1.3 Establishment of GIS Database

1.3.1 Introduction

Information that is to be dealt with in environmental management is diverse and exists in various forms such as digital, texts, tables, maps and photographs. Information in inconsistent forms is, however important, difficult to efficiently utilise for intended purposes. Therefore, information integration is vital and nowadays, a geographical information system is widely considered indispensable.

The GIS establishment at the BCE is one of the key tasks assigned to the team. The team has attempted to examine the purpose of database utilisation, methods of use, important areas, database items, data forms, and other elements of the database structure. The database particularly contains data on the environment, and will be fully used by the BCE.

1.3.2 Database Structure

The environmental database structure established in this project consists of six main categories (refer to Table1-1). These databases were developed in Azerbaijan with the help of a local sub-contractor: (1) base map, (2) information on natural resources/conditions, (3) information on social resources/conditions, (4) environmental information - pollution source, (5) environmental information - ambient quality and (6) environmental information - pollution maps.

Table 1-1: Database structure

Main category	Sub category	Data type
Base map	Boundary (study area)	Polygon
	Main roads	Line
	Place names	Point
	Surface water	Polygon, Line
	Jeiranbatan reservoir and its watershed	Polygon, line, Grid
	Buildings	Polygon
	Railways	Line
	Settlement	Polygon
Natural conditions	Topography (Elevation)	Grid
	Geology	Polygon
	Meteorology • Rainfall • Temperature • Wind direction • Wind speed	Point
	Hydrology • Surface water • Groundwater	Polygon, Line
	Fauna and flora (rare species)	Polygon, Point
	Vegetation	Polygon, Grid
Social conditions	Administrative boundary	Polygon
	Population	Polygon
	Areas designated particular purpose	Polygon
	Land use	Polygon, Grid
	Land use change	Grid
	Health statistics	Polygon
	City water facilities	Point

	Medical institutions	Point
Environmental information (Pollution sources)	Environmental passports	Point
	Power generation plants	Point
	Oil mining ground	Grid
	Farmland (large-scale)	Polygon
	Solid waste treatment / disposal	Point
	Sewage treatment facilities	Point
Environmental information (Ambient quality)	Environmental quality / emission standards	Document
	Air quality	Point
	Water quality	Polygon, Point
	Soil quality	Point
	Water contamination distribution	Grid
Environmental information (Pollution maps)	Pollution maps	Point

a. Base map

The base map contains data of (1) Boundary (Study area), (2) Main roads, (3) Place names, (4) Surface waters, (5) Jeiranbatan reservoir and its watershed, (6) Buildings, (7) Railways and (8) Settlement.

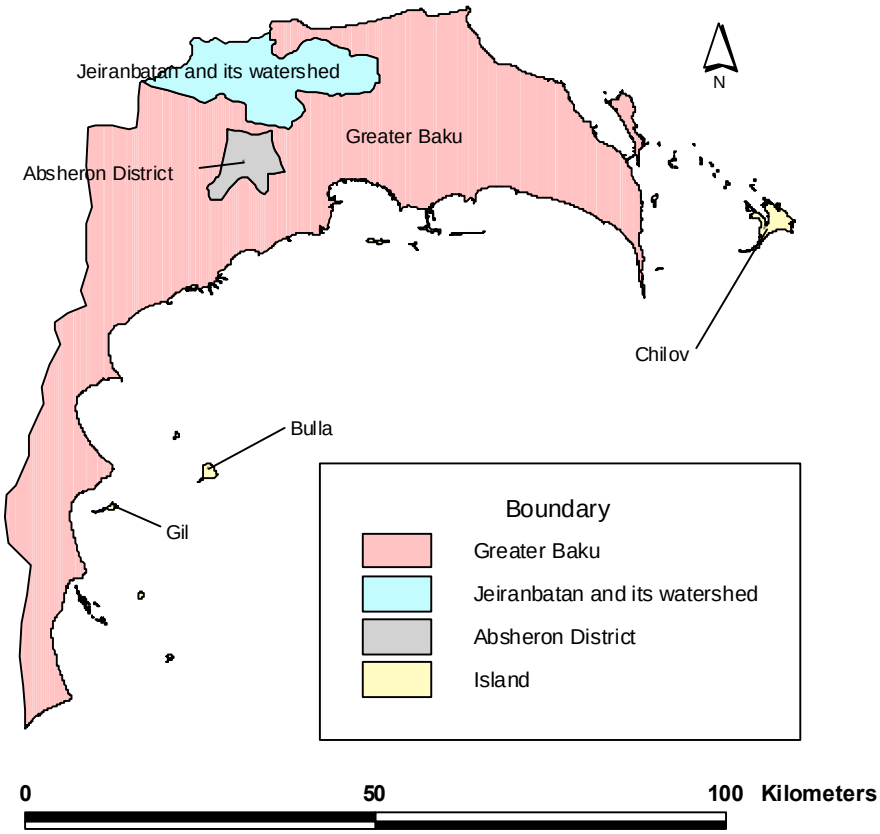
Data sources for base map are as follows:

- The base map for the Greater Baku is a hard copy topographic map at the scale of 1:10,000 with coordinate system Pulkovo 1942.
- The air-photo survey as well as field survey for the base map has been carried out in the years 1972, 1975, 1976, 1977, 1985, 1986.
- The year of production of this base maps is from 1989 to 1996.
- Also for the base map of Greater Baku at the scale of 1:5,000 has been used. These maps have been produced from the maps of 1:2,000 scale.
- The air-photo survey and field survey for the map of 1:5,000 scale have been carried out in the years 1980, 1982, 1983, and produced within year 1989 – 1996
- The air-photo survey and field survey for the map of 1:2,000 scale have been carried out in the years 1980,1982, 1983, and produced within year 1987 – 1989.
- The areas which have been revised on the base map are as follows;
  - Sangachal – Primorks area (southern part of Baku)
  - The 9th mikrorayon area
  - The area between former Sovetskaya street and Narimanov prospect
  - The parks named after Aliyev within area of hole city
  - The surrounding areas within hotels Hyatt Regency and Europe
  - Sharifsadeh street and many other buildings within territory oh whole Baku city

The details of each data are described below.

a.1 Boundary (Study area)

- Spatial data (Polygon)



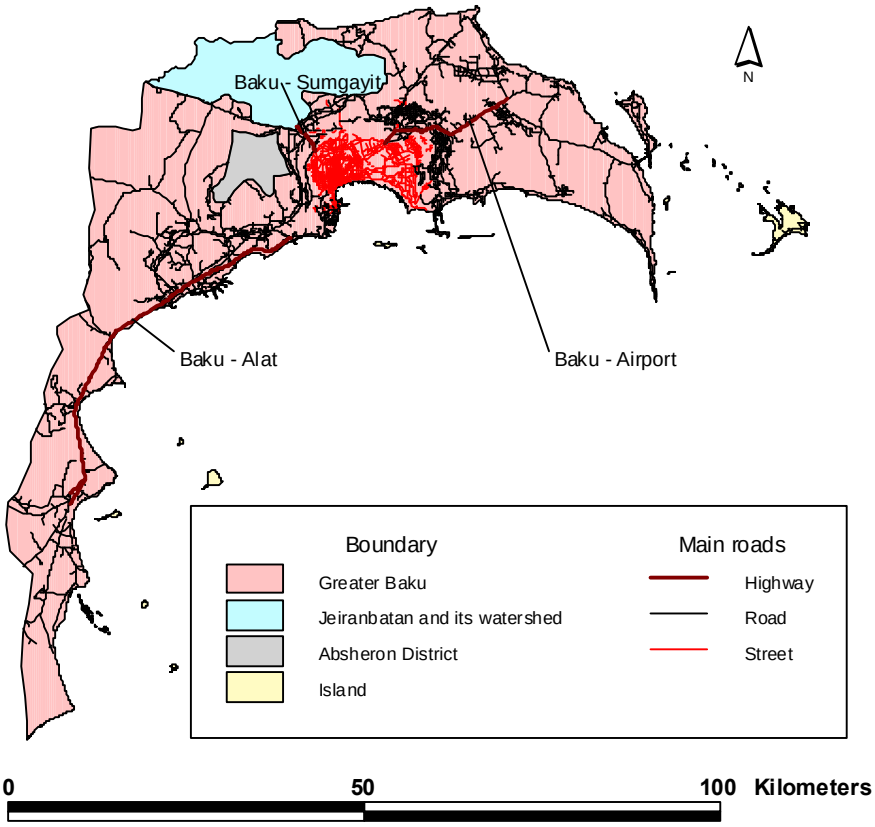
- Result of analysis using the attribute table

Area name	Area (km^2)
Greater Baku	2,094.69
Jeiranbatan and its watershed	243.28
Absheron District	61.17
Islands	28.37
Total Area	2,427.51

In an attribute table some islands have their name (refer to “boundary” theme in the GIS database).

a.2 Main roads

- Spatial data (Line)



- Result of analysis using the attribute table

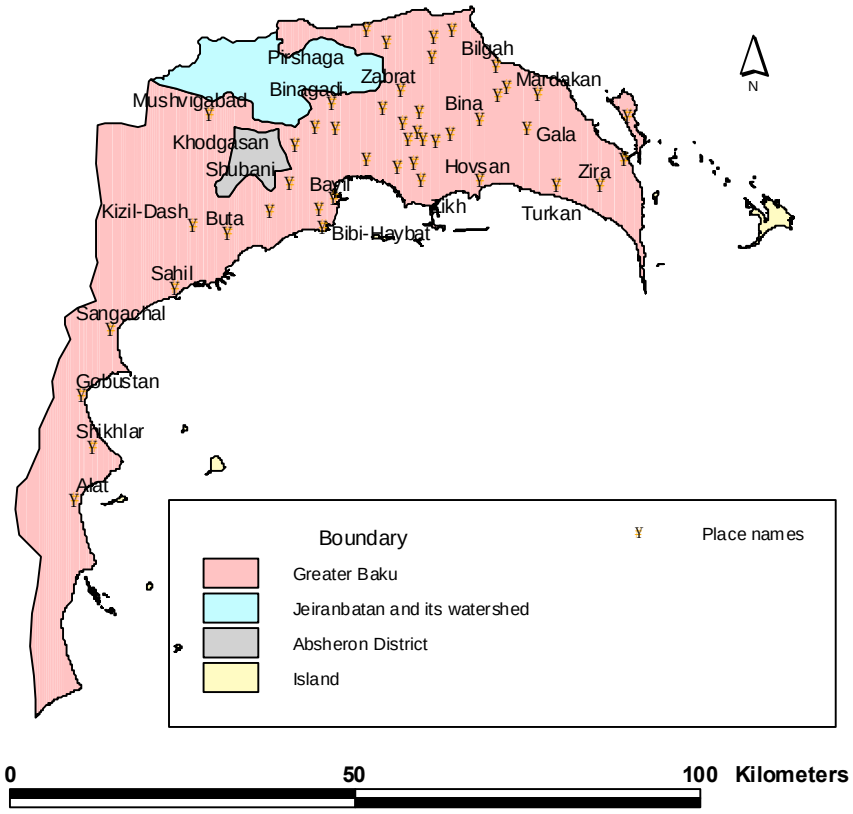
Type	Length (km)
Highway	82.19
Road	1,591.83
Street	566.50
Total Length	2,240.52

All the roads are divided into three types: Highways, streets of “Small Baku” and roads of “suburb area”. There are three highways, 1581 roads and 469 streets in

Greater Baku. If you would like to know more detailed information of each road, refer to the "main_roads" theme in the GIS database

a.3 Place names

- Spatial data (Point)



- Attribute table

ID	NAME	District ID	District Name
1	Bayil	1	Sabayil
2	Bibi-Haybat	1	Sabayil
3	Badamdar	1	Sabayil
4	Keshla	5	Nizami
5	Ahmadli	6	Khatai
6	Shubani	7	Garadag

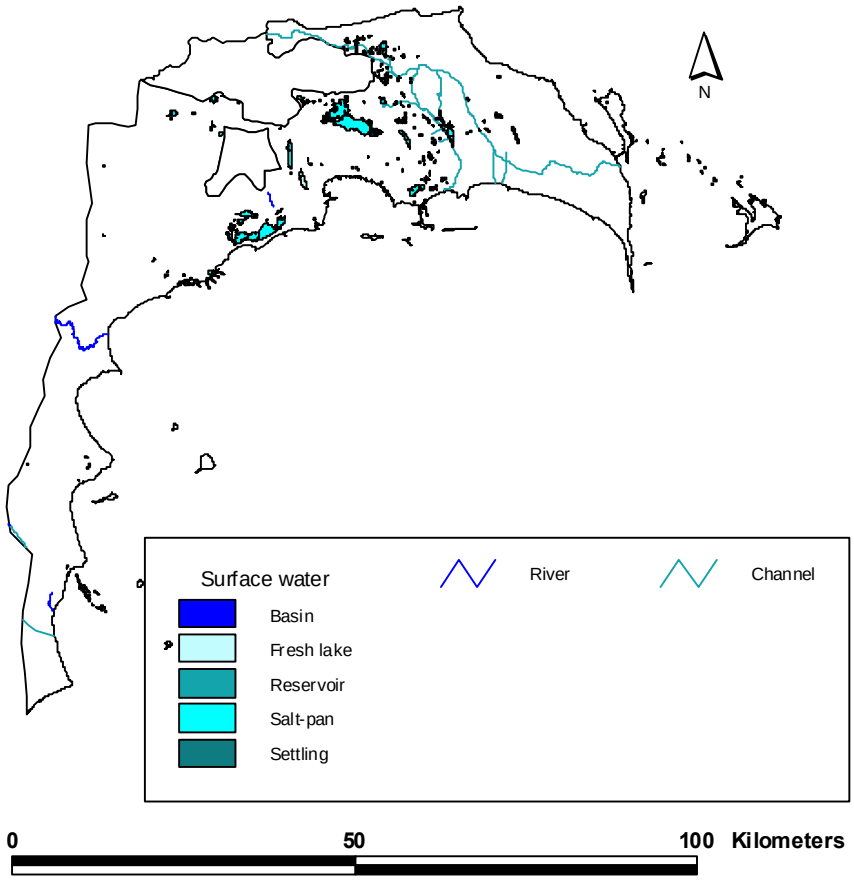
7	Shikhlar	7	Garadag
8	Sahil	7	Garadag
9	Sangachal	7	Garadag
10	Gobustan	7	Garadag
11	Lokbatan	7	Garadag
12	Buta	7	Garadag
13	Alat	7	Garadag
14	Mushvigabad	7	Garadag
15	Kizil-Dash	7	Garadag
16	Binagadi	8	Binagadi
17	Baladgari	8	Binagadi
18	Rasulzadeh	8	Binagadi
19	Khodgasan	8	Binagadi
20	Zabrat	9	Sabunchu
21	Mashtaga	9	Sabunchu
22	Balakhani	9	Sabunchu
23	Sabunchu	9	Sabunchu
24	Bakikhanov	9	Sabunchu
25	Ramana	9	Sabunchu
26	Kurdakhani	9	Sabunchu
27	Nardaran	9	Sabunchu
28	Pirshaga	9	Sabunchu
29	Bilgah	9	Sabunchu
30	Zikh	10	Surakhani
31	Garachukhur	10	Surakhani
32	Hovsan	10	Surakhani
33	Bulbula	10	Surakhani
34	Yeni Surakhani	10	Surakhani
35	Surakhani	10	Surakhani
36	Amiradgan	10	Surakhani
37	Pirallahi	11	Azizbeyov
38	Mardakan	11	Azizbeyov
39	Shuvalan	11	Azizbeyov
40	Bina	11	Azizbeyov
41	Shagan	11	Azizbeyov
42	Gala	11	Azizbeyov
43	Zira	11	Azizbeyov
44	Turkan	11	Azizbeyov
45	Buzovna	11	Azizbeyov
46	Gurgan	11	Azizbeyov

Refer to “place_names” theme in the GIS database

There are 46 place names in settlement in Greater Baku. As for Yasamal, Nasimi and Narimanov district, they don’t have place name in level of settlement.

a.4 Surface water

- Spatial data (Polygon, Line)



- Result of analysis using attribute table

Surface water

Type	Area (ha)
Basin	22.91
Fresh lake	170.34
Reservoir	39.33
Salt-pan	4,596.85
Settling	282.61
Total Area	5,112.04

There is other information in the attribute table of surface water, such as “name” and “height”. Name shows each water object and height means designated water-line of

each water object. If you would like to know more detailed information, refer to "surface_water" theme in the GIS database.

River

Name	Length (km)
Pirsaat	3.40
Jeyrankechmaz	20.41
Pirsaat	0.50
Shordere	2.16
Total Length	26.47

Refer to "river" theme in the GIS database

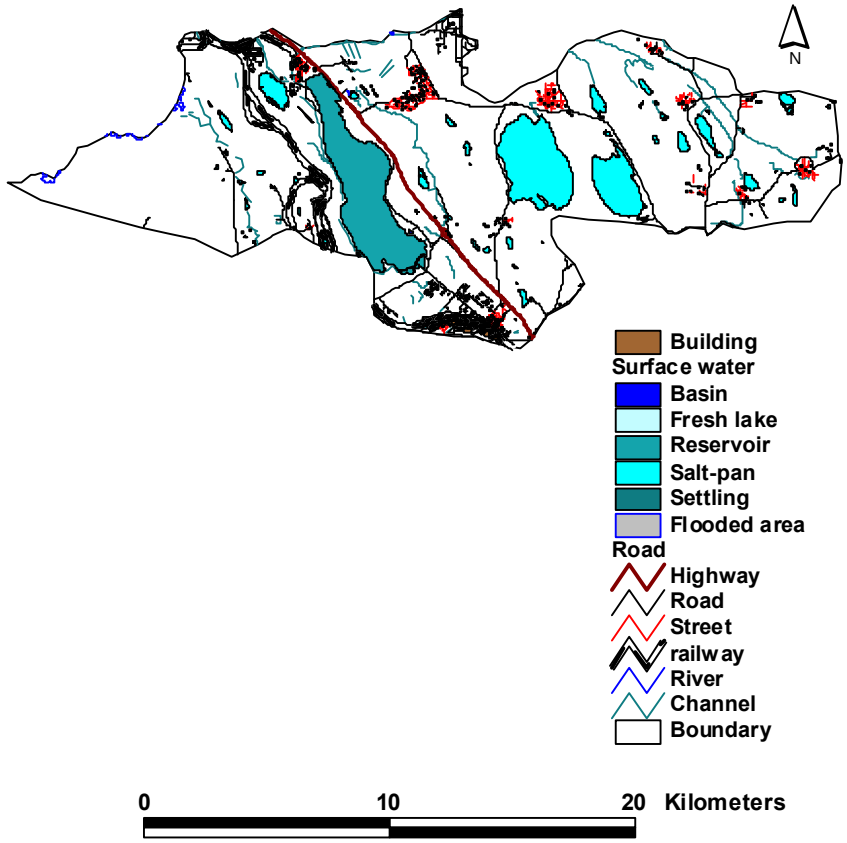
Channel

Name of channel	Length (km)
Main Shirvan collector	5.47
Samur-Absheron	67.09
Local Utilisation	63.29
Total Length	135.85

Refer to "channel" theme in the GIS database

a.5 Jeiranbatan reservoir and its watershed

- Spatial data (Polygon, Line)



- Results of analysis using each attribute table

Boundary

Name	Area (km^2)
Jeiranbatan reservoir and its watershed	243.28

Refer to “jrb_bound” theme in the GIS database

Surface water

Type	Area (ha)
Basin	7.67
Fresh lake	0.00
Reservoir	1,392.20
Salt-pan	1,699.54

Settling	0.15
Flooded area	0.67
Total Area	3,100.23

Refer to “jrb_surface_water” theme in the GIS database.

Road

Type	Length (km)
Highway	18.42
Road	136.64
Street	58.87
Total Length	213.94

Refer to “jrb_roads” theme in the GIS database.

Railway

Total Length (km)
69.66

Refer to “jrb_railway” theme in the GIS database

River

Name	Total Length (km)
Sumgayit	5.88

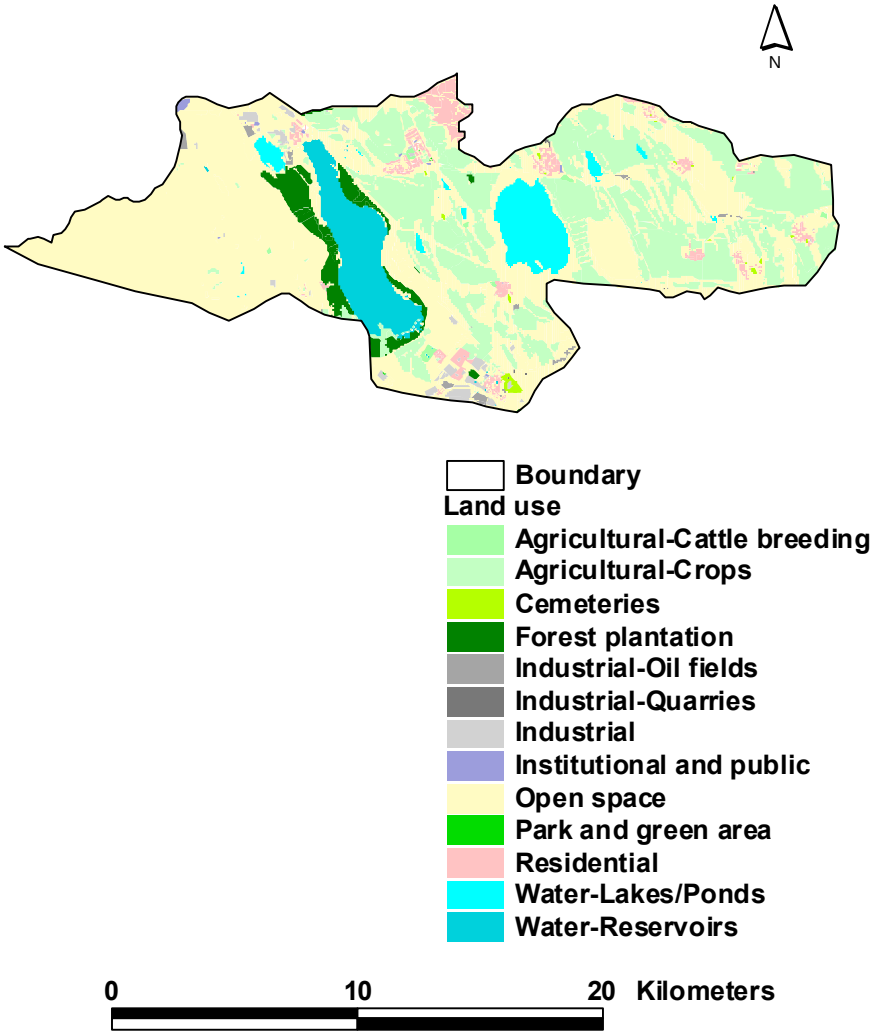
Refer to “jrb_rivers” theme in the GIS database.

Channel

Name	Length (km)
Absheron Magistral Canal	6.11
Local Utilisation	75.83
Total length	81.94

Refer to “jrb_channel” theme in the GIS database.

- Spatial data (Polygon)



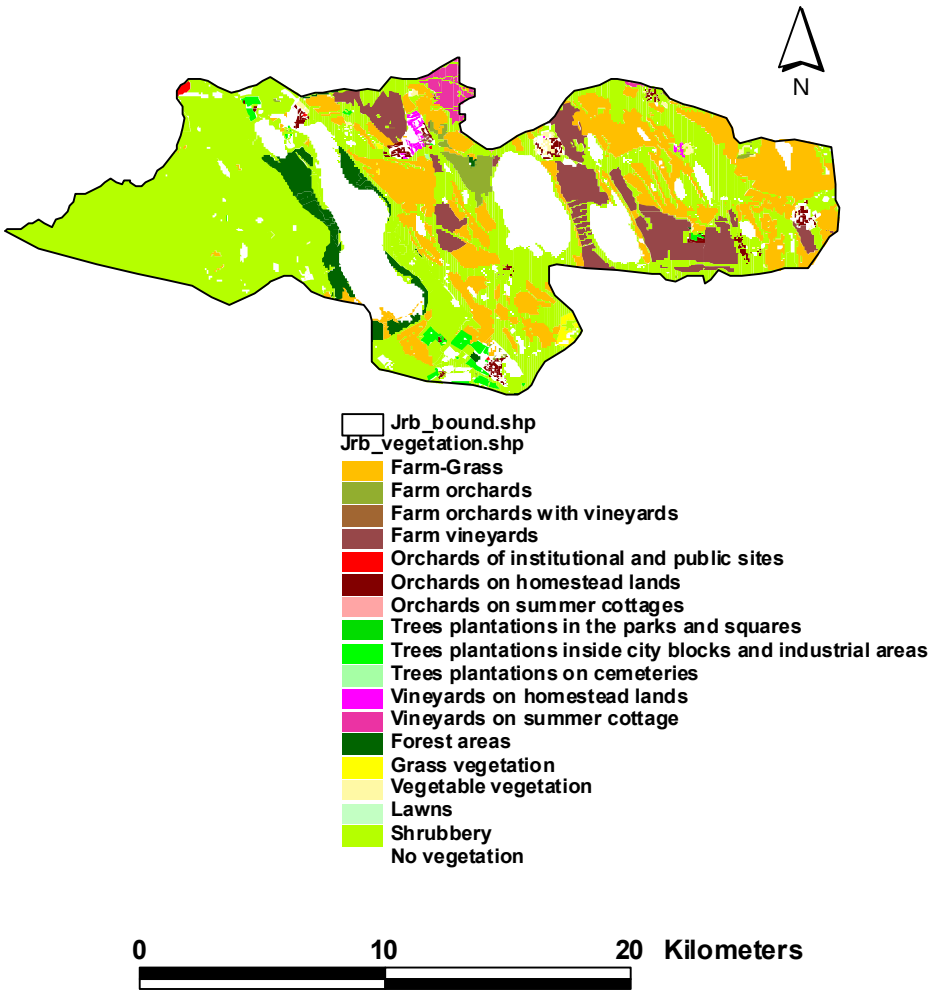
- Result of analysis using attribute table

Type	Area (ha)
Agricultural-Cattle breeding	69.06
Agricultural-Crops	6,850.56
Cemeteries	71.26
Forest plantation	816.76
Industrial	279.90
Industrial-Oil fields	118.50
Industrial-Quarries	7.87

Institutional and public	36.16
Open space	12,800.13
Park and green area	1.73
Residential	819.85
Water-Lakes/Ponds	1,052.70
Water-Reservoirs	1,403.46
Total Area	24,327.92

Refer to “jrb_landuse” theme in the GIS data.

- Spatial data (Polygon)



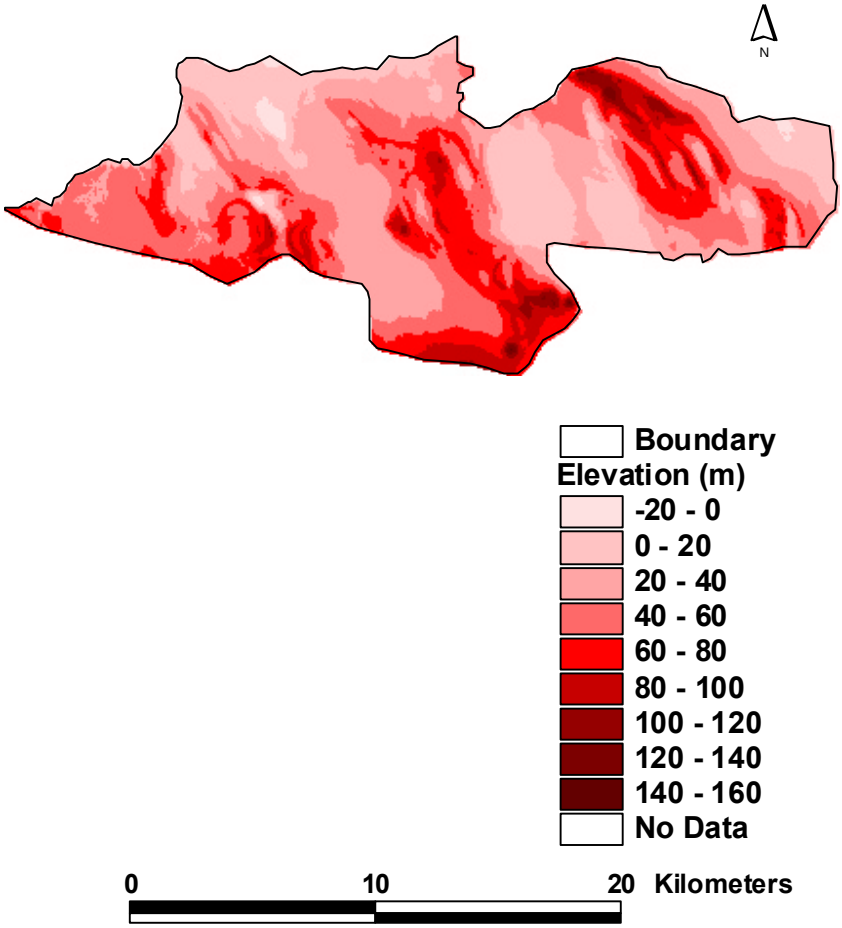
- Result of Analysis using attribute table

Type	Area (ha)
Farm-Grass	4,629.84
Farm orchards	299.07
Farm orchards with vineyards	1.92
Farm vineyards	1,899.77
Orchards of institutional and public sites	26.53
Orchards on homestead lands	259.24
Orchards on summer cottages	8.19
Trees plantations in the parks and squares	0.98
Trees plantations inside city blocks and industrial areas	236.22
Trees plantations on cemeteries	3.41
Vineyards on homestead lands	82.78
Vineyards on summer cottage	256.28
Forest areas	816.76
Grass vegetation	66.45
Vegetable vegetation	122.95
Lawns	0.75
Shrubbery	11,634.76
No vegetation	3,982.02
Total Area	24,327.92

Refer to “jrb_vegetation” theme in the GIS database

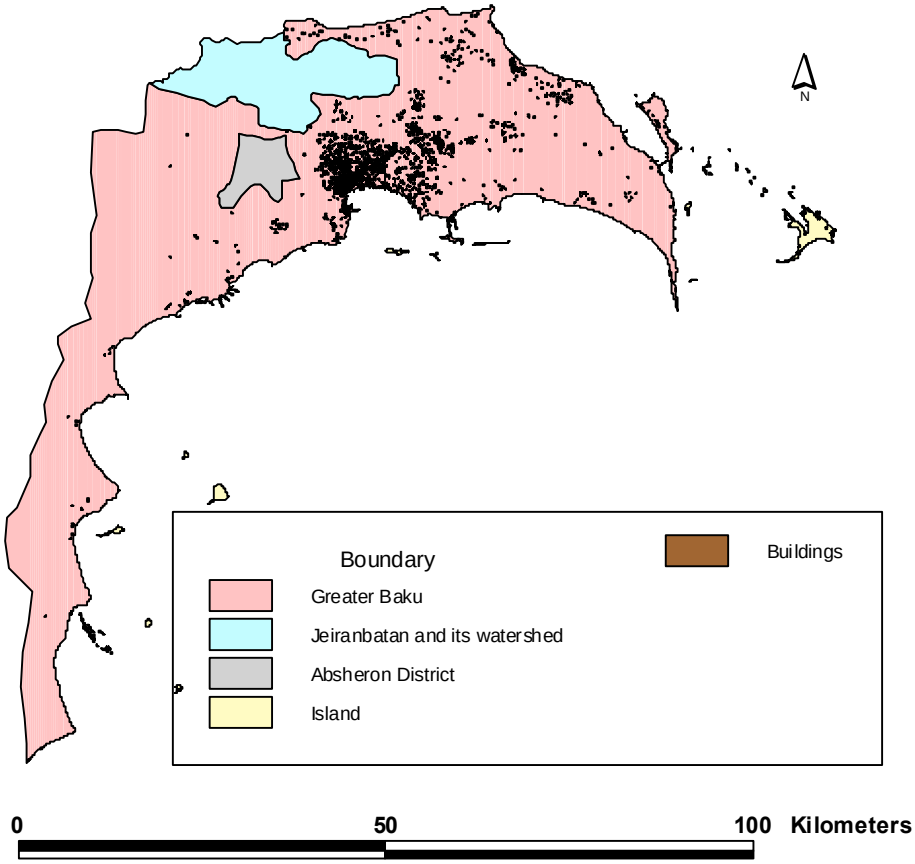
- Spatial data (GRID)

Refer to “dtm_jb” theme in the GIS data



a.6 Buildings

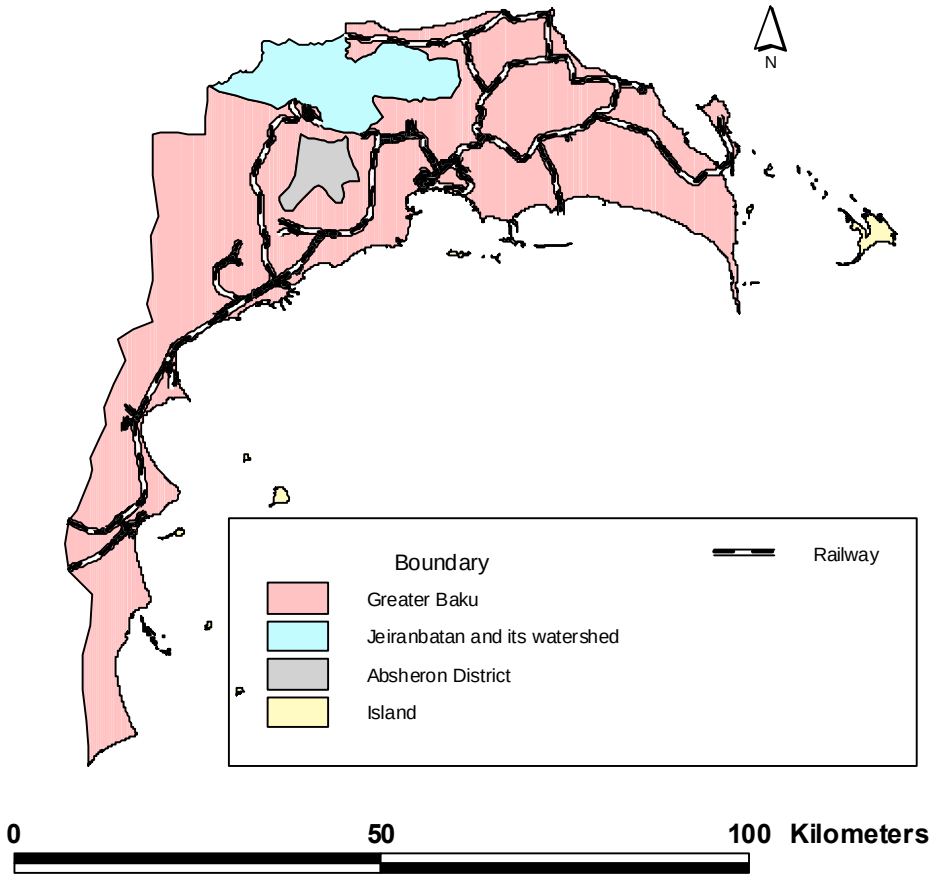
- Spatial data (Polygon)



There is no information in its attribute table. This theme has only spatial data (refer to "buildings" theme in the GIS database.

a.7 Railways

- Spatial data (Line)



