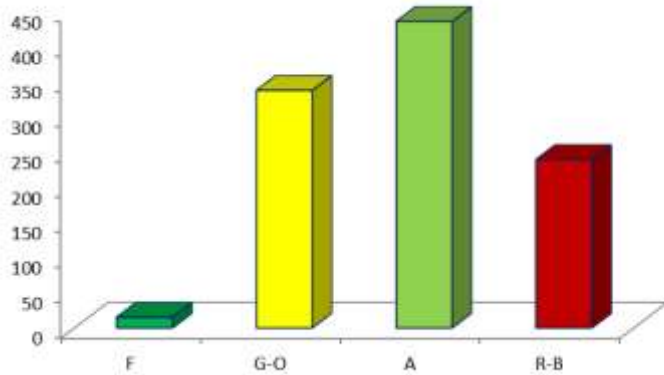
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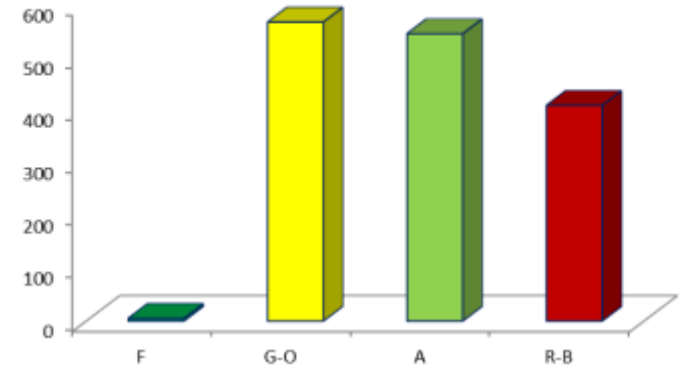
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URBAN SPRAWL EFFECT

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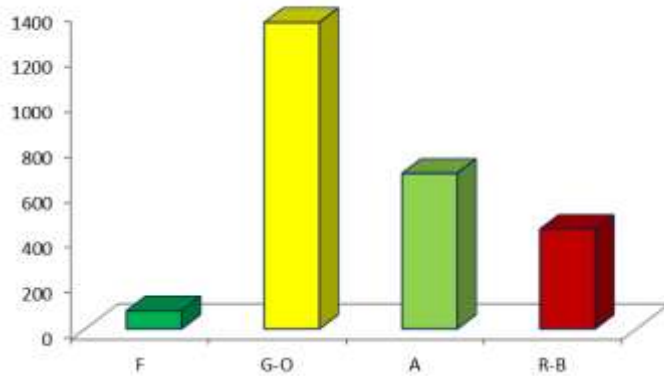


**1984
LULC
TYPES**

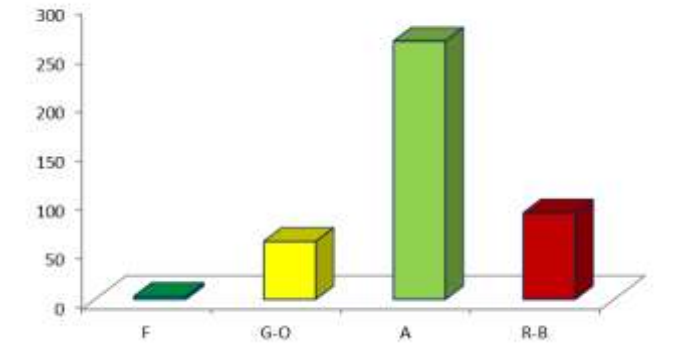


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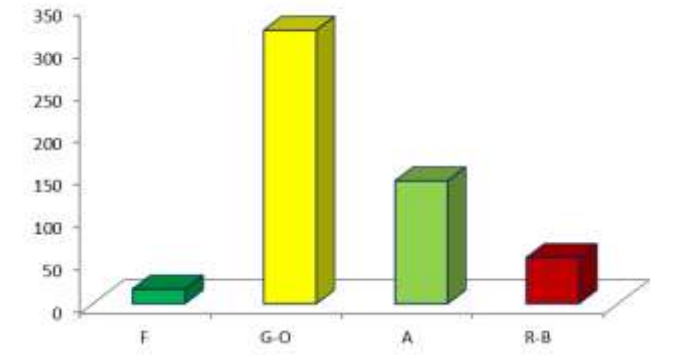
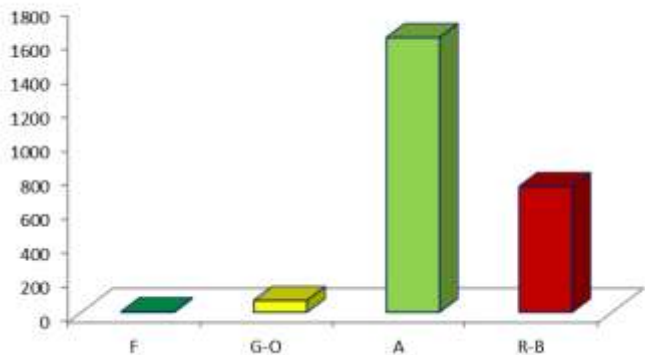


