



Fourth Session of OIC Statistical Commission

21-23 April 2014, Ankara–Turkey



SPATIAL ANALYSIS OF STATISTICS

(WITH SPECIAL REFERENCE TO QATAR CENSUS 2010)

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Spatial Analysis of Statistics

Overview

- Spatial Analysis of Statistics- Answering Where & How!
- Spatial Analysis Techniques- Processes & Methods
- Spatial Analysis of Census 2010 Results- Examples from QSA Data Users
- Disseminating Spatially Analyzed Statistics- Printed, Digital and through Web Applications

Spatial Analysis of Statistics- Answering Where & How!

Spatial Analysis of Statistics - Answering Where & How!

- Data Users are often not only interested in answering the-
 - “How much” question, but
 - “How much is Where” question
- Spatial (Geographic) Analysis of Statistics-
 - Transforms Data into Information, and
 - Presents results to the users in a concise and easy to understand manner

For Example-

Population Distribution representation through Maps

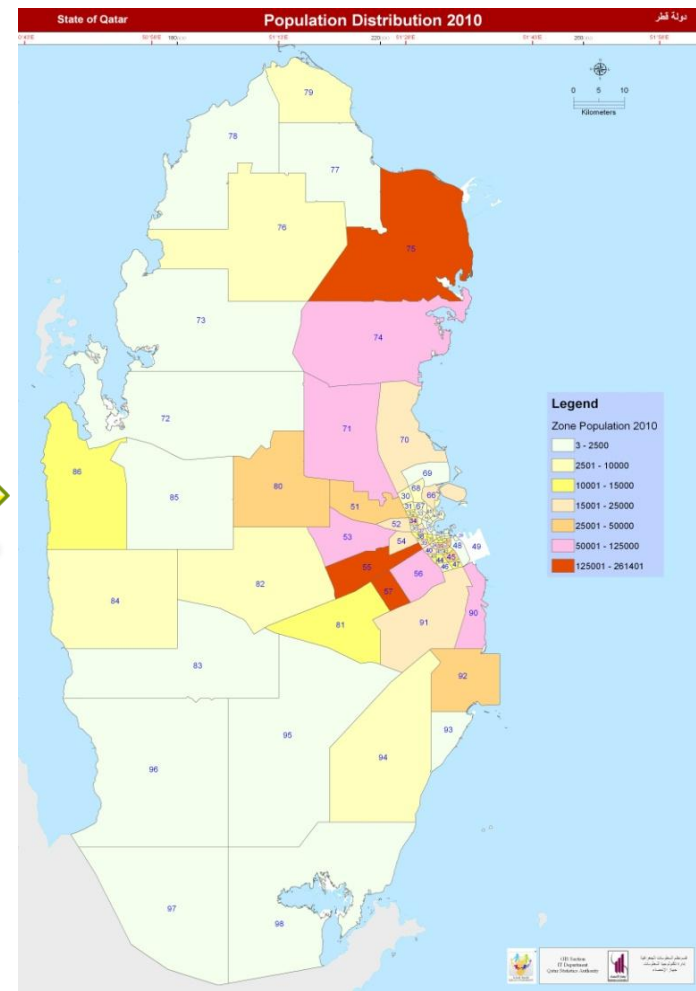
Spatial Analysis of Statistics-Answering Where & How!

- Population Distribution (By Census Blocks)

Tables

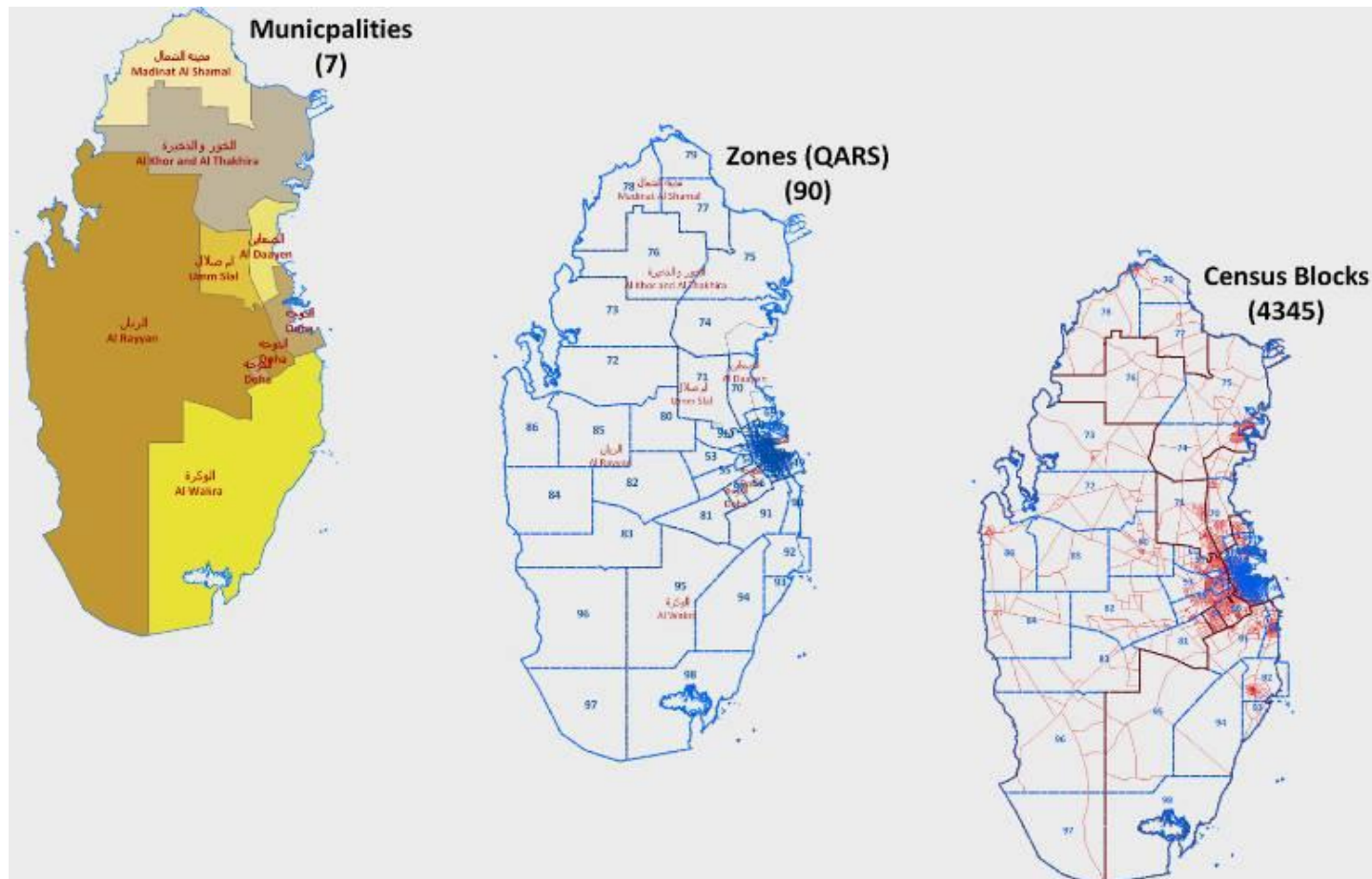
OBJECTID	Zone	Block Id	Block Cod	TOTAL_MALE	TOTAL_FEMA	TOTAL_P
172	13	5	Z13B005	501	0	501
173	13	6	Z13B006	1	0	1
174	13	7	Z13B007	113	46	159
175	13	37	Z13B037	39	0	39
176	13	38	Z13B038	392	329	721
177	13	42	Z13B042	206	141	347
178	13	41	Z13B041	227	187	414
179	13	40	Z13B040	208	107	315
180	13	27	Z13B027	234	122	356
181	13	29	Z13B029	366	215	581
182	13	8	Z13B008	75	48	123
183	13	9	Z13B009	86	40	126
184	13	11	Z13B011	38	5	43
185	13	28	Z13B028	215	180	395
186	13	34	Z13B034	216	16	232
187	13	33	Z13B033	<Null>	<Null>	<Null>
188	13	15	Z13B015	201	45	246
189	13	23	Z13B023	147	58	205
190	13	21	Z13B021	334	193	527
191	14	42	Z14B042	597	98	695
192	14	34	Z14B034	212	107	319
193	14	47	Z14B047	19	4	23
194	14	40	Z14B040	155	26	181
195	14	41	Z14B041	265	192	457
196	14	39	Z14B039	265	21	286
197	14	35	Z14B035	185	39	224
198	14	38	Z14B038	278	26	304
199	14	43	Z14B043	329	43	372
200	14	36	Z14B036	134	17	151
201	14	37	Z14B037	397	36	433
202	14	44	Z14B044	380	80	460
203	14	29	Z14B029	145	14	159
204	14	33	Z14B033	79	6	85
205	14	20	Z14B020	359	2	361
206	14	10	Z14B010	<Null>	<Null>	<Null>