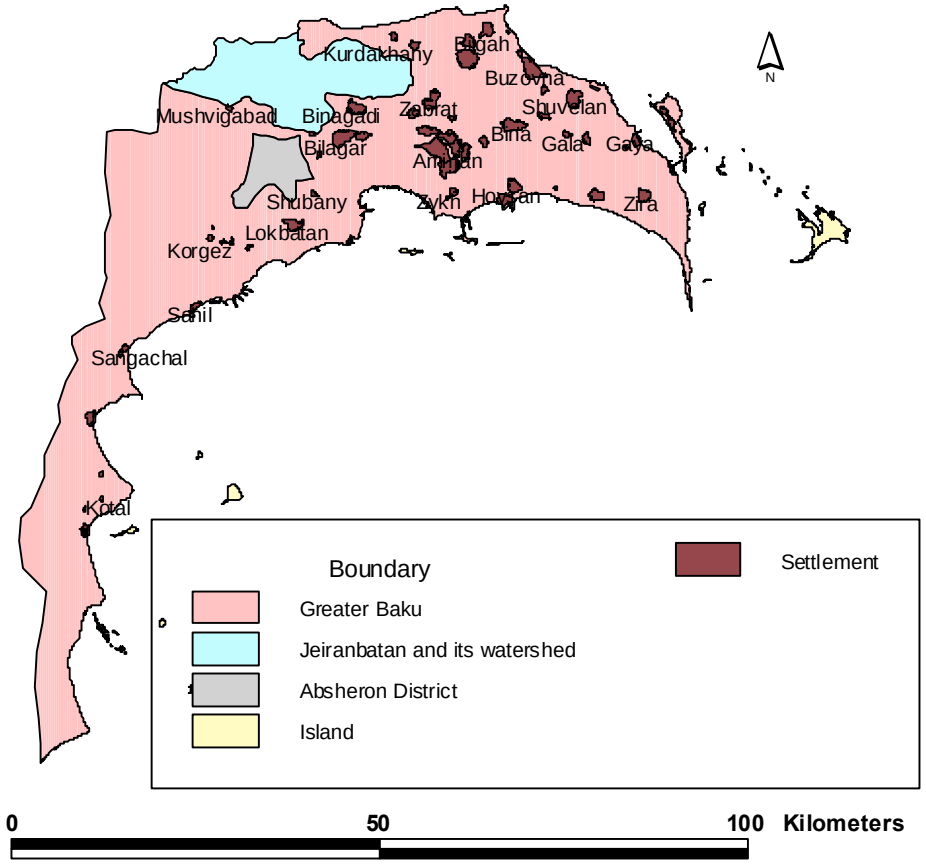
- Result of analysis using attribute table

Total Length (km)
500.79

Refer to “railway” theme of GIS database

a.8 Settlement

- Spatial data (Polygon)



- Result of analysis using attribute table

Name of settlement	Area (ha)
Shongar	8.72
Alat	117.51
Bash Alat	14.19
Amirjan	240.39
Zykh	107.59
Bakikhanov	688.44
Garachukhur	445.79

Balakhany	146.93
Bibiheybat	21.30
Bilagar	494.37
Bilgah	247.30
Binagadi	316.93
Buzovna	514.98
Sahil	104.22
Dubendi	114.41
Gala2	100.27
Gala	73.42
Gaya	1.59
Gobustan	164.18
Goshagyshlag	23.21
Gurgan	51.59
Gyzyl Dash	52.14
Hovsan	512.48
Janubi	53.64
Khandan	111.52
Haji Hasan	46.63
Korgez	66.91
Kurdakhany	118.46
Shaghan	84.93
Shuvelan	357.96
Mushvigabad	52.51
Nardaran	221.67
Pirallahy	210.53
Puta	41.31
Ramana	50.75
Bulbula	231.33
Sangachal	106.90
Shubany	46.92
Sulutepe	31.80
Surakhany	208.20
Turkan	245.61
Yeni Ramana	37.39
Yeni Surakhany	102.95
Zabrat	350.87
Zafaran	11.68
Zugulba	44.04
Zira	235.12
Yeni Turkan	12.50
Rasulzade	162.79
Kotal	31.27
Shykhlar	33.63
Bina	393.12

Mashtagha	566.73
Lokbatan	281.30
Sabunchu	245.47
Pirshaghy	72.78
Total Area	9,431.15

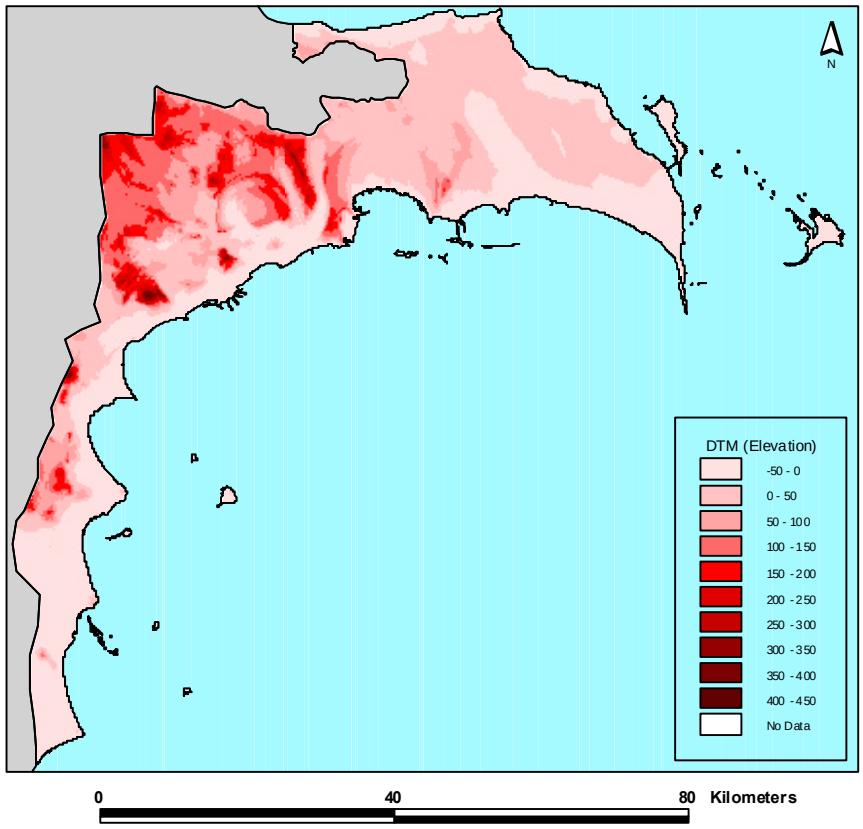
Refer to “settlement” theme in the GIS database.

b. Natural conditions

The base map contains data of (1) Topography (Elevation), (2) Geology, (3) Meteorology, (4) Hydrology, (5) Fauna and flora and (6) Vegetation.

b.1 Topography (Elevation)

- Spatial data (Grid)



- Data sources

Elevation data was created on the basis of a TIN model (Triangulated Irregular Network). The TIN was created based on contour lines and spot heights of topographical maps at a scale of 1:10,000. The resolution of the DTM is five metres.

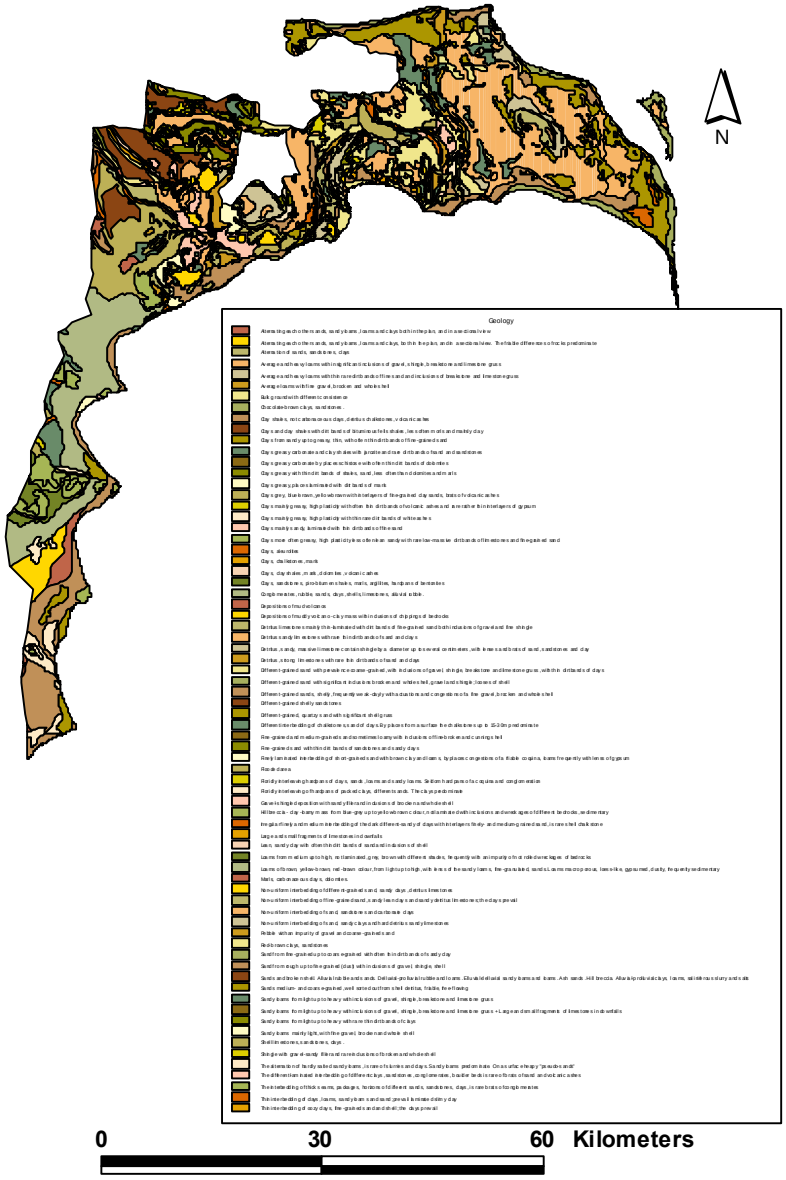
Data sources for base map are as follows:

- The base map for the Greater Baku is a hard copy topographic map at the scale of 1:10,000 with coordinate system Pulkovo 1942.
- The air-photo survey as well as field survey for the base map has been carried out in the years 1972, 1975, 1976, 1977, 1985, 1986.
- The year of production of this base maps is from 1989 to 1996.
- Also for the base map of Greater Baku at the scale of 1:5,000 has been used. These maps have been produced from the maps of 1:2,000 scale.

- The air-photo survey and field survey for the map of 1:5,000 scale have been carried out in the years 1980, 1982, 1983, and produced within year 1989 – 1996
- The air-photo survey and field survey for the map of 1:2,000 scale have been carried out in the years 1980,1982, 1983, and produced within year 1987 – 1989.

b.2 Geology

- Spatial data (Polygon)



- Result of analysis using attribute table

Code	Type	Area (ha)
1	Bulk ground with different consistence	886.18
4	Sandy loams from light up to heavy with inclusions of gravel, shingle, breakstone and limestone gruss	7,458.63
5	Average and heavy loams with insignificant inclusions of gravel, shingle, breakstone and limestone gruss	6,995.86
7	Thin interbedding of clays, loams, sandy loams and sand; prevail laminated slimy clay	2,240.84
8	Different-grained, quartzy sand with significant shell gruss	15,132.70
9	Large and small fragments of limestones in downfalls	55.45
10	Depositions of muddy volcano - clay mass with inclusions of chippings of bedrocks	2,371.54
11	Different-grained sand with significant inclusions brocken and whole shell, gravel and shingle; looses of shell	5,763.41
12	Sand from rough up to fine grained (dust) with inclusions of gravel, shingle, shell	10,257.59
13	Sandy loams mainly light, with fine gravel, brocken and whole shell	1,742.56
14	Average loams with fine gravel, brocken and whole shell	205.03
15	Lean, sandy clay with often thin dirt bands of sand and inclusions of shell	44.82
16	Gravel-shingle deposition with sandy filler and inclusions of brocken and whole shell	3,309.33
17	Different-grained shelly sandstones	117.24
18	Different-grained sand with prevalence coarse-grained, with inclusions of gravel, shingle, breakstone and limestone gruss, with thin dirt bands of clays	10,955.97
19	Sandy loams from light up to heavy with rare thin dirt bands of clays	2,259.50
20	Shingle with gravel-sandy filler and rare inclusions of broken and whole shell	918.13
21	Average and heavy loams with thin rare dirt bands of fine sand and inclusions of breakstone and limestone gruss	683.31
22	Clays mainly sandy, laminated with thin dirt bands of fine sand	716.53
24	Detritus sandy limestones with rare thin dirt bands of sand and clays	25,979.79
25	Thin interbedding of oozy clays, fine-grained sand and shell; the clays prevail	510.11
26	Fine-grained sand with thin dirt bands of sandstones and sandy clays	314.41
27	Pebble with an impurity of gravel and coarse-grained sand	44.33
28	Clays from sandy up to greasy, thin, with often thin dirt bands of fine-grained sand	111.64
29	Non-uniform interbedding of different-grained sand, sandy clays, detritus limestones	493.59
30	Detritus limestones mainly thin-laminated with dirt bands of fine-grained sand both inclusions of gravel and fine shingle	229.14
31	Sand from fine-grained up to coarse-grained with often thin dirt bands of sandy clay	126.75
33	Non-uniform interbedding of sand, sandy clays and hard detritus sandy limestones	1,970.29
34	Detritus, sandy, massive limestone contain shingle by a diameter up to several centimeters, with lenses and brats of sand, sandstones and clay	4,850.96
35	Fine-grained and medium-grained sand sometimes loamy with inclusions of fine-broken and cunning shell	70.42
36	Clays more often greasy, high plasticity less often lean sandy with rare low-massive dirt bands of limestones and fine-grained sand	37.90
37	Non-uniform interbedding of fine-grained sand, sandy lean clays and sandy detritus limestones; the clays prevail	4,804.81
38	Detritus, strong limestones with rare thin dirt bands of sand and clays	5,047.30
39	Clays mainly greasy, high plasticity with thin rare dirt bands of white ashes	1,273.18
40	Clays mainly greasy, high plasticity with often thin dirt bands of volcanic ashes and	277.46

	rare rather thin interlayers of gypsum	
41	Non-uniform interbedding of sand, sandstones and carbonate clays	8,883.27
42	Clays greasy, places laminated with dirt bands of marls	337.50
43	Clays greasy with thin dirt bands of shales, sand, less often than dolomites and marls	2,798.27
44	Clays greasy carbonate by places schistose with often thin dirt bands of dolomites	522.11
45	Clays greasy carbonate and clay shales with jarozite and rare dirt bands of sand and sandstones	1,172.61
46	Clays and clay shales with dirt bands of bituminous fells shales, less often morls and marlsly clay	2,106.96
49	Flooded area	4,499.70
50	Sandy loams from light up to heavy with inclusions of gravel, shingle, breakstone and limestone gruss + Large and small fragments of limestones in downfalls	27.98
101	Hill breccia - clay-loamy mass from blue-grey up to yellow-brown colour, not laminated with inclusions and wreckages of different bedrocks, sedimentary	3,196.71
102	Loams from medium up to high, not laminated, grey, brown with different shades, frequently with an impurity of not rolled wreckages of bedrocks	2,041.98
103	Loams of brown, yellow-brown, red-brown colour, from light up to high, with lenss of the sandy loams, fine-granulated, sands. Loams macro porous, loess-like, gypsumed, dustly, frequently sedimentary	16,409.39
106	Alternating each other sands, sandy loams, loams and clays, both in the plan, and in a sectional view. The friable differences of rocks predominate	2,746.59
132	The alternation of hardly salted sandy loams, is rare of slurries and clays. Sandy loams predominate. On a surface heapy "pseudo-sands"	2,126.60
133	Sands medium- and coarse-grained, well sorted out from shell detritus, friable, free-flowing	2,205.00
134	Different-grained sands, shelly, frequently weak-clayly with actuations and congestions of a fine gravel, brocken and whole shell	9,897.29
135	Alternating each other sands, sandy loams, loams and clays both in the plan, and in a sectional view	1,796.38
161	Finely laminated interbedding of short-grained sand with brown clay and loams, by places congestions of a friable coquina, loams frequently with lenss of gypsum	305.96
162	Floridly interleaving hardpans of clays, sands, loams and sandy loams. Seldom hardpans of a coquina and conglomeration	112.33
167	Irregular finely and medium interbedding of the dark different-sandy of clays with interlayers finely- and medium-grained sand, is rare shell chalkstone	175.54
168	Floridly interleaving of hardpans of packed clays, different sands. The clays predominate	1,010.60
171	Different interbedding of chalkstones, sand of clays. By places from a surface the chalkstones up to 15-30m predominate	2,237.65
172	The different-laminated interbedding of different clays, sandstones, conglomerates, boulder beds is rare of brats of sand and volcanic ashes	176.21
173	Clays grey, blue-brown, yellow-brown with interlayers of fine-grained clay sands, brats of volcanic ashes	406.14
174	The interbedding of thick seams, packages, horizons of different sands, sandstones, clays, is rare brats of conglomerates	2,482.04
202	Sands and broken shell. Alluvial rubble and sands. Delluvial-prolluvial rubble and loams. Elluvial-delluvial sandy loams and loams. Ash sands. Hill breccia. Alluvial-prolluvial clays, loams, saliniferous slurry and salts	5,974.59
205	Conglomerates, rubble, sands, clays, shells, limestones, alluvial rubble.	91.92
209	Shell limestones, sandstones, clays.	9,323.44
210	Clays, aleurolites	755.25
211	Clay shales, not carbonaceous clays, detritus chalkstones, volcanic ashes	944.80
212	Alternation of sands, sandstones, clays	1,081.58
213	Clays, chalkstones, marls	499.38
214	Clays, clay shales, marls, dolomites, volcanic ashes	505.10

215	Marls, carbonaceous clays, dolomites.	27.32
216	Chocolate-brown clays, sandstones.	40.79
217	Clays, sandstones, piro-bitumen shales, marls, argillites, hardpans of bentonites	216.97
218	Red-brown clays, sandstones	929.13
231	Depositions of mud volcanos	694.40
	Total Area	207,016.21

Refer to “geology” theme in the GIS database

- Data sources

Engineering-Geological map of 1:50000 scale, 1983, (SCGMR),
Engineering-Geological map of 1:200000 scale, 1982, (SCGMR),
Geological map of 1:200000 scale, 1960, (SCGMR).
SCGMR : State Committee on Geology and Mineral Resources

b.3 Meteorology

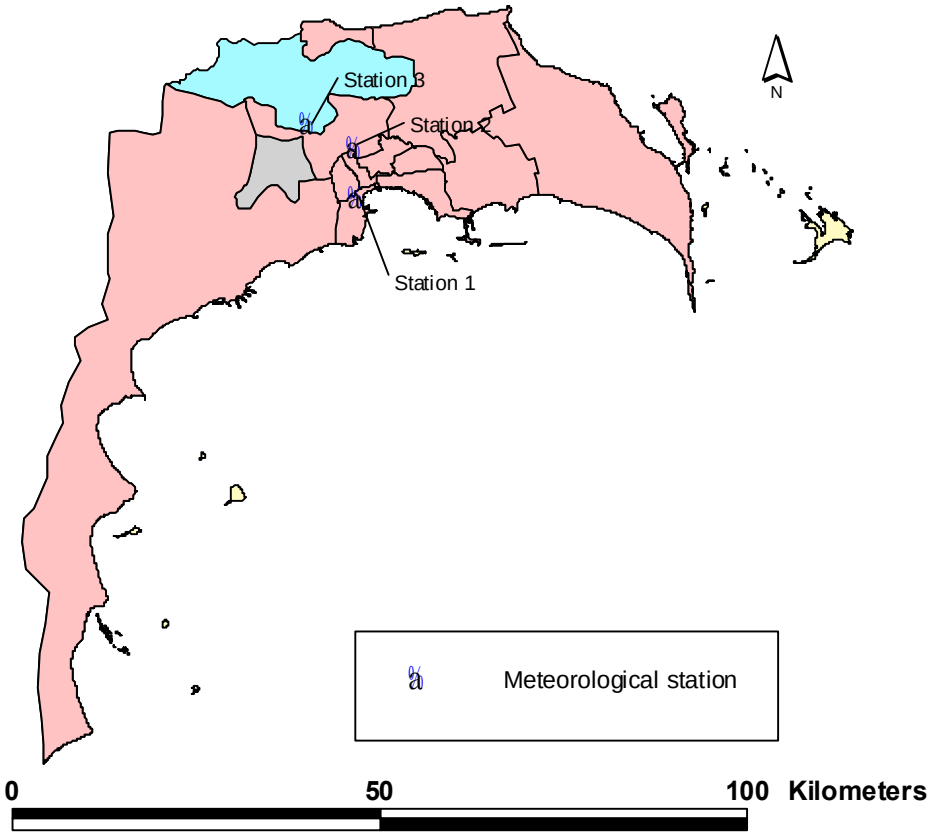
In the “Meteorology” there have been prepared data describing weather conditions. The “Baku” HMS (Hydrometeorology Station) was founded in the beginning of XX century. In April 1994 the location of station was changed within Baku boundaries. In February 1999 the station was moved into Khyrdalan-settlement being located outside the project boundaries. The data were prepared according movement of the station.

The team digitised meteorological data. The data include rainfall, temperature, wind velocity and wind direction, based on statistical data obtained from the State Committee for Hydrometeorology. The data specifications are as follows.

- rainfall: monthly average data from 1990 to 1999
- temperature: monthly maximum, minimum and average temperature from 1990 to 1999
- wind velocity: monthly maximum wind speed, maximum instantaneous wind velocity and average wind velocity from 1990 to 1999
- wind direction: monthly average wind direction from 1990 to 1999 was collected

The information was managed with the MS Excel software and exported to the ArcView GIS. Location of the observatory was registered as a point data with a attribute table including ID.

- Spatial data (Point)



- Attribute table

Refer to “m1.xls, m2.xls, m3.xls, wd1.xls, wd2xls, wd3xls” in the GIS database.

- Data sources

State Hydrometeorology Committee

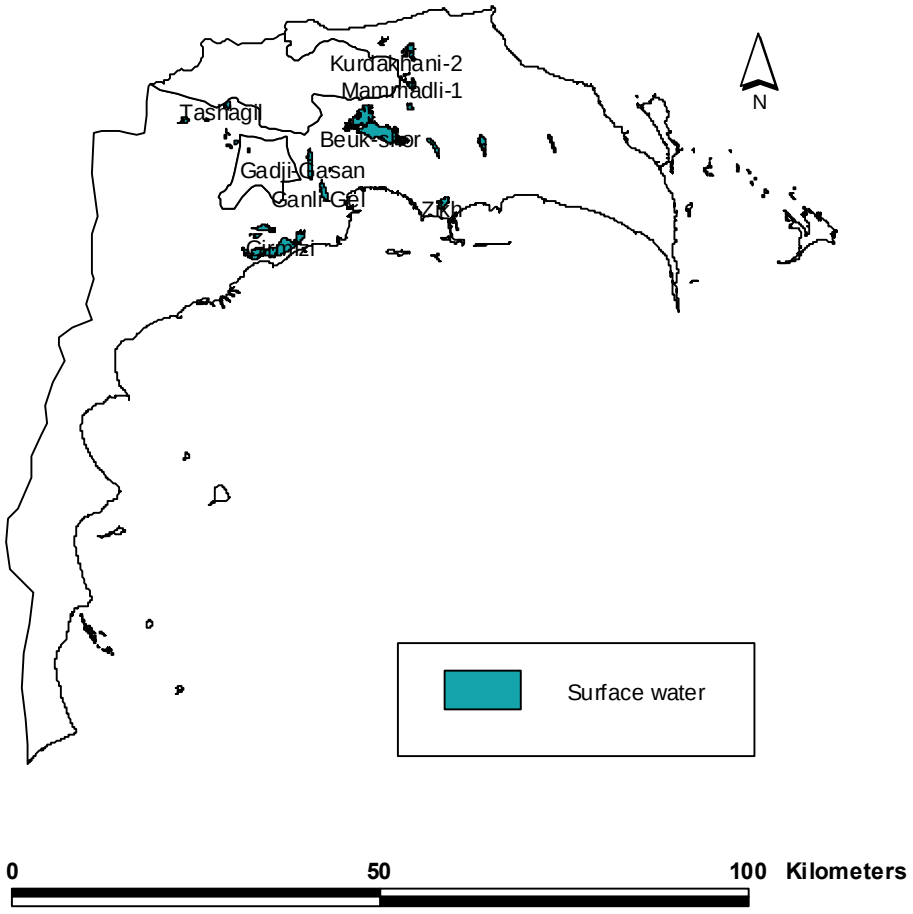
b.4 Hydrology

Hydrological data, i.e. surface water and groundwater, were prepared by the team based on the data provided by the State Committee for Hydrometeorology that surveyed those water bodies.

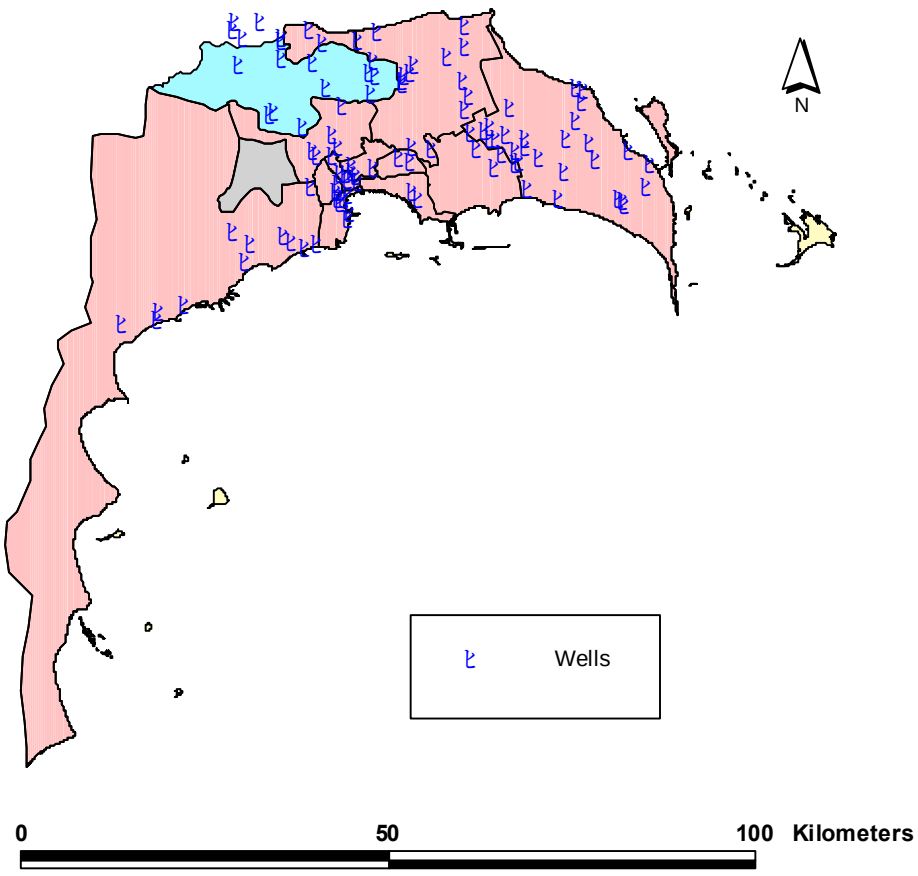
The data on surface waters were created as polygon data with an attribute table including the following information: name, area , depth.

As for groundwater, the location of wells was entered as point data with an attribute table containing the name and average annual depth from the ground level observed in 1990, 1995 and 1999. Furthermore, groundwater direction was also digitised as line data.

- Spatial data of surface water (Polygon)



- Spatial data of groundwater (Point)



- Attribute table of surface water

ID	Name	Area (km^2)	Depth (m)
1	Gadji-Gasan	1.80	3.50
2	Bul-Bula	1.20	4.50
3	Zikh	1.30	2.50
4	Zabrat-1	0.50	2.00
5	Girmizi	2.70	1.50
6	Ganli-Gel	2.70	5.00
7	Alatava-1	0.03	4.50
8	Shorchala-1	0.12	N/A

9	Agchala	0.16	N/A
10	Egri-Chalashor	0.12	N/A
11	Meili-Kulichala	N/A	N/A
12	Shorchala-2	0.34	1.00
13	Taddichala	0.20	N/A
14	Gosha Jatagchala	0.20	N/A
15	Tashagil	0.44	N/A
16	Beuk-shor	9.20	5.50
17	Alatava-2	0.04	4.00
18	Pirshaga	0.12	1.30
19	Pirshaga RW st	0.20	1.00
20	Kurdakhani-2	3.30	N/A
21	Puta	0.50	N/A
22	Puta-2	2.20	1.00
23	Yeni Surakhani	0.80	2.20
24	Mammadli-1	0.80	N/A
25	Zabrat-2	0.10	1.10
26	Mammadli-2	0.20	N/A
27	Gala	0.52	N/A

Refer to “lakes” theme in the GIS database.

Area : Official area of each surface water.
Depth : Official depth of each surface water

- Attribute table of groundwater

ID	Name	Wdpt (1990)	Wdpt (1995)	Wdpt (1999)
1	185	2.01	2.17	2.76
2	161	0.91	0.75	0.87
3	157	1.57	1.29	2.00
4	248	13.35	13.31	13.33
5	246A	15.17	15.92	14.84
6	246	17.99	17.02	17.03
7	141	18.64	19.57	18.57
8	140	10.98	12.75	16.12
9	152	19.38	19.29	19.49
10	241	25.01	25.06	25.92
11	153	0.00	0.00	0.00
12	150	5.14	5.94	6.80
13	154	13.78	14.68	14.77
14	159	4.19	4.05	4.24
15	214	6.17	5.63	5.76
16	135	1.78	1.49	2.00
17	133	3.33	4.11	4.18
18	148	3.12	4.30	4.73
19	250	8.08	8.33	8.10

20	11	15.02	11.27	11.56
21	213	3.34	3.88	3.94
22	209	3.52	3.57	3.45
23	204	3.53	1.34	1.42
24	203	0.87	0.79	1.98
25	211	2.58	2.81	1.49
26	147	5.82	7.12	6.11
27	199	1.23	0.91	1.40
28	22	1.14	0.36	0.65
29	26	1.76	1.01	2.00
30	20	9.48	6.29	6.25
31	46	1.79	1.31	1.53
32	3	1.41	2.43	2.56
33	129	0.20	0.25	0.70
34	128	1.89	1.26	1.19
35	126	8.63	6.61	7.14
36	127	8.73	8.52	7.12
37	196	2.88	3.85	3.18
38	108	2.01	1.97	2.28
39	233	2.20	3.27	3.20
40	172	3.19	4.54	4.29
41	174	3.45	4.74	4.98
42	176	3.13	4.13	4.34
43	177	3.45	4.21	4.42
44	111	6.39	5.32	5.95
45	15	1.12	0.38	0.45
46	223	10.77	9.39	9.26
47	100	1.54	2.11	2.22
48	2	13.54	14.07	14.37
49	234	1.65	1.36	1.48
50	216	0.46	0.16	0.60
51	44	0.67	0.69	1.51
52	218	4.18	3.98	3.78
53	124	0.24	1.07	1.68
54	271	N/A	N/A	4.14
55	235	2.63	2.12	2.22
56	117	0.31	1.24	1.28
57	189	13.20	12.49	12.35
58	122	2.25	2.41	2.28
59	23	0.63	0.48	0.65
60	230	1.94	1.81	2.12
61	229	1.10	1.66	2.51
62	169	9.00	9.98	10.80
63	92	4.89	2.78	2.40
64	221	4.49	4.46	5.02

65	82	17.07	16.84	16.54
66	84	3.31	5.02	3.86
67	89	2.32	2.94	2.86
68	102	4.21	3.98	3.97
69	226	1.80	3.60	4.43
70	220	16.29	15.59	15.34
71	251	12.99	8.40	7.85
72	162	2.65	2.73	2.80
73	B-2	10.82	10.82	15.56
74	B-6	18.30	18.20	19.10
75	41/5	1.34	0.66	0.73
76	42/5	1.25	0.44	0.60
77	25/5	5.49	5.08	5.11
78	1/1	4.39	4.33	4.28
79	121	1.18	1.61	1.80
80	27	1.22	1.14	2.96
81	28	0.00	0.00	0.00
82	42	0.05	0.08	0.09
83	261	N/A	N/A	2.19
84	4S	1.71	1.46	1.62
85	181	2.87	1.09	1.50
86	179	1.17	1.16	1.77
87	26/5	1.26	0.47	0.47
88	5/5	2.81	2.81	2.80
89	8/5	3.33	3.33	3.34
90	1/5	3.33	3.33	3.34
91	2M	3.72	3.43	3.32
92	8M	4.29	4.19	4.10
93	12	6.10	5.57	5.71
94	13	2.78	3.27	3.27
95	264	N/A	N/A	5.47
96	44/5	2.01	1.48	1.42
97	51	2.38	1.70	1.82
98	22/5	2.48	1.04	1.11
99	107	3.78	2.07	1.34
100	41	1.96	1.14	1.12
101	34	7.46	3.06	3.13
102	15S	0.00	1.05	1.27
103	13S	1.76	2.09	2.34
104	18N	3.73	4.29	4.03

Name : Location name of each well
Wdpt (1990) : Average annual depth from the ground level in 1990
Wdpt (1995) : Average annual depth from the ground level in 1995
Wdpt (1999) : Average annual depth from the ground level in 1999

- Data source of surface water

State Hydrometeorology Committee

Absheron Regional Water Company

"Water Resources of Azerbaijan SSR", S.G.Rustamov, R.M.Kashkay, Baku, 1989

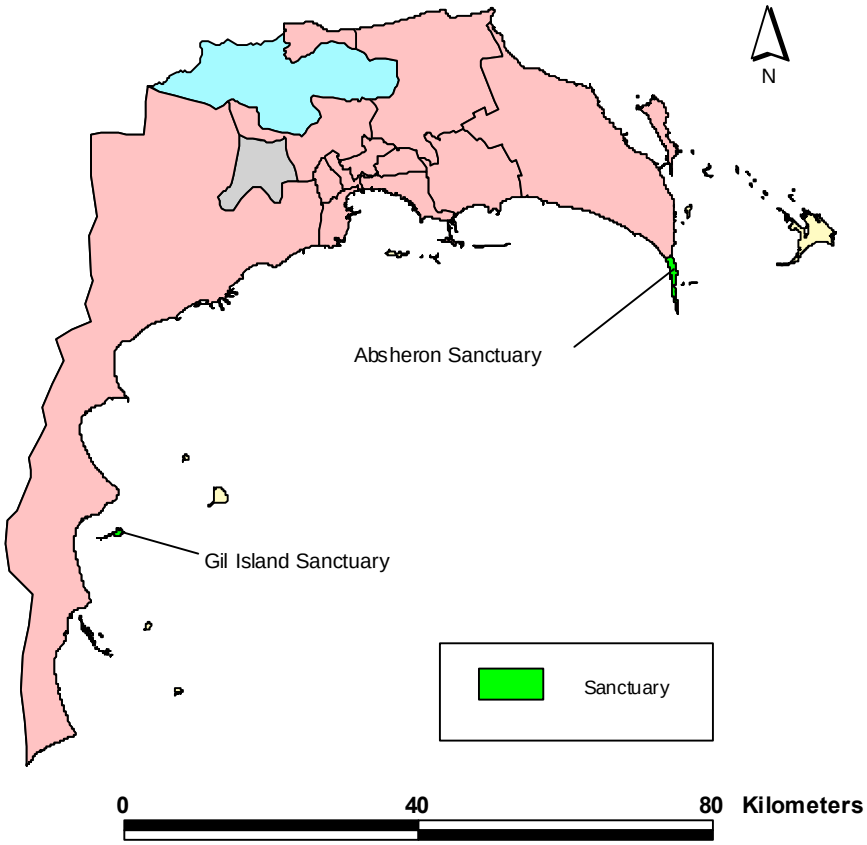
- Data source of groundwater

State Committee on Geology and Mineral Resources

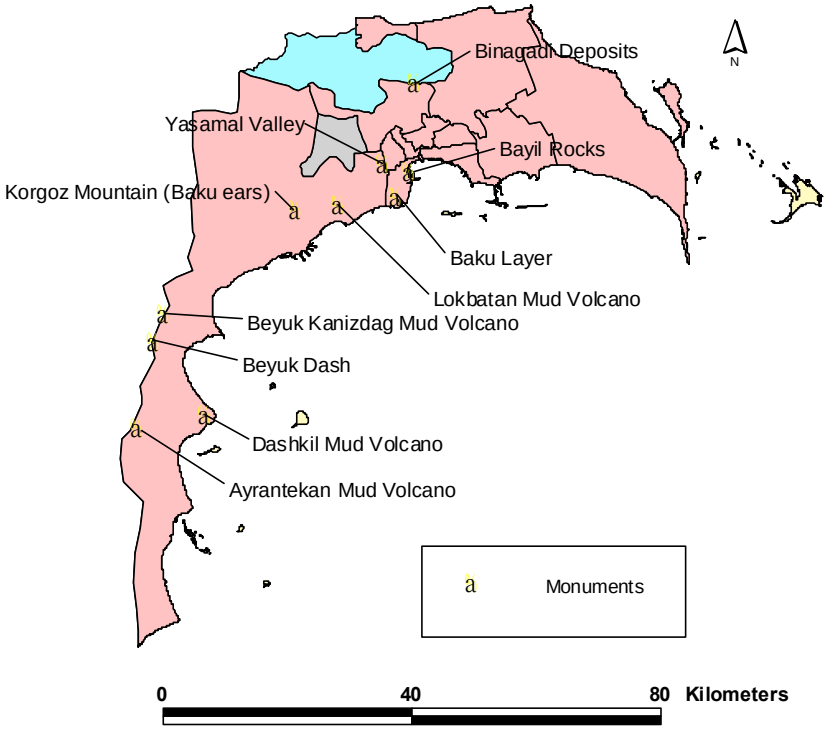
b.5 Fauna and flora (rare species)

As for the data of fauna and flora, sanctuaries and monuments data were created. There are two sanctuaries and 10 monuments in the Greater Baku.