**TO
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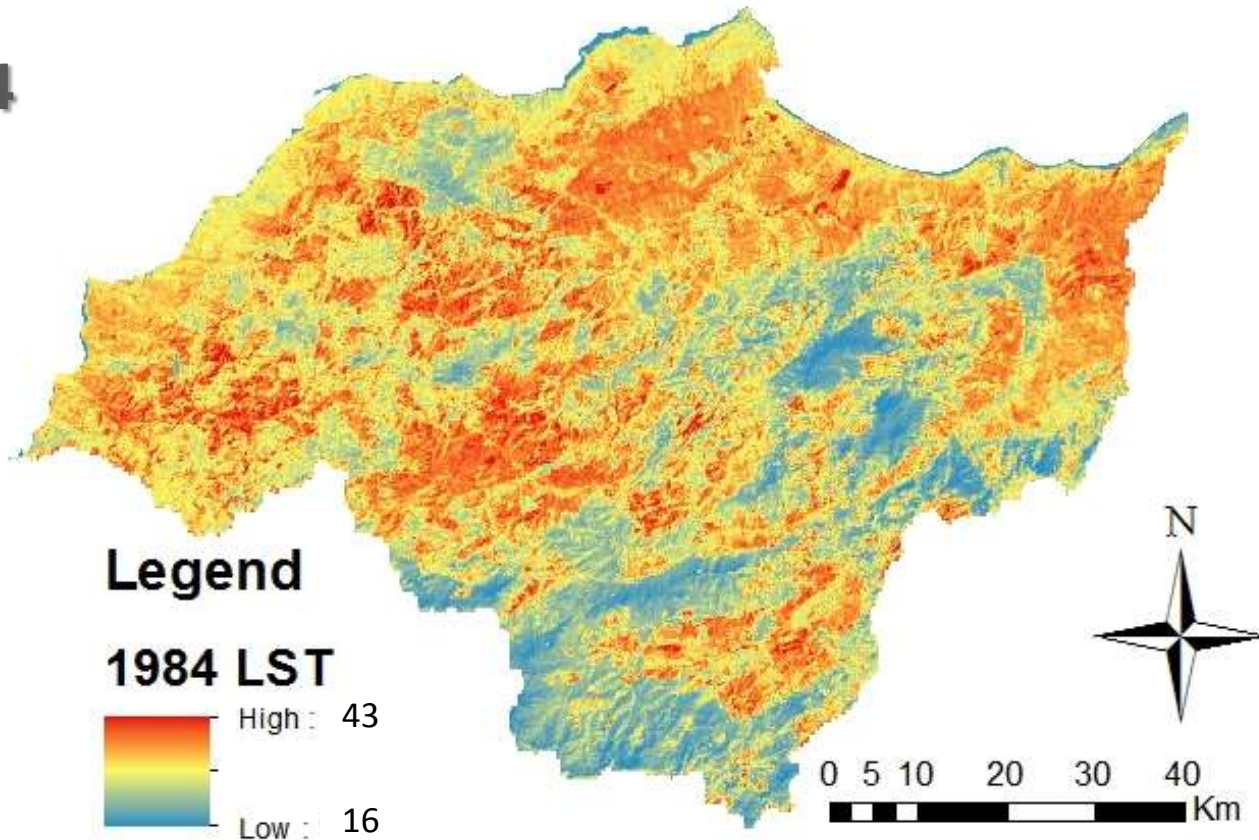


Y
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1984 LST Status

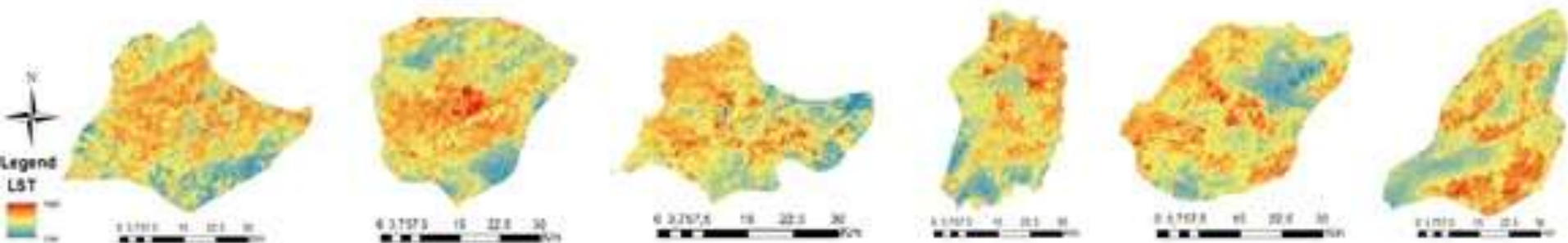
1984

27 C



1984 LST Status of Districts Depending on LULC Types

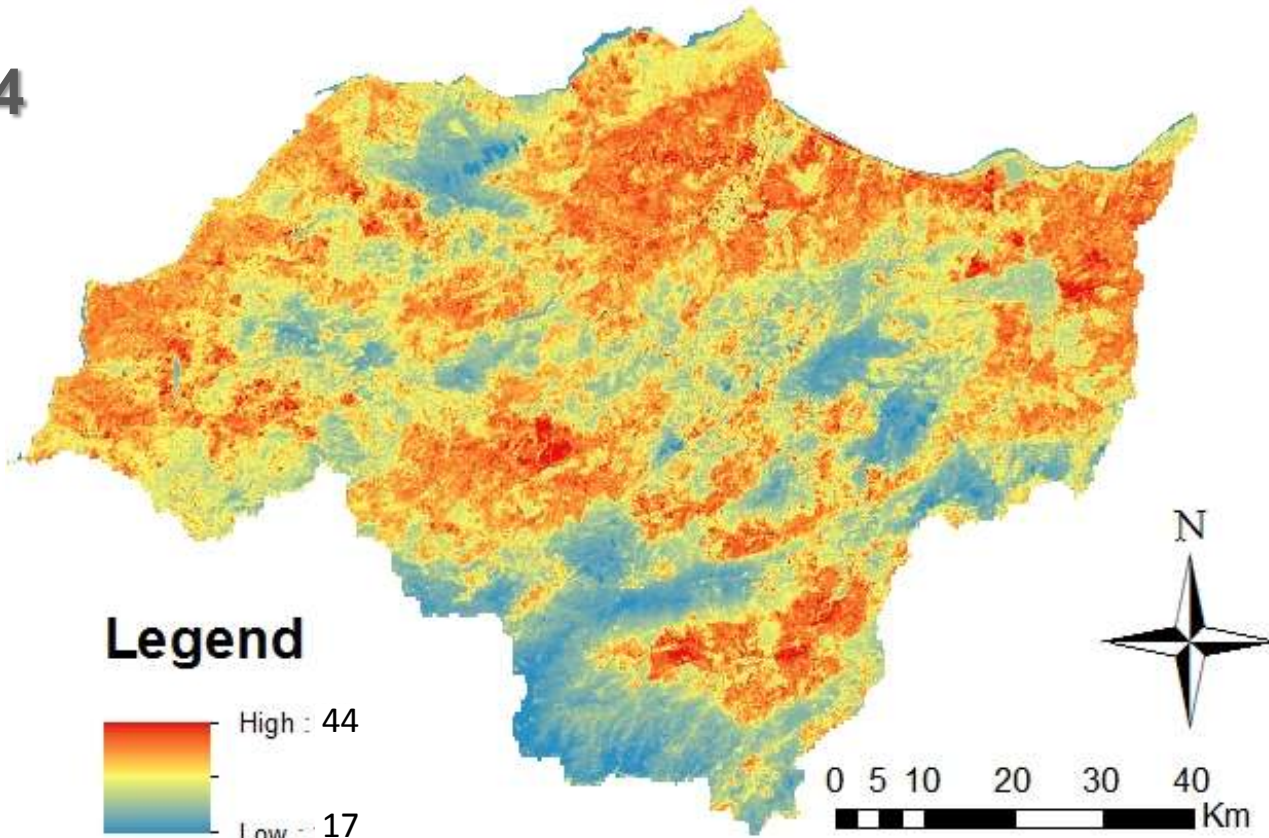
District/LST	MIN	MAX	RANGE	MEAN	STD
Biga	22,2	43,3	21,1	29,8	2,0
Can	16,0	41,0	25,0	29,5	1,9
Canakkale	17,2	40,1	22,9	29,6	1,7
Gonen	16,1	39,6	23,5	29,1	2,3
Lapseki	15,3	40,0	24,7	30,0	2,1
Yenice	16,0	42,3	26,3	30,5	2,1
OVERALL	16,0	43,3	27,3	30,3	2,1