Maps



Spatial Analysis Techniques- Processes & Methods- Census Geography

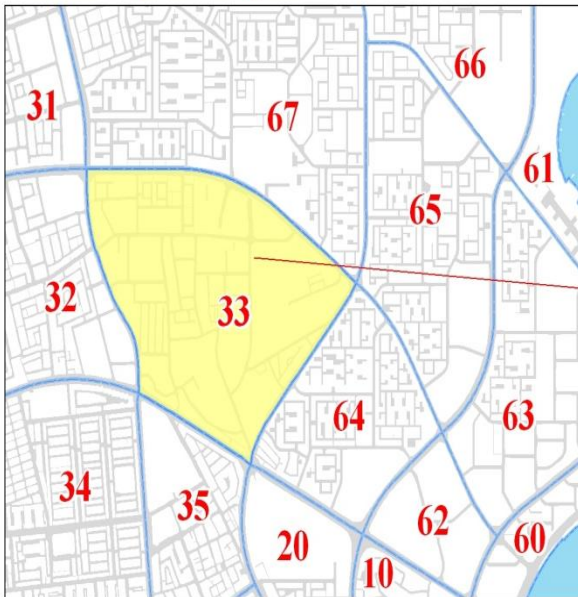
- Qatar Three Tier Administrative/ Census Data Unit Hierarchy 2010



Spatial Analysis Techniques-Processes & Methods- Census GIS Database

- Zone Level- Census GIS Database

Zones (QARS) 2010



Census Geography Database

Geographic Features Table- Zones

OBJECT	ZONE_NO	SHAPE_Le	SHAPE_Are
11664	35	4537.2	1118086.0
11667	63	6033.8	1953118.4
11668	65	6244.9	2104705.3
11671	67	9023.9	4228395.7
11674	33	6668.6	2743700.2
11712	64	4772.3	1411789.0

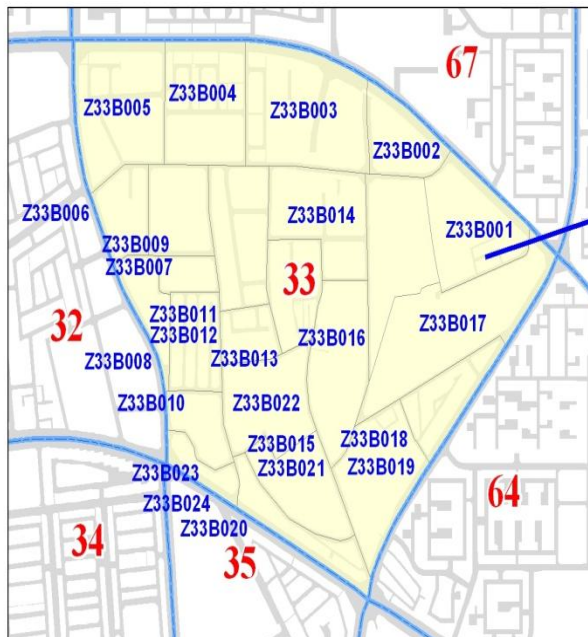
Attribute Table - Zones

ZONE_NO	MALES	FEMALES	TOTAL2010
35	4632	3070	7702
63	3161	2009	5170
65	3686	4024	7710
67	4078	4508	8586
33	2909	2288	5197
64	2100	1924	4024

Spatial Analysis Techniques Processes & Methods- Census GIS Database contd..

- Census Block Level- Census GIS Database

Census Blocks 2010



Geographic Features Table- Census Blocks

OBJECTID	ZONENO	BLOCKNO	BLOCKCODE	Shape_L	Shape_Area
1074	33	1	Z33B001	1566.3	149061.4
1075	33	2	Z33B002	1234.5	85880.4
1077	33	3	Z33B003	1957.7	232501.5
1085	33	4	Z33B004	1635.0	166593.0
1076	33	5	Z33B005	1798.5	193601.3
1086	33	6	Z33B006	1071.4	70943.5
1073	33	7	Z33B007	1229.2	91938.2

Attribute Table- Census Blocks

BLOCKCODE	MALES2010	FEM2010	TOTAL2010
Z33B001	103	90	193
Z33B002	16	0	16
Z33B003	3	0	3
Z33B004	168	178	346
Z33B005	100	80	180
Z33B006	200	62	262
Z33B007	0	0	0

Spatial Analysis Techniques Processes & Methods- Some Prevalent Forms useful with Population data

- **Thematic Mapping**- Spatial & Temporal

Common

- » **Choropleths**- Color Maps

Advanced

- » **Dasymetric Mapping**- using geographic layers such as Land use
- » **Volumetric Mapping**- Estimating and Representing Statistics at small Data Units level for which Census data is not made available- e.g., for Buildings falling within a Census Block
- **Queries**- Where & How and sometime answering Why!
- **Transformation**- Buffering- Point, Line & Polygon

Spatial Analysis Techniques Processes & Methods- Some Prevalent Forms useful with Population data

– Contd..

- **Spatial Interpolation-** method designed to fill in values that lie between observations (Samples).