- Spatial data of sanctuary (Polygon)


N
Absheron Sanctuary
Gil Island Sanctuary
Sanctuary
0
40
80
Kilometers

- Spatial data of monuments (Point)



- Attribute table of sanctuary

ID	Area (km^2)	Name	Dt_Lg_Est	Purpose	Resp_Org
1	4.5	Absheron Sanctuary	July, 1969	N/A	BCE
2	1.3	Gil Island Sanctuary	February, 1964	Protection of Birds Migration and Caspian Seal Rookery	BCE

Fauna	Flora
Birds, Seal, Wolf, Fox, Brown hare	Seaside sand vegetation
Birds, Saiga tartarica, Wolf, Fox, Brown hare	Seaside sand vegetation

Area : Area of sanctuary (unit = km2)
Name : Name of sanctuary
Dt_Lg_Est : Date and legislative base of establishment
Purpose : Purpose of establishment
Resp_org : Responsible organisation

Fauna : Species of fauna
Flora : Species of flora

Refer to "sanctuary" theme in the GIS database

- Attribute table of monument

ID	Name	Dt_Lg_Est	Description	Resp_Org	Type
1	Binagadi Deposits	1995, Statement on BCE #05/535	Deposits of over 50,000 bones of quaternary creatures, including 40 mammal species, 120 bird species, 2 reptile species, 1 amphibian species, 107 insect species and 22 plant species.	Binagadi executive power	Paleontological
2	Baku Layer	1999, Statement on BCE #05/530	Hill with 125m height revealing low quaternary deposits of 70m thickness.	Sabayil and Bibi-Eibat executive power	Geological
3	Bayil Rocks	March 16 of 1982, Annex of Statement No 167 of CCCP of Azerbaijan and Soviet of Ministers of Azerbaijan SSR	Demonstrates movement of the earth's crust	Sabayil shipyard	Geological-paleontological
4	Lokbatan Mud Volcano	1998, Statement on BCE #05/1487	Elevation is 130 m above sea level. It is reported to have 20 registered eruptions that is the greatest number. It does not have a gryphon stage unlike the other mud volcanoes.	Karadag executive power	Geological, volcanological
5	Beyuk Kanizdag Mud Volcano	1998, Statement on BCE #05/1489	Elevation is 400 m above sea level and diameter is 2 km. Diameter of the crater is 250-300 m.	Karadag executive power	Geological, volcanological
6	Ayrantekan Mud Volcano	1998, Statement on BCE #11/700	It has 66 gryphons and saleses which erupt gas, mud and oily water. The last big eruption was observed in 1990.	Karadag executive power	Geological, volcanological
7	Korgoz Mountain (Baku ears)	1998, Statement on BCE #06-05/120	It shows a pattern of the destroyed anticlinal fold composed of compact limestone. Elevation is 388.8 m above sea, the highest point of the peninsula.	Karadag executive power	Geological
8	Beyuk Dash	March 16 of 1982, Annex of Statement No 167 of CCCP of Azerbaijan and Soviet of Ministers of Azerbaijan SSR	It is a group of clay karsts with a great number of craters of various depths and diameters (0.5 to 15 m).	Gobustan State Hystoric-Art Museum	Geological
9	Yasamal Valley	March 16 of 1982, Annex of Statement No 167 of CCCP of Azerbaijan and Soviet of Ministers of Azerbaijan SSR	It shows beautiful valley erosion.	Shubahi Settlement Council	Cultural
10	Dashkil Mud Volcano	March 16 of 1982, Annex of Statement No 167 of CCCP of Azerbaijan and Soviet of Ministers of Azerbaijan SSR	It represents a flat elevation with scattered mud salses.	Alat Settlement Council	Geological, volcanological

Name : Name of monument
Dt_Lg_Est : Date and legislative base of establishment
Type : Type of monument
Description : Description of monument
Resp_Org : Responsible organisation

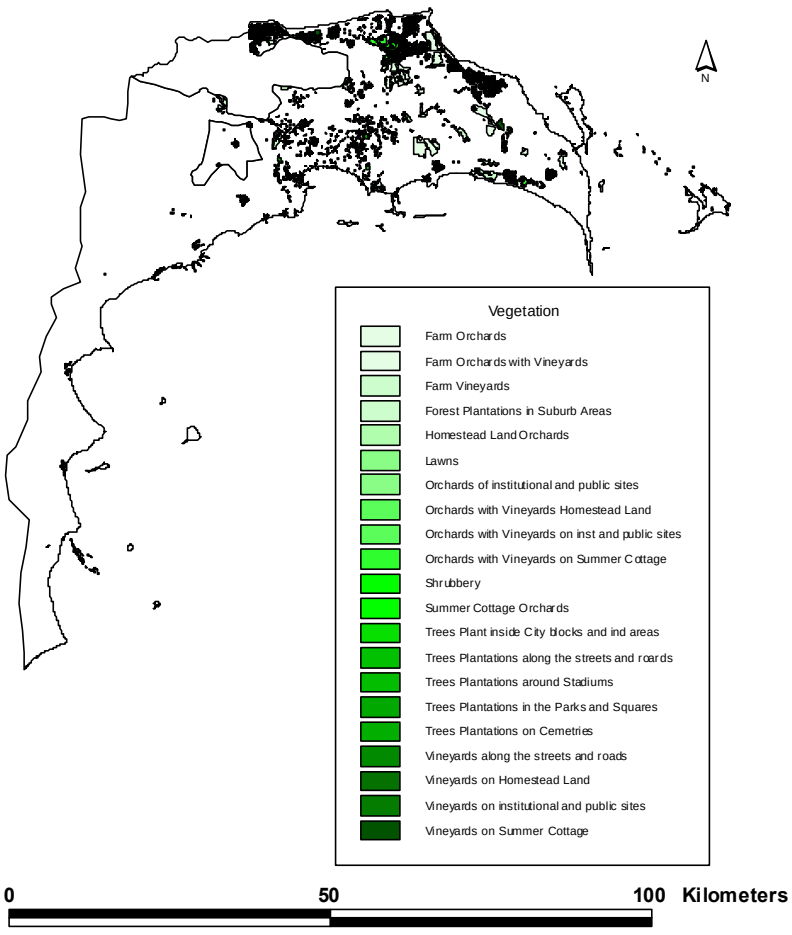
b.6 Vegetation

The team employed existing digital data on vegetation and also satellite images as supplemental information.

The source of the existing data is the Department of Planting of Trees and Gardens of the Municipality of Baku and the data were prepared by experts from different governmental organisations. There are 21 vegetation categories each represented as polygon data with an attribute table including vegetation type and type code.

As for satellite images, the data source is LANDSAT TM, which was taken on 31 July 1988 and 23 August 1999.

- Spatial data of vegetation



- Result of analysis using attribute table

Type code	Type	Area (ha)
1	Farm Orchards	3,472.56
2	Farm Orchards with Vineyards	347.95
3	Farm Vineyards	941.90
4	Forest Plantations in Suburb Areas	1,110.90
5	Homestead Land Orchards	2,789.32
6	Lawns	13.41
7	Orchards of institutional and public sites	56.56
8	Orchards with Vineyards Homestead Land	87.61
9	Orchards with Vineyards on inst and public sites	21.66
10	Orchards with Vineyards on Summer Cottage	3,333.75
11	Shrubbery	116.78
12	Summer Cottage Orchards	470.25
13	Trees Plant inside City blocks and ind areas	734.91
14	Trees Plantations along the streets and roards	182.01
15	Trees Plantations around Stadiums	21.46
16	Trees Plantations in the Parks and Squares	701.93
17	Trees Plantations on Cemetries	268.07
18	Vineyards along the streets and roads	4.70
19	Vineyards on Homestead Land	31.82
20	Vineyards on institutional and public sites	1.56
21	Vineyards on Summer Cottage	1,600.87
	Total Area	16,309.98

Refer to “vegetation” theme in the GIS database

- NDVI (Normalised Difference Vegetation Index)

Precondition

The team calculated the NDVI (Normalised Difference Vegetation Index) using TM data taken in two different periods and analysed vegetation status. Such analysis is subject to the following preconditions.

Seasons

Since NDVI is an indicator of the relative amount and health of the vegetation, it is influenced by the seasons. The TM images used by the team were acquired in July 1988 and in August 1999; the one month difference is considered to have no serious impact on the VI.

Precipitation

Vegetation status is obviously influenced by precipitation; more rainfall activates vegetation. Therefore rainfall data at the time when the Landsat images were taken should have been collected. The team was not successful in obtaining precipitation data in July 1988, and thus could not determine the difference or similarity in precipitation when comparing the VI taken in two different periods.

Vegetation Index (NDVI)

Computation of electromagnetic wave intensity using several wave bands is often applied to vegetation distribution analysis and atmospheric correction. In the computation, a radiation value is typically divided by the other so that spectral information can be emphasised, free from noises produced by uneven land surfaces.

The reflection ratio of plants is high for near IR (Band 4) and low for visible red (Band 3). To calculate the NDVI for each pixel on an image, data obtained using Band 3 and Band 4 are applied to the following equation.

NDVI = (Band 4 – Band 3)/(Band 4 + Band 3)

Where Band 4: standardised electromagnetic wave intensity; one pixel.
Band 3: standardised electromagnetic wave intensity; one pixel.

NDVI ranges from –1.0 to 1.0. A less than zero NDVI indicates land with poor vegetation such as water bodies and bare lands, whilst an NDVI between zero and 1.0 signifies land with rich vegetation. The team extracted the area with an NDVI of over zero, which is then further divided into five classes in terms of NDVI: (A) 0 to 0.1, (B) 0.1 to 0.2, (C) 0.2 to 0.3, (D) 0.3 to 0.4 and (E) 0.4 or more. Vegetation is denser in this order. Areas A, B and C are typically crop fields, while areas D and E are tree plantations and forests.

Results

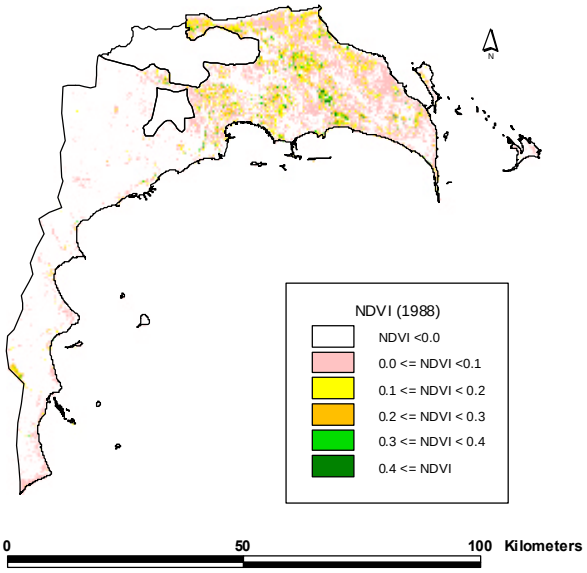
Areas classified by NDVI (two scenes: 1988 and 1999) are shown in below table.

It is clear that the areas under the entire five classes have decreased. This is particularly the case for classes A, B and C. Areas of classes D and E were already small in 1988 and further halved in 1999. The decline in vegetation areas cannot be fully attributed to less rainfall due to the unavailability of the 1988 rainfall data. The NDVI maps are presented below.

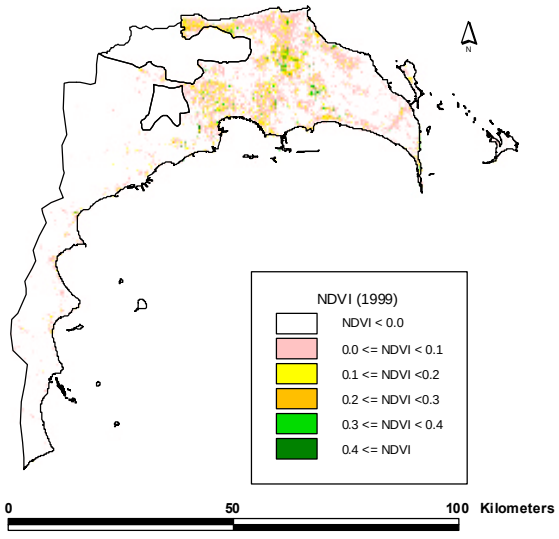
Areas of NDVI Classification in 1988 and 1999

NDVI Classes	1988 (km^2)	1999 (km^2)
A (0.0 – 0.1)	458.0	310.0
B (0.1 – 0.2)	120.1	79.2
C (0.2 – 0.3)	44.9	25.0
D (0.3 – 0.4)	16.4	8.5
E (0.4 – 1.0)	7.7	4.1
Total	647.1	426.8

- Spatial data of NDVI in 1988 (Grid)



- Spatial data of NDVI in 1999 (Grid)



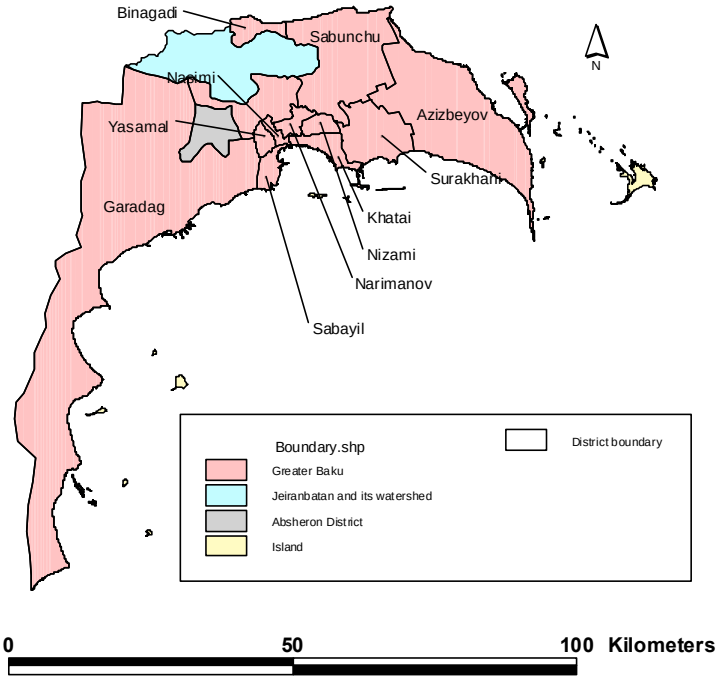
c. Social conditions

Social information was classified into 8 categories: (1) administrative boundary, (2) population, (3) areas designated for particular purposes, (4) land use, (5) changes in land use, (6) health statistics, (7) city water facilities and (8) medical institutions.

c.1 Administrative boundary

The team digitised the administrative boundaries of the 11 districts based on hard copy maps of Baku at a scale of 1:10,000 (maps at a scale of 1:5000 were used for adjustment). The data were represented as polygon data with an attribute table including district names and area coverage.

- Spatial data (Polygon)



- Attribute table

ID	Name	Area (ha)
1	Sabayil	2,447.25
2	Yasamal	1,526.04
3	Nasimi	1,047.74
4	Narimanov	1,986.82

5	Nizami	1,904.73
6	Khatai	3,628.54
7	Garadag	108,373.08
8	Binagadi	13,063.43
9	Sabunchu	25,475.79
10	Surakhani	10,931.93
11	Azizbeyov	39,083.41
	Total Area	209,468.76

Refer to “dist_bound” theme in the GIS database

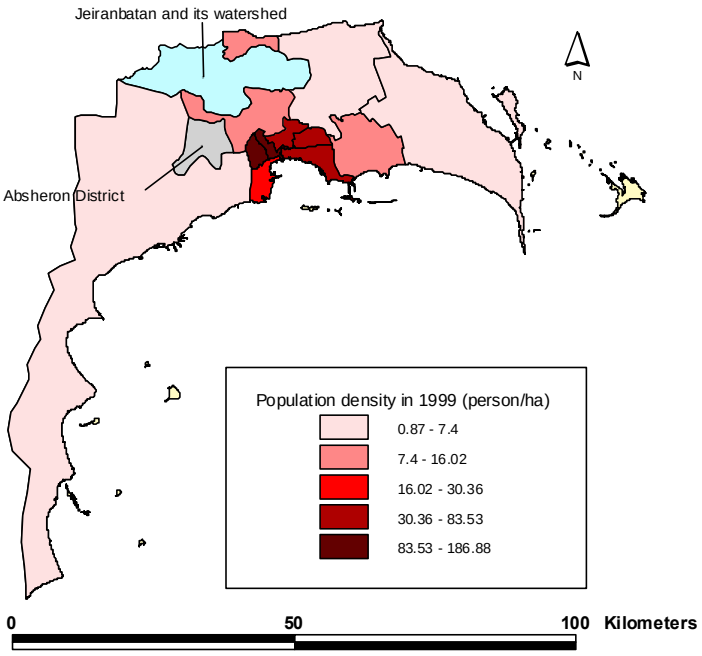
- Data source

Baku City Administration

c.2 Population

The data on population was prepared by district based on the statistics of 1972, 1977, 1982, 1987, 1992 and 1997. Due to Nizami district wasn’t present in 1972 and 1977, the information of population absent for these years.

- Spatial data (Polygon)



- Attribute table

ID	Name	Area (ha)	Pop_1972	Pop_1977	Pop_1982	Pop_1987	Pop_1992	Pop_1997	POP_1999
1	Sabayil	2,447.25	109,900	102,900	102,200	95,200	78,200	74,500	74,300
2	Yasamal	1,526.04	196,500	210,100	221,800	227,200	219,100	220,200	221,500
3	Nasimi	1,047.74	223,400	230,400	229,800	222,900	199,200	195,300	195,800
4	Narimanov	1,986.82	178,100	197,100	173,800	171,200	145,500	141,500	147,900
5	Nizami	1,904.73	No data	No data	153,500	161,000	160,300	157,600	159,100
6	Khatai	3,628.54	200,000	269,500	170,600	222,000	216,100	208,900	215,500
7	Garadag	108,373.08	51,200	54,400	61,200	78,100	91,000	91,100	94,300
8	Binagadi	13,063.43	89,700	112,900	162,300	183,400	186,000	195,600	209,300
9	Sabunchu	25,475.79	143,600	166,800	177,300	188,800	189,500	184,500	188,600
10	Surakhani	10,931.93	67,900	73,300	78,800	109,300	147,000	144,700	165,800
11	Azizbeyov	39,083.41	90,100	97,400	106,300	112,600	113,700	113,300	116,400

Den_1972	Den_1977	Den_1982	Den_1987	Den_1992	Den_1997	Den_1999
44.91	42.05	41.76	38.90	31.95	30.44	30.36
128.76	137.68	145.34	148.88	143.57	144.30	145.15
213.22	219.90	219.33	212.74	190.12	186.40	186.88
89.64	99.20	87.48	86.17	73.23	71.22	74.44
0.00	0.00	80.59	84.53	84.16	82.74	83.53
55.12	74.27	47.02	61.18	59.56	57.57	59.39
0.47	0.50	0.56	0.72	0.84	0.84	0.87
6.87	8.64	12.42	14.04	14.24	14.97	16.02
5.64	6.55	6.96	7.41	7.44	7.24	7.40
6.21	6.71	7.21	10.00	13.45	13.24	15.17
2.31	2.49	2.72	2.88	2.91	2.90	2.98

Refer to “population” theme in the GIS database

ID : District ID
Name : District name
Area : Area of district (unit = ha)
Pop_1972 : Total number of population in 1972 (unit = person)
Pop_1977 : Total number of population in 1977 (unit = person)
Pop_1982 : Total number of population in 1982 (unit = person)
Pop_1987 : Total number of population in 1987 (unit = person)
Pop_1992 : Total number of population in 1992 (unit = person)
Pop_1997 : Total number of population in 1997 (unit = person)
Pop_1999 : Total number of population in 1999 (unit = person)
Den_1972 : Population density in 1972 (unit = person/ha)
Den_1977 : Population density in 1977 (unit = person/ha)
Den_1982 : Population density in 1982 (unit = person/ha)
Den_1987 : Population density in 1987 (unit = person/ha)
Den_1992 : Population density in 1992 (unit = person/ha)
Den_1997 : Population density in 1997 (unit = person/ha)
Den_1999 : Population density in 1999 (unit = person/ha)

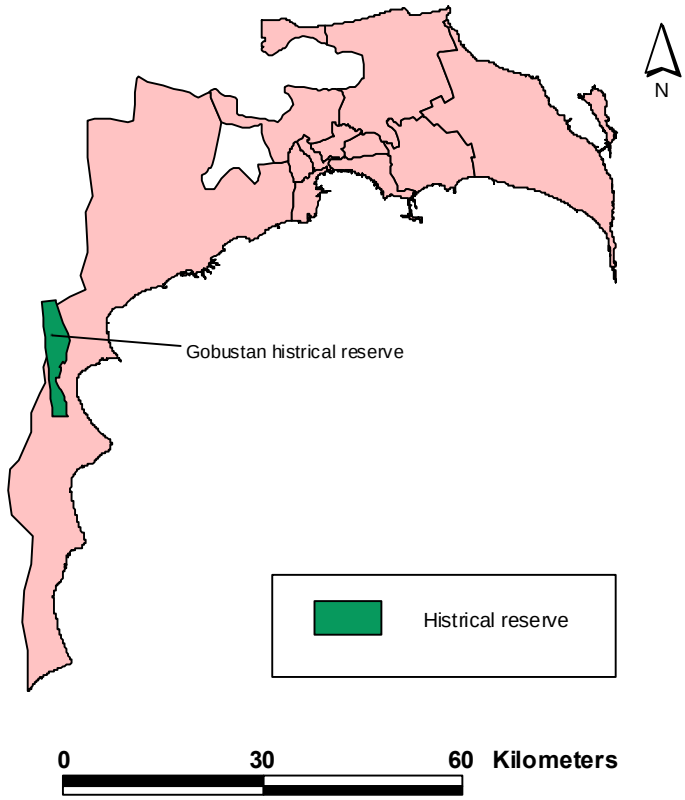
- Data source

State Statistical Committee

c.3 Areas designated for particular purpose

The data of nature reserve and national park were developed as an information of areas designated particular purpose. There is one reserved area and one national park in Greater Baku.

- Spatial data of nature reserve (Polygon)



- Attribute table of nature reserve

ID	Area (ha)	Name	Date_Est	Purpose	Resp_Org
1	4,265.18	Gobustan histrical reserve	N/A	Protect of the ancient rock painting	Ministry of Culture

Refer to “reserve” theme in the GIS database

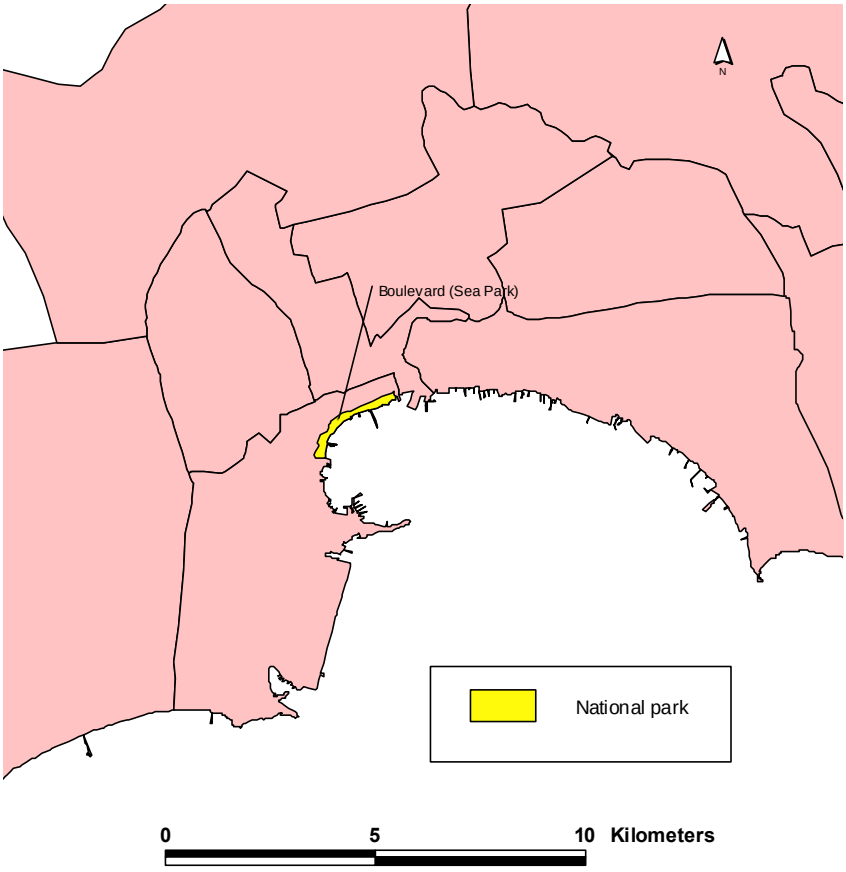
Area : Area of nature reserve (unit = ha)
Name : Name of nature reserve
Date_Est : Date of establishment
Purpose : Purpose of establishment
Resp_Org : Responsible Organisation

- Data source of nature reserve

Land use data from R.I.S.K. Company

Ministry of Culture

- Spatial data of national park (Polygon)



- Attribute table national park

ID	Area (km^2)	Name	Date_Est	Purpose	Resp_Org
1	0.500	Boulevard (Sea Park)	N/A	Protect and develop park as zone of rest	Baku City Administration

Refer to “national_park” theme in the GIS database.

Area : Area of national park
Name : Name of national park
Date_Est : Date of establishment
Purpose : Purpose of establishment
Resp_Org : Responsible organisation

- Data source

Land use data from R.I.S.K. Company

Baku City Administration

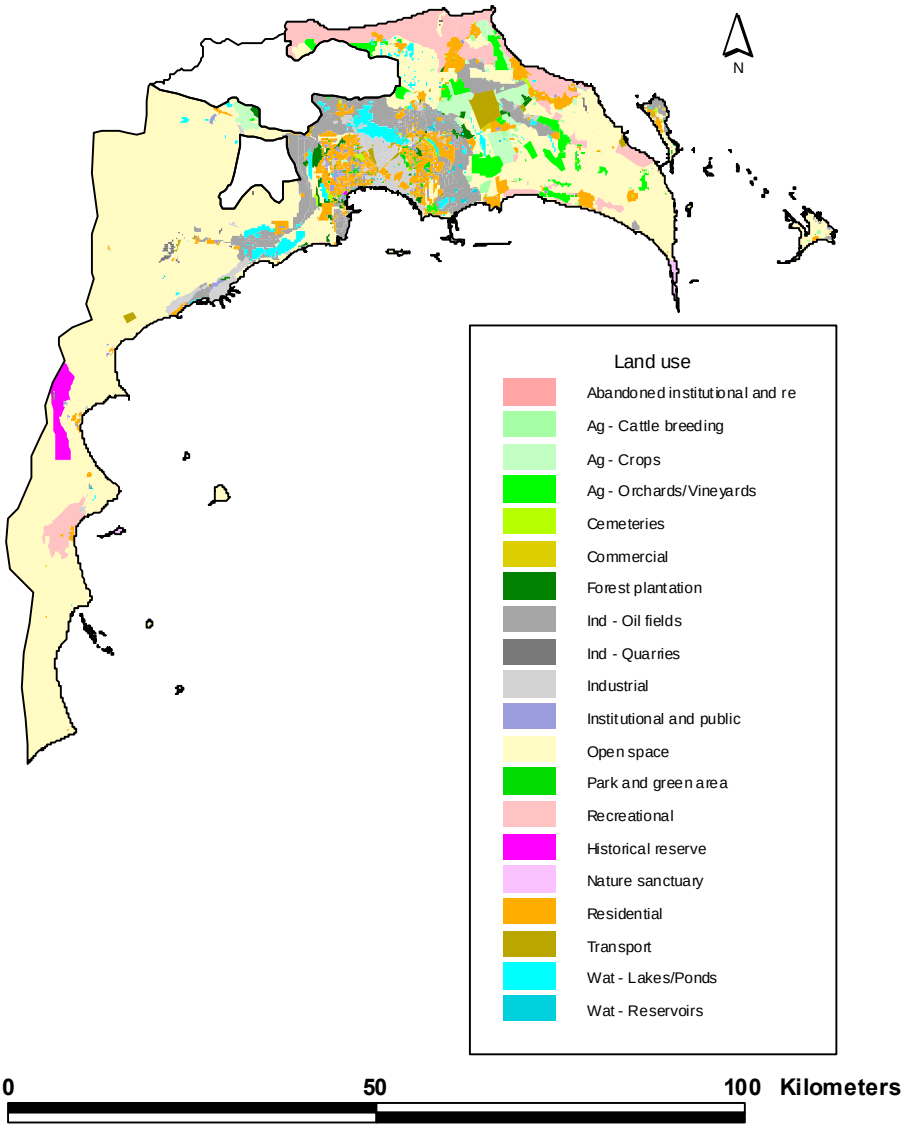
c.4 Land use

The team used existing digital data on land use as well as satellite images as supplemental information.

The source of the existing land use data is hard copy maps of Baku at a scale of 1:10,000 (maps at a scale of 1:5,000 and 1:2,000 were used for adjustments) as well as information received from the Department for Green Plantation of the Municipality of Baku. Further the information was adjusted and updated by field surveys. The data is classified into 19 categories.

As for satellite images, the data source is LANDSAT TM, which was taken on 31 July 1988 and 23 August 1999.

- Spatial data (Polygon)



- Attribute table

Type	Area (ha)
Abandoned institutional and residential	46.07
Ag - Cattle breeding	936.63
Ag - Crops	4,914.52
Ag - Orchards/Vineyards	5,735.47
Cemeteries	583.22
Commercial	159.48
Forest plantation	1,750.60

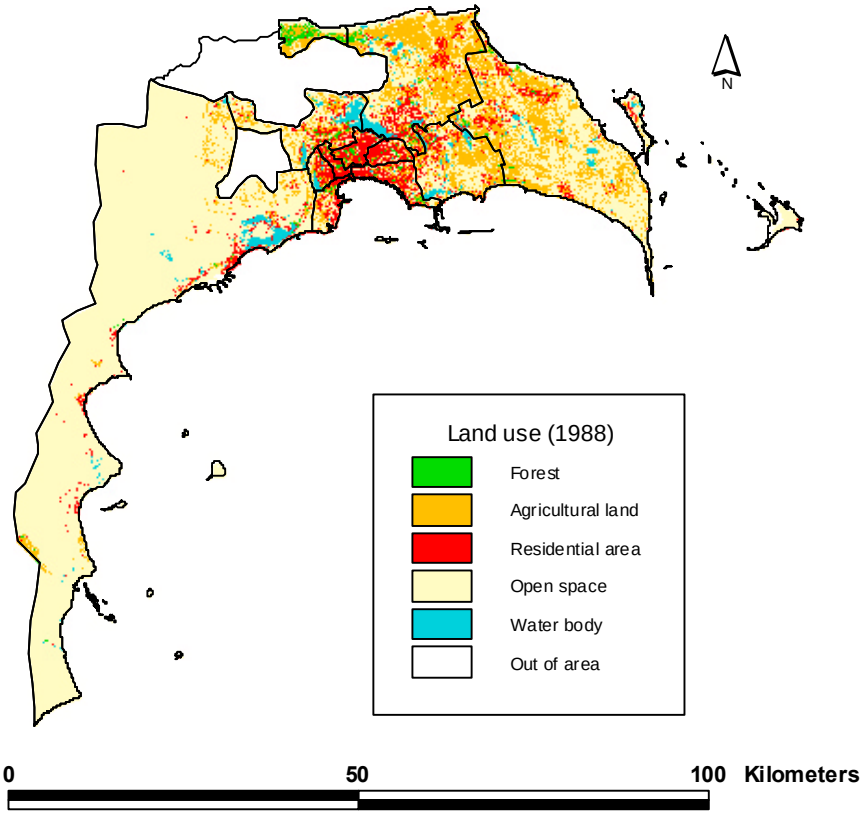
Historical reserve	2,409.80
Industrial - Oil fields	17,885.39
Industrial - Quarries	449.84
Industrial	6,493.03
Institutional and public	2,032.68
Nature sanctuary	515.88
Open space	129,460.17
Park and green area	589.65
Recreational	15,848.02
Residential	14,522.05
Transport	2,762.30
Water - Lakes/Ponds	4,879.08
Water - Reservoirs	316.04
Total Area	212,289.92

Refer to "landuse" theme in the GIS database.