2014 LST STATUS

2014

26 C

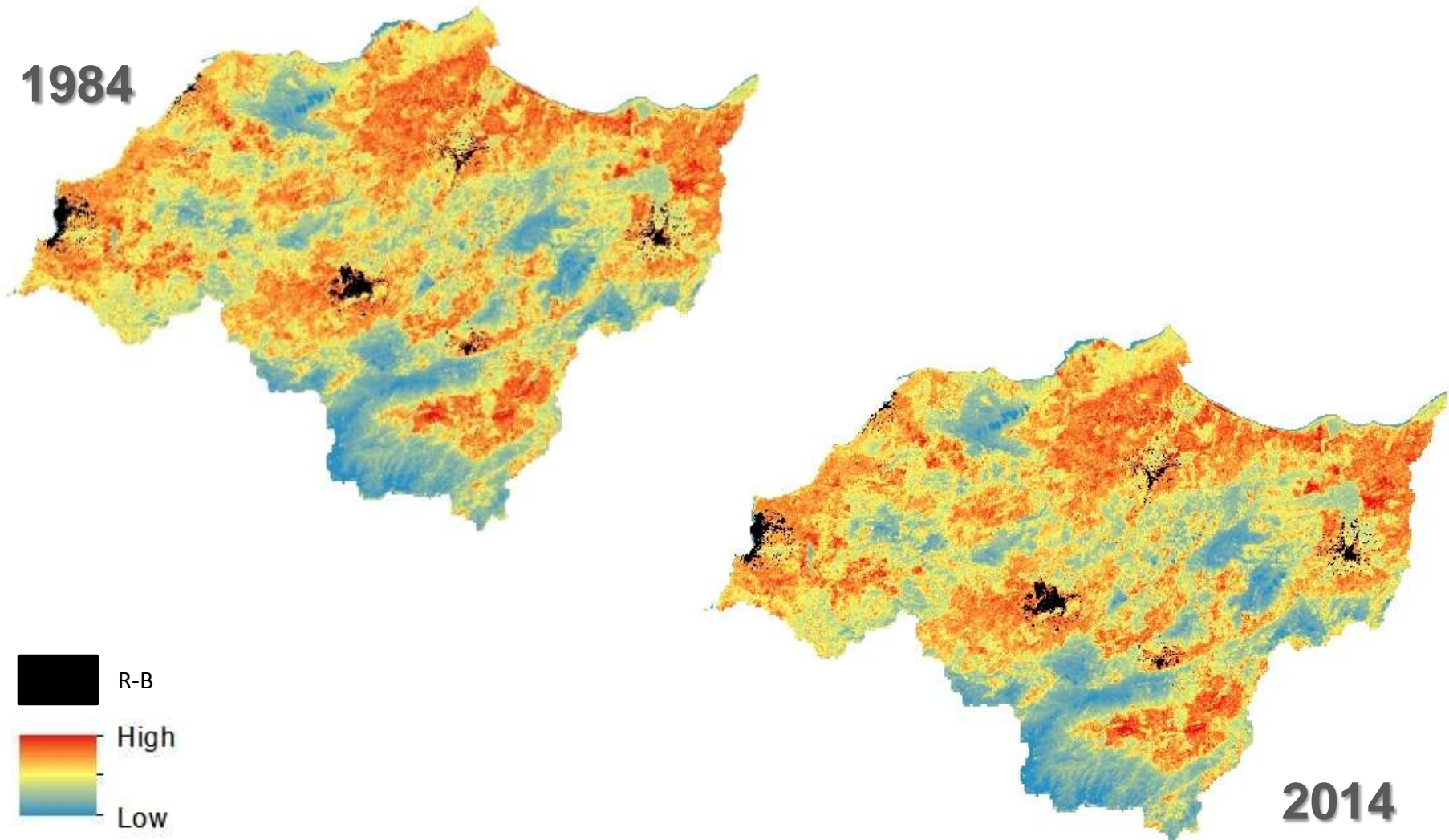


2014 LST Status of Districts Depending on LULC Types

District/LST	MIN	MAX	RANGE	MEAN	STD
Biga	20,1 ↓	44,0 ↑	23,9 ↑	28,9 ↓	2,2 ↑
Can	20,1 ↑	43,6 ↑	23,5 ↑	30,3 ↑	2,2 ↑
Canakkale	18,8 ↑	42,8 ↑	24,0 ↑	30,1 ↑	2,3 ↑
Gonen	18,3 ↑	39,4 ↓	21,1 ↓	28,5 ↓	2,4 ↑
Lapseki	21,0 ↑	42,5 ↑	21,5 ↓	29,4 ↓	2,4 ↑
Yenice	17,3 ↑	42,5 ↑	25,2 ↓	28,9 ↓	2,5 ↑
OVERALL	17,3 ↑	44,0 ↑	26,7 ↓	29,4 ↓	2,3 ↑



LST CHANGES IN URBAN AREAS








LST CHANGES IN URBAN AREAS

1984

District/LST	MIN	MAX	RANGE	MEAN	STD
Biga	24,0	36,3	12,3	31,2	1,97
Can	23,6	40,6	17,0	31,9	2,64
Canakkale	18,8	36,7	17,9	31,7	1,54
Gonen	24,5	36,3	11,8	31,0	1,72
Lapseki	21,9	34,8	12,9	29,3	1,83
Yenice	23,6	38,2	14,7	31,9	2,27