The type of analysis include-

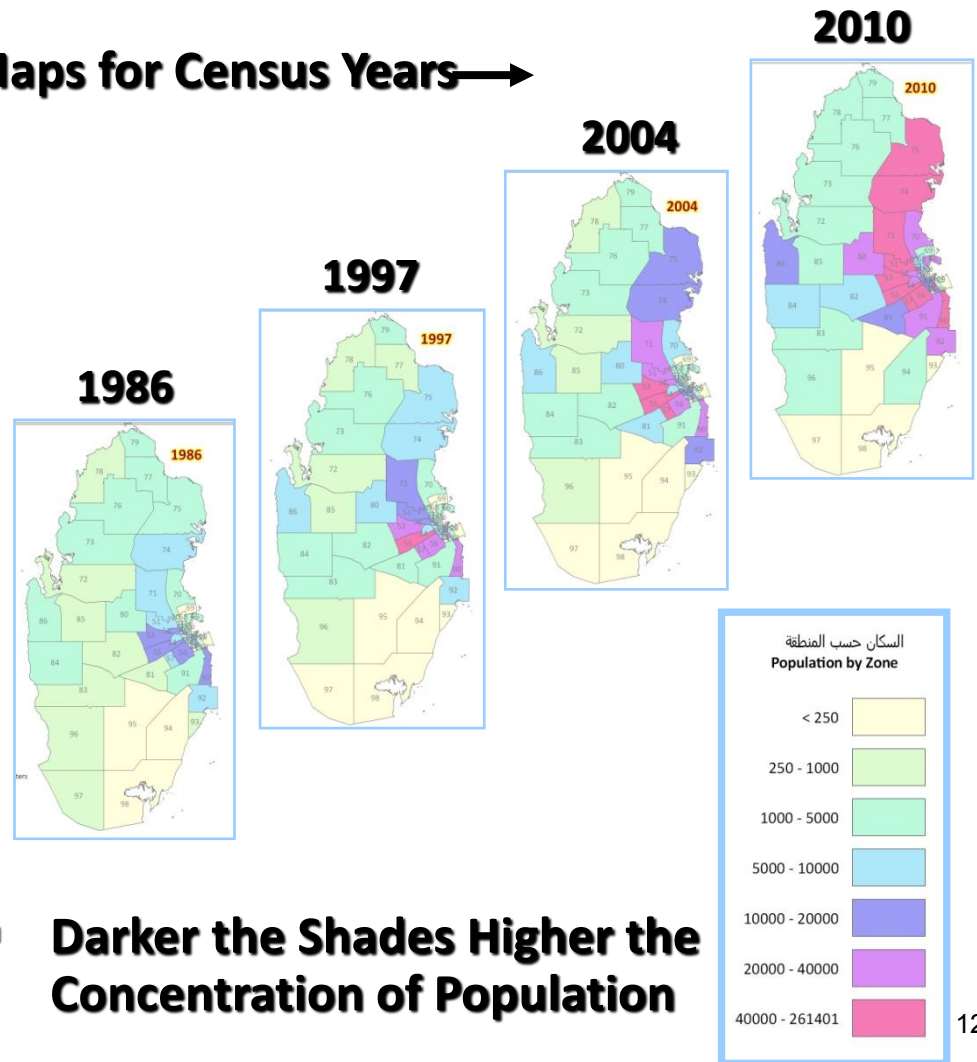
- **Kriging-** estimate the values of unsampled sites-
- **Thiessen polygons-** assumes that the values of the unsampled data are equivalent to those of the sampled points.
- **Centre of Population-** used to display the center of population using the weighted average of x and y coordinates of populated points
- **Cluster analysis-** regards the distribution of points in space irrespective of their actual locations to determine whether patterns are random, clustered, or dispersed
- **Hot Spots-** are where high values are surrounded by high values, or cold spots, where low values are surrounded by low values.

Spatial Analysis Techniques & Methods- Transforming Mapping- Spatial & Temporal

Table

ZONE_NO	POP_86	POP_97	POP04	POP2010
1	1291	1047	827	240
2	1168	515	294	35
3	6689	5415	7273	4886
4	7333	7914	9655	14063
5	3496	3546	3175	4138
6	3144	3120	3917	3462
7	1484	1353	1901	679
10	3262	3206	3921	8
11	5170	3724	5236	63
12	4436	3558	1379	1067
13	3254	3217	4615	8648
14	6612	7565	9385	10808
15	7698	8129	9459	13059
16	7255	7099	9330	14230
17	4450	4306	6130	7125
18	683	656	777	741
19	279	260	176	6
20	143	71	31	539
21	696	595	576	1532
22	4681	5175	6869	10590
23	5833	7429	8003	13582
24	8035	8649	10391	17219
25	10658	14074	19024	31573
26	9141	10826	16697	24763
27	13226	14022	19345	26069
28	1267	1554	1479	1868
29	2338	1969	770	1
30	596	1866	4093	7059
31	927	1493	4486	9871
32	5958	7780	8246	14725
33	1419	2179	2952	5197
34	16867	16869	19821	35125
35	2776	4323	5311	7702
36	1460	2549	2982	4716
37	11873	12502	13189	21066
38	3962	5447	5323	14113
39	7365	9889	10963	15184
40	5418	7573	10818	15114
41	4796	3660	4606	6204