- Data source

- The base map for the Greater Baku is a hard copy topographic maps at the scale of 1:10,000 with coordinate system Pulkovo 1942.
- The air-photo survey as well as field survey for the base map has been carried out in the years 1972, 1975, 1976, 1977, 1985, 1986.
- The year of production of this base maps is from 1989 to 1996.
- Also for the base map of Greater Baku at the scale of 1:5,000 has been used. These maps have been produced from the maps of 1:2,000 scale.
- The air-photo survey and field survey for the map of 1:5,000 scale have been carried out in the years 1980, 1982, 1983, and produced within year 1989 – 1996
- The air-photo survey and field survey for the map of 1:2,000 scale have been carried out in the years 1980,1982, 1983, and produced within year 1987 – 1989.
- The areas which have been revised on the base map are as follows;
  - Sangachal – Primorks area (southern part of Baku)
  - The 9th mikrorayon area
  - The area between former Sovetskaya street and Narimanov prospect
  - The parks named after Aliyev within area of hole city
  - The surrounding areas within hotels Hyatt Regency and Europe
  - Sharifsadeh street and many other buildings within territory oh whole Baku city
- All alteration have been made based on the data received from the General Architectural and city planning division of BEP
- The base source for land use is a hard copy topographic map of Baku at the scale of 1:10,000 (adjustment has been carried out by maps of 1:5,000 and 1:2,000 scale) as well as information received from Department for Green Plantation of Municipality of Baku. Also this information have been adjusted and updated by field surveys.

- Spatial data of land use in 1988 (Grid)

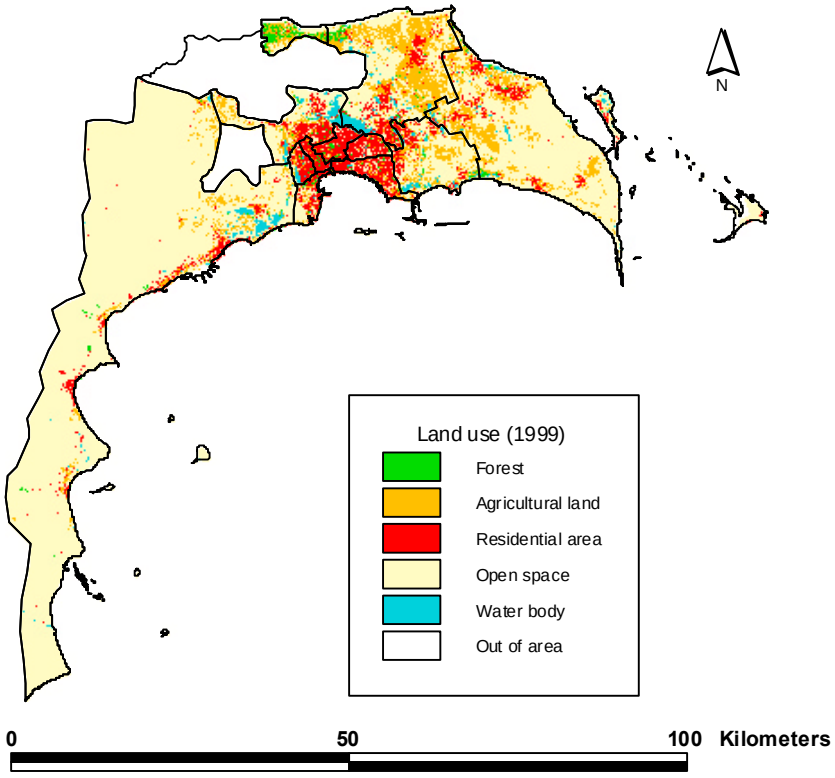


- Attribute table

Legend	Area (ha)
Forest	2,932.50
Agricultural land	39,431.50
Residential area	17,408.00
Open space	143,600.75
Water body	6,443.25
Total Area	209,816.00

Refer to “cls1988” theme in the GIS database

- Spatial data of land use in 1999 (Grid)



- Attribute table

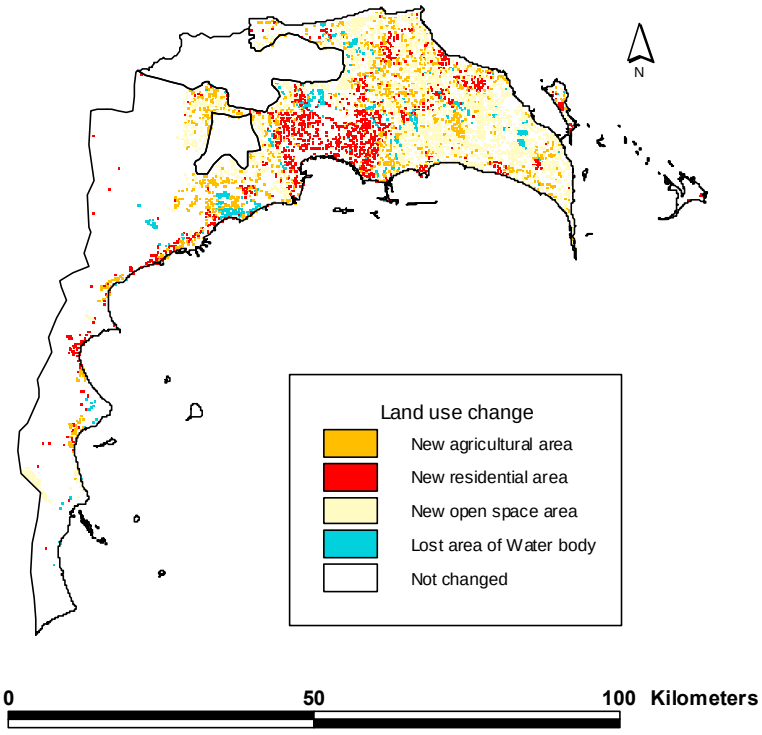
Legend	Area (ha)
Forest	2,646.50
Agricultural land	26,581.75
Residential area	19,622.75
Open space	154,430.75
Water body	4,828.75
Total Area	208,110.50

Refer to “cls1999” theme in the GIS database

c.5 Land use change

The data of land use change was build using land use data in 1988 and 1999. The spatial data and attribute table of land use change are shown below.

- Spatial data (Grid)



- Attribute table

Legend	Area (ha)
Lost area of Water body	2,922.75
New residential area	8,900.75
New open space area	20,891.00
New agricultural area	9,780.50
Not changed	1,120,275.00

Refer to “land_change” theme in the GIS database

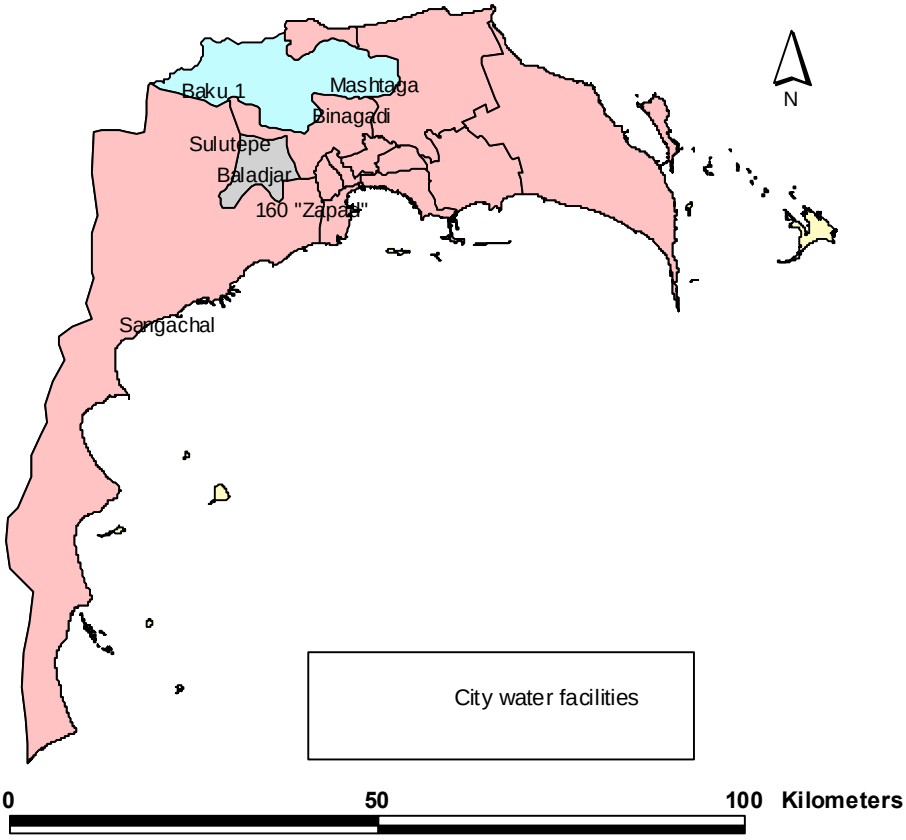
- Data source

Land use data in 1988 and 1999 that were developed using Landsat TM.

c.6 City water facilities

The data on city water facilities were prepared as point data with an attribute table including facility name, capacity, type and service districts. There are 24 city water facilities in the study area: 13 are pumping station, and the rest are reservoir including one out of operation. The map for the distribution of city water facilities is as shown below.

- Spatial data (Point)



- Attribute table

Name	Type	Cap_r (m^3)	Cap_ps (m^3/h)	Serv_dist	Serv_facil
Baku 1	PS		100	Garadag	
Sangachal	PS		27000		Khirdalan PS, Baladjar PS, Binagadi PS, 69 "Vostok" R
Sangachal	R	24000			Khirdalan PS, Baladjar PS, Binagadi PS, 69 "Vostok" R
110 "Zapad"	PS		2400	Yasamal, Nizami, Nasimi, Surakhani	
110 "Zapad"	R	405000		Yasamal, Nizami, Nasimi, Surakhani	
69 "Zapad"	R	35000		Yasamal, Sabayil, Narimanov	
69 "Zapad"	PS		4800	Yasamal, Sabayil, Narimanov	
152 "Alatava"	R	10000		Yasamal, Sabayil	
152 "Alatava"	PS		3750	Yasamal, Sabayil	
160 "Sever"	PS		3600	Binagadi, Nasimi	
160 "Sever"	R	50000		Binagadi, Nasimi	
Binagadi	PS		25400	Binagadi, Narimanov, Nizami, Nasimi, Khatai	
69 "Vostok"	R	90000		Nizami, Narimanov, Surakhani, Khatai	110 "Vostok" R
69 "Vostok"	PS		27200	Nizami, Narimanov, Surakhani, Sabunchu, Khatai	110 "Vostok" R
110 "Vostok"	PS		14400	Nizami, Sabunchu, Surakhani, Khatai	
110 "Vostok"	R	125000		Nizami, Sabunchu, Surakhani, Khatai	
Mashtaga	R			Sabunchu	110 "Vostok" R
Mashtaga	PS		6000	Sabunchu	110 "Vostok" R
160 "Zapad"	R	16000		Yasamal	
Baladjar	PS		6250	Binagadi	"Alatava" R
Khirdalan	PS		5000		"Alatava" R, 160 "Sever" R
Sulutepe	R	15000		Binagadi	
Sulutepe	PS		5000	Binagadi	
126 "Garachukhur"	R	20000		Surakhani	

Refer to “city_water” theme in the GIS database
Name : Name of water city facility
Type : Type of water city facility (PS : Pumping station, R : Reservoir)
Cap_r : Capacity of reservoir (unit = m3)
Cap_ps : Capacity of pumping station (unit = m3/hour)
Serv_dist : Service district of city water facility
Serv_facil : Service facility of city water facility

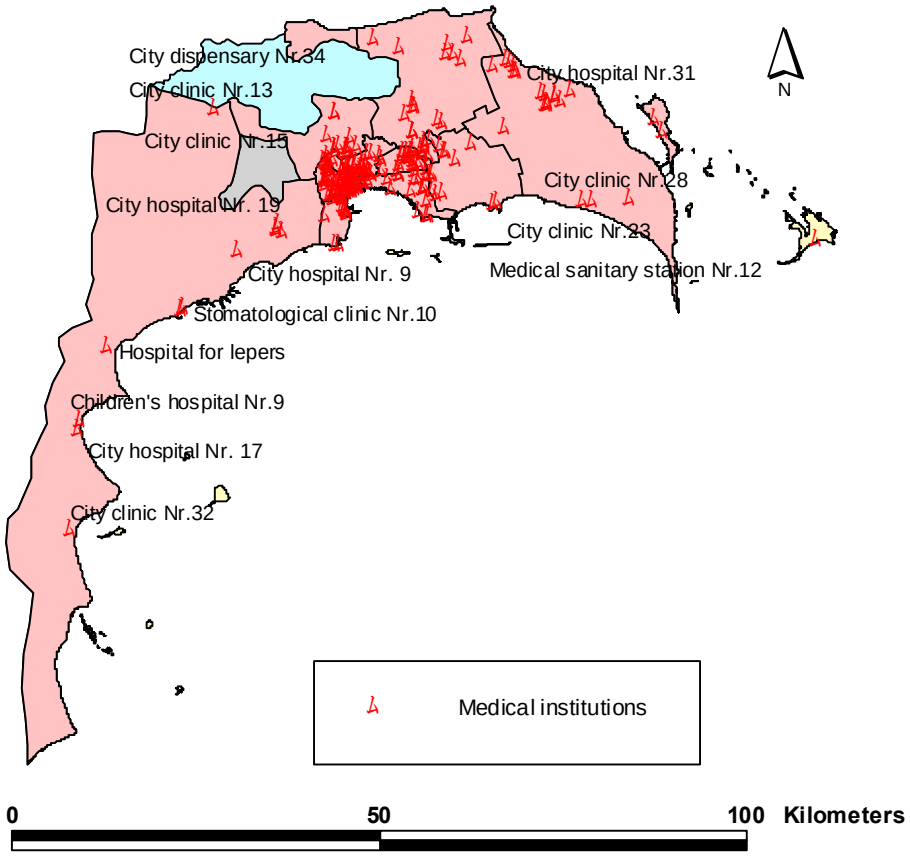
- Data source

Absheron Regional Water Company

c.7 Medical institutions

Preparing GIS for medical institutions provides plotting medical institutions on the customer map. Initially it was prepared a list of 233 medical institutions of Baku including information about name, type, number of beds, number of doctors, provided service, phone number and address.

- Spatial data (Point)



- Attribute table

Part of an attribute is shown below.

Name of Institution	Type of inst.	Private or Public	# of beds	# of doctors	Services	Tel.	Address
Azizbeyov district							
Rehabilitation Hospital Nr.3 (for government employees)	Hospital	Public	75	4	general theraphy	54-34-70	Shuveljan Settlement, #27, Indrim Str.
Hospital for war veteran	Hospital	Public	300	19	general diagnostics, therapy, surgery	54-27-90	Mardakjan Settlement, #7, Aliev Str.
Sanatorium named after G.Gindes	Sanatorium	Public	112	5	general theraphy	53-09-14	Zagulba Settlement, #4, Gelebe Str.
Republic children's sanatorium in Buzovna	Sanatorium	Public	290	8	general theraphy	53-61-15	Buzovna Settlement, #4, Gelebe Str.
City hospital Nr.26	Hospital	Public	330	91	general diagnostics, therapy, surgery	54-42-33	Mardakjan Settlement, #6, Kasimova Str.
City hospital Nr.29	Hospital	Public	60	35	general diagnostics, therapy, surgery	54-43-64	Bina Settlement, #2, Basina Str.
City hospital Nr.31	Hospital	Public	60	10	general diagnostics therapy surgery	54-40-82	Mardakjan Settlement, North Hidro Power Station, #2, Basina Str.
Medical sanitary station Nr.3	Med. sanitary station	Public	195	25	general medical examination, diagnostics, theraphy	59-47-58	Pirallakchi Settlement, #2213, Rzaeva Str.
Medical sanitary station Nr.20	Med. sanitary station	Public	50	5	general medical examination, diagnostics, theraphy	53-00-37	Vishnevka Station

Refer to “medic_inst” theme in the GIS database.

- Data source

Baku Health Department

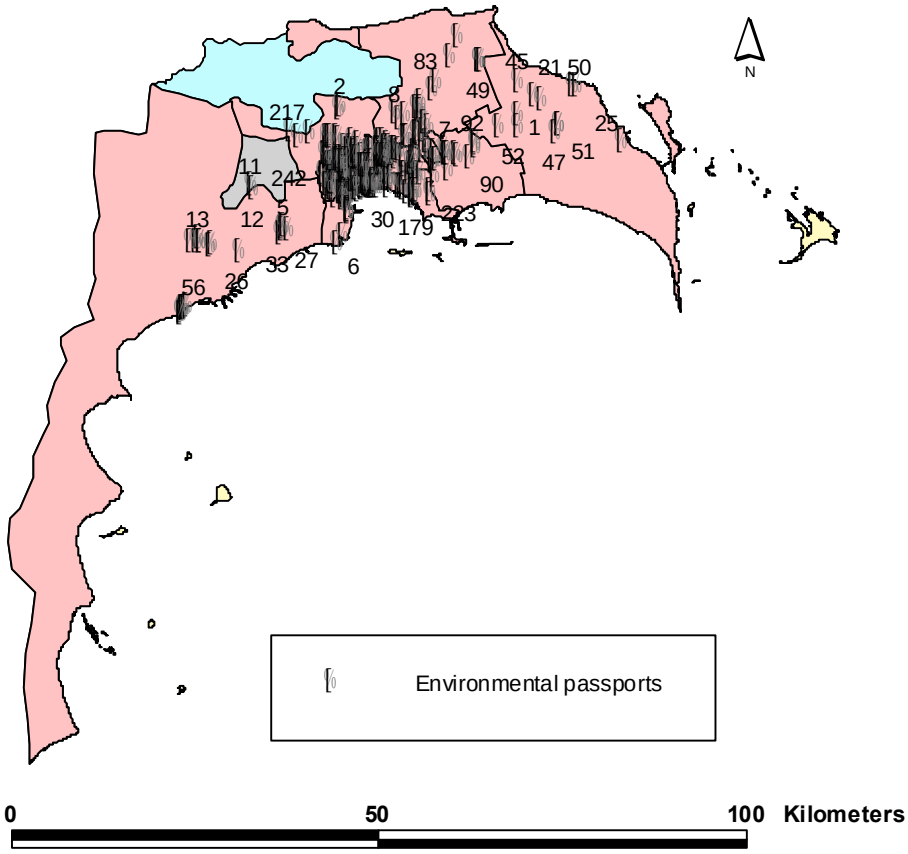
d. Environmental Information (Pollution sources)

Environmental information regarding pollution sources is classified into 6 categories: (1) environmental passport, (2) power generation plants, (3) oil mining ground, (4) farmlands (large-scale farmland), (5) solid waste treatment/disposal facilities, and (6) sewage treatment facilities.

d.1 Environmental passports

Data on environmental passport were prepared in this project. The location of factories was indicated in a point shape file with an attribute table including factory names, category of factories, addresses, telephone numbers, factory profiles, raw material consumption, air emission, water discharge, waste generation, and others. Profiles of 288 factories were surveyed and distribution map of environmental passport is shown below.

- Spatial data (Point)



- Attribute table

One of the environmental passports is shown below as a sample. The environmental passport has 211 items in the attribute table.

ID	1
Name	NGDU named Z.Tagiyev
Kategory	1
District	Azizbekov
Business Activities	Oil extraction
Location (Address)	Baku 370046, Azizbekov r/w station
Name of Department for Eco-passport	ch.engineer

Telephone	545831
Facsimile	n/a
Number of Emloyee	2300
Annual Turn Over	n/a
Total Area (ha)	3100
Main raw material 1	Separol
Annual consumption of Raw material 1 in ecological passport (ton/year)	10.8
Annual consumption of Raw material 1 in current situation (ton/year)	n/a
Main raw material 2	Cement
Annual consumption of Raw material 2 in ecological passport (ton/year)	201.4
Annual consumption of Raw material 2 in current situation (ton/year)	324
Main raw material 3	Dissolvent
Annual consumption of Raw material 3 in ecological passport (ton/year)	n/a
Annual consumption of Raw material 3 in current situation (ton/year)	11.4
Main production 1	Mineral oil
Main production 2	Natural gas
Main production 3	n/a
Main production 4	n/a
Main production 5	n/a
Electricity consumption at present situation (103W.h/year)	29600
Electricity consumption as in ecology passport (103W.h/year)	4109
Gas consumption at persent situation (10 m3/year)	n/a
Gas consumption as in Ecology passport (10 m3/year)	n/a
Coal consumption at present situation (ton/year)	n/a
Coal consumption as in Ecology passport (ton/year)	n/a
LPG Consumption (Propane, Butane) at present situation (ton/year)	n/a
LPG Consumption (Propane, Butane) as in Ecology passport (ton/year)	n/a
Petrolium Consumption at present situation (ton/year)	730.4
Petrolium Consumption as in Ecology passport (ton/year)	871.8
Heavy Oil Consumption at present situation (ton/year)	n/a
Hevy oil Consumption as in Ecology passport (ton/year)	n/a
Thermal Energy from Outside at present situation (Kcal/year)	n/a
Termal Energy from Outside as in Ecology passport (Kcal/year)	n/a
Name of Flue Gas 1	Smoke, gases, oil preparation
Average Wolume of Flue Gas at present m3/hour	n/a
Average Wolume of Flue Gas by ecology passport m3/hour	n/a
Average Wolume of Flue Gas at present ton/year	n/a
Average Wolume of Flue Gas by ecology passport ton/year	n/a
Concentration of SOx at present mg/m3	n/a
Concentration of SOx by ecology passport mg/m3	n/a
SOx emission volume at present ton/year	n/a
SOx emission volume by ecology passport ton/year	n/a
Concentration of NOx at present mg/m3	n/a
Concentration of NOx by ecology passport mg/m3	n/a
NOx emission volume at present ton/year	28.41
NOx emission volume by ecology passport ton/year	18.71
Concentration of SS at present mg/m3	n/a
Concentration of SS by ecology passport mg/m3	n/a
SS emission at present ton/year	n/a
SS emission by ecology passport ton/year	n/a

Name of Flue Gas 2	Smoke gases from boilers
Average Wolume of Flue Gas at present m3/hour	n/a
Average Wolume of Flue Gas by ecology passport m3/hour	n/a
Average Wolume of Flue Gas at present ton/year	n/a
Average Wolume of Flue Gas by ecology passport ton/year	n/a
Concentration of SOx at present mg/m3	n/a
Concentration of SOx by ecology passport mg/m3	n/a
SOx emission volume at present ton/year	n/a
SOx emission volume by ecology passport ton/year	n/a
Concentration of NOx at present mg/m3	n/a
Concentration of NOx by ecology passport mg/m3	n/a
NOx emission volume at present ton/year	3.73
NOx emission volume by ecology passport ton/year	2.73
Concentration of SS at present mg/m3	n/a
Concentration of SS by ecology passport mg/m3	n/a
SS emission at present ton/year	n/a
SS emission by ecology passport ton/year	n/a
Name of Flue Gas 3	Cars' exhaust gases
Average Wolume of Flue Gas at present m3/hour	n/a
Average Wolume of Flue Gas by ecology passport m3/hour	n/a
Average Wolume of Flue Gas at present ton/year	n/a
Average Wolume of Flue Gas by ecology passport ton/year	n/a
Concentration of SOx at present mg/m3	n/a
Concentration of SOx by ecology passport mg/m3	n/a
SOx emission volume at present ton/year	2.82
SOx emission volume by ecology passport ton/year	3.48
Concentration of NOx at present mg/m3	n/a
Concentration of NOx by ecology passport mg/m3	n/a
NOx emission volume at present ton/year	15.46
NOx emission volume by ecology passport ton/year	18.56
Concentration of SS at present mg/m3	n/a
Concentration of SS by ecology passport mg/m3	n/a
SS emission at present ton/year	n/a
SS emission by ecology passport ton/year	n/a
Name of Flue Gas 4	n/a
Average Wolume of Flue Gas at present m3/hour	n/a
Average Wolume of Flue Gas by ecology passport m3/hour	n/a
Average Wolume of Flue Gas at present ton/year	n/a
Average Wolume of Flue Gas by ecology passport ton/year	n/a
Concentration of SOx at present mg/m3	n/a
Concentration of SOx by ecology passport mg/m3	n/a
SOx emission volume at present ton/year	n/a
SOx emission volume by ecology passport ton/year	n/a
Concentration of NOx at present mg/m3	n/a
Concentration of NOx by ecology passport mg/m3	n/a
NOx emission volume at present ton/year	n/a
NOx emission volume by ecology passport ton/year	n/a
Concentration of SS at present mg/m3	n/a
Concentration of SS by ecology passport mg/m3	n/a
SS emission at present ton/year	n/a
SS emission by ecology passport ton/year	n/a
Name of Flue Gas 5	n/a
Average Wolume of Flue Gas at present m3/hour	n/a
Average Wolume of Flue Gas by ecology passport m3/hour	n/a
Average Wolume of Flue Gas at present ton/year	n/a
Average Wolume of Flue Gas by ecology passport ton/year	n/a
Concentration of SOx at present mg/m3	n/a

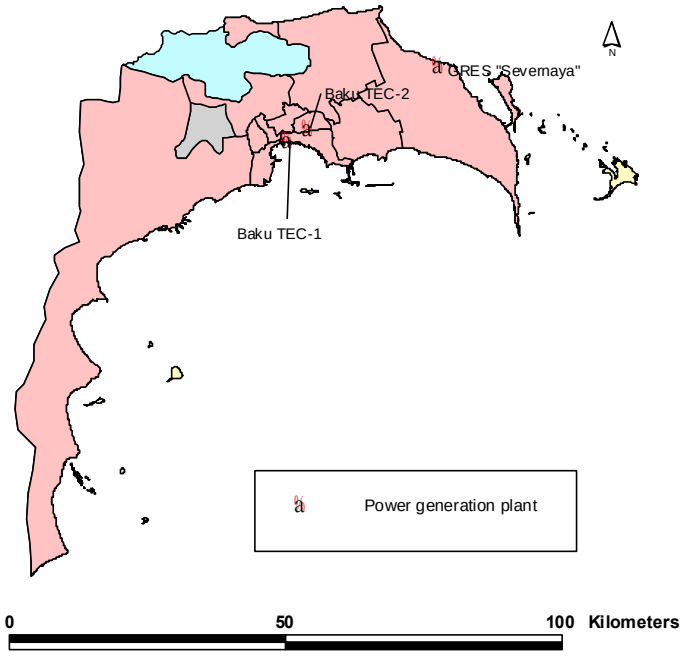
Concentration of SOx by ecology passport mg/m3	n/a
SOx emission volume at present ton/year	n/a
SOx emission volume by ecology passport ton/year	n/a
Concentration of NOx at present mg/m3	n/a
Concentration of NOx by ecology passport mg/m3	n/a
NOx emission volume at present ton/year	n/a
NOx emission volume by ecology passport ton/year	n/a
Concentration of SS at present mg/m3	n/a
Concentration of SS by ecology passport mg/m3	n/a
SS emission at present ton/year	n/a
SS emission by ecology passport ton/year	n/a
Name of Flue Gas 6	n/a
Average Wolume of Flue Gas at present m3/hour	n/a
Average Wolume of Flue Gas by ecology passport m3/hour	n/a
Average Wolume of Flue Gas at present ton/year	n/a
Average Wolume of Flue Gas by ecology passport ton/year	n/a
Concentration of SOx at present mg/m3	n/a
Concentration of SOx by ecology passport mg/m3	n/a
SOx emission volume at present ton/year	n/a
SOx emission volume by ecology passport ton/year	n/a
Concentration of NOx at present mg/m3	n/a
Concentration of NOx by ecology passport mg/m3	n/a
NOx emission volume at present ton/year	n/a
NOx emission volume by ecology passport ton/year	n/a
Concentration of SS at present mg/m3	n/a
Concentration of SS by ecology passport mg/m3	n/a
SS emission at present ton/year	n/a
SS emission by ecology passport ton/year	n/a
Wastewater 1	Sea water
Destination of Wastewater	n/a
Average Volume of Wastewater at present ton/hour	84.72
Average Volume of Wastewater as in Ecology passpot ton/hour	85.14
BOD concentration at present mg/lit	n/a
BOD concentration as in Ecology passport mg/lit	n/a
COD concentration at present mg/lit	n/a
COD concentration as in Ecology passport mg/lit	n/a
Consentration of suspended stuff at present mg/lit	n/a
Consentration of suspended stuff as in Ecology passport mg/lit	n/a
Wastewater 2	Water from wells
Destination of Wastewater	À
Average Volume of Wastewater at present ton/hour	104.44
Average Volume of Wastewater as in Ecology passpot ton/hour	133.06
BOD concentration at present mg/lit	n/a
BOD concentration as in Ecology passport mg/lit	n/a
COD concentration at present mg/lit	n/a
COD concentration as in Ecology passport mg/lit	n/a
Consentration of suspended stuff at present mg/lit	n/a
Consentration of suspended stuff as in Ecology passport mg/lit	n/a
Waste 1	Oil mud
Category	2
Amount of Waste t/y (present)	118.73
Amount of Waste t/y (passport)	122.254
% of Waste discharged outsides (present)	100
% of Waste discharged outsides (passport)	100
Primary chemical component	Clay, oil
Secondary chemical component	Clay, oil
Waste 2	n/a

Category	n/a
Amount of Waste t/y (present)	n/a
Amount of Waste t/y (passport)	n/a
% of Waste discharged outsides (present)	n/a
% of Waste discharged outsides (passport)	n/a
Primary Chemical component	n/a
Secondary Chemical component	n/a
Waste 3	n/a
Category	n/a
Amount of Waste t/y (present)	n/a
Amount of Waste t/y (passport)	n/a
% of Waste discharged outsides (present)	n/a
% of Waste discharged outsides (passport)	n/a
Primary Chemical component	n/a
Secondary Chemical component	n/a
Waste 4	n/a
Category	n/a
Amount of Waste t/y (present)	n/a
Amount of Waste t/y (passport)	n/a
% of Waste discharged outsides (present)	n/a
% of Waste discharged outsides (passport)	n/a
Primary Chemical component	n/a
Secondary Chemical component	n/a
Waste 5	n/a
Category	n/a
Amount of Waste t/y (present)	n/a
Amount of Waste t/y (passport)	n/a
% of Waste discharged outsides (present)	n/a
% of Waste discharged outsides (passport)	n/a
Primary Chemical component	n/a
Secondary Chemical component	n/a
Waste 6	n/a
Category	n/a
Amount of Waste t/y (present)	n/a
Amount of Waste t/y (passport)	n/a
% of Waste discharged outsides (present)	n/a
% of Waste discharged outsides (passport)	n/a
Primary Chemical component	n/a
Secondary Chemical component	n/a
Remarks	

d.2 Power generation plants

The team established the database on power generation plants. The location of power generation plans was digitised in a point shape file with an attribute table which includes the names of each plant, capacity, main fuel and service districts. There are three power generation plants in the Greater Baku.

- Spatial data (Point)



- Attribute table

ID	Name	Type	Capa (MW-H/year)	Main_fuel	Serv_dist
1	Baku TEC-1	Heat Power Center	36.0	Mazute, Gas	Khatai, Nasimi, Yasamal, Sabayil, Narimanov, Garadag, Binagadi, Sabunchu, Surakhani, Nizami
2	Baku TEC-2	Heat Power Center	3.7	Mazute, Gas	Nizami, Khatai, Narimanov, Sabunchu, Surakhani
3	GRES "Severnaya"	City District Power Station	37.0	Mazute, Gas	Azizbeyov, Sabunchu, Surakhani, Binagadi, Narimanov, Nizami, Khatai

Refer to “power_generation” theme in the GIS database.

Name : Name of power generation plant
Type : Type of power generation plant
Capa : Capacity of power generation plant (MW-H : 1,000,000VA/hour)
Serv_dist : Service district of power generation plant

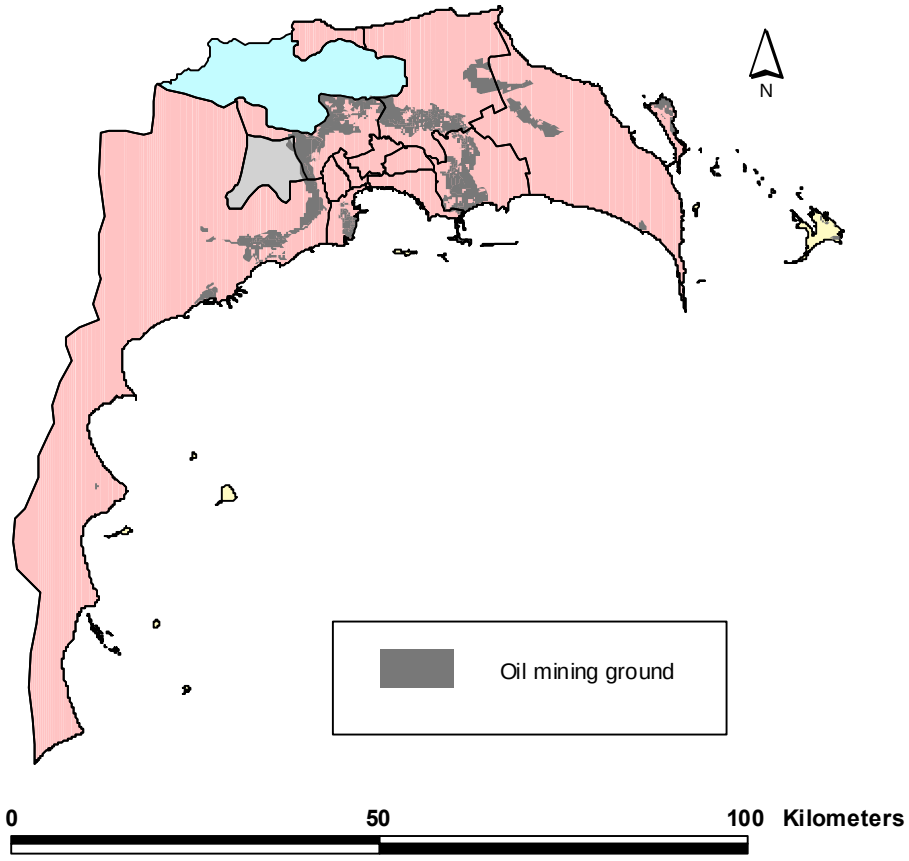
- Data source

AzEnergy
Technical passports of the stations

d.3 Oil mining ground

The data on oil mining ground was established using land use data, including area information in the attribute table. The distribution map of oil mining ground is shown below.