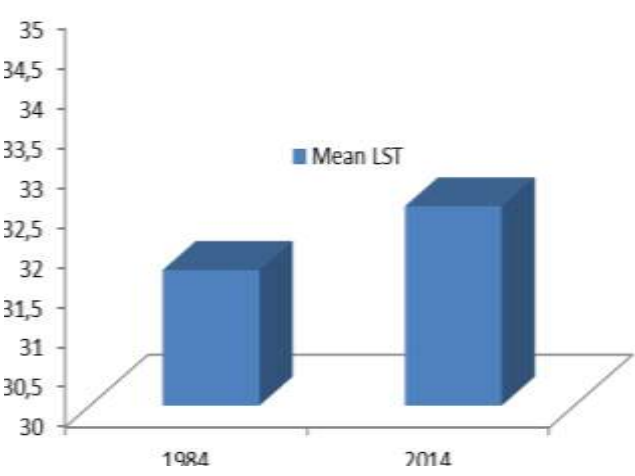
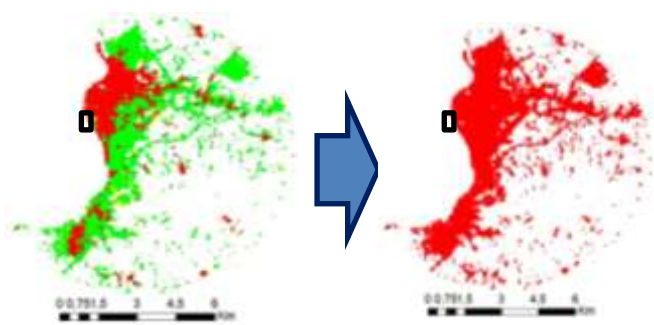
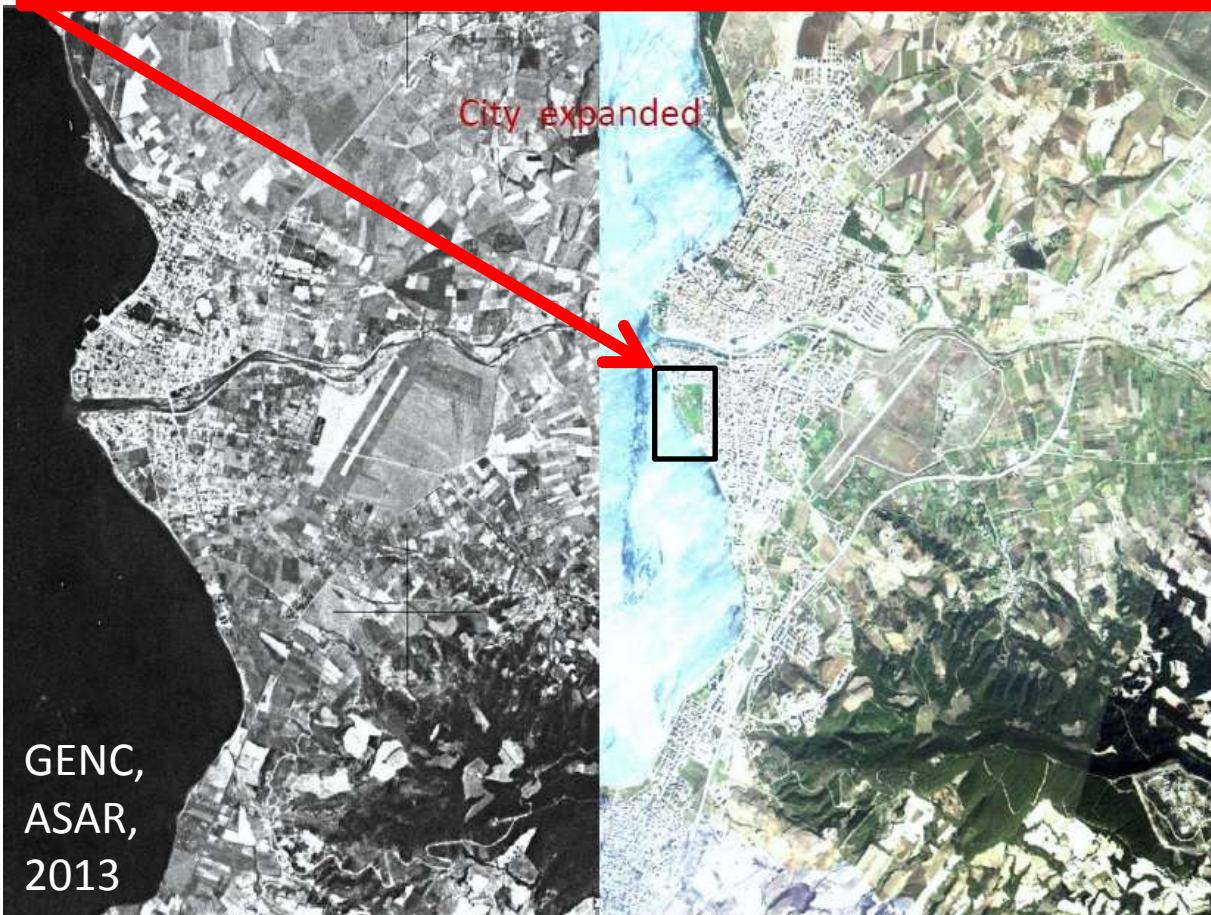
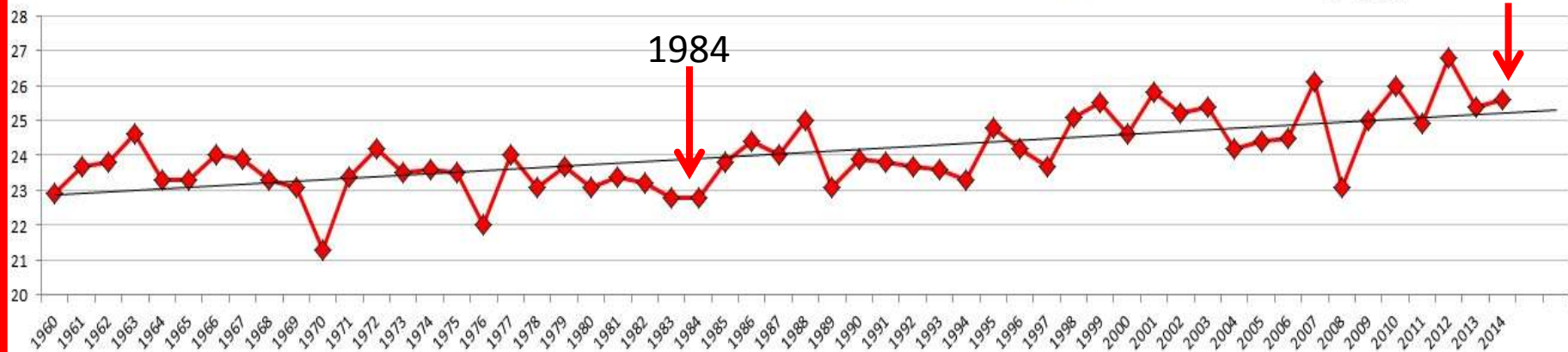
2014

District/LST	MIN 	MAX 	RANGE 	MEAN 	STD 
Biga	26,7	37,6	10,9	32,4	1,38
Can	26,9	41,0	14,1	34,8	1,92
Canakkale	24,6	37,8	13,3	32,5	1,12
Gonen	25,5	37,2	11,2	32,2	1,55
Lapseki	25,5	35,4	9,9	31,4	1,51
Yenice	24,2	38,8	14,6	33,7	1,70

SUMMER SEASON ANNUAL MEAN TEMPERATURE (°C)

$$y = 0,0431x + 22,838$$
$$R^2 = 0,4308$$

2014

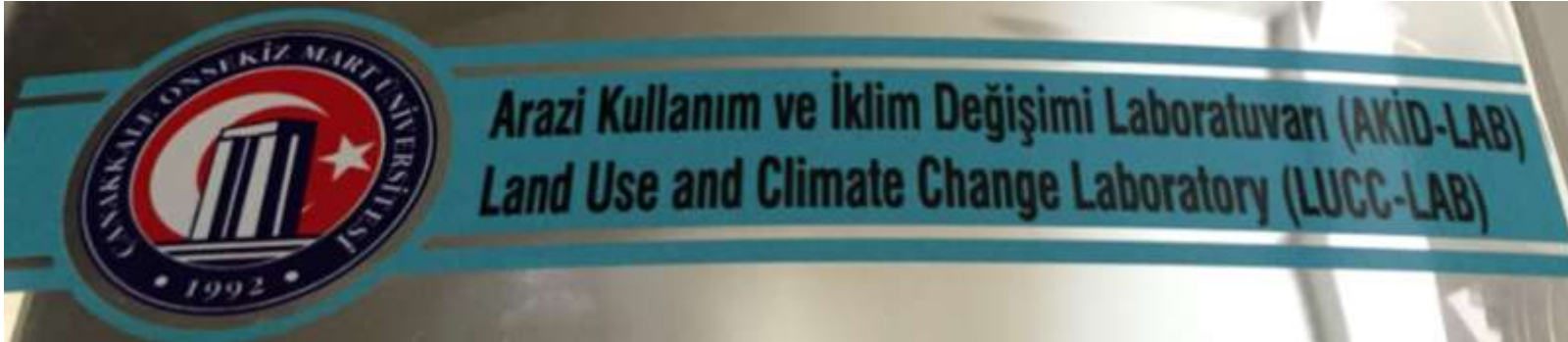


Conclusions

- ✓ Results indicated that study area have experienced an intense urbanization process within three decades (1984-2014)
- ✓ This process have lead to loss of agricultural and grazing lands which are converted to urban and forest areas
- ✓ There is a sign that LST is related with LULC types need to work on more in region
- ✓ Difficulties occurred while determining overall and district-based LST changes due to large variability of surface materials
- ✓ Consideration of LST changes between 1984-2014 in urbanized areas using present urban area zone provided more observable results