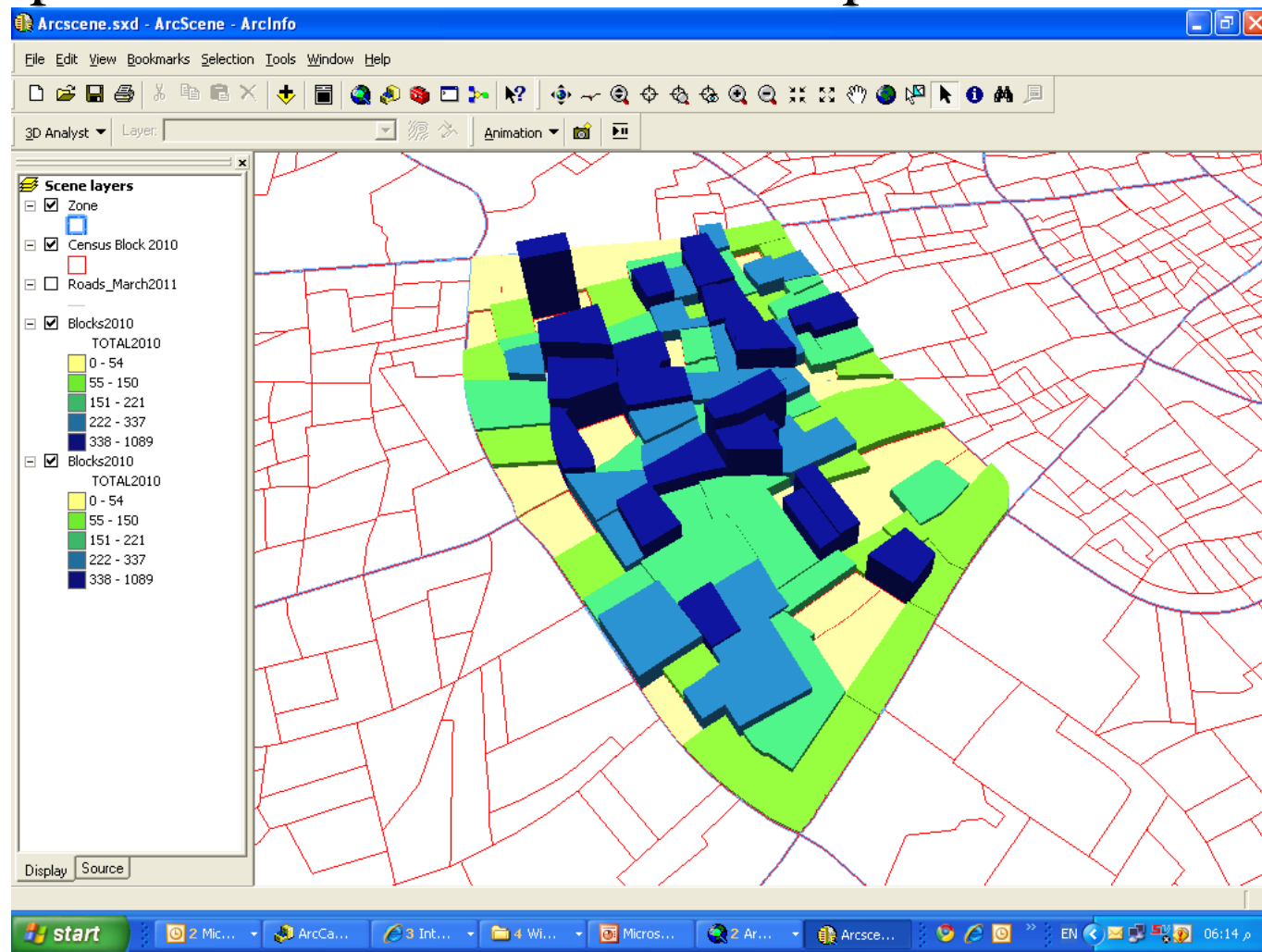
Maps for Census Years →



- Darker the Shades Higher the Concentration of Population

- 2D & 3D Representation of Census 2010 Population Data

- # 3D

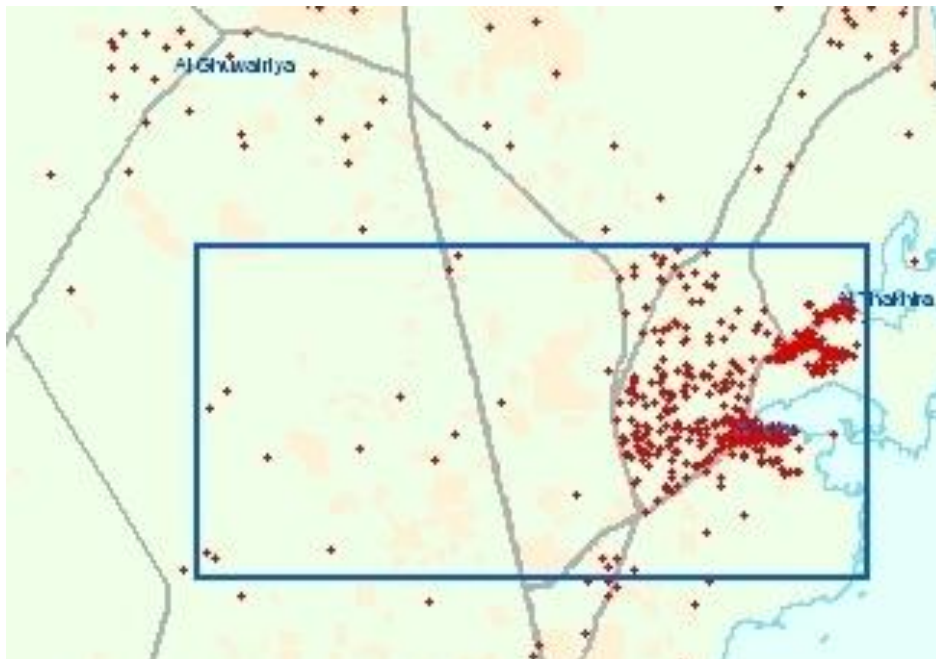


Spatial Analysis Techniques & Methods-

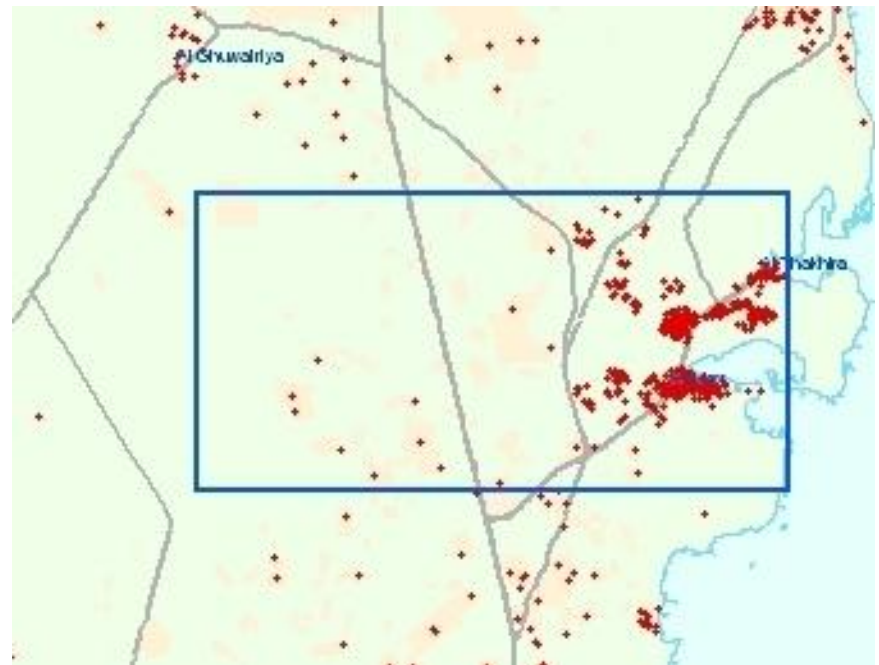
Dasymetric Mapping

- Dasymetric Mapping

Before



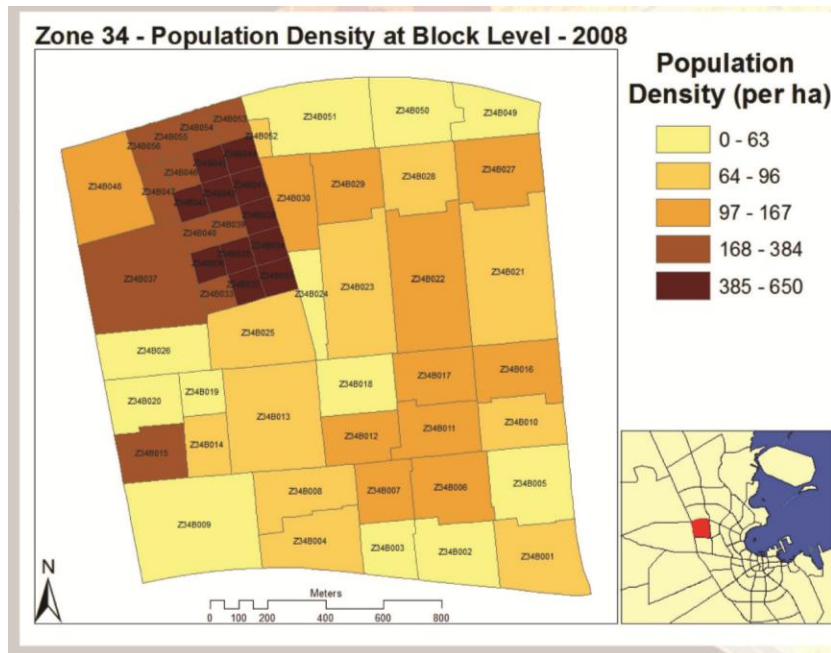
After



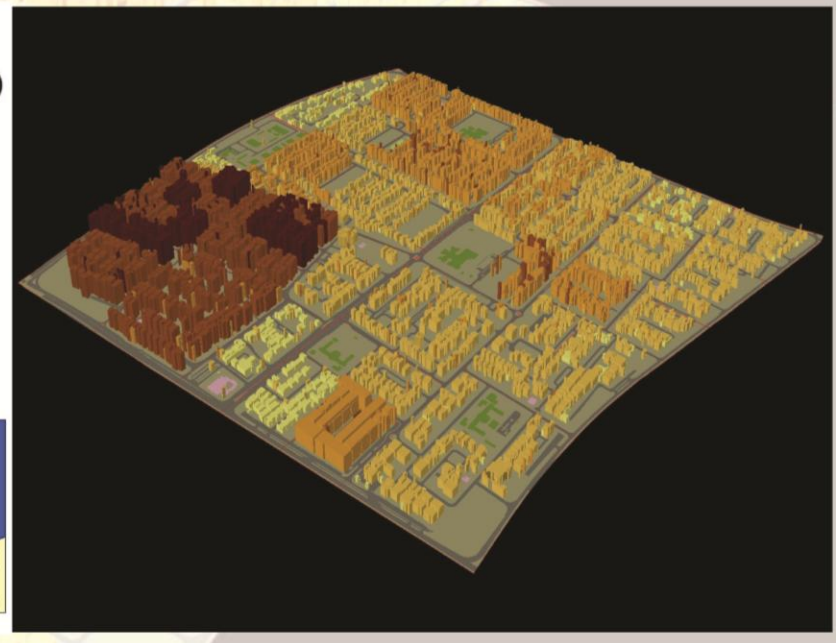