- Spatial data (Grid)



- Result of analysis using attribute table

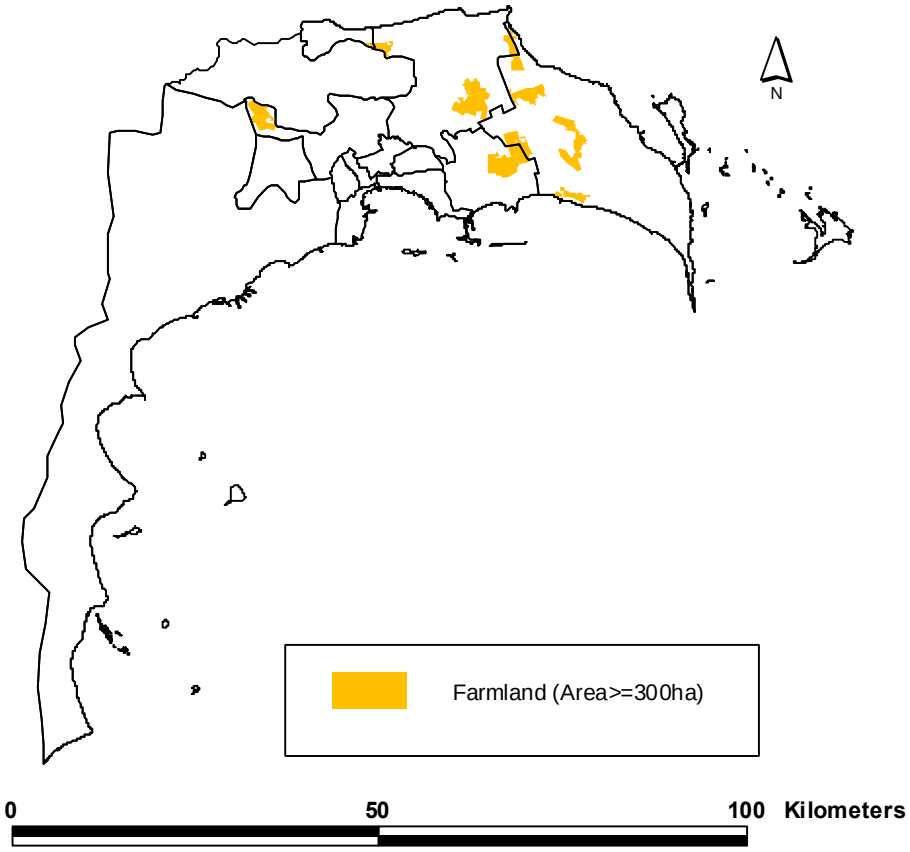
Legend	Area (ha)
Oil fields	18,172.17

Refer to “oil_mining” theme in the GIS database

d.4 Farmland (large-scale farmland)

This data was prepared using land use data. Moreover, in consideration of the pollution source of farmland, the large-scale farmland which has the area of 300ha or more was extracted.

- Spatial data (Grid)



- Result of analysis using attribute table

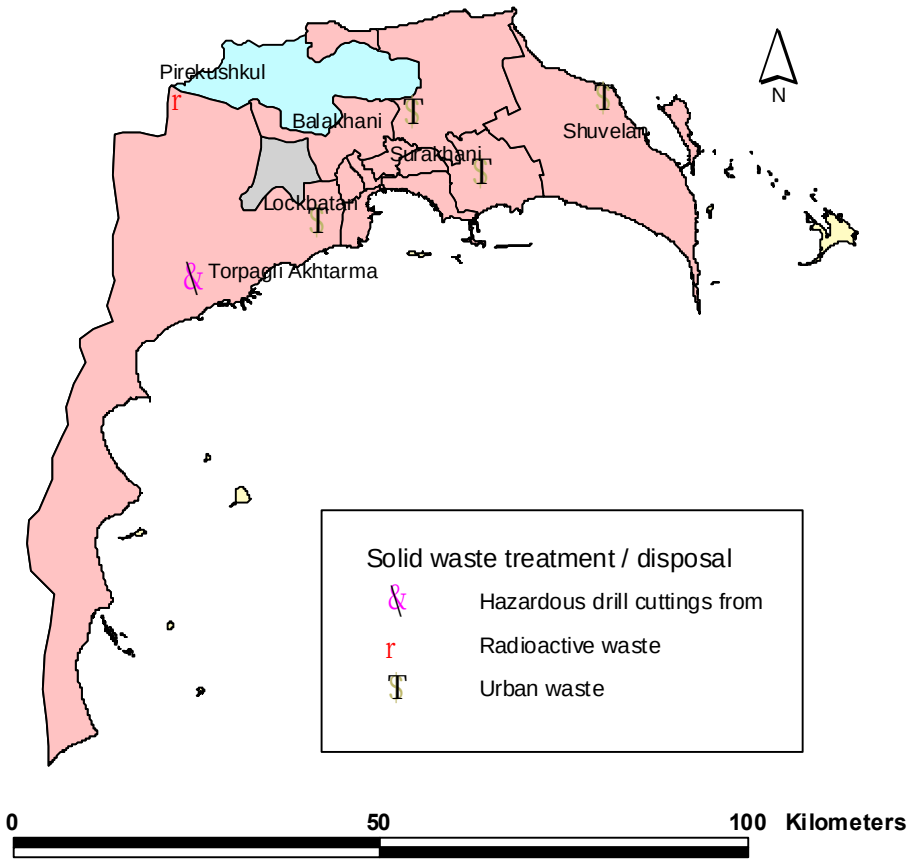
Legend	Area (ha)
Farmland (Area>=300ha)	7,615.06

Refer to “farmland” theme in the GIS database.

d.5 Solid waste treatment / disposal

There are no facilities for utilisation of solid wastes in the project area. Dumpsites are used for this purpose. There are a great number of non-registered dumps. Data being relevant to the location of the legally registered dumpsites are prepared. The location of the facilities was indicated in a point shape file with an attribute table containing the facility name, facility type, capacity, method and service districts.

- Spatial data (Point)



- Attribute table

Name	Type	Method	Capacity	Serv_dist
Shuvelan	Urban waste	Heap	N/A	Azizbeyov
Surakhani	Urban waste	Heap	N/A	Surakhani
Lockbatan	Urban waste	Heap	401500 m^3 for 1999	Sabayil, Yasamal, Garadag
Balakhani	Urban waste	Heap	869795 m^3 for 1999	Narimanov, Sabunchu, Nasimi, Nizami, Khatai, Binagadi
Pirekushkul	Radioactive waste	Burial	6 hectares of area	All territory
Torpagli Akhtarma	Hazardous drill cuttings from	Chemical treatment	43039 t for 1985-1999	Oil industry of all areas

refer to " solid_waste" theme in the GIS database.

Name : Name of solid waste treatment / disposal site
Type : Type of solid waste treatment / disposal site
Method : Processing method of solid waste treatment / disposal site
Capacity : Capacity of solid waste treatment / disposal site
Serv_dist : Service district of solid waste treatment / disposal site

- Data source

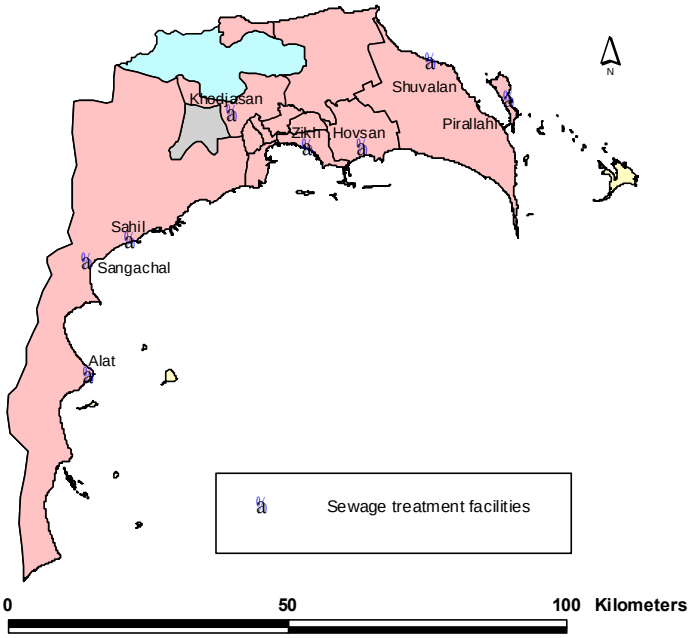
Baku City Administration

d.6 Sewage treatment facilities

Functions of recycling and removing of liquid wastes are fulfilled by the sewerage treatment stations. The sewerage treatment stations are in critical condition and a part of wastewater is throwing off in to the sea.

There are eight treatment stations in Greater Baku. The distribution map of sewage treatment facilities is shown below.

- Spatial data (Point)



- Attribute table

Name	Type	Method	Cap (m^3/day)	Serv_dist
Khodjasan	Treatment plant	Mechanical	22800	Binagadi
Sahil	Treatment plant	Biological	20000	Garadag
Sangachal	Treatment plant	Biological	0	Not operated
Alat	Treatment plant	Biological	0	Not operated
Zikh	Treatment plant	Mechanical	46000	Narimanov, Khatai
Hovsan	Treatment plant	Biological	580000	Binagadi, Yasamal, Nasimi, Narimanov, Nizami, Khatai, Surakhani, Sabunchu, Sabayil
Pirallahi	Treatment plant	Biological	400	Azizbeyov
Shuvalan	Treatment plant	Mechanical	2000	Azizbeyov

Refer to “sewage” theme in the GIS database.

Name : Name of facilities

Type : Type of facilities
Method : Processing method of facilities
Cap : Capacity of facilities (unit = m3/day)
Serv_dist : Service district of facilities

- Data source

BakCanalizaciya Enterprise

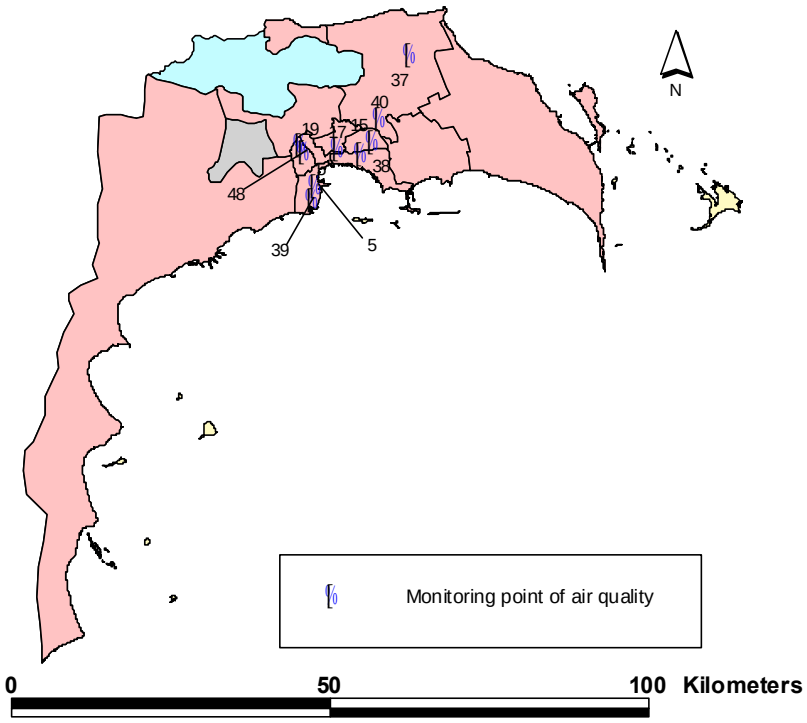
e. Environmental Information (Ambient quality)

Environmental information regarding ambient quality consists of five categories: (1) environmental quality/emission standards, (2) air quality, (3) water quality, (4) soil quality and (5) water contamination distribution.

e.1 Air quality

The air quality data, the monitoring points were digitised in a point shape file with an attribute table indicating the levels of dust, sulphur dioxide, carbon monoxide, black carbon and others. There are nine monitoring points in Greater Baku. The monitoring point map is shown below.

- Spatial data (Point)



- Attribute table

The attribute table of annual average data for NO_2 is shown below.

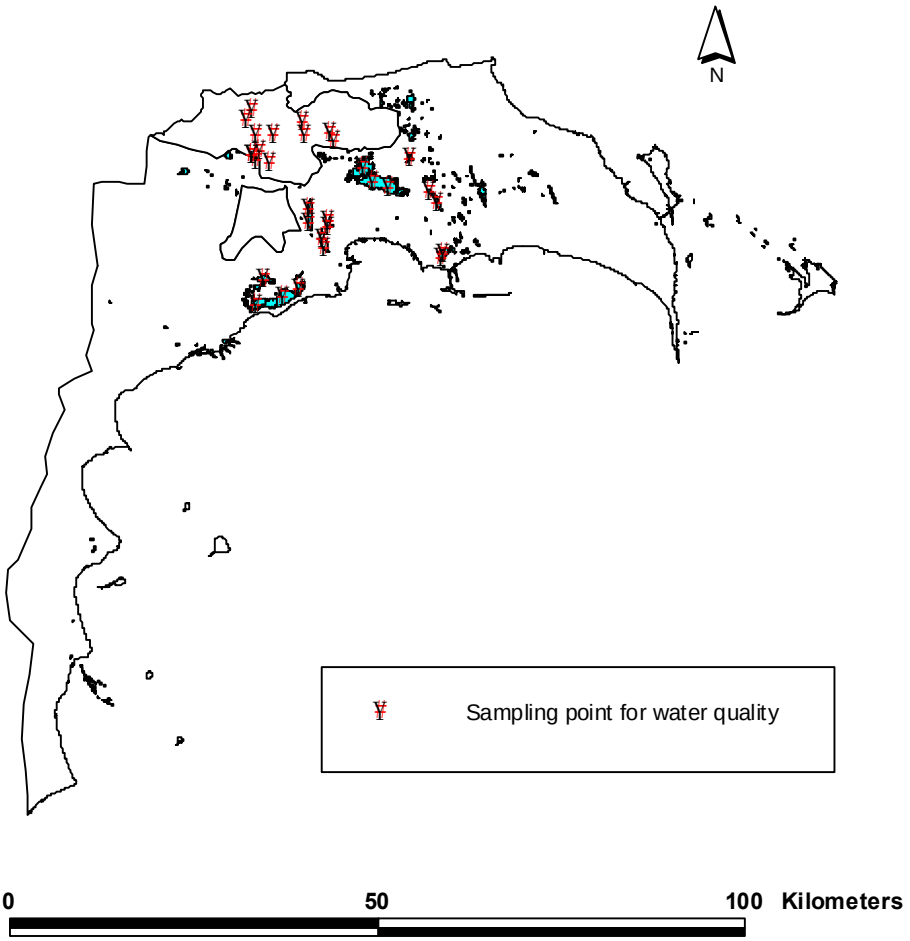
Station	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
5	0.080	0.096	0.090	0.077	0.073	0.084	0.075	0.062	0.059	0.059
15	0.073	0.098	0.090	No data	0.054	0.058	0.063	0.062	0.060	0.058
17	0.081	0.095	0.091	0.081	0.074	0.083	0.071	0.085	0.082	0.075
19	0.072	0.096	0.085	0.079	0.053	0.052	No data	0.061	0.059	No data
37	No data	No data	No data	0.072	0.059	0.059	0.062	0.058	0.058	0.057
38	No data	No data	No data	0.092	0.079	0.080	0.080	0.074	0.069	0.072
39	No data	No data	No data	0.077	0.065	0.062	0.066	0.060	0.058	0.052
40	No data	No data	No data	0.083	0.067	0.065	0.069	0.062	0.059	0.052
48	No data	No data	No data	0.085	0.080	0.076	0.078	0.072	0.068	0.072

Refer to “air_quality” theme in the GIS database.

e.2 Water quality

The team created the water quality data for several lakes. The data on its monitoring point was created as a point shape file with attribute table indicating name, location, colour, sediment, pH, Salinity, Cd, As, Hg, Pb, Cr, BOD, COD, SS and so on. The distribution map of monitoring point for water quality is shown below.

- Spatial data (Point)



- Attribute table

Name	Color	Sediment	pH	SALINITY	Cd	As	Hg	Pb	Cr	Cn	PCB	BOD	COD	SS
W07	Transparent	No sediment	8.68	367.00	0.00	0.00	0.00	0.00	0.00	0.00	8.70	4.30	14.00	0.58
W06	Transparent	No sediment	8.80	445.00	0.00	0.00	0.00	0.00	0.00	0.00	4.60	4.60	12.00	0.53
W08	Transparent	No sediment	8.46	550.00	0.00	0.00	0.00	0.00	0.00	0.00	1.20	4.80	11.00	1.51
W09	Transparent	White sediment	8.66	680.00	0.00	0.00	0.00	0.00	0.00	0.00	3.20	5.10	15.00	1.64
W10	Low green colour	Green sediment	8.90	1020.00	0.00	0.00	0.00	0.00	0.00	0.00	6.50	3.10	22.00	0.82
W11	Low green colour	Black sediment	9.01	1100.00	0.00	0.00	0.00	0.00	0.00	0.00	9.40	3.90	24.00	0.70
W15	Low yellow	A few sediment	9.40	4840.00	0.00	0.00	0.00	0.00	0.00	0.00	12.10	2.60	18.00	4.13
W14	Low yellow	White crystalline saline sediment	8.26	9999999999.00	0.00	0.00	0.00	0.00	0.00	0.00	4.20	0.60	24.00	9.61
W13	Low yellow	Black sediment	8.12	9999999999.00	0.00	0.00	0.00	0.00	0.00	0.00	4.30	0.50	22.00	9.34
W12	Low yellow	White crystalline saline sediment (saturated solution)	8.11	9999999999.00	0.00	0.00	0.00	0.00	0.00	0.00	5.20	0.70	19.00	10.20
W17	Low yellow	White sediment	9.82	700.00	0.00	0.00	0.00	0.00	0.00	0.00	4.80	3.60	15.00	2.29
W18	Low yellow	White sediment	9.66	399.00	0.00	0.00	0.00	0.00	0.00	0.00	4.70	4.10	18.00	2.41
W16	Yellow-green	Grey sediment	10.21	39400.00	0.00	0.00	0.00	0.00	0.00	0.00	5.40	0.30	21.00	16.80
W19	muddy-green	No sediment	8.33	9999999999.00	0.00	0.00	0.00	0.00	0.00	0.00	15.60	0.60	24.00	19.60
W20	Low muddy-green	No sediment	8.45	9999999999.00	0.00	0.00	0.00	0.00	0.00	0.00	19.30	0.50	21.00	29.50
W21	Low yellow	Soil and saline sediment	8.79	9999999999.00	0.00	0.00	0.00	0.00	0.00	0.00	7.20	0.40	14.00	41.60
W22	Low yellow	Soil and saline sediment	8.78	9999999999.00	0.00	0.00	0.00	0.00	0.00	0.00	6.80	0.30	17.00	56.20
W23	muddy- pink	Yes	8.65	9999999999.00	0.00	0.00	0.00	0.00	0.00	0.00	2.30	0.60	14.00	9.54
W24	muddy- pink	White saline sediment	8.50	9999999999.00	0.00	0.00	0.00	0.00	0.00	0.00	1.80	0.40	12.00	7.43
W25	Transparent	White sediment	9.90	4050.00	0.00	34.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
W05	Transparent	No sediment	8.36	5910.00	0.00	16.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
W26	muddy	White sediment	9.63	146.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
W27	Transparent	No sediment	9.55	146.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
W28	muddy	Low green sediment	9.30	260.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
W29	muddy	Low green sediment	9.93	17800.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.20	18.00	18.70
W30	muddy	Low green sediment	10.04	17700.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.30	15.00	21.20
W31	stratification	No sediment	10.13	8300.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.10	17.00	24.80
W01	Transparent	A few, yellow sediment	7.70	5430.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
W04	Transparent	No sediment	8.27	3360.00	0.00	14.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
W03	Transparent	No sediment	8.01	3200.00	0.00	12.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
W02	Transparent	No sediment	8.20	3840.00	0.00	24.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Refer to “water_quality” theme in the GIS database.

Unit is as follows:

Cd, Ag, Hg, Pb, Cr : micro g / l

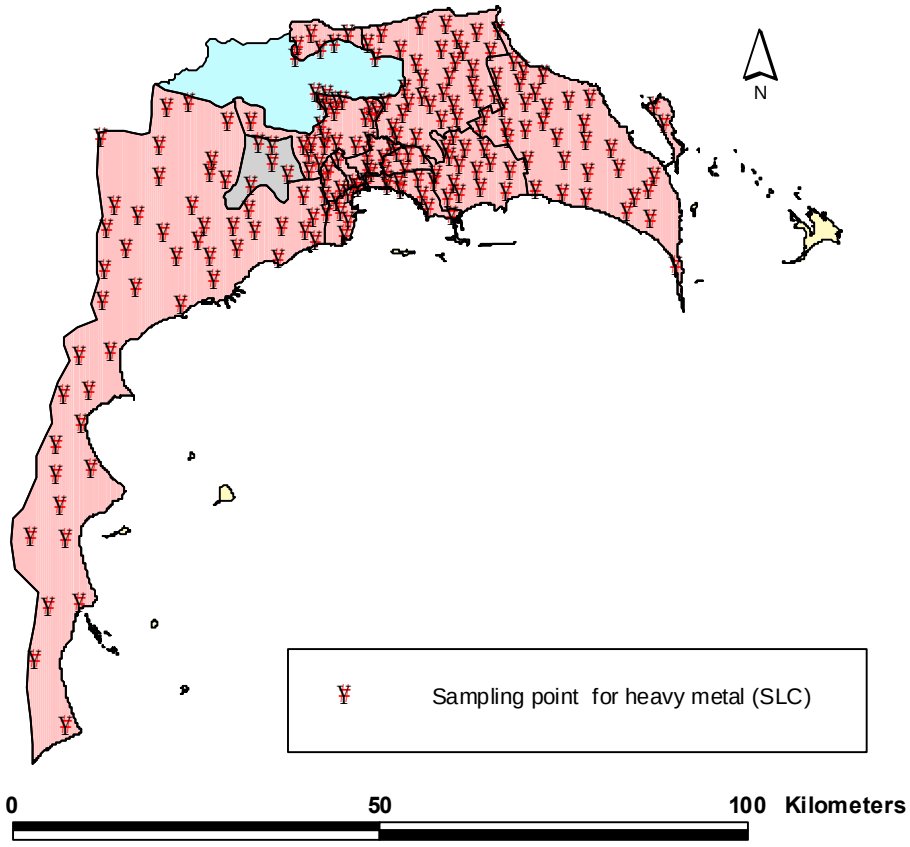
Salinity, Cn, PCB, SS : mg / l

BOD, COD : mg O_2 / l

e.3 Soil quality

The data regarding soil quality, the data of heavy metal components and oil oil contamination are created as a point shape file. The distribution map of soil sampling point is shown below.

- Spatial data of heavy metal (Point)



- Attribute table

Part of attribute table of heavy metal is shown below.

ID2	Sr	Mo	Pb	V	Ni	Cr	Co	Zn	Cu	Ba	Mn	Ti	Ag	Ga	Zr	Sn	Y
81	2.900	4.500	3.100	1.100	0.900	1.200	1.000	1.807	0.964	1.000	2.000	0.667	10.000	0.526	0.588	0.600	0.517
80	0.900	4.500	2.000	3.300	1.200	1.800	1.000	1.200	2.000	1.000	1.100	1.800	1.100	1.200	0.100	1.300	0.070
82	2.300	4.400	1.100	1.600	0.900	1.200	1.000	0.964	1.084	0.000	1.500	0.667	2.143	0.526	0.588	0.400	0.345
98	7.000	3.000	5.000	3.000	2.000	0.800	1.000	0.400	0.600	1.000	0.300	0.900	0.900	0.600	0.500	0.600	0.200
83	2.000	5.000	2.000	2.000	1.500	0.900	1.000	1.205	0.361	11.000	5.000	1.333	4.286	0.421	0.412	0.400	0.000
85	999.000	4.000	2.000	1.500	999.000	0.900	1.000	1.100	1.900	1.000	0.700	0.700	0.900	1.200	0.300	1.200	0.400
84	3.000	4.000	2.500	2.000	1.300	0.900	1.000	0.900	2.000	0.000	999.000	999.000	0.800	0.900	0.600	1.300	0.100
100	0.900	9.100	1.900	2.200	0.500	0.800	0.000	0.900	1.200	0.000	1.200	1.300	1.400	1.300	0.600	0.900	0.200
79	1.000	4.500	1.900	4.400	1.700	1.800	2.000	0.900	1.900	1.000	1.700	2.000	0.900	0.800	0.700	1.000	0.090
78	0.100	3.000	1.900	2.200	0.500	0.400	0.000	1.300	1.800	0.000	1.300	0.600	0.500	0.900	0.500	0.600	0.100
99	1.000	13.000	3.000	2.000	0.900	0.600	1.000	0.700	3.000	1.000	0.900	1.000	0.900	0.800	0.200	0.700	0.300
101	0.900	4.500	3.100	1.100	0.700	0.800	1.000	0.500	0.900	0.000	0.800	1.200	0.800	1.000	0.300	0.800	0.400
68	0.400	8.500	4.100	5.000	2.100	1.800	2.000	2.410	2.410	1.000	3.000	1.556	2.857	1.579	0.588	1.600	0.345
102	0.300	10.000	5.000	5.600	3.400	2.400	3.000	0.600	1.100	1.000	0.900	0.600	0.700	1.100	0.400	0.900	0.300
67	1.700	8.000	3.700	5.600	1.700	1.500	2.000	1.205	1.205	1.000	2.000	1.556	2.857	1.579	0.529	1.600	0.483
77	0.200	999.000	0.600	0.100	0.300	0.400	0.000	1.200	1.700	1.000	1.500	0.900	0.900	1.200	0.300	0.700	0.400
65	0.800	10.000	3.100	3.300	1.600	1.800	1.000	1.205	0.964	1.000	1.000	1.333	2.143	1.579	0.471	1.600	0.345
63	1.200	13.000	2.900	5.200	1.900	1.100	1.000	2.169	1.807	1.000	3.000	1.333	1.429	1.579	0.529	1.600	0.345
15	0.100	2.000	1.900	1.500	0.500	0.600	0.000	1.205	0.361	0.000	1.000	0.333	0.000	0.053	1.765	0.800	0.000
14	0.100	3.000	3.100	1.100	0.500	0.600	0.000	1.205	0.361	0.000	1.000	0.333	0.000	0.526	1.765	0.800	0.345
76	0.300	10.000	5.000	5.000	3.400	2.400	3.000	0.800	1.300	1.000	1.300	1.500	1.300	1.000	0.200	0.900	0.500
64	0.400	6.000	2.700	2.200	1.400	1.600	1.000	1.807	1.566	0.000	3.000	1.333	1.429	0.684	0.588	1.600	0.448
12	0.400	2.000	1.900	0.900	0.500	0.700	0.000	0.602	0.361	0.000	0.200	0.222	0.000	0.263	0.471	0.000	0.103
62	0.400	3.700	2.300	1.800	1.500	1.800	0.000	1.566	10.843	0.000	0.240	1.556	1.429	1.053	1.176	1.600	0.690
109	0.600	5.000	1.900	1.100	1.000	1.800	0.000	0.900	0.800	0.000	0.900	0.600	1.000	0.700	0.500	0.900	0.600
25	0.500	999.000	0.600	0.400	0.300	0.700	0.000	9.639	0.361	0.000	0.400	0.333	0.000	1.579	0.235	0.800	0.172
179	0.400	3.000	0.600	0.100	0.300	0.600	0.000	0.400	0.900	1.000	1.200	0.900	0.900	0.600	0.500	0.700	0.500
178	0.600	999.000	0.500	0.200	0.200	0.400	0.000	1.400	1.200	0.000	0.900	1.600	1.200	1.200	0.200	0.900	0.300
11	0.100	3.000	1.200	1.300	0.900	0.600	1.000	1.205	0.602	0.000	0.300	0.267	0.000	0.526	0.235	0.000	0.103
12a	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000
8	1.300	0.500	3.100	1.700	0.600	0.600	999.000	0.012	0.482	0.000	0.400	0.178	0.000	1.053	0.176	0.200	0.103
8a	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000
1	0.200	3.600	6.900	0.200	2.400	0.800	3.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1a	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000
1k	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000
2	2.400	1.800	2.500	1.200	0.500	1.700	0.000	1.205	0.241	0.000	0.400	0.178	1.429	0.000	0.176	1.200	0.103
3	0.500	1.000	1.900	0.900	0.500	0.800	0.000	1.205	0.361	0.000	0.200	0.133	1.429	0.000	0.176	0.000	0.103
4	0.200	1.800	2.500	1.300	0.700	1.300	0.000	1.205	0.361	0.000	0.200	0.133	1.429	0.000	0.176	0.000	0.103
190	0.500	1.000	2.500	0.800	0.900	1.200	1.000	1.900	1.600	1.000	1.200	1.300	1.400	0.800	0.400	1.000	0.100
6	0.600	0.500	2.900	0.500	0.300	0.900	1.000	0.361	0.361	1.000	0.300	0.111	1.429	0.000	0.176	0.000	0.103
192	0.100	1.000	1.200	1.200	0.300	0.400	0.000	0.900	0.900	1.000	1.800	0.900	1.200	1.200	0.800	2.000	0.100
5	0.400	0.500	3.100	0.300	0.300	1.000	0.000	1.205	0.120	1.000	1.000	0.222	7.143	0.000	0.294	0.000	0.103
191	0.200	999.000	1.300	0.900	0.500	0.400	0.000	1.800	1.200	1.000	1.900	1.200	0.900	0.600	0.300	1.500	0.400
114	0.300	1.000	1.700	0.600	0.500	0.700	0.000	0.800	1.000	0.000	1.000	0.700	0.900	1.000	0.400	0.900	0.300
110	0.200	1.000	1.900	1.300	0.500	1.000	1.000	0.700	1.200	0.000	0.700	0.900	0.800	0.900	0.300	0.800	0.700
13	0.100	1.000	0.900	0.900	0.400	0.500	0.000	0.024	0.361	0.000	0.300	0.200	0.000	1.053	0.176	0.000	0.069
193	2.000	3.000	1.900	2.200	0.500	0.400	0.000	0.800	2.000	2.000	1.500	1.500	1.300	1.300	0.300	0.900	0.300
70	1.200	1.700	1.900	3.200	0.900	0.600	1.000	2.000	1.600	1.000	1.200	1.400	1.300	1.400	999.000	1.000	0.300
113	0.100	3.000	1.700	0.500	0.300	0.300	0.000	0.900	0.800	0.000	0.700	0.900	1.000	0.900	0.200	0.600	0.400
69	1.400	1.500	2.000	3.000	0.600	0.900	1.000	3.000	2.000	1.000	0.900	1.200	0.800	1.100	999.000	1.200	0.100
199	1.200	2.000	2.300	0.400	0.900	0.600	0.000	1.300	0.800	0.000	1.700	1.400	1.100	1.900	0.600	0.900	0.500
75	0.100	999.000	0.300	0.300	0.400	0.400	0.000	0.600	1.900	1.000	0.800	1.300	1.000	20.000	0.600	1.700	0.300
108	0.400	3.000	3.100	2.200	1.700	2.400	1.000	1.000	1.200	1.000	0.700	0.800	1.200	1.000	0.300	1.000	0.400
201	0.500	1.500	2.000	1.200	0.700	0.900	0.000	0.500	0.900	1.000	1.800	1.200	0.700	1.100	0.700	1.300	0.600
111	0.300	4.000	2.100	0.400	0.300	0.600	0.000	1.200	1.000	0.000	1.200	0.700	0.900	1.200	0.500	1.100	0.600
200	0.800	1.900	1.700	1.100	0.800	0.600	1.000	0.900	0.900	1.000	0.900	1.600	0.800	1.400	0.500	0.600	0.300
112	0.500	1.300	1.800	1.300	0.700	0.500	0.000	1.300	1.400	1.000	0.900	0.800	0.600	0.500	0.200	0.900	0.300
117	0.100	999.000	1.200	1.100	0.600	0.400	0.000	1.000	1.000	0.000	1.000	0.900	0.900	0.800	0.400	0.900	0.400
182	0.200	3.000	2.500	1.700	1.000	1.900	1.000	1.200	1.300	1.000	0.800	0.900	0.900	1.200	0.600	1.200	0.300
118	0.200	1.000	1.300	1.200	0.400	0.600	0.000	0.900	1.200	1.000	0.800	0.090	0.800	0.600	0.500	0.800	0.300
196	1.000	0.800	1.800	0.900	0.600	0.600	0.000	1.300	1.200	1.000	1.300	0.800	0.500	1.300	0.600	1.200	0.100
195	1.000	1.500	2.300	1.000	1.200	0.500	1.000	1.200	1.700	1.000	0.800	0.900	0.900	0.500	0.500	1.000	0.060
194	1.500	2.200	2.300	2.500	0.900	1.000	1.000	0.600	1.300	1.000	0.900	0.900	0.800	0.200	0.200	1.300	0.070
180	0.200	1.000	3.100	1.100	0.500	0.960	0.000	0.900	2.000	1.000	1.000	1.200	1.300	1.900	0.300	0.600	0.600
115	0.200	1.200	2.500	0.600	0.500	0.700	0.000	1.200	0.900	0.000	1.200	0.900	0.800	1.000	0.500	0.800	0.400