▪

OUR FOCUSES & STUDY GROUP



**Agricultural Sensor and Remote
Sensing Laboratory
(ASRESEL)**



Water stress detection using ASD Agrispec

MAIZE



Photosynthesis measurement



Chlorophyll reading EGGPLANT

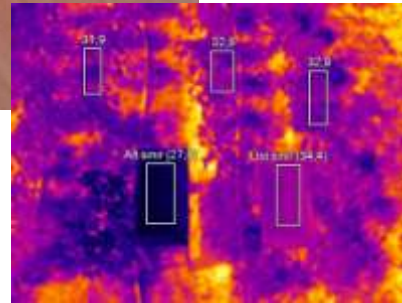


Project:
Determination of
Agricultural
Potantial of Canakkale
Province



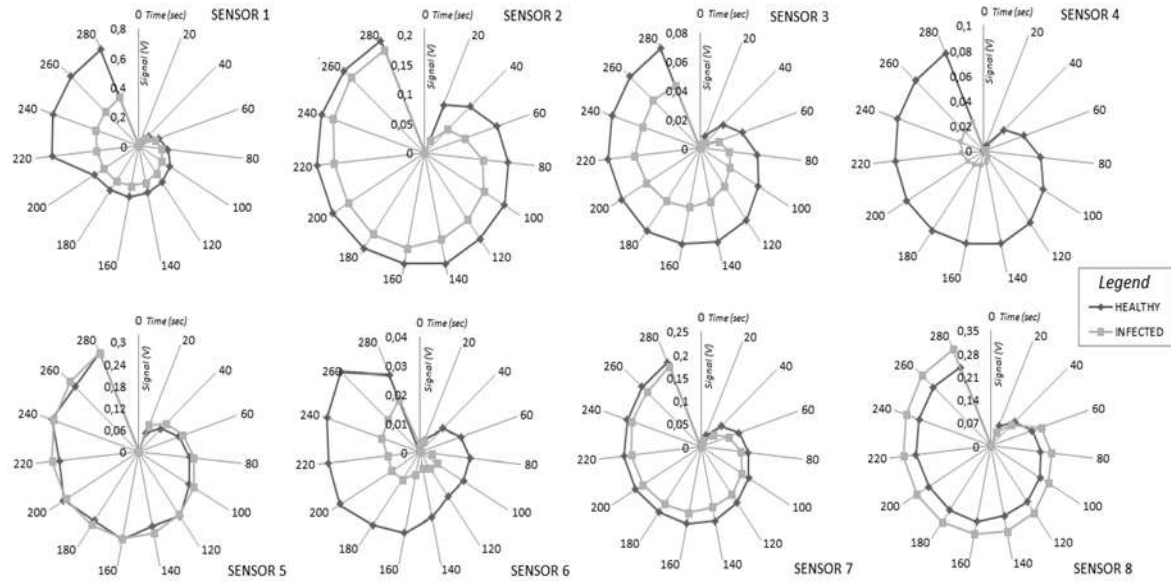
Education Seminars
2006
2008
2010
2014





Thermal camera

Spectroradiometer measurement in Kapija



ODOUR MEASUREMENTS

QUALITY ASSESMENTS OF FOOD PRODUCTS

MANURE & SOIL PROPERTIES

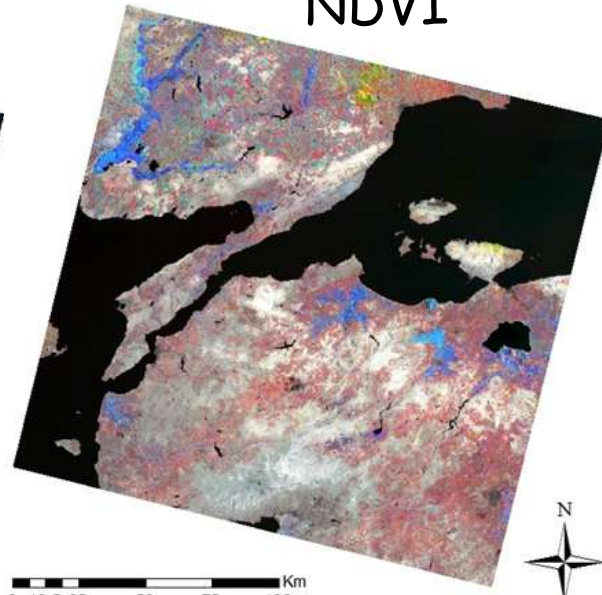
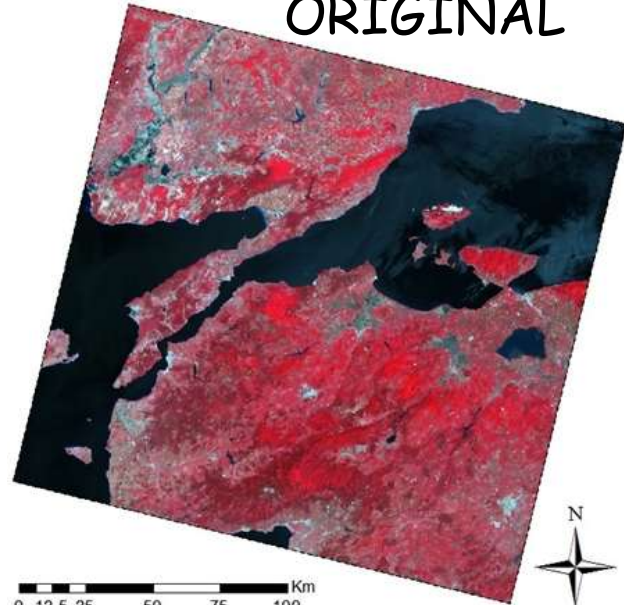


Electronic Nose System

ORIGINAL

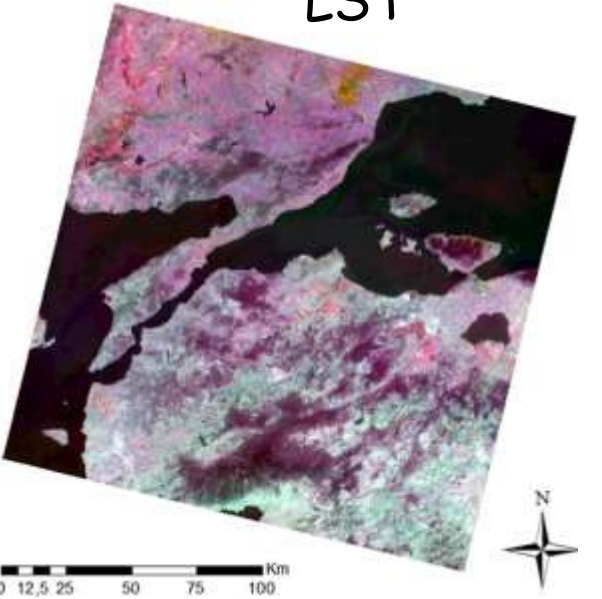
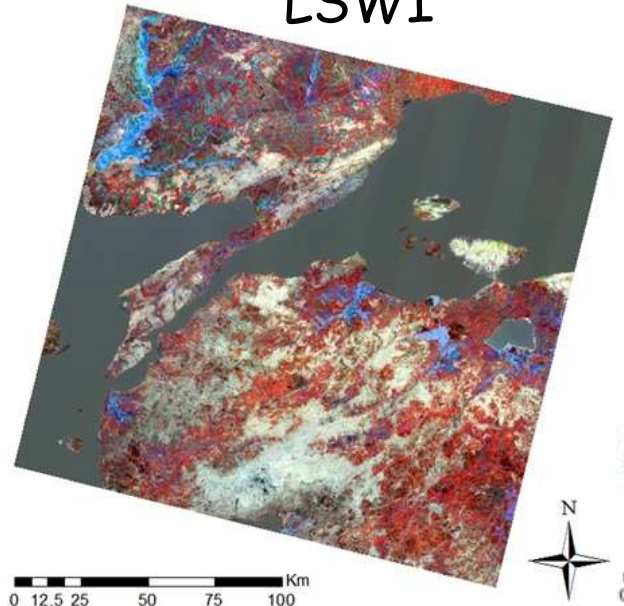
NDVI