Spatial Analysis Techniques & Methods- Volumetric Mapping

- Volumetric Mapping

Population Data by Census Blocks

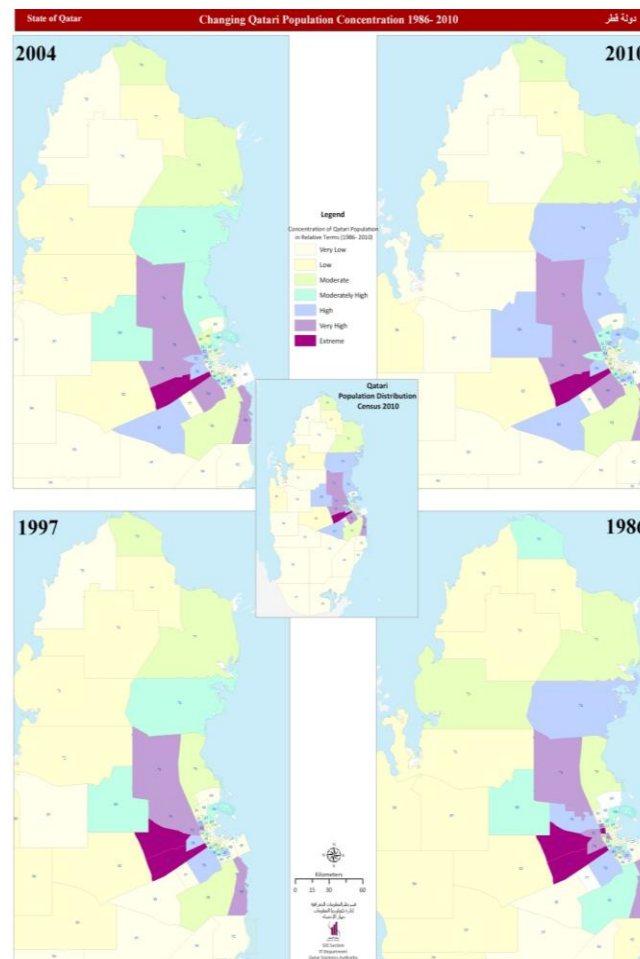


Estimated Population Data by Buildings



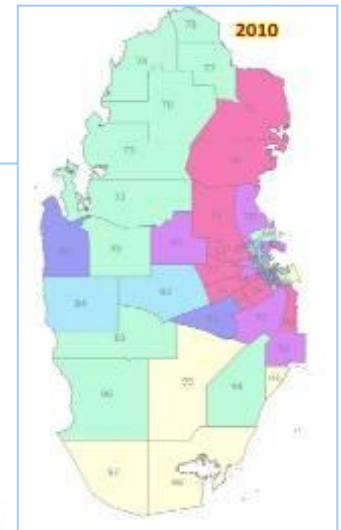
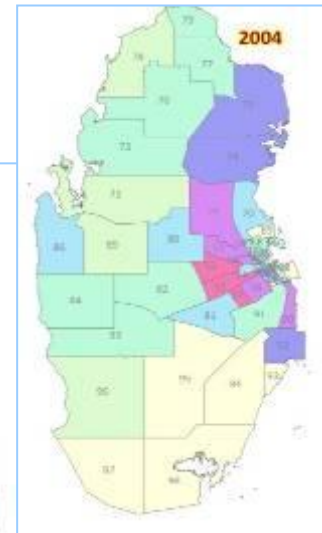
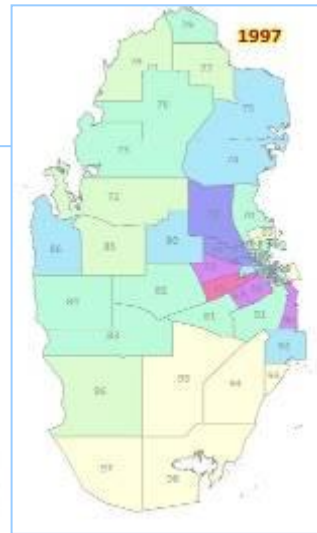
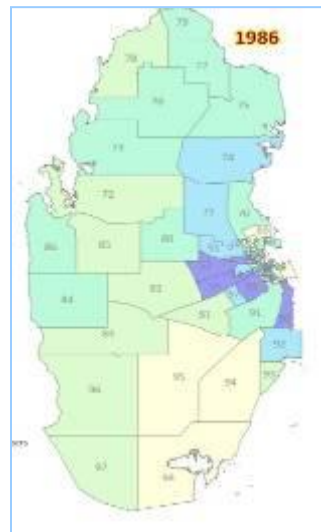
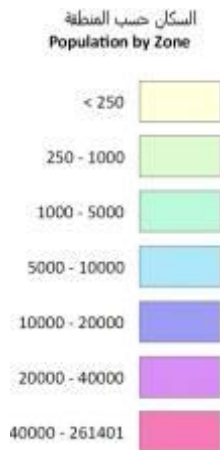
Spatial Analysis Techniques & Methods- Trends & Patterns