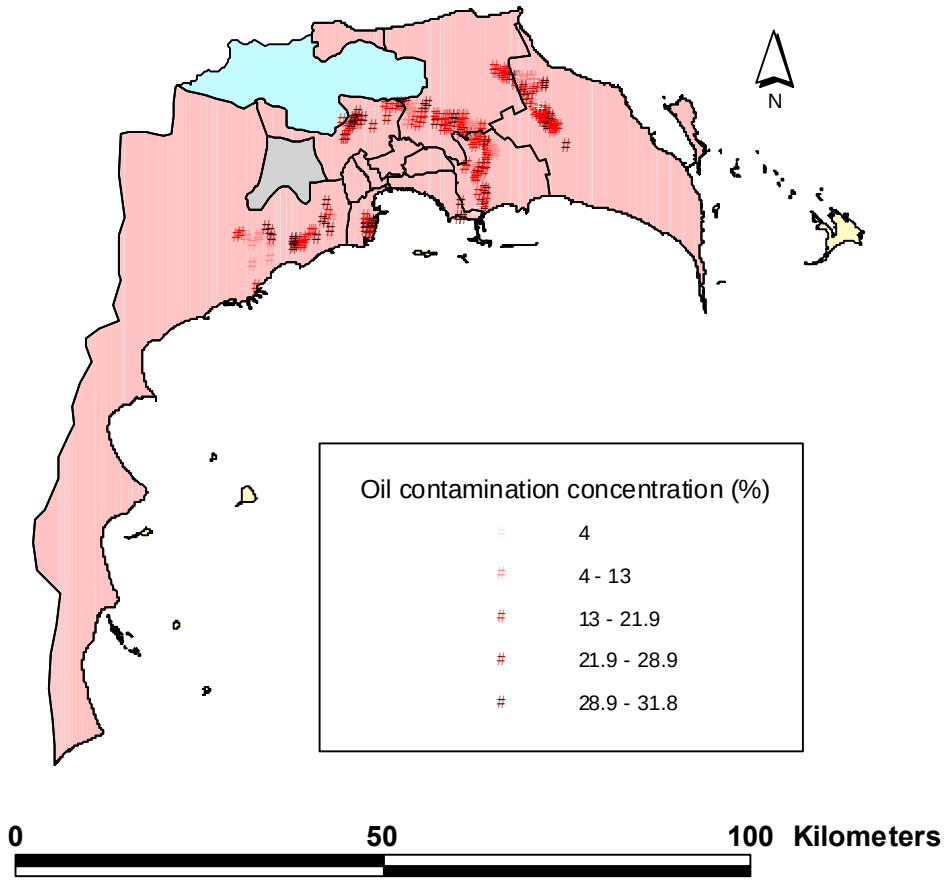
181	0.100	1.000	3.100	1.100	0.900	1.450	1.000	0.800	1.200	1.000	1.300	0.900	0.800	1.400	0.500	1.300	0.100
5a	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000	999.000
9	0.300	30.000	2.500	2.200	0.900	0.700	1.000	1.205	0.482	0.000	0.300	0.222	2.857	1.579	0.118	0.800	0.103
10	0.100	9.000	1.900	1.500	0.900	0.600	1.000	0.000	0.361	0.000	0.400	0.333	0.000	1.053	0.235	0.000	0.345
7	0.600	0.500	1.900	0.300	1.200	1.200	0.000	0.120	0.120	0.000	0.400	0.222	0.000	0.421	0.353	0.200	0.103
27	0.500	1.000	1.200	0.800	0.500	0.600	0.000	1.205	0.602	0.000	0.500	0.267	0.000	1.053	0.235	1.200	0.172
33	6.200	3.000	1.100	1.100	0.700	1.100	1.000	1.205	0.241	0.000	0.600	0.178	1.429	0.263	0.294	0.800	0.345
177	0.400	4.000	1.250	0.200	1.000	0.100	1.000	1.700	1.600	0.000	1.600	1.400	0.700	1.000	0.800	4.100	0.400
176	0.300	3.200	9.000	1.000	0.900	0.090	1.000	1.000	1.300	1.000	1.800	0.700	1.300	0.800	0.200	1.000	0.200
32	1.500	3.000	1.300	0.600	0.200	0.500	0.000	0.120	0.120	2.000	4.000	0.133	1.143	0.158	0.353	1.200	0.034
175	0.200	3.000	2.400	1.100	0.500	0.100	1.000	0.900	1.700	1.000	1.700	1.500	1.200	1.100	0.300	0.900	0.500
158	0.090	4.000	0.500	2.200	0.900	0.180	1.000	999.000	0.600	1.000	0.800	0.600	1.000	0.600	0.400	0.600	0.400
153	0.200	2.000	2.000	1.100	0.900	0.100	0.000	1.600	0.800	0.000	1.200	1.400	0.900	1.100	0.600	1.200	0.300
154	0.200	15.000	1.900	0.900	0.700	0.100	1.000	1.700	1.600	0.000	0.900	0.600	0.900	0.600	0.500	0.600	0.200
34	0.200	0.200	2.200	1.200	0.900	1.500	0.000	2.410	0.964	1.000	0.800	0.444	1.429	0.053	1.176	1.200	0.690
152	0.400	3.000	5.000	1.700	0.700	0.200	1.000	0.900	0.900	0.000	0.800	0.200	0.900	1.200	0.500	1.000	0.200
151	2.000	5.500	3.200	2.300	1.400	1.000	1.000	0.800	0.600	0.000	0.900	0.600	0.800	1.000	0.300	1.200	0.300
119	0.200	1.200	1.900	1.300	0.500	1.000	1.000	0.800	0.600	0.000	0.900	0.100	0.700	0.800	0.600	0.900	0.200
184	0.200	999.000	1.250	0.600	0.400	0.800	0.000	1.900	0.800	1.000	1.100	1.500	0.900	0.900	0.300	0.800	0.500
29	0.200	0.700	1.500	0.900	0.500	0.800	0.000	0.361	0.120	0.000	0.200	0.178	0.000	0.526	0.235	0.400	0.103
183	0.200	1.000	1.250	1.100	0.600	0.700	0.000	3.000	0.900	1.000	1.500	1.200	1.100	1.400	0.400	0.600	0.400
185	0.800	999.000	0.100	0.200	0.300	0.400	0.000	2.000	1.900	0.000	0.300	1.100	0.800	0.800	0.500	1.300	0.600
30	0.200	999.000	0.800	0.600	0.300	0.400	0.000	0.964	0.241	0.000	0.200	0.222	0.000	1.053	0.176	0.000	0.000
72	0.200	0.500	1.900	0.600	0.500	0.700	0.000	1.800	1.400	1.000	2.000	0.900	1.200	1.500	0.200	1.500	0.400
120	0.300	999.000	1.200	0.600	0.300	0.700	0.000	0.900	0.800	1.000	1.000	0.800	1.000	0.900	0.300	0.500	0.500
197	1.200	1.500	2.200	1.300	0.900	0.600	0.000	0.900	1.300	1.000	1.700	2.000	0.600	1.200	0.300	1.300	0.090
198	0.800	0.900	1.300	1.000	0.600	1.200	1.000	1.200	1.700	1.000	1.800	1.800	1.400	1.800	0.200	0.800	0.600
73	0.200	1.000	1.900	1.100	0.500	1.000	0.000	0.900	0.900	1.000	1.300	0.800	0.900	1.800	0.400	2.000	0.100
28	0.400	0.500	2.500	0.900	0.500	0.600	0.000	1.205	0.361	0.000	0.400	0.178	0.000	0.526	0.176	1.200	0.103
71	0.600	0.500	2.000	1.200	0.700	0.600	1.000	1.900	1.200	1.000	1.900	1.300	1.400	1.200	0.600	1.200	0.200
61	2.100	0.400	2.500	3.300	2.100	1.600	1.000	1.446	1.446	1.000	2.000	1.556	1.143	10.526	0.706	1.600	0.690
121	0.600	0.500	1.300	1.100	0.500	0.600	0.000	1.200	1.500	1.000	0.900	0.300	0.700	0.800	0.200	0.900	0.300
123	0.600	0.500	1.900	1.200	0.700	0.600	0.000	0.700	0.900	1.000	0.600	0.300	1.200	0.900	0.500	0.800	0.600
150	2.300	5.000	3.100	2.200	1.700	1.200	1.000	1.500	0.900	0.000	1.200	1.700	0.900	0.700	0.500	0.900	0.200
31	1.200	999.000	1.300	0.100	0.200	0.600	0.000	3.614	0.361	0.000	0.500	0.178	0.000	0.526	0.294	4.000	0.103
186	0.600	0.500	1.500	1.100	0.500	0.600	0.000	1.800	1.700	0.000	1.900	1.700	2.000	2.000	0.300	1.400	0.700
187	0.200	0.600	1.900	0.600	0.500	0.200	0.000	1.300	0.900	1.000	1.700	1.300	1.500	1.500	0.300	0.700	0.400
159	0.100	8.000	3.800	1.000	1.000	0.020	1.000	1.100	1.200	0.000	0.700	0.900	1.000	1.200	0.600	1.000	0.200
36	2.600	5.700	2.300	2.500	0.700	1.700	1.000	0.964	0.723	1.000	0.800	0.222	0.714	0.526	0.471	1.200	0.345
155	0.200	4.000	2.500	0.200	1.000	0.200	0.000	0.900	1.500	0.000	1.200	0.900	0.700	0.900	0.300	1.200	0.200
35	0.200	7.000	1.800	1.500	0.800	999.000	1.000	6.024	0.964	0.000	1.000	0.222	1.429	0.526	0.588	0.800	0.345
164	0.200	3.200	1.300	1.100	0.500	0.060	0.000	0.800	1.700	1.000	1.500	1.300	0.900	1.900	0.200	0.700	0.300
163	0.100	3.000	1.300	1.600	0.700	0.100	0.000	1.200	2.000	1.000	1.300	1.400	0.500	1.100	999.000	1.300	0.100
160	0.060	5.000	1.250	1.700	0.500	0.009	1.000	0.900	0.800	1.000	0.900	0.800	0.900	1.000	0.200	0.900	0.600
173	5.800	6.000	3.800	2.200	1.400	1.200	1.000	0.400	0.900	0.000	1.300	1.800	1.100	0.600	0.600	1.100	0.300
174	2.000	3.600	1.250	0.800	0.250	0.080	1.000	1.200	0.800	0.000	1.500	1.700	1.200	0.500	0.300	0.400	0.300
172	3.000	5.000	3.800	1.700	1.000	1.200	1.000	0.800	1.200	0.000	0.200	2.000	1.200	0.800	0.200	1.200	0.500
53	17.600	1.000	1.900	0.100	0.100	1.200	1.000	0.000	0.120	0.000	0.800	0.178	1.429	0.158	0.176	1.200	0.000
52	3.900	4.700	4.200	1.700	1.100	1.100	1.000	0.602	1.205	2.000	2.000	1.111	4.286	1.053	0.588	0.800	0.207
171	2.900	3.000	5.000	1.100	1.000	1.000	1.000	0.600	1.400	1.000	1.700	0.600	0.900	0.900	0.300	1.200	0.600
37	1.100	3.000	1.300	1.500	0.600	1.000	1.000	1.205	0.602	1.000	1.000	0.222	1.429	0.526	0.353	1.600	0.517
162	0.090	3.000	1.250	1.700	0.500	0.090	1.000	0.700	1.600	1.000	2.000	1.200	0.600	1.200	999.000	1.100	0.400
161	5.800	3.000	1.900	0.900	0.500	0.600	0.000	0.600	1.200	0.000	1.000	0.700	0.800	0.900	0.500	0.800	0.300
157	0.300	2.500	1.300	2.200	0.900	0.090	1.000	0.900	0.700	0.000	0.900	0.400	0.700	0.400	0.300	0.700	0.300
156	0.300	2.000	1.900	1.100	0.300	0.200	1.000	1.500	1.200	0.000	0.600	0.700	0.900	0.700	0.600	0.800	0.400
147	0.300	3.000	2.500	0.200	0.900	0.100	1.000	1.200	1.300	0.000	1.200	0.900	0.800	0.900	0.200	1.100	0.400
146	5.800	2.000	3.100	0.900	0.200	0.600	0.000	0.800	0.900	0.000	0.900	0.600	0.900	0.700	0.500	0.400	0.200
148	0.200	3.000	1.900	1.700	0.900	0.700	1.000	1.400	1.600	1.000	0.300	0.500	1.500	0.800	0.500	0.600	0.300
60	2.400	6.000	4.100	1.900	1.500	1.200	1.000	0.843	1.928	1.000	2.000	1.333	1.429	1.053	0.588	2.000	0.345
149	2.400	6.000	6.200	1.100	1.400	1.200	1.000	0.800	0.700	0.000	0.700	0.300	1.000	0.900	0.400	0.800	0.100
125	0.030	3.000	1.250	1.200	0.300	0.050	0.000	1.300	0.700	0.000	0.900	0.800	1.000	0.900	0.500	0.200	0.100
188	0.030	2.000	1.300	1.200	0.500	0.020	0.000	1.900	1.300	1.000	0.900	0.900	0.900	1.700	0.500	0.600	0.200
189	2.400	5.500	6.000	1.100	1.200	1.000	1.000	2.000	1.900	1.000	0.900	1.400	0.800	0.900	0.600	1.200	0.300
124	0.100	2.000	1.200	1.100	0.300	0.050	0.000	1.200	0.800	0.000	0.500	0.900	0.900	0.600	0.200	0.800	0.300
74	0.200	999.000	1.200	0.100	0.200	0.400	0.000	0.800	2.000	1.000	0.900	1.500	0.700	1.900	0.800	1.900	0.100
122	0.300	1.200	2.000	1.300	0.500	0.900	0.000	0.900	1.300	0.000	0.700	0.600	1.000	1.200	0.100	0.300	0.400
38	0.700	2.300	1.300	1.300	0.400	0.500	0.000	0.361	0.482	0.000	1.500	0.178	1.429	0.211	0.471	1.600	0.345
143	1.200	2.000	1.900	2.200	0.900	1.200	0.000	1.500	1.600	0.000	0.800	0.600	1.200	1.000	0.200	0.600	0.300
126	0.100	4.000	1.300	1.670	0.500	0.060	0.000	0.600	0.300	0.000	0.300	0.600	1.200	1.300	0.400	0.500	0.400
56	4.700	5.700	3.600	2.100	1.900	1.600	1.000	0.602	1.928	1.000	1.900	1.333	7.143	1.053	0.588	2.800	0.345
55	3.900	4.800	3.300	1.200	0.500	1.600	1.000	0.361	0.843	1.000	2.000	0.889	1.429	0.526	0.353	2.000	0.172

50	0.700	2.000	2.100	1.700	0.700	1.200	0.000	2.410	0.843	1.000	0.900	0.289	2.857	0.789	0.882	2.000	0.345
59	1.400	4.300	2.500	1.100	1.900	1.600	1.000	1.205	1.566	1.000	2.000	1.556	1.429	1.053	0.824	1.600	0.345
58	2.900	3.000	3.100	0.900	1.000	0.300	1.000	0.361	0.241	1.000	5.000	0.667	2.857	0.004	0.353	0.800	0.345
165	1.500	5.000	3.800	2.200	2.600	1.800	2.000	1.300	1.500	0.000	1.700	0.900	1.300	1.800	0.400	0.600	0.090
169	2.400	6.000	3.100	1.700	1.700	1.800	1.000	1.200	0.800	1.000	1.300	1.500	1.100	1.200	0.100	0.500	0.500
167	1.800	5.000	1.900	1.100	1.400	1.200	1.000	0.900	2.000	0.000	0.900	1.500	1.400	1.800	0.500	1.200	0.100
166	1.000	3.000	1.900	3.300	1.700	1.800	1.000	1.200	1.800	1.000	1.100	0.800	1.200	0.900	0.300	1.900	0.070
168	2.900	5.000	3.100	1.100	1.400	1.200	1.000	0.500	1.900	0.000	0.500	1.300	0.800	0.900	0.700	1.000	0.100
57	2.700	4.700	2.500	1.200	1.200	1.300	1.000	0.361	0.843	1.000	2.000	1.111	0.714	1.053	0.765	1.600	0.345
54	4.800	4.700	3.200	1.300	0.900	1.300	1.000	0.241	0.843	1.000	1.700	1.111	2.857	1.053	0.412	2.000	0.241
170	2.900	3.000	1.300	0.900	0.500	1.000	1.000	1.100	0.600	0.000	1.500	0.900	0.800	1.300	0.600	1.300	0.400
130	0.700	2.100	1.300	1.800	0.500	0.500	0.000	1.000	1.400	0.000	1.200	0.800	0.900	1.000	0.200	0.900	0.500
142	0.900	2.100	2.500	1.500	1.000	1.800	0.000	2.000	0.900	1.000	0.400	0.800	1.600	0.500	0.300	1.200	0.600
51	0.700	2.000	1.600	1.700	0.600	0.800	0.000	2.410	0.723	0.000	0.900	0.178	1.429	0.526	1.000	2.000	0.690
128	0.900	2.000	1.900	1.100	0.300	0.600	0.000	1.400	0.800	0.000	1.100	0.800	0.600	0.900	0.500	0.800	0.200
127	0.060	3.000	1.900	1.700	0.600	0.070	1.000	0.700	0.900	0.000	1.000	0.900	0.700	0.800	0.200	0.900	0.300
136	0.030	2.000	1.250	4.100	0.500	0.020	0.000	1.800	1.900	0.000	0.600	1.200	1.100	1.000	0.600	0.500	0.700
66	5.500	3.300	3.100	2.400	0.500	1.300	3.000	0.241	0.482	1.000	3.000	0.889	0.000	0.053	0.412	0.400	2.414
39	0.400	2.500	1.600	1.400	0.500	0.400	0.000	0.024	0.482	0.000	1.500	0.178	1.429	0.526	0.412	1.600	0.345
133	1.500	0.500	1.300	0.900	0.300	0.600	0.000	2.100	1.500	0.000	1.500	0.800	1.200	0.900	0.300	0.900	0.500
129	0.600	2.000	2.000	2.200	1.000	1.200	1.000	1.300	0.900	0.000	1.000	0.900	1.100	0.900	0.500	1.000	0.200
132	1.800	1.200	1.400	0.700	0.300	0.500	0.000	1.400	0.700	1.000	1.200	0.900	1.500	1.300	0.500	1.400	0.200
49	1.600	0.800	1.300	0.800	0.300	0.400	0.000	1.325	0.723	3.000	5.000	0.133	1.429	2.105	0.471	0.560	0.345
131	1.500	1.000	1.300	0.900	0.300	0.200	0.000	0.900	0.800	0.000	0.900	1.000	1.200	1.300	0.300	1.200	0.600
134	1.200	1.000	1.300	1.100	0.500	0.600	0.000	1.700	1.400	1.000	1.300	1.000	1.300	1.400	0.500	0.800	0.400
135	1.900	1.200	1.400	1.500	0.800	0.700	0.000	1.100	0.900	0.000	1.100	0.900	0.800	1.100	0.700	0.900	0.600
40	1.000	1.800	1.300	1.500	0.700	0.800	0.000	0.241	0.602	1.000	2.000	0.200	0.714	0.526	0.588	1.600	0.690
139	1.500	0.500	0.900	0.600	0.200	0.200	0.000	0.800	0.700	0.000	0.900	0.700	1.000	0.900	0.300	0.800	0.600
138	1.500	1.000	0.600	0.200	0.100	0.100	0.000	1.200	1.500	0.000	0.500	0.600	0.900	1.000	0.600	0.900	0.300
141	0.300	2.000	0.900	1.700	0.800	1.200	1.000	1.100	1.200	0.000	0.900	1.200	0.800	0.600	0.200	1.000	0.400
137	0.900	3.000	1.400	1.800	0.900	1.000	1.000	0.700	1.300	1.000	1.300	1.500	1.200	0.900	0.200	0.600	0.300
140	0.600	3.000	3.800	1.700	0.900	1.800	1.000	1.200	1.400	0.000	0.400	0.300	0.900	0.700	0.500	0.900	0.300
42	0.500	2.500	2.400	1.700	0.900	1.500	1.000	1.205	0.964	0.000	1.500	0.222	1.429	0.526	0.588	0.800	0.690
41	1.500	0.700	0.700	4.200	0.200	0.200	0.000	0.000	0.072	0.000	2.000	0.067	0.000	0.158	0.294	1.600	0.345
145	2.900	6.000	3.100	1.700	0.500	2.400	1.000	0.900	0.700	0.000	0.800	1.000	0.600	0.500	0.200	0.300	0.300
116	0.900	0.800	1.300	1.100	0.500	0.600	0.000	1.400	1.200	1.000	1.000	0.800	1.200	1.100	0.300	1.000	0.200
90	14.700	2.700	1.250	1.100	0.600	0.600	1.000	0.400	1.300	0.000	1.600	0.900	1.300	0.800	0.100	1.100	0.600
91	13.000	3.000	1.300	0.900	0.300	0.630	1.000	1.200	1.400	0.000	0.900	1.200	0.800	0.600	0.300	1.000	0.500
92	6.000	2.800	2.500	2.200	0.700	1.000	1.000	0.900	1.200	0.000	1.200	0.900	0.700	0.900	0.200	0.900	0.200
89	8.800	3.600	1.900	1.100	0.500	1.200	1.000	0.800	0.900	1.000	1.800	0.900	1.200	0.900	0.300	1.200	0.100
93	2.100	0.700	1.200	1.700	1.800	1.400	1.000	1.000	0.900	0.000	1.000	1.200	0.900	0.500	0.300	1.100	0.600
88	2.900	3.600	1.200	1.600	0.500	0.800	1.000	0.600	0.900	1.000	1.700	1.600	1.200	0.200	0.300	1.300	0.600
94	2.200	0.800	4.300	2.300	1.800	1.800	2.000	0.900	1.400	1.000	1.300	1.500	1.200	1.100	0.800	1.300	0.700
87	2.000	2.700	1.200	0.500	1.100	1.200	1.000	1.200	1.500	0.000	1.500	1.600	1.100	0.900	0.600	1.200	0.600
95	2.700	0.600	1.900	1.100	0.700	0.600	0.000	0.400	0.900	0.000	0.800	1.100	0.900	0.800	0.200	1.100	0.500
86	0.900	5.000	1.900	3.300	1.400	0.300	0.000	0.500	1.200	0.000	1.300	1.400	1.200	1.300	0.200	1.300	0.500
211	5.000	4.000	2.000	2.100	1.700	0.900	0.000	1.100	1.300	1.000	1.800	1.300	0.900	1.200	0.200	0.600	0.100
96	5.800	3.700	2.500	2.200	0.700	1.000	1.000	0.900	1.200	1.000	1.500	1.700	1.300	1.000	0.500	0.900	0.300
210	1.200	4.000	2.000	2.300	1.200	0.500	1.000	0.400	0.800	1.000	0.700	0.900	0.800	1.900	0.600	0.700	0.500
97	11.600	2.800	2.600	1.100	0.500	1.200	1.000	1.100	0.800	1.000	1.100	1.300	0.800	1.200	0.300	0.700	0.500
209	1.200	3.000	2.500	1.200	0.700	0.900	1.000	0.900	0.900	0.000	0.300	0.700	1.200	0.800	0.300	0.900	0.300
208	2.000	1.500	1.400	1.200	1.100	0.900	1.000	1.000	1.700	0.000	1.100	0.600	1.300	0.600	0.400	1.000	0.700
105	0.600	1.000	1.900	1.100	0.500	0.700	0.000	0.600	0.700	1.000	0.300	0.900	1.000	1.000	0.600	1.100	0.300
206	4.500	5.000	1.200	0.900	1.200	0.800	1.000	1.200	1.300	0.000	0.800	1.500	0.700	1.000	0.300	1.300	0.300
207	0.900	4.000	2.000	1.200	1.300	1.700	1.000	0.900	2.000	0.000	1.500	1.200	0.600	1.200	0.500	1.500	0.500
103	0.400	8.000	3.800	5.500	1.300	1.800	2.000	0.900	1.000	1.000	0.700	0.500	0.700	1.000	0.500	0.800	0.200
104	0.300	8.000	3.500	5.000	1.700	1.500	1.000	1.100	1.200	0.000	1.000	0.300	0.500	0.900	0.700	1.000	0.400
203	2.000	3.100	0.900	1.200	0.800	0.600	0.000	0.800	1.400	1.000	1.600	1.700	1.400	0.500	0.300	1.100	0.800
204	2.900	3.100	2.200	1.300	0.600	1.000	1.000	0.600	1.200	1.000	1.200	1.300	1.300	0.900	0.500	0.900	0.500
106	0.700	1.200	2.000	1.200	0.600	0.800	1.000	0.900	1.000	0.000	0.400	0.800	0.900	0.700	0.300	0.800	0.200
107	0.200	5.000	1.800	0.300	0.300	0.600	0.000	1.300	1.900	1.000	0.900	0.900	1.000	1.200	0.500	0.900	0.500
144	0.900	1.000	0.900	1.100	0.500	0.600	0.000	1.200	0.900	0.000	0.700	0.900	1.000	0.900	0.500	0.900	0.400
202	0.300	3.000	1.900	2.200	1.700	1.200	1.000	1.200	1.300	1.000	1.700	1.500	1.200	1.200	0.800	1.200	0.700
205	0.700	4.500	2.100	1.200	0.900	1.000	1.000	0.400	0.900	1.000	1.300	0.900	1.100	0.500	0.100	1.500	0.600

Refer to “heavy_metal_slc” theme in the GIS database.
Unit : mg / kg

- Data source
  State Land Committee

- Spatial data of oil contamination (Point)



- Attribute table of oil contamination

ID	Type	Concentration (%)	Depth
1	Mazutized, surface thin	13.0	<10
2	Mazutized, middle-thick	28.2	<10
3	Mazutized, thick	21.7	<10
4	Mazutized, super-thick	26.8	<10
5	Bitumenized, dry, taciric, surface thin	12.6	<10
6	Bitumenized, medi-dry, peelly, middle-thick	18.4	<10
7	Bitumenized, humidified, middle-thick	21.9	<10
8	Bitumenized, periodically humidified, thick	31.8	<10
9	Bitumenized, self-growing, thin	4.0	<10
10	Bitumenized, self-growing, middle-thick	10.1	<10
11	Contaminated by the cutting rocks, impregnated by petrochemicals, thin	11.9	<10
12	Contaminated by the cutting rocks, impregnated by petrochemicals, middle-thick	30.8	<10
13	Contaminated by the cutting rocks, impregnated by petrochemicals, thick	29.6	<10
14	Contaminated by the cutting rocks, impregnated by petrochemicals, super-thick	28.9	<10
15	Flooded by the wastewater from an oil-fields		

Refer to " oil_point_0-10_slc" theme in the GIS database.

Type : Type of thickness of soil
Concentration (%) : Oil pollutant concentration in soil
Depth : Depth from ground level

- Data source

State Land Committee

e.4 Water contamination distribution

- Water Temperature

Any object emits electromagnetic waves whose intensity corresponds to its physical characteristics including temperature. The intensity of electromagnetic waves from water detected by the TM sensor using Band 6 (i.e. thermal infrared) can be used to estimate water temperature. Such estimation can be done in two ways.

The first method requires a set of actual water temperature data at several monitoring points. Correlation between the water temperature data and TM Band 6 data at the same points are analysed. If the correlation is reasonably high, the correlation formula can be applied to all TM Band 6 data on the whole water body to understand water temperature distribution. The team attempted this method using the 1999 water temperature, but the correlation coefficient was too low (0.361) to produce a distribution map.

The second method that was adopted by the team uses a theoretical equation by which temperature can be drawn from the TM Band 6 data. The distribution map of temperature in 1988 and 1999 were thus developed[1] and they are shown below. From the comparison of the two maps it is found that lake temperature is generally higher in 1999 than in 1988. The findings also showed that the water temperature of Lake Ganli-Gel tends to be lower than that of others.

- Transparency and Phenol

Water pollution problems escalate with urbanisation and industrialisation. Water pollution monitoring is another possibility to utilise satellite information.

Water transparency is largely affected by concentration of suspended solids (SS). When light enters clean water, it will reach the bottom, but visible blue light (about 0.50 μm), which is easily scattered by any impurities in water, will be reflected back to the air. In water with high SS, on the other hand, longer wave light (green and yellow, about 0.65 μm) are also reflected.

Water colour is also influenced by the presence of phytoplankton. It is known that chlorophyll, a pigment in phytoplankton for photosynthesis, selectively absorbs light in a range of 0.45 μm and 0.65 μm.

Therefore the TM data in Bands 1 or 2, or occasionally 3, which together cover wave lengths from 0.45 to 0.69 μm, should provide information on SS and chlorophyll amount.

In a usual process, the correlation between the real SS and chlorophyll data at monitoring points and TM data at the same points is expressed in a formula, which is then applied to the whole area. The team, however, did not find real SS data or chlorophyll data and substituted transparency data for SS data and phenol for chlorophyll. Data of phenol concentration was used because the higher the phenol concentration is, the higher the COD, and it can be a representative parameter of water contamination. 1988 Data on transparency and phenol concentration were not available, therefore only data acquired in 1999 were employed.

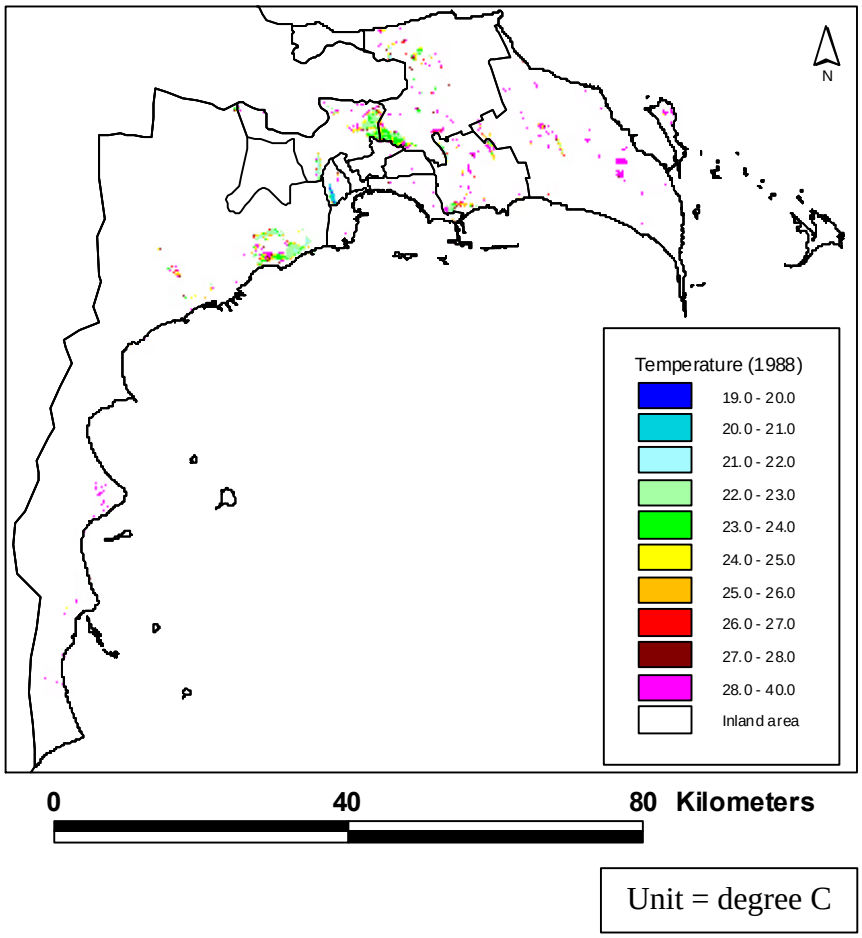
The correlation coefficient between transparency data (measured on 30 July 1999) and TM Band 1 data was 0.555, and 0.916 between phenol data (measured on the same date) and TM Band 1 data. Correlation formulae were developed and applied to whole water bodies to create maps of transparency distribution and phenol concentration distribution are shown below.

The maps show that Lake Beuk-Shor is poor in transparency and contains high phenol.

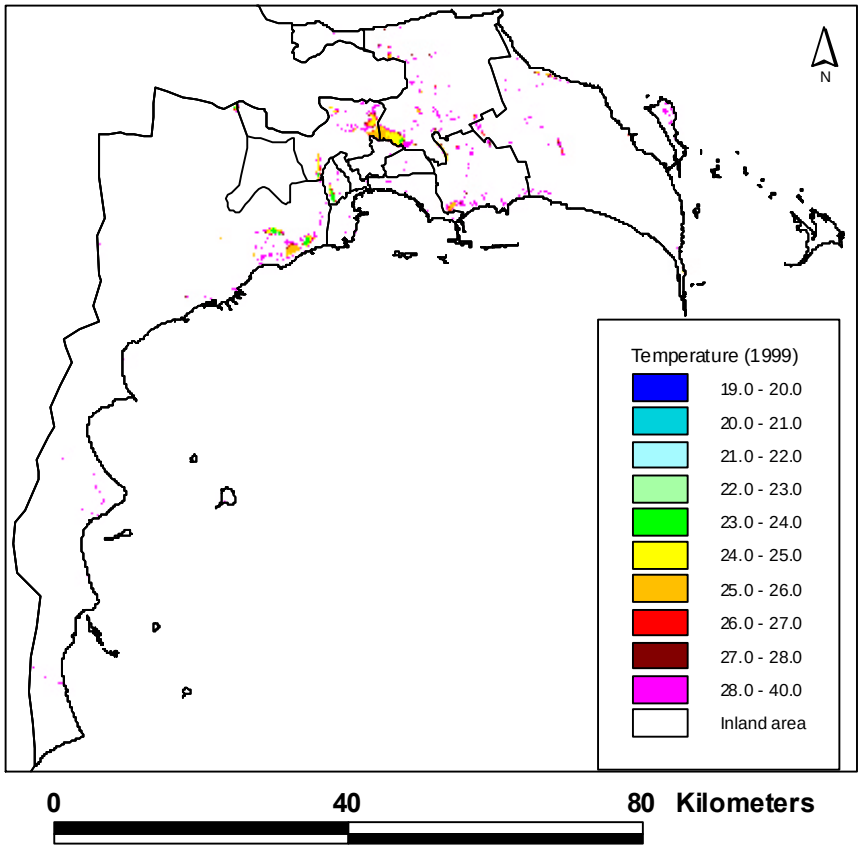
The TM band 2 data did not show good correlation with real data of transparency and phenol.

[1] The maps are in fact developed from data not of temperature data but of brightness temperature. Brightness temperature and temperature are the same for ideal objects, but in reality they are not equal and emissivity ε correlates the two. ε varies with objects but is nearly one for water. Therefore the maps can be considered to display water temperature distribution. The water temperature data are, however, subject to the influences by air moisture resulting in errors of about ±0.5 degrees.