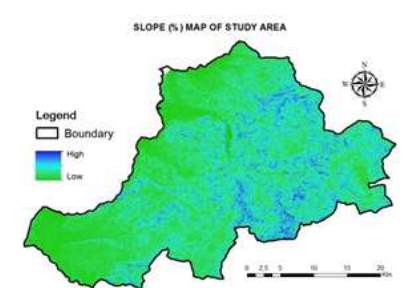
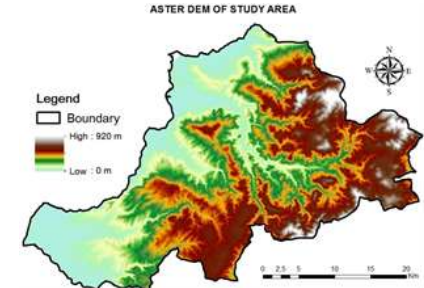
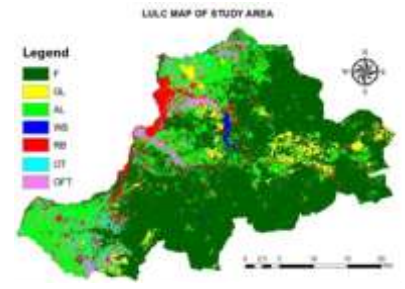
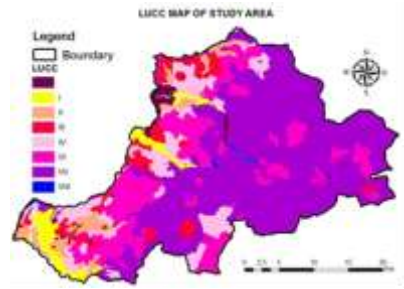
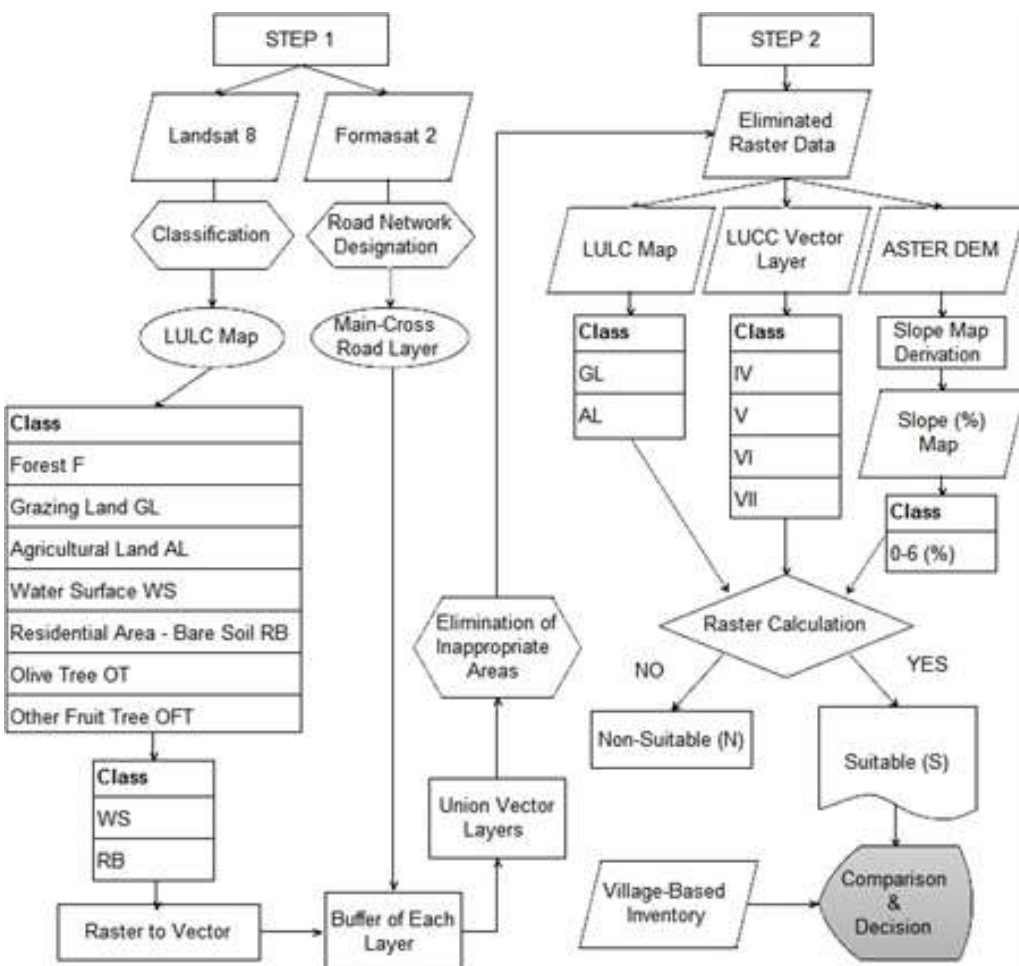
RICE PADDY DETERMINATION USING SEASONAL IMAGES