- Changing Concentration of Qatari Population in 25 Years



Spatial Analysis Techniques & Methods- Trends & Patterns

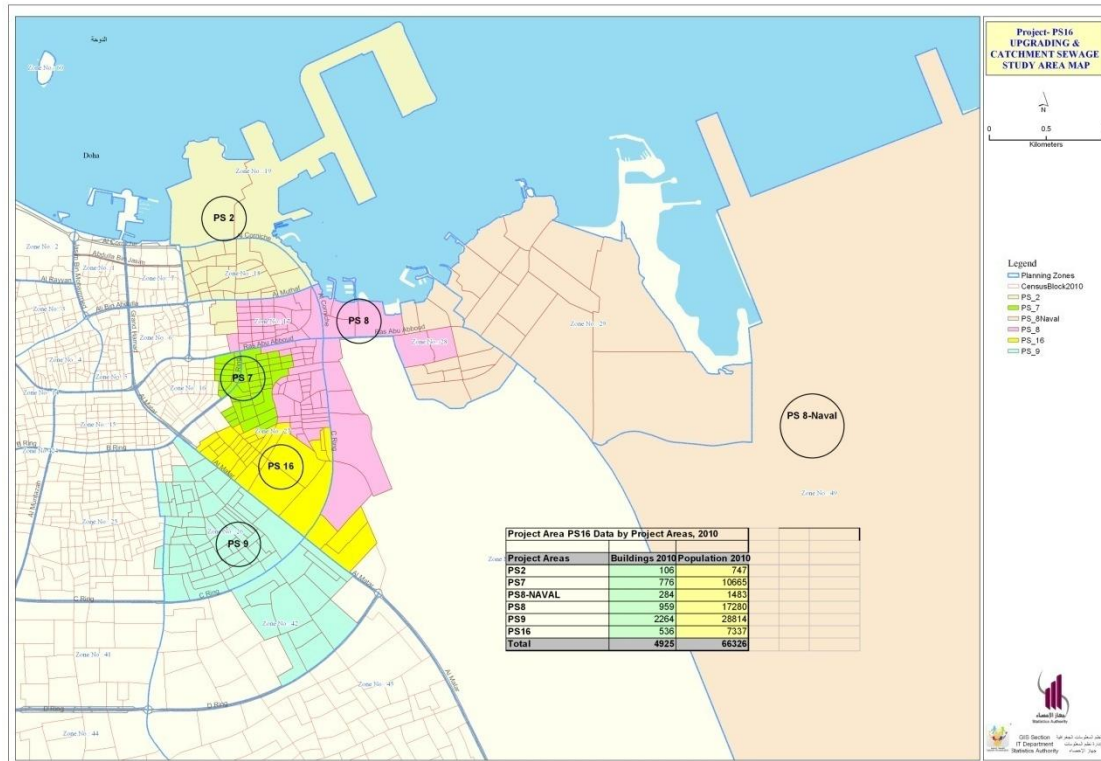
- Theme_Representation- Changing Population Concentration (1986-2010)



Spatial Analysis of Census 2010 Results- Examples from QSA Data Users

Spatial Analysis of Census 2010 Results- Examples from QSA Data Users

- Data Retrieval for User Specified Areas-



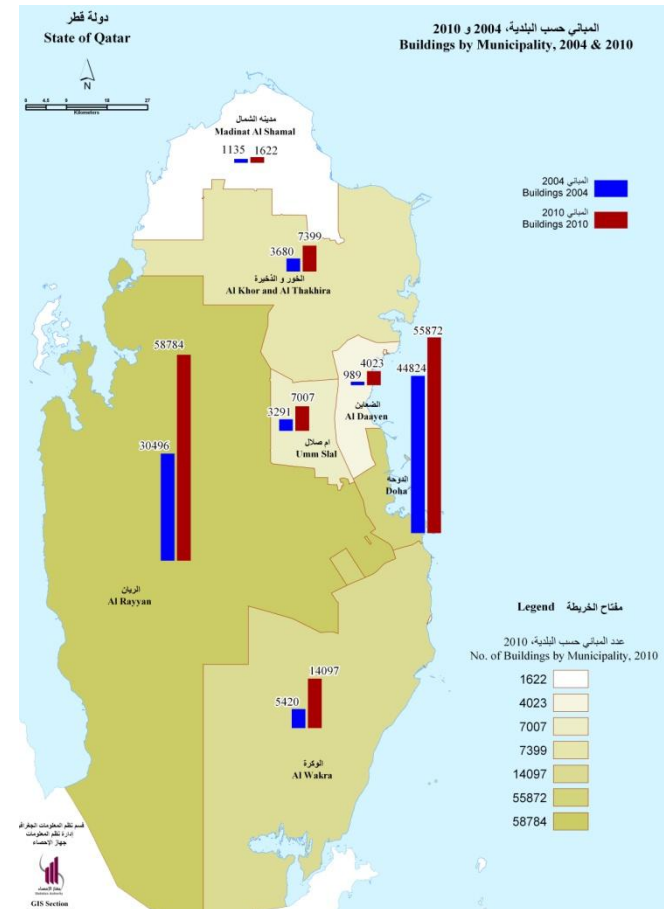
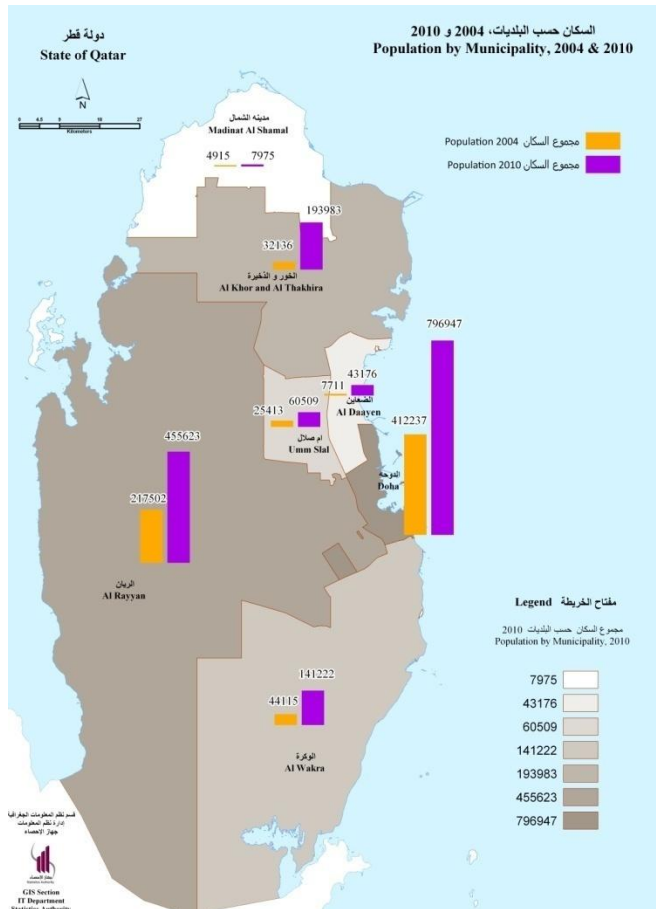
ASGHAL (Sewage Catchment- Project Areas)