- Spatial data of water temperature in 1988 (Grid)

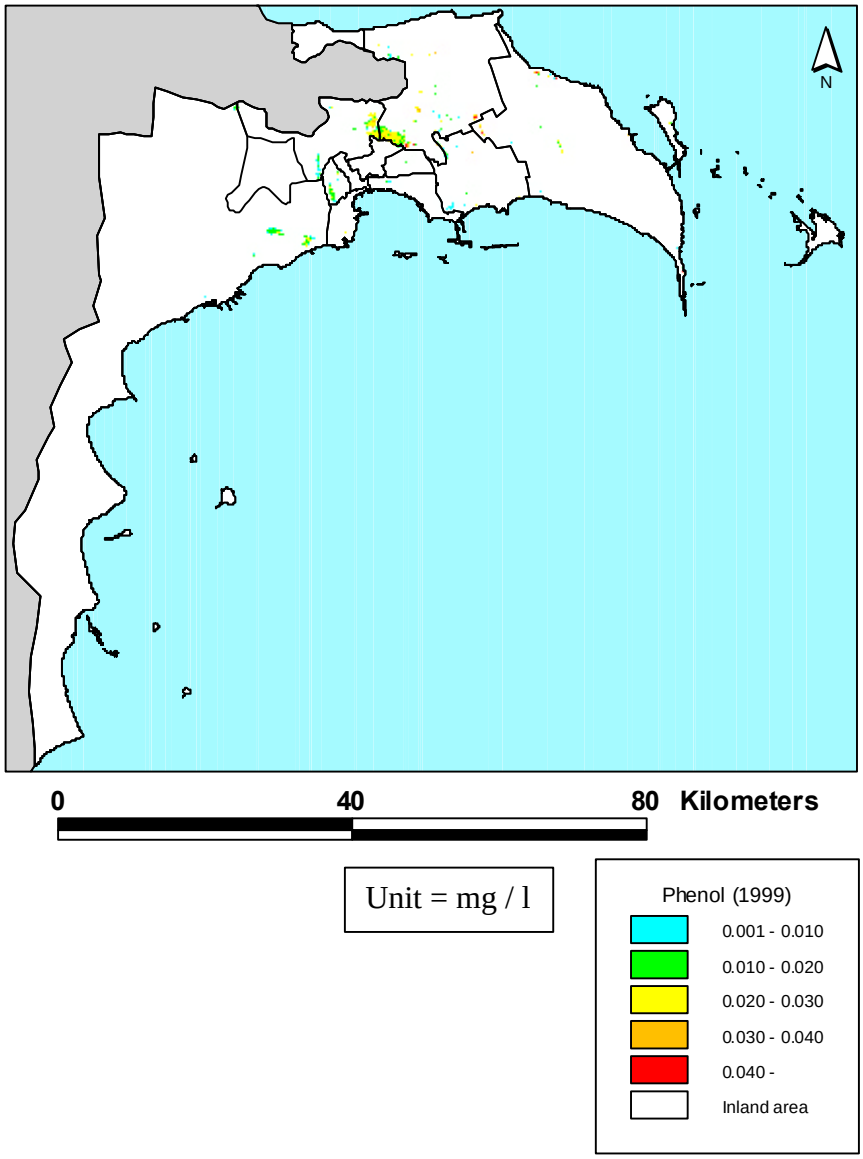


- Spatial data of water temperature in 1999 (Grid)

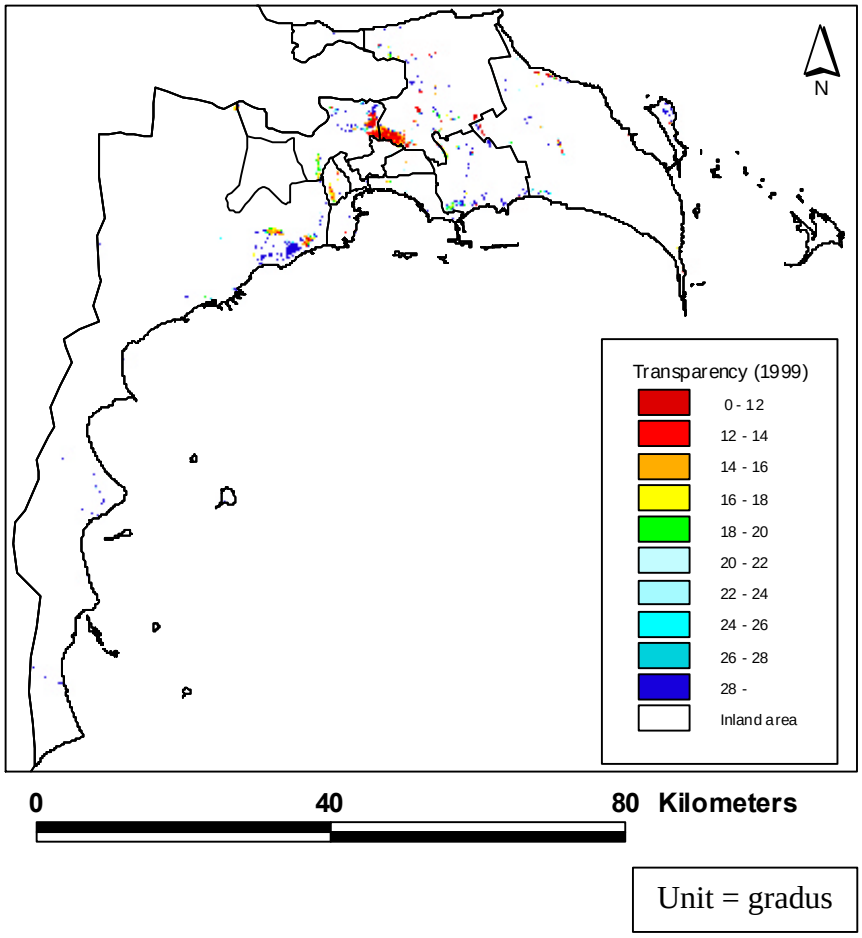


Unit = degree C

- Spatial data of phenol in 1999 (Grid)



- Spatial data of transparency (Grid)

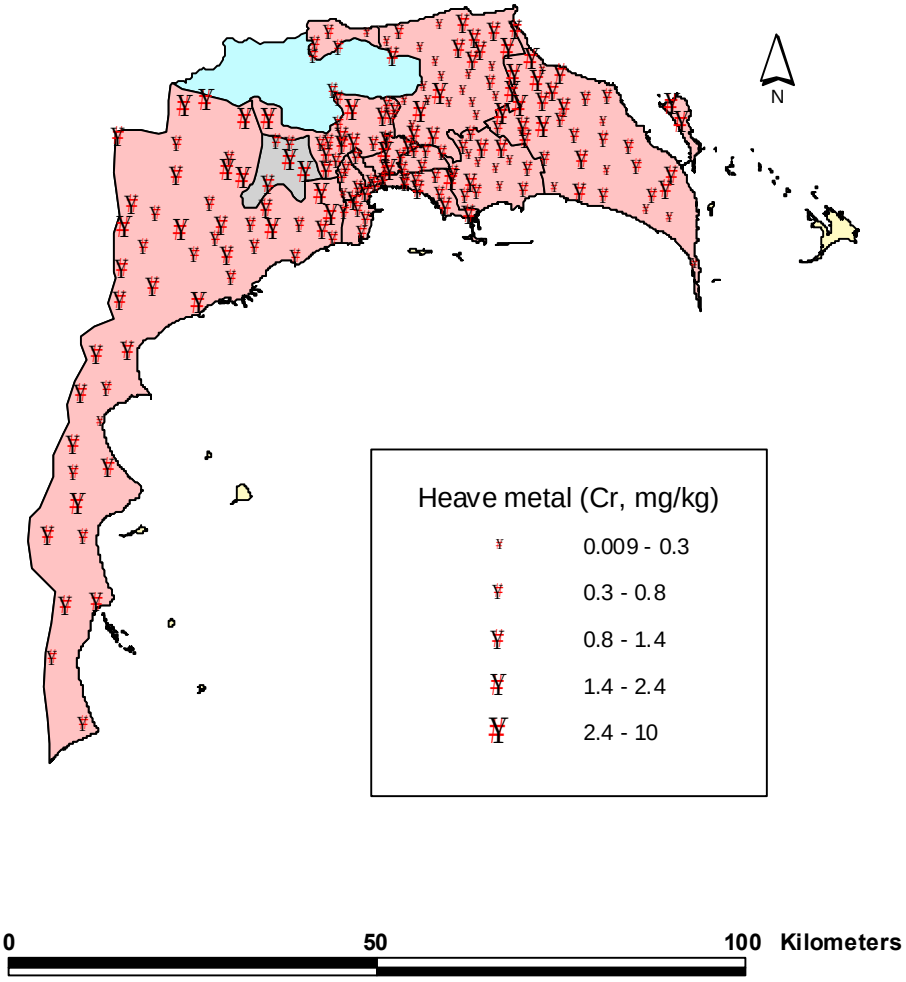


Unit = gradus

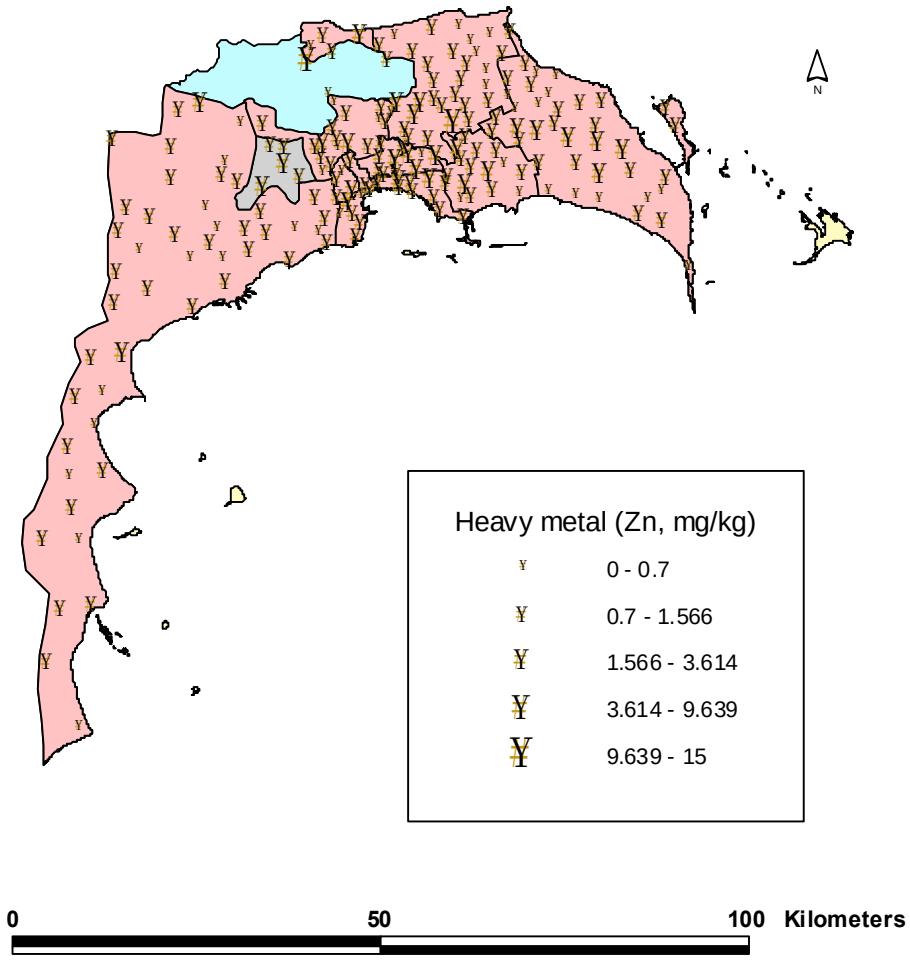
f. Environmental Information (Pollution maps)

The team was prepared pollution maps using data of ambient quality. Some case example is shown below.

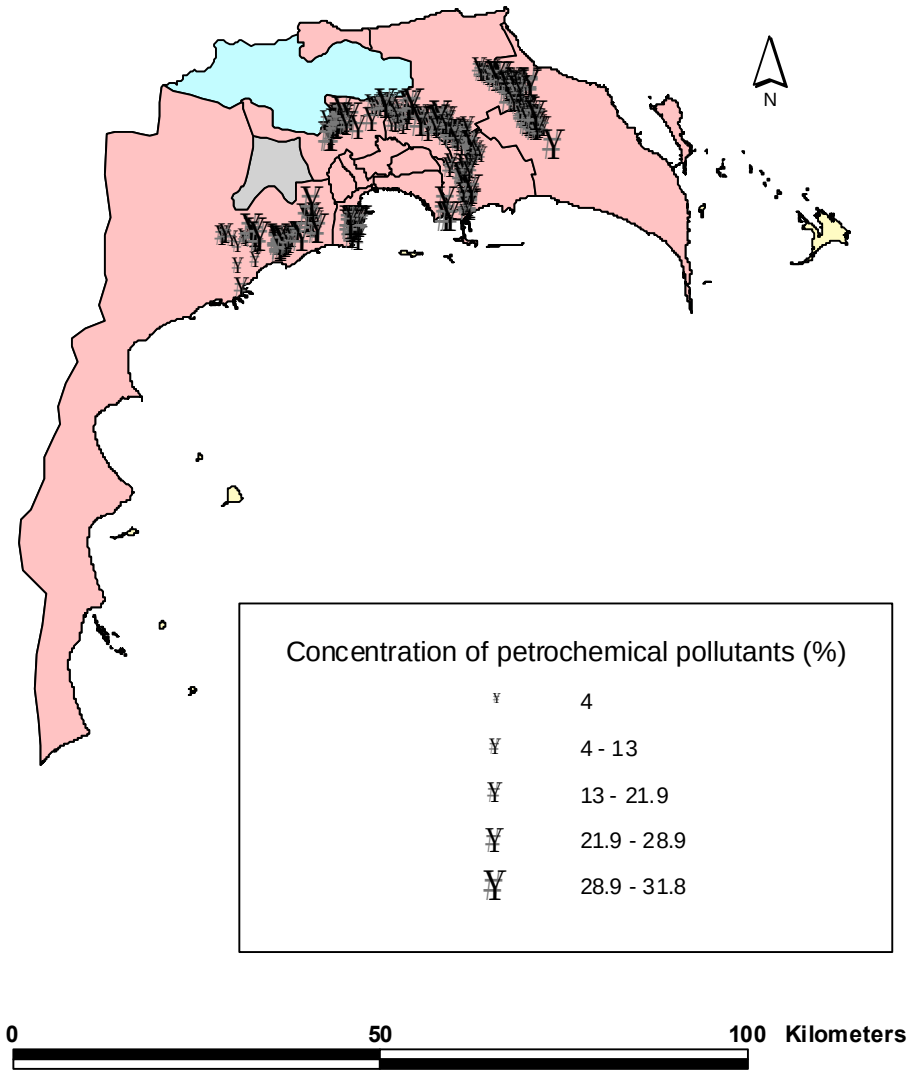
- Pollution map of heavy metal using Cr (Point)



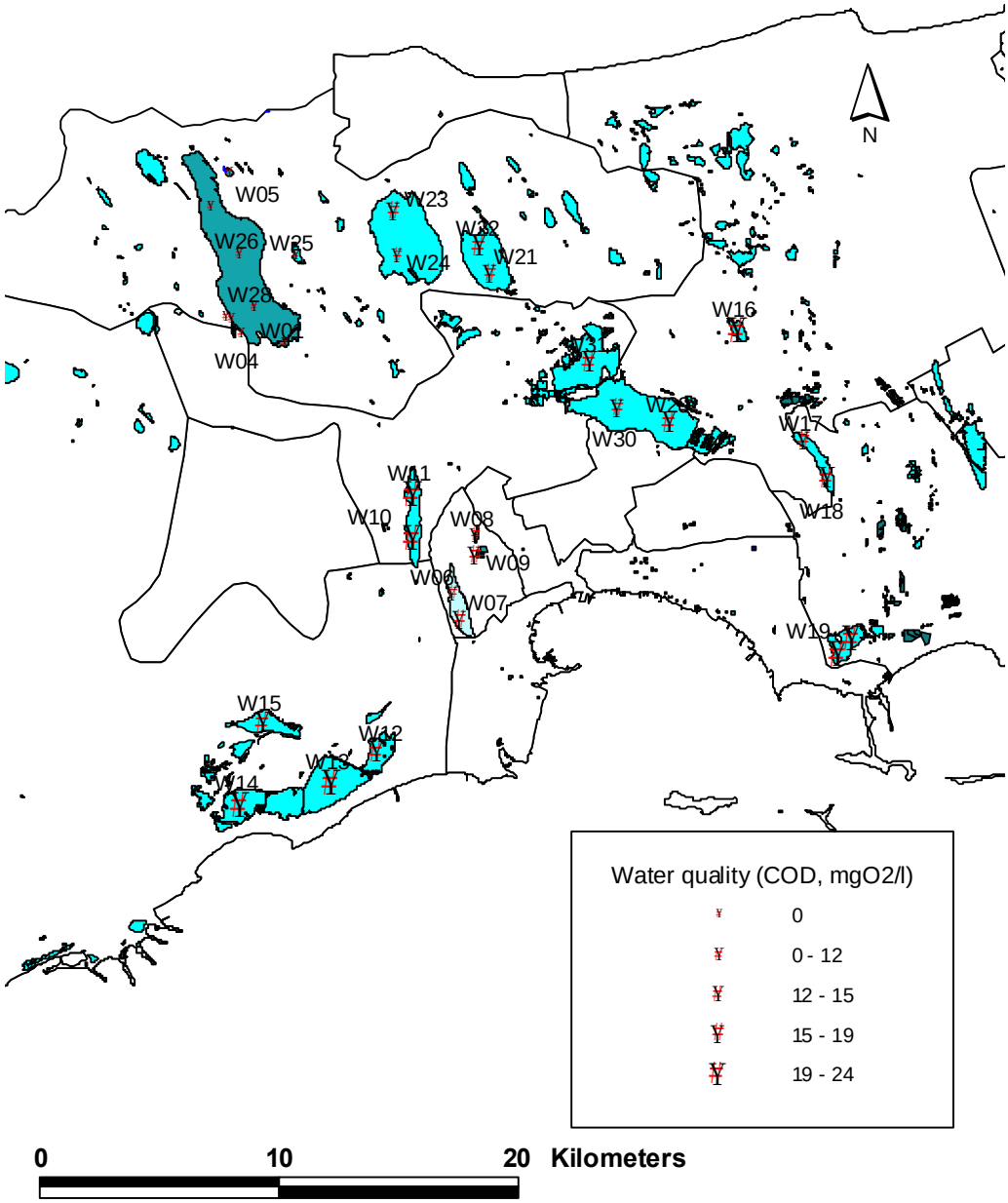
- Pollution map of heavy metal using Zn (Point)



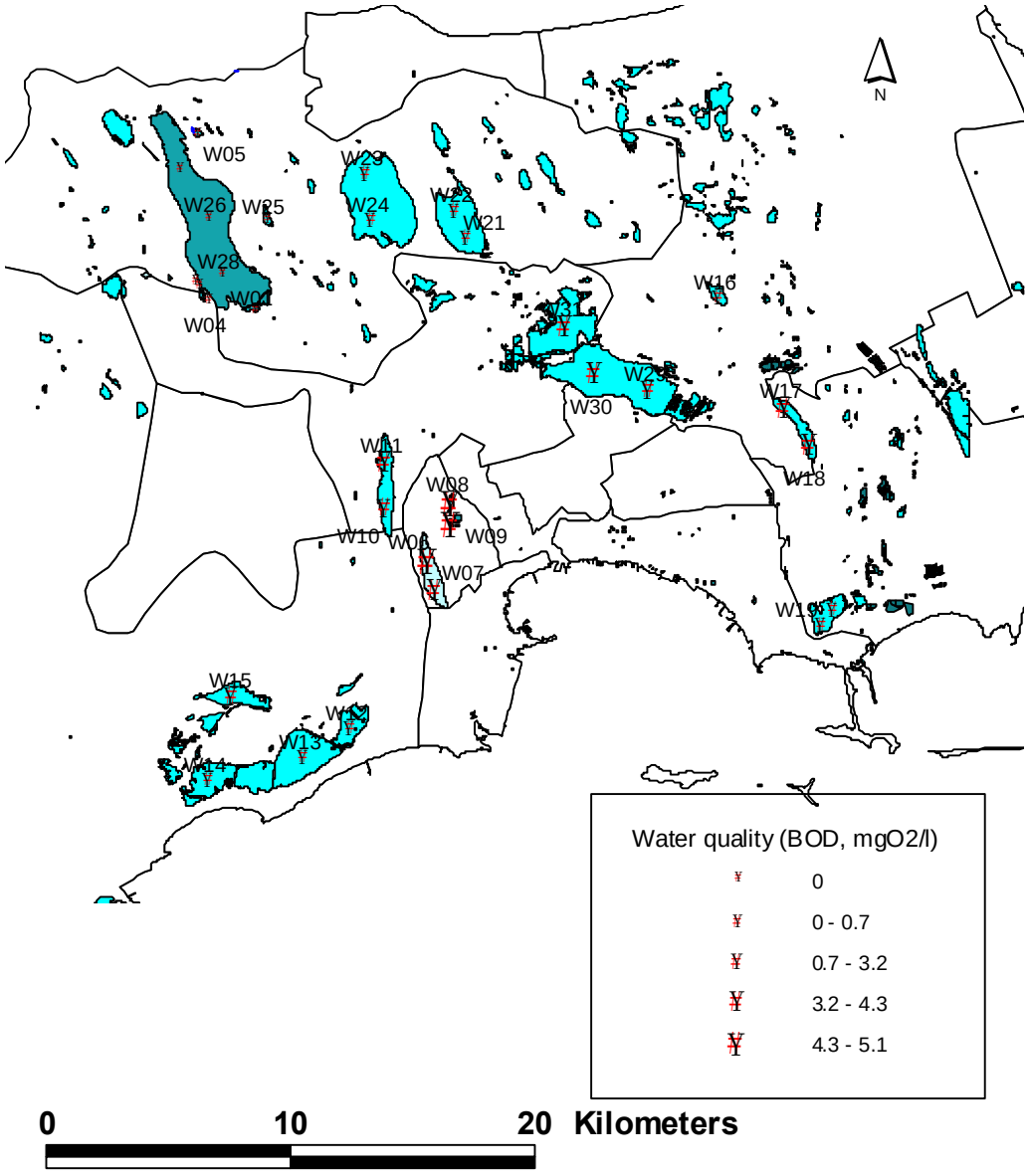
- Pollution map of oil contamination using petrochemical concentration



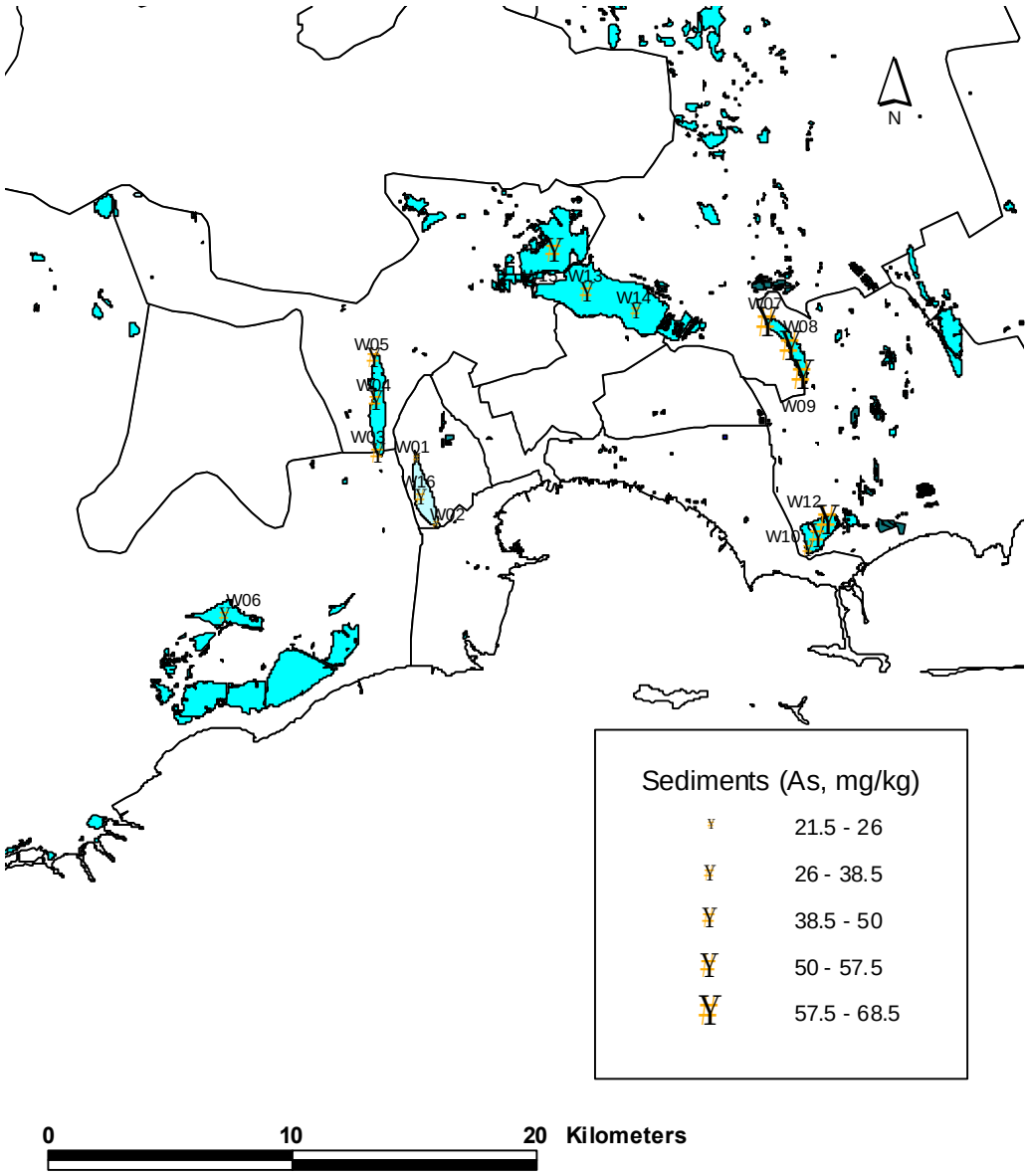
- Pollution map of water quality using COD



- Pollution map of water quality using BOD

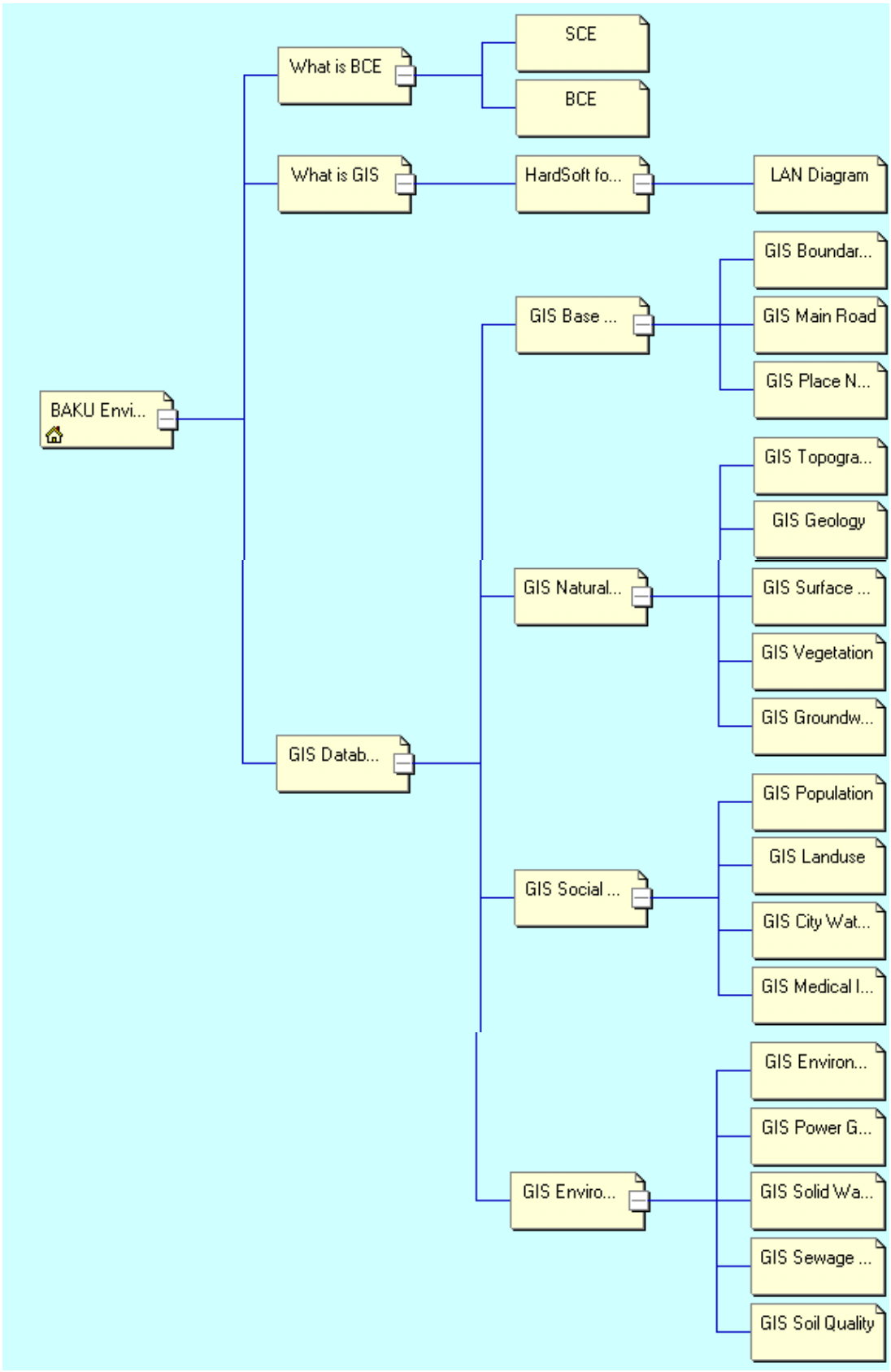


- Pollution map of sediment using As



1.4 Web Page of BCE

1.4.1 Navigation Structure



1.4.2 Web Pages

BAKU Environmental Database

Baku Committed for Ecology

Home

What is BCE

What is GIS

GIS Database

According to the agreement between the government of Azerbaijan Republic and the government of Japan, a study on environmental management in Baku city was carried out from January 2000 to March 2001 with financial support by the government of Japan through Japan International Cooperation Agency (JICA). JICA entrusted the entire work of the study to Kokusai Kogyo Co., Ltd., which organized an international consulting team composed of 11 Japanese, 2 British and 1 Azeri specialists with different expertise.

The environmental database that is presented in this homepage using GIS technique was established during this study by the consulting team in close cooperation with Baku Committee for Ecology and Nature Utilization Control and other environmental organizations in Azerbaijan.

The main purposes of building this homepage are (i) integration of environmental data that have been accumulated in various organizations, (ii) wide distribution of those data, and (iii) environmental awareness sharing among the general public. From this page, the visitors will see the land use, air quality, water quality, soil quality, and other graphically visualized environmental information of Baku city.

For further information and suggestions, please send an e-mail to: admin@bce.go.az

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What is BCE

Baku Committed for Ecology

Baku Committee for Ecology

Home

SCE

BCE

BCE, Baku Committee for Ecology and Nature Utilization Control, is one of the regional offices subordinate to State Committee for Ecology and Nature Utilization (SCE). Based in the capital of Azerbaijan, BCE is responsible for law enforcement for environmental protection and rational use of nature resources within the greater Baku. The duties and functions of the BCE are stipulated in its charter, which was developed based on Law of the Republic of Azerbaijan on Environmental Protection.

- SCE Organization Structure
- BCE Organization Structure

BCE Building

Home

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SCE

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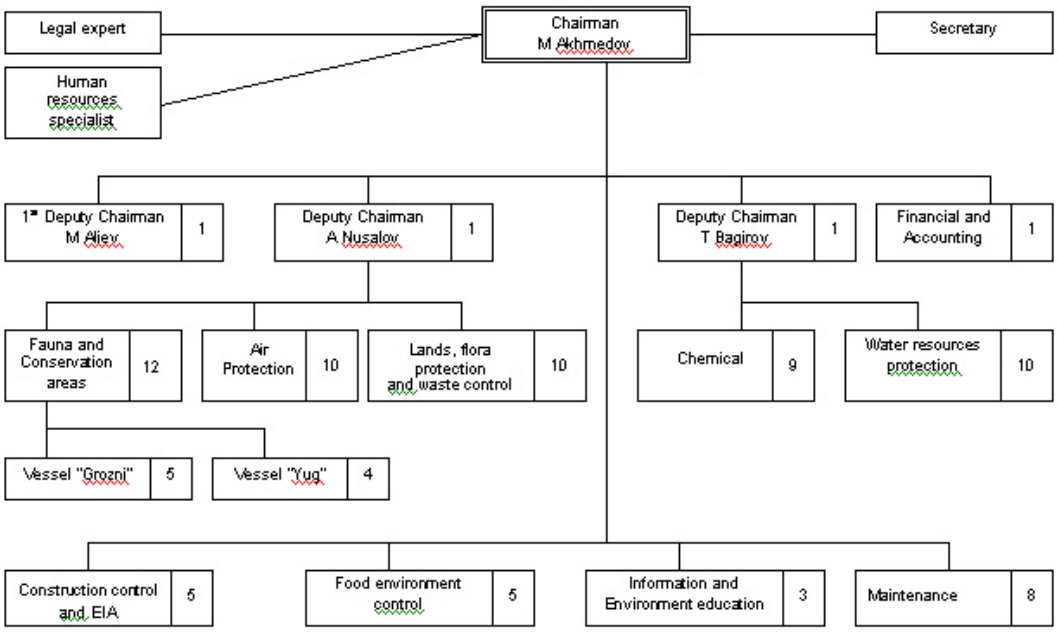
SCE Organisation Structure



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BCE

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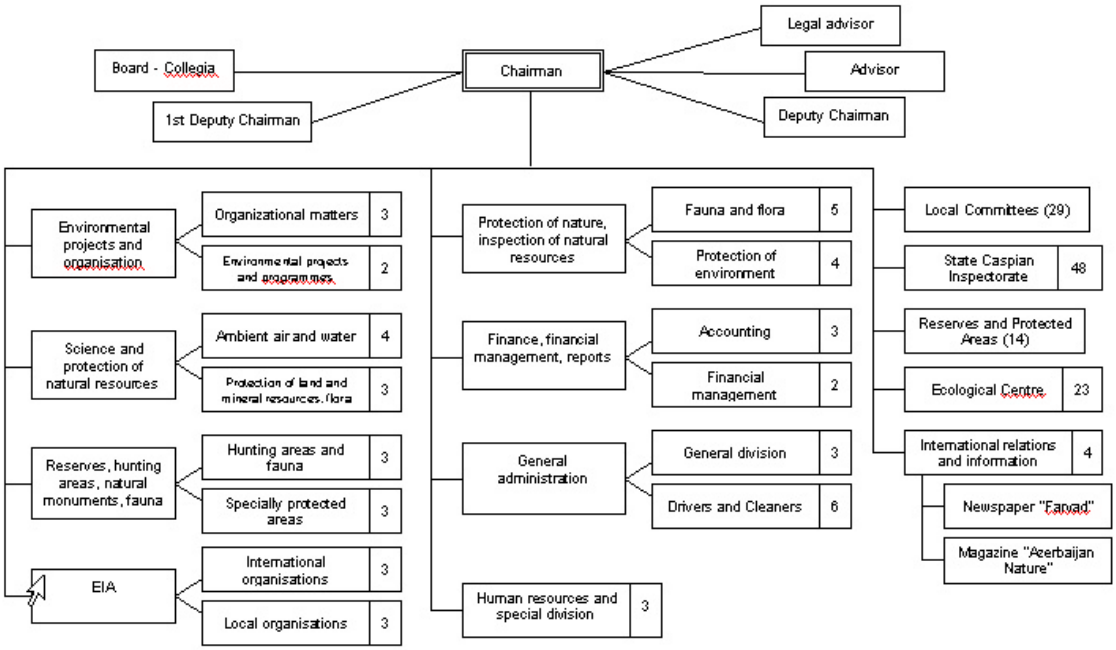
BCE Organisation Structure



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What is GIS

Baku Committed for Ecology

Geographic Information System (GIS)

Home

One of the main benefits of GIS is improved management of your organization and resources. A GIS can link data sets together by common locational data, such as addresses, which helps departments and agencies share their data.

A GIS is not just an automated decision making system but a tool to query, analyze, and map data in support of the decision making process.

For example, GIS can be used to help reach a decision about the location of a new housing development that has minimal environmental impact, is located in a low-risk area, and is close to a population center. The information can be presented succinctly and clearly in the form of a map and accompanying report, allowing decision makers to focus on the real issues rather than trying to understand the data. Because GIS products can be produced quickly, multiple scenarios can be evaluated efficiently and effectively.

Making maps with GIS is much more flexible than traditional manual or automated cartography approaches. A GIS creates maps from data pulled from databases. Existing paper maps can be digitized and translated into the GIS as well.

Making maps with GIS is much more flexible than traditional manual or automated cartography approaches. A GIS creates maps from data pulled from databases. Existing paper maps can be digitized and translated into the GIS as well.

The GIS-based cartographic database can be both continuous and scale free. Map products can then be created centered on any location, at any scale, and showing selected information symbolized effectively to highlight specific characteristics. A map can be created anytime to any scale for anyone, as long as you have the data.