LSWI

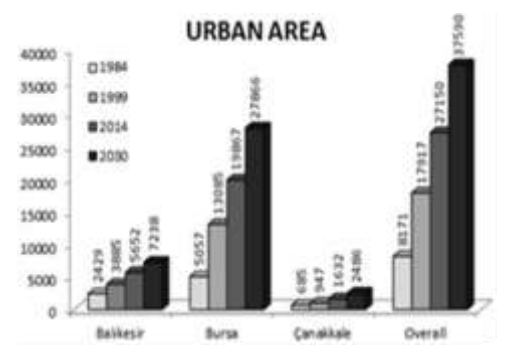
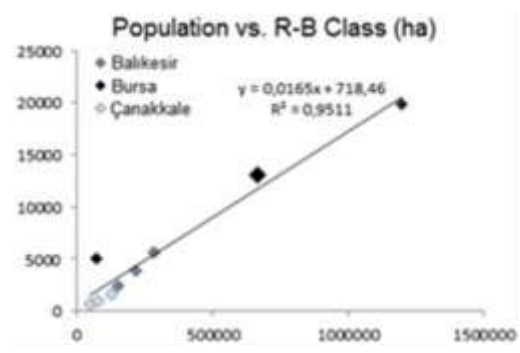
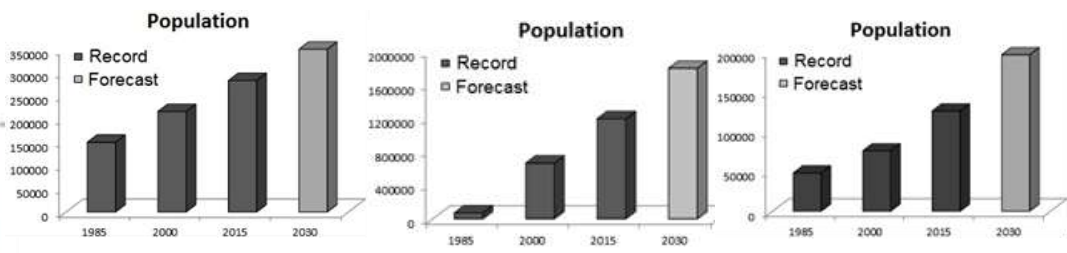
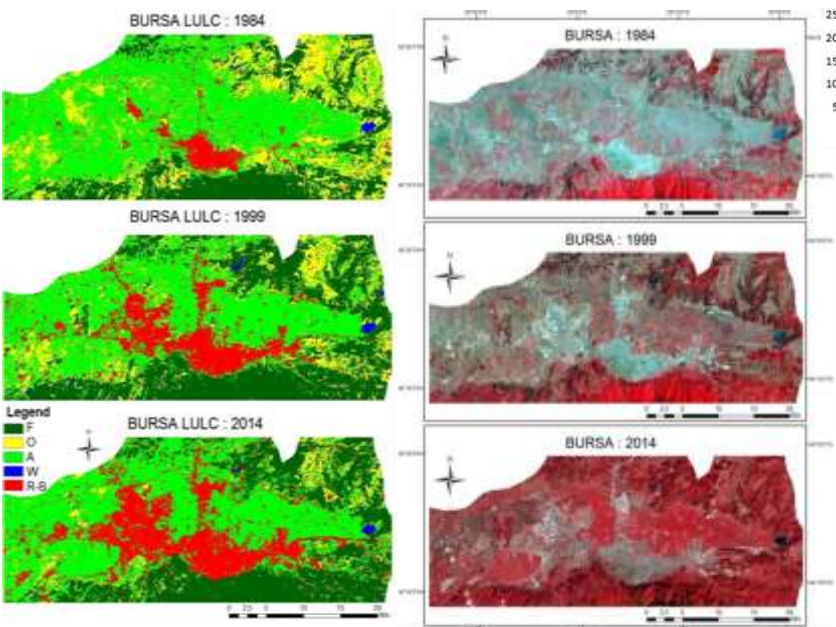
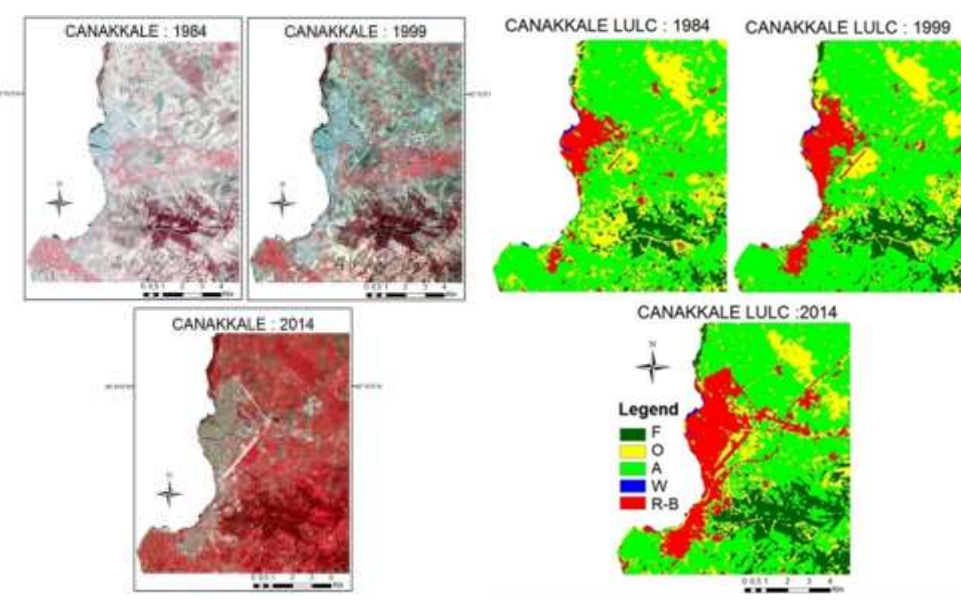
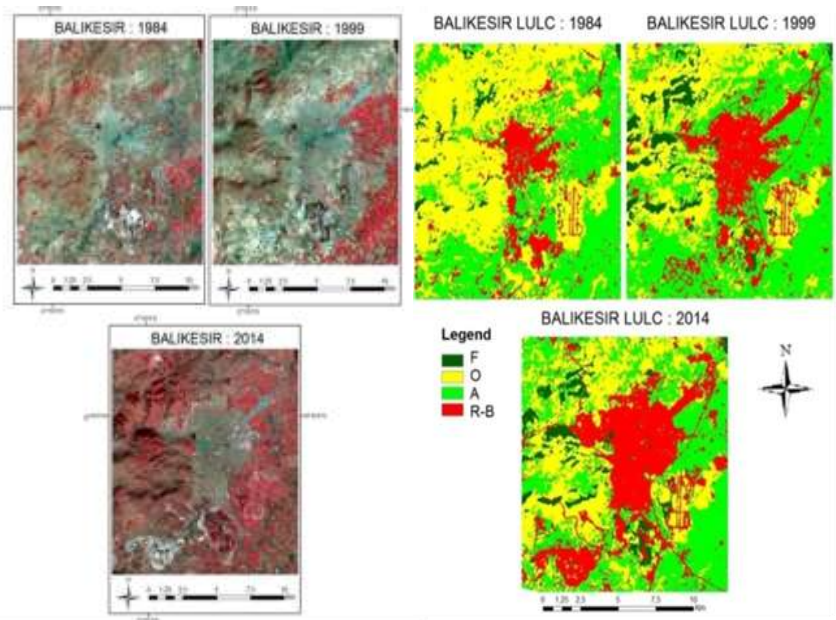
LST