Project Area PS16 Data by Project Areas, 2010		
Project Areas	Buildings 2010	Population 2010
PS2	106	747
PS7	776	10665
PS8-NAVAL	284	1483
PS8	959	17280
PS9	2264	28814
PS16	536	7337
Total	4925	66326



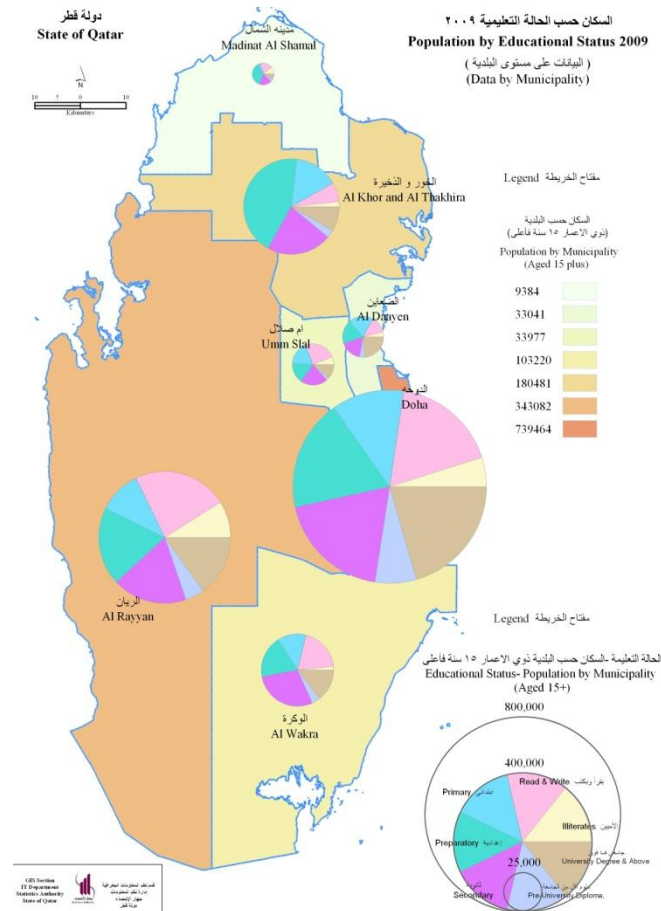
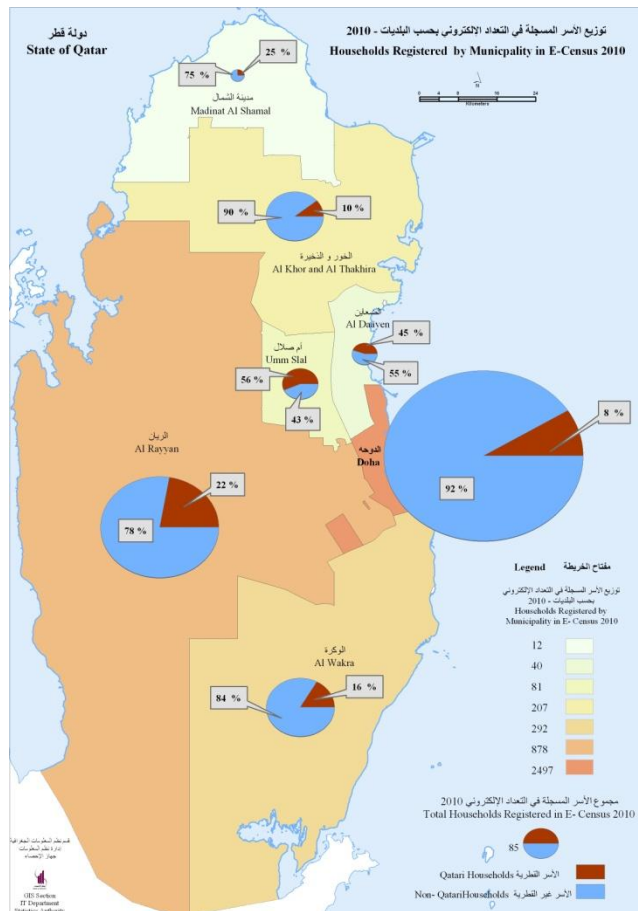
Spatial Analysis of Census 2010 Results- Examples from QSA Data Users

- Thematic Mapping- Census 2010 Results Publications



Spatial Analysis of Census 2010 Results- Examples from QSA Data Users

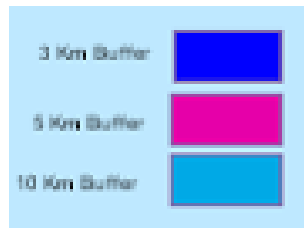
- Thematic Mapping- Census 2010 Results- Publications



Spatial Analysis of Census 2010 Results- Examples from QSA Data Users

- Buffering- Point (Landmark)

- Census 2010 Data Request from Shopping Malls in Qatar
- Buffers of 3, 5 and 10 Km surrounding the Location