Hardware and Software settled for use GIS at BCE

- Hardware&Software for GIS

Home

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HardSoft for GIS

Baku Committed for Ecology

Hardware and Software settled in BCE for GIS

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Up

LAN Diagram

Hardware	
1 Server ***Dell™ PowerEdge 2300***	2 Workstations ***Dell™ OptiPlex GX1***
entium® III 500Mhz Processors 'AM Memory 512MB fonitor 14' SCSI HD 18MB DD 1.44 'DR/ 4X 'D 24X ape Back Up .eyboard/Mouse	entium® III 500Mhz Processors 'AM Memory 512MB fonitor 21' SCSI HD 9MB DD 1.44 'DR/ 24x/4x .eyboard/Mouse
Software	
Server	Workstation
Windows® NT® Server 4.0 Microsoft® Office 2000 Professional	Windows® 98 Second Edition Microsoft® Office 2000 Professional Arc View® 3.2 Arc View® 3.2 Arc View® Spatial Analyst Arc View® 3D Analyst
Others Devices	
Plotter HP Design Jet 750C+ Printer HP DeskJet 1120 (A3, 600dpi colour, 7ppp) Scanner Mustek ScanExpress SCSI A3SP Digitizer Calcomp Drawing Board III 34480-H4 (A0 format) UPS PowerCom	

- Network Connection Diagram

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LAN Diagram

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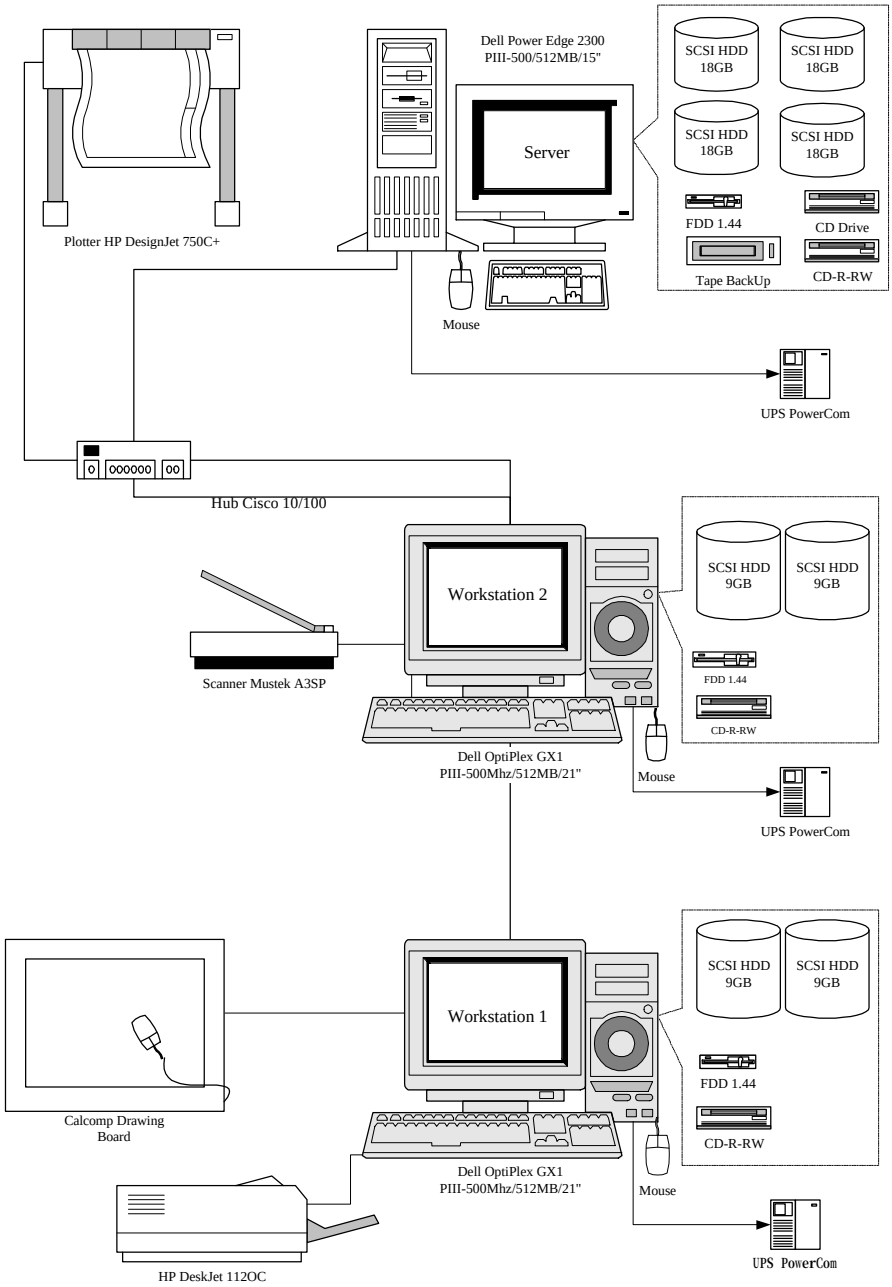

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GIS Database

Baku Committed for Ecology

Environmental GIS Database

Base Map

Natural Conditions

Social Conditions

Environmental Preservation Fund

Environmental Information
(Pollution sources)
(Ambient quality)
(Pollution maps)

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GIS Base Map

Baku Committed for Ecology

Main category	Sub category	Data type
Base Map	Boundary of Greater Baku	Polygon
	Main roads	Line
	Place names	Point
	Surface water	Polygon, Line
	Jeiranbatan reservoir and its catchment area	Polygon, Line, Grid
	Buildings	Polygon
	Railways	Line
	Settlement	Polygon

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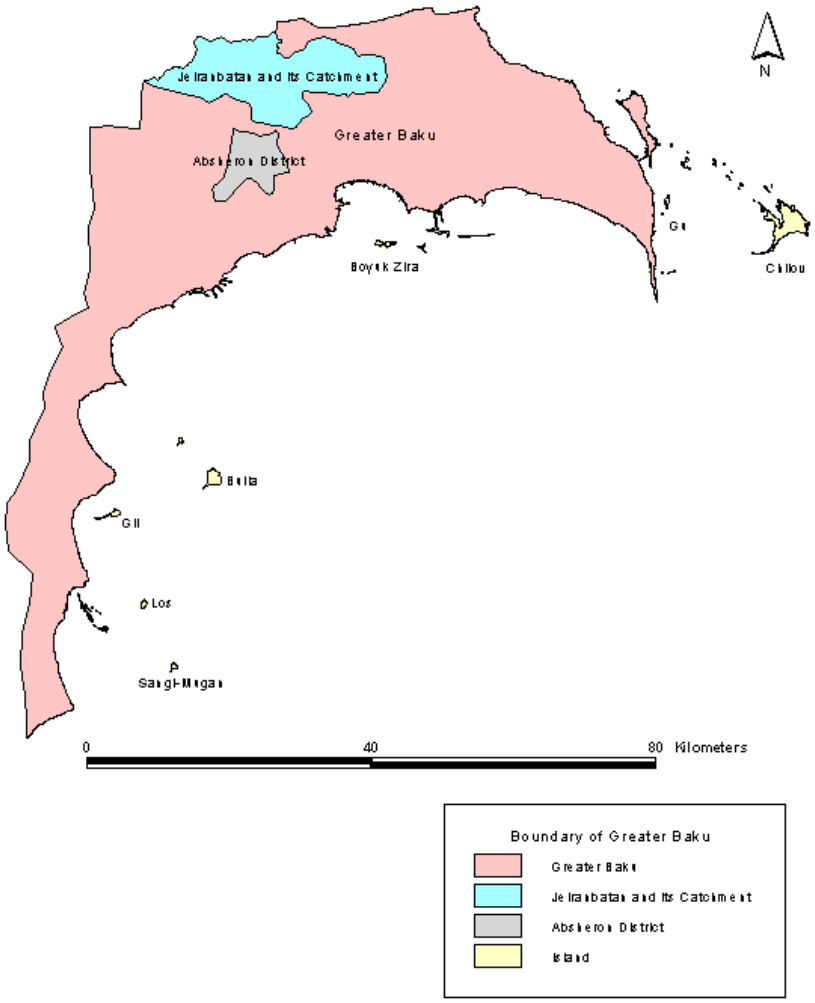
GIS Boundary of Greater Baku

Baku Committed for Ecology



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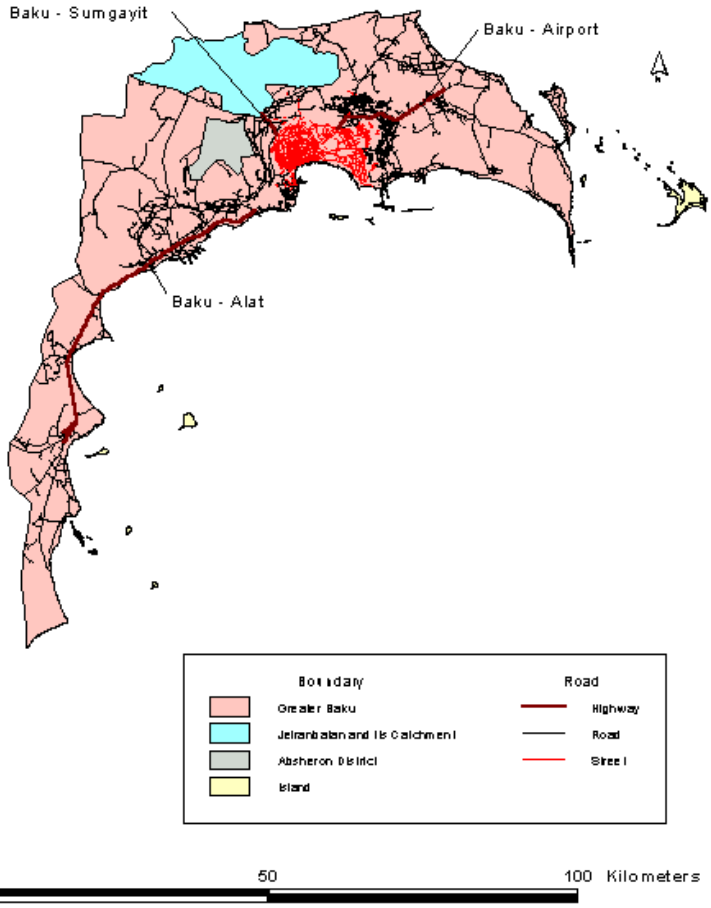
GIS Main Road

Baku Committed for Ecology



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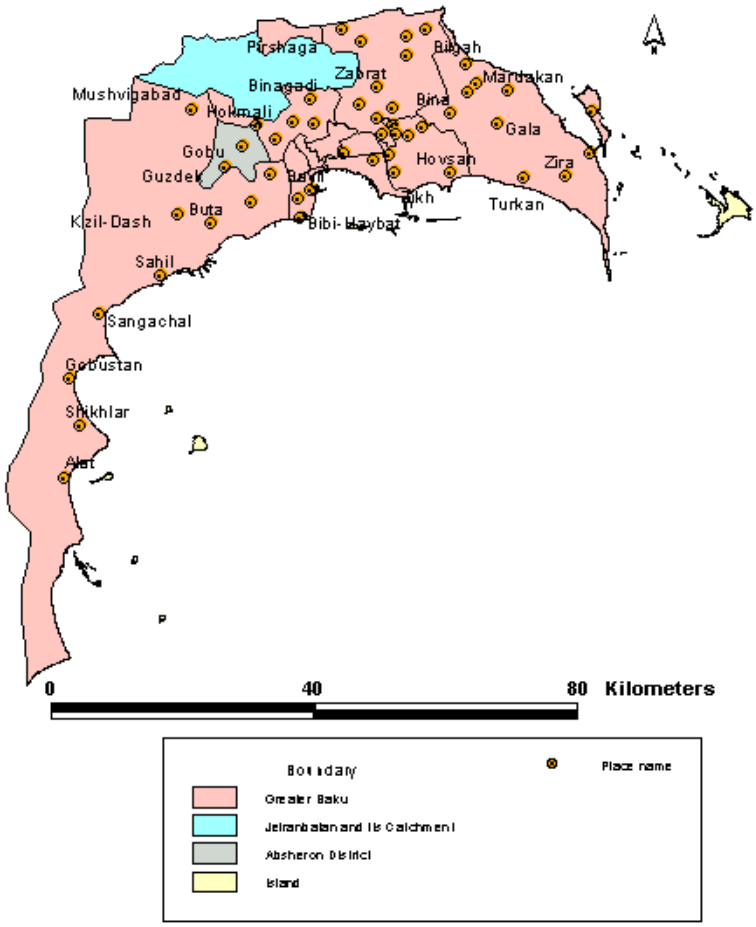
GIS Place Names

Baku Committed for Ecology



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GIS Natural Conditions

Baku Committed for Ecology

Main category	Sub category	Data type
Natural Conditions	Topography (DTM)	Grid
	Geology	Polygon
	Meteorology Rainfall Temperature Wind direction Wind speed	Point
	Hydrology Surface water Groundwater	Polygon, Point
	Fauna and flora (rare species)	Polygon, Point
	Vegetation	Polygon, Grid

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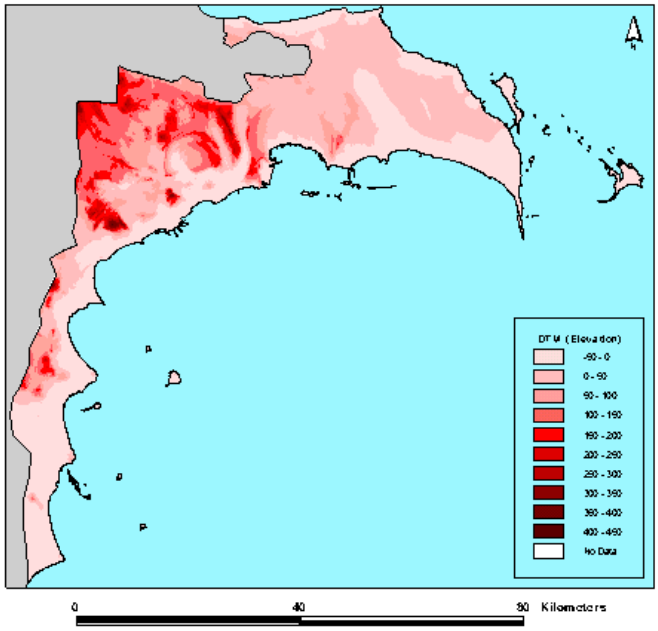
GIS Topography DTM

Baku Committed for Ecology



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GIS Geology

Baku Committed for Ecology

2.2. Geology

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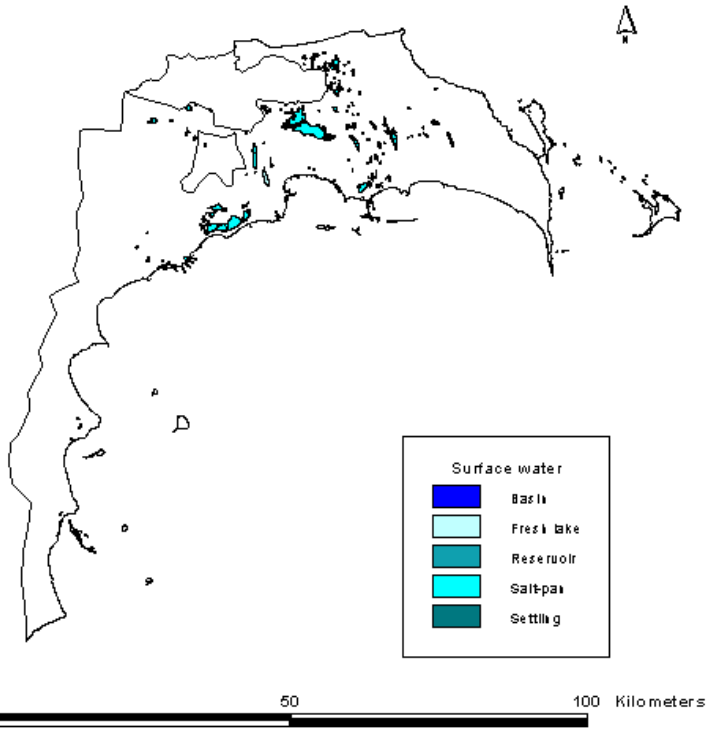
GIS Surface Water

Baku Committed for Ecology



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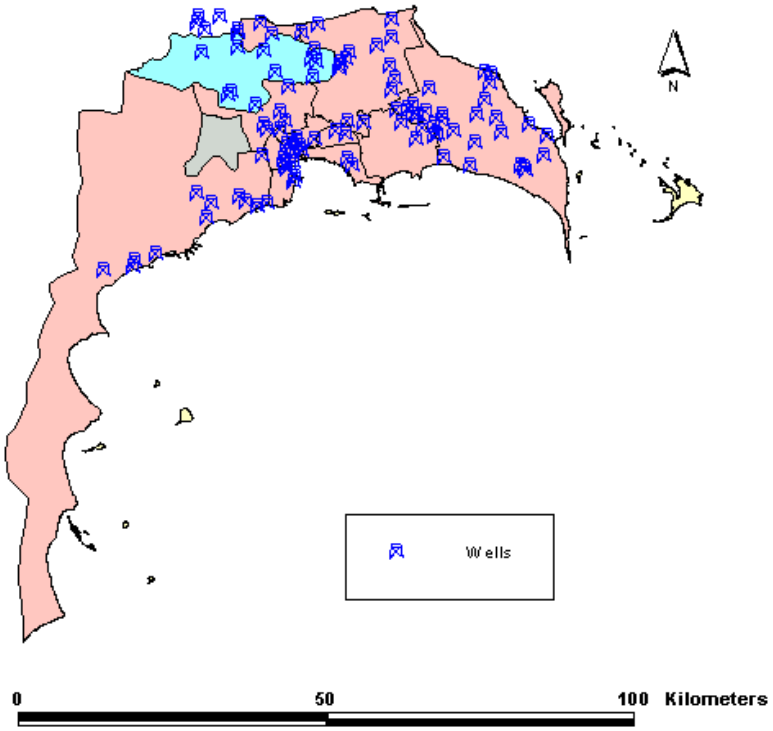
GIS Groundwater

Baku Committed for Ecology



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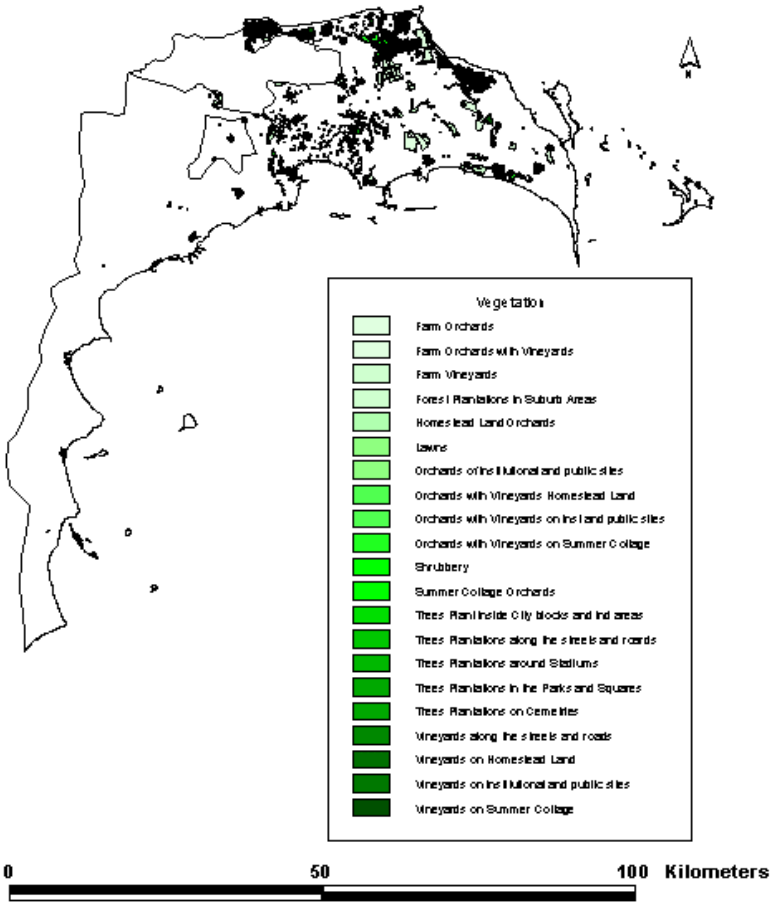
GIS Vegetation

Baku Committed for Ecology



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GIS Social Conditions

Baku Committed for Ecology

Main category	Sub category	Data type
Social Conditions	Administrative boundary	Polygon
	Population	Polygon
	Areas designated particular purpose	Polygon, Point
	Land use	Polygon, Grid
	Land use change	Grid
	Health statistics	Polygon
	City water facilities	Point
	Medical institutions	Point
Environmental Preservation Fund	Environmental preservation fund	Point

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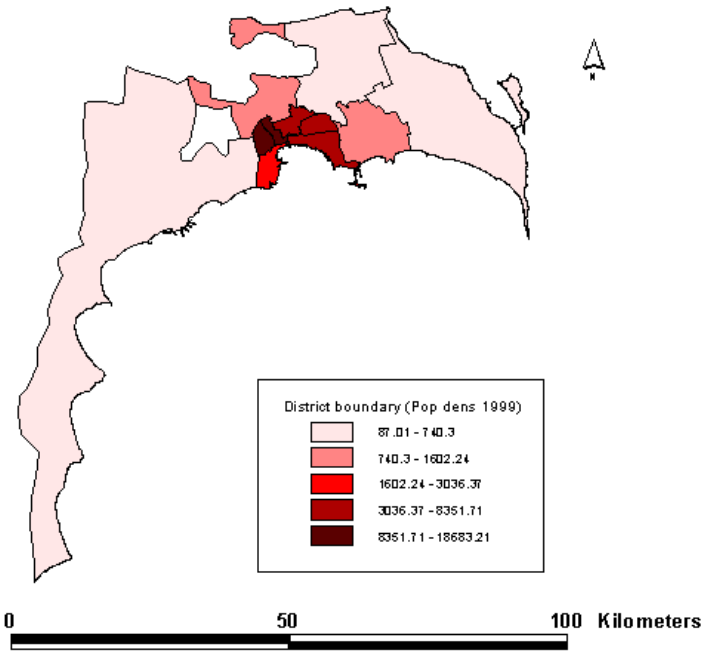
GIS Population

Baku Committed for Ecology



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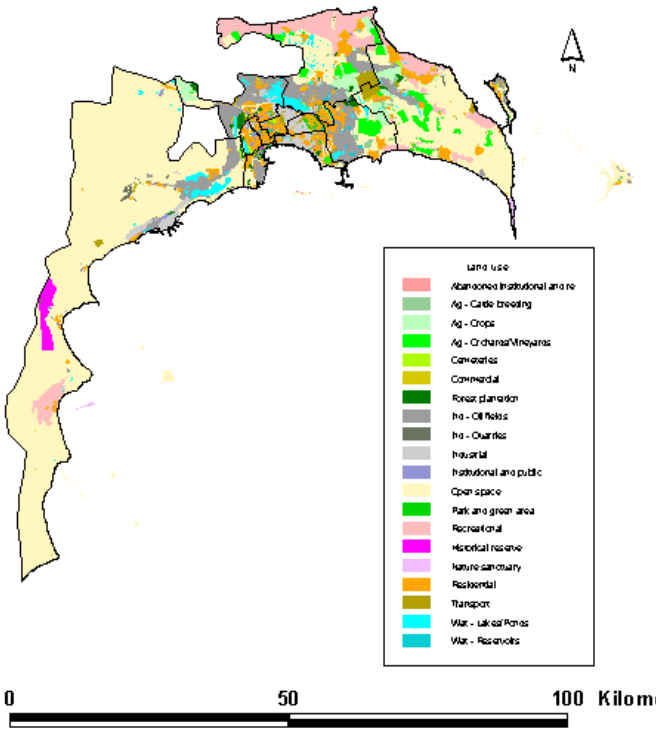
GIS Landuse

Baku Committed for Ecology



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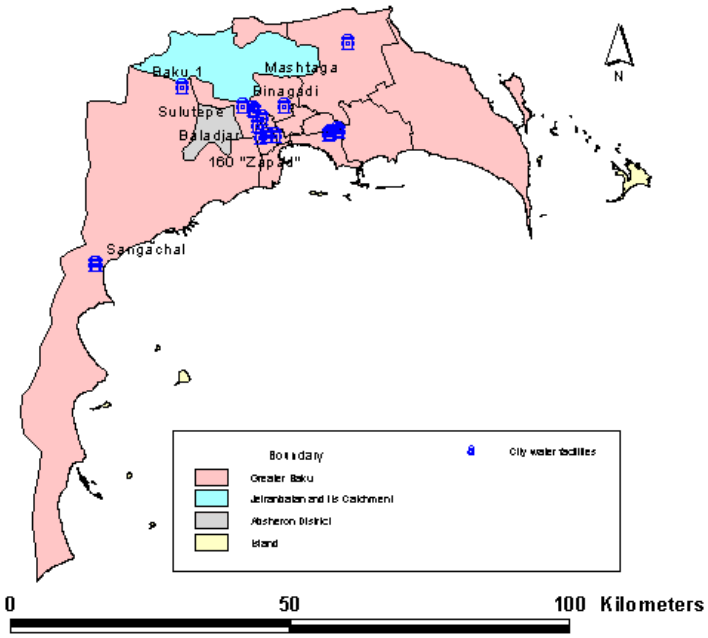
GIS City Water Facilities

Baku Committed for Ecology



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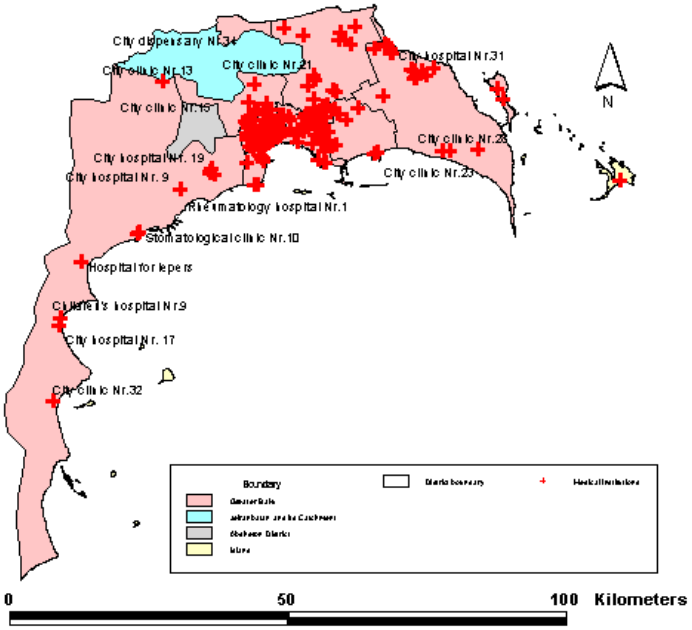
GIS Medical Institutios

Baku Committed for Ecology



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GIS Environmental Information

Baku Committed for Ecology

Main category	Sub category	Data type
Environmental Information (Pollution sources)	Environmental passports	Point
	Power generation plants	Point
	Oil mining ground	Grid
	Farmland (large-scale farmland)	Polygon
	Solid waste treatment / disposal	Point
	Sewage treatment facilities	Point
Environmental Information (Ambient quality)	Environmental quality / emission standards	Document
	Air quality	Point
	Water quality	Polygon
	Soil quality	Point
	Water contamination distribution	Grid
Environmental Information(Pollution maps)	Pollution maps	Polygon, Point

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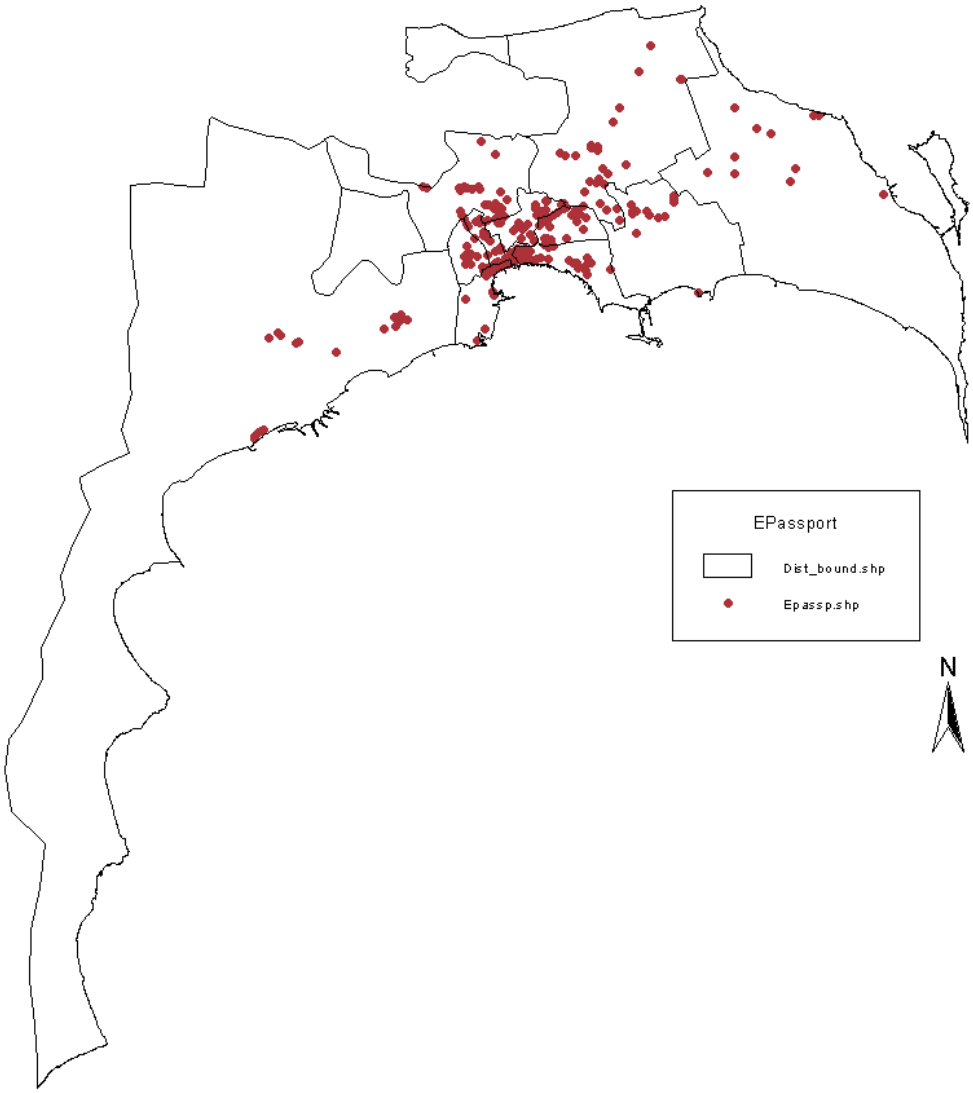
GIS Environmental Passport

Baku Committed for Ecology

This contain all locations of factories that have Environmental Passport



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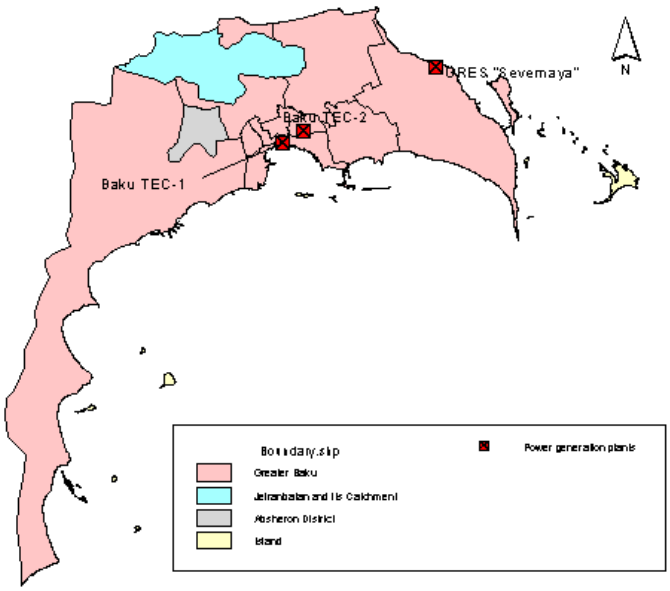
GIS Power Generation Plants

Baku Committed for Ecology



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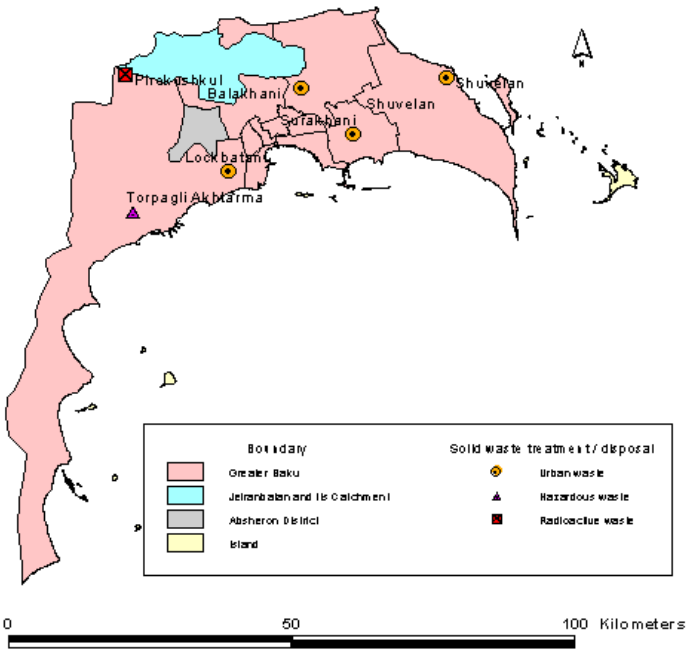
GIS Solid Waste Treatment/Disposal

Baku Committed for Ecology



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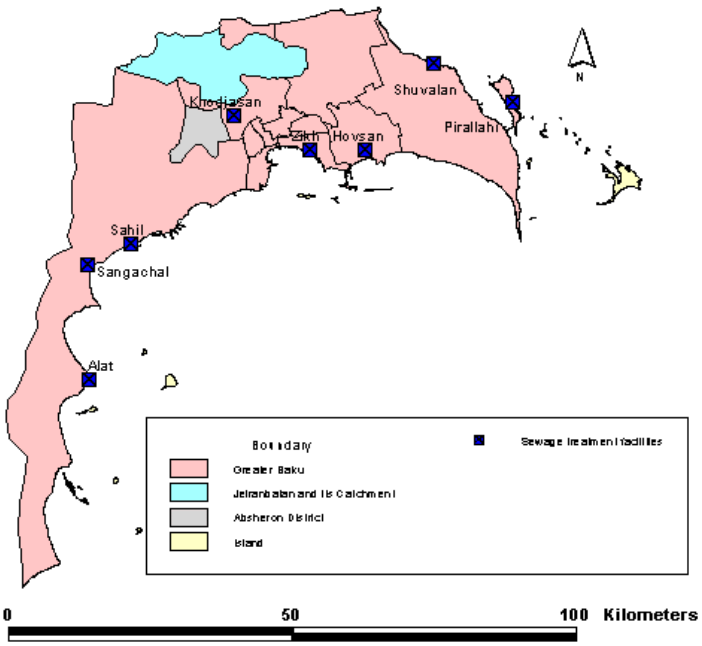
GIS Sewage Treatment Facilities

Baku Committed for Ecology



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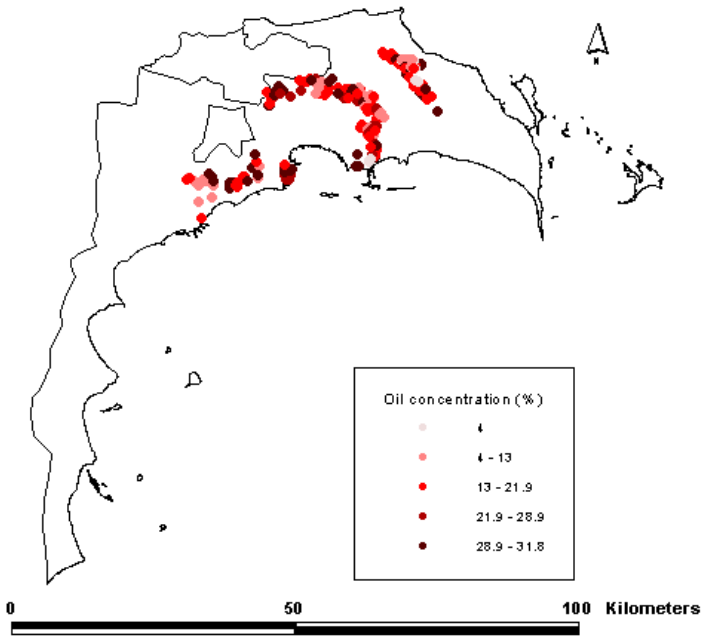
GIS Soil Quality

Baku Committed for Ecology



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