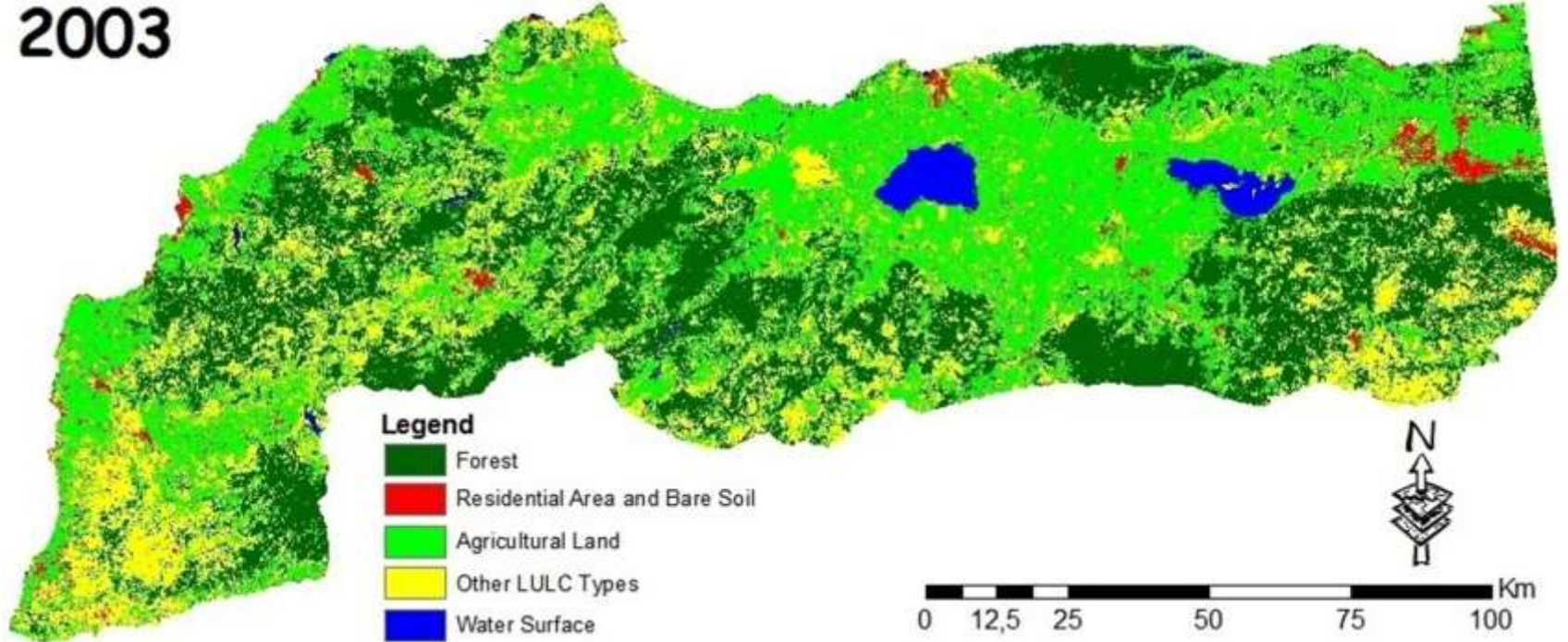
LIVESTOCK SUITABLE LANDS



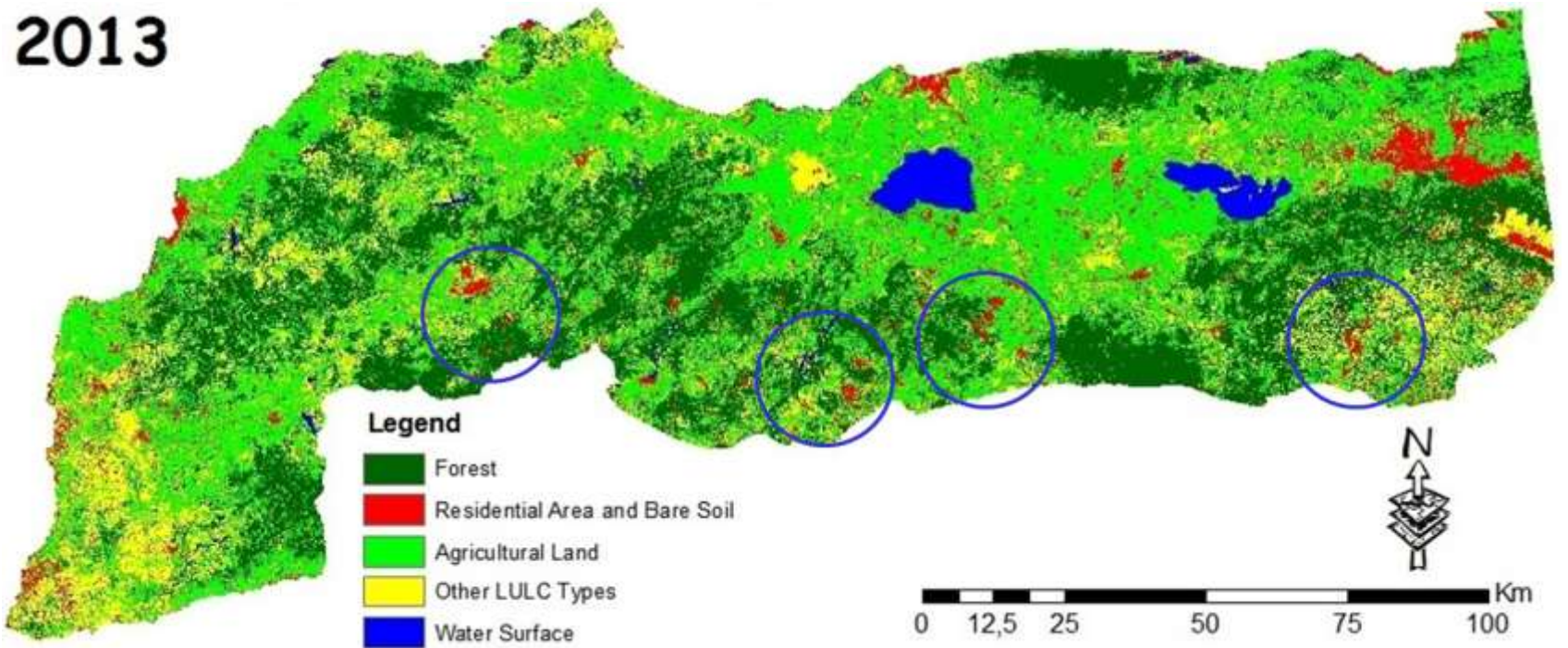


ESTIMATION OF FUTURE LAND DEMANDS

2003



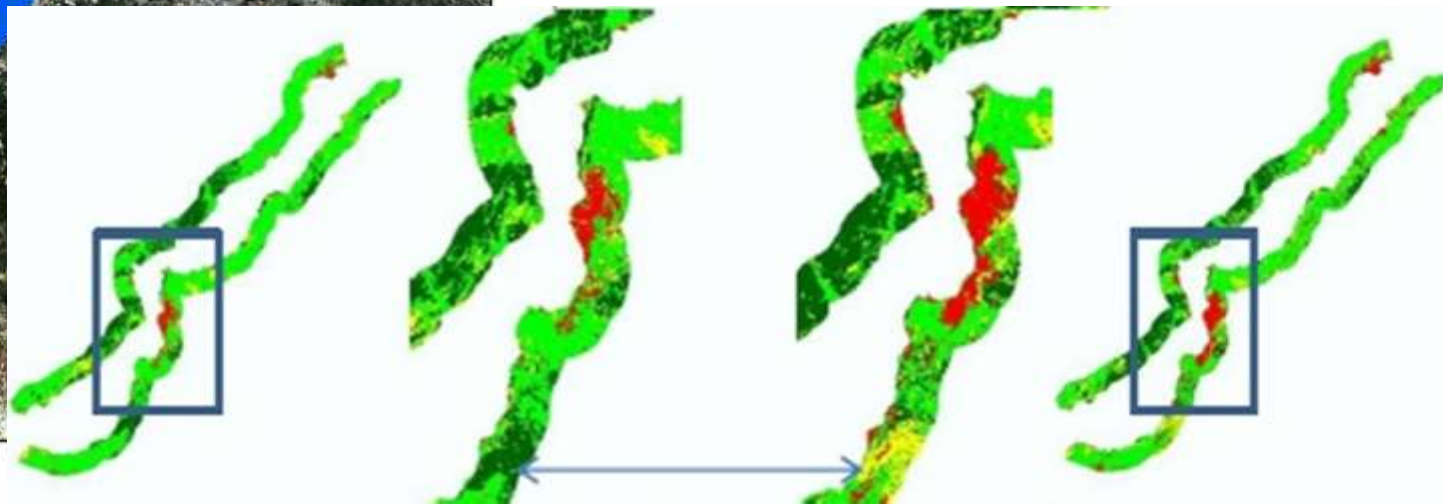
2013





LULC CHANGES AROUND CANAKKALE STRAIT

Levent GENC
Burak ASAR



STUDY GROUP



THANK YOU