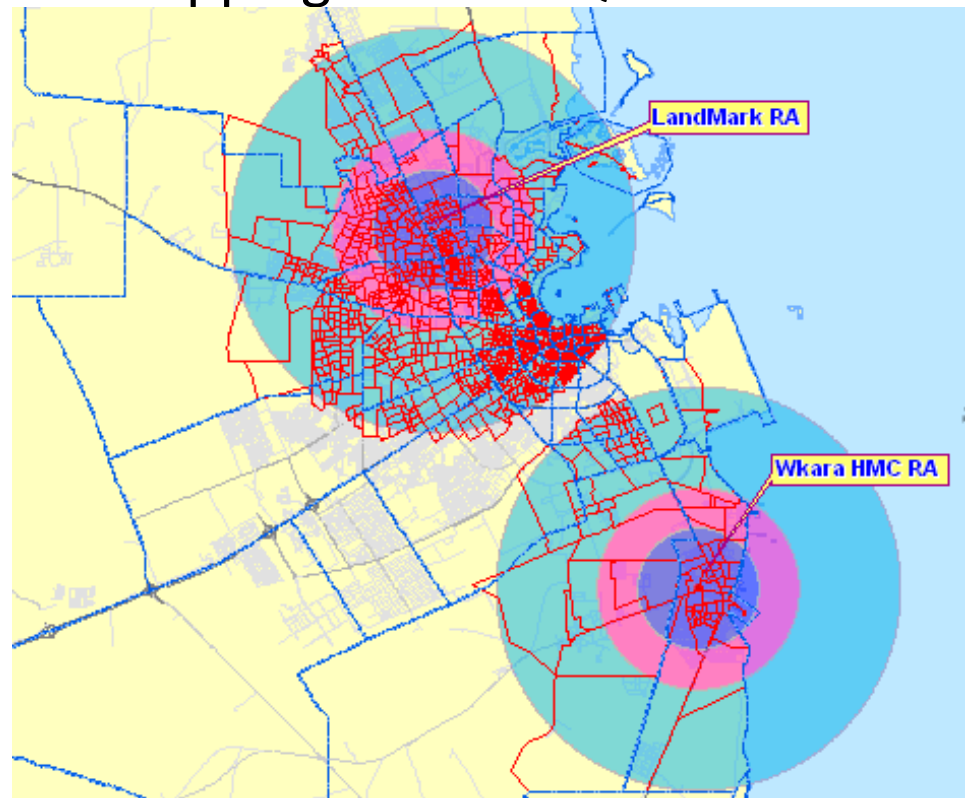
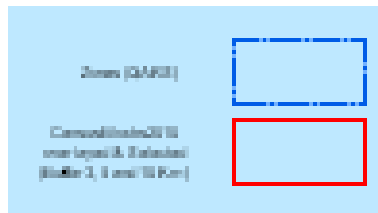


Two Proposed Mall Sites



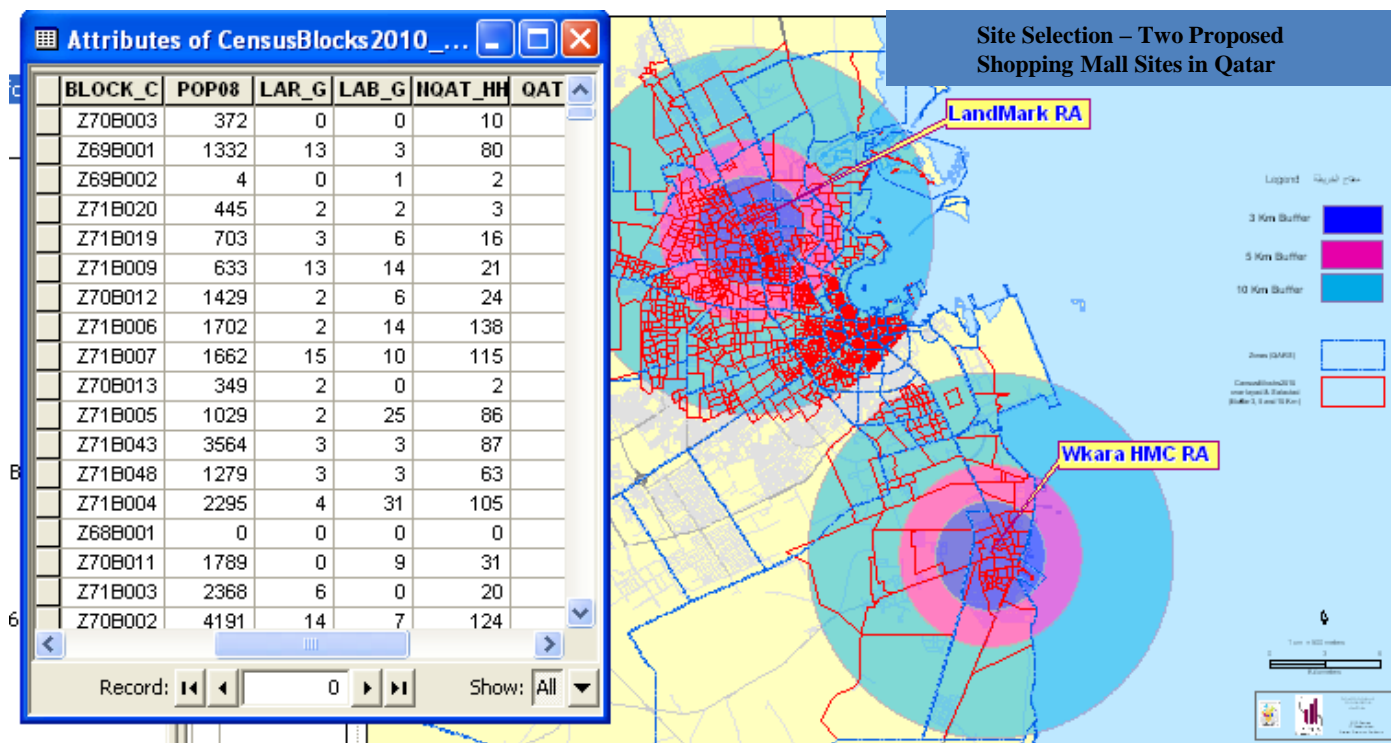
Spatial Analysis of Census 2010 Results- Examples from QSA Data Users

- Buffering- Point (Landmark)
 - Census 2010 Data Request from Shopping Malls in Qatar
- Zone and Census 2010 Boundaries Overlaid and Intersected



Spatial Analysis of Census 2010 Results- Examples from QSA Data Users

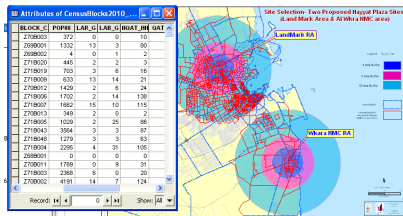
- Buffering- Point (Landmark)
 - Attribute data Joined to Census Block Layers using the Key Field- BLOCKCODE



Spatial Analysis of Census 2010 Results- Examples from QSA Data Users

- Buffering- Point (Landmark)

- Attribute data further Processed and Summary Tables Generated-



AI Wakra_HMC							
Buffer Distance	Total Populati on	Qatari Populati on	Non_Qat ari Populati on	Labor gatherin gs	Non_Qat ari Househo lds	Qatari Househol ds	Total Est Buildin gs
3 Kilometer	16890	3812	13078	314	779	608	86
5 Kilometer	693	0	693	21	15	0	17
10 Kilometer	39771	4194	35577	431	2083	650	335
Landmark RA							
Buffer Distance	Total Populati on	Qatari Populati on	Non_Qat ari Populati on	Labor gatherin gs	Non_Qat ari Househo lds	Qatari Househol ds	Total Estab_ Buildin gs
3 Kilometer	71939	16296	55643	1343	6598	2569	404
5 Kilometer	61749	15328	46421	1039	6599	2290	457
10 Kilometer	285842	35045	250797	12057	32241	5371	2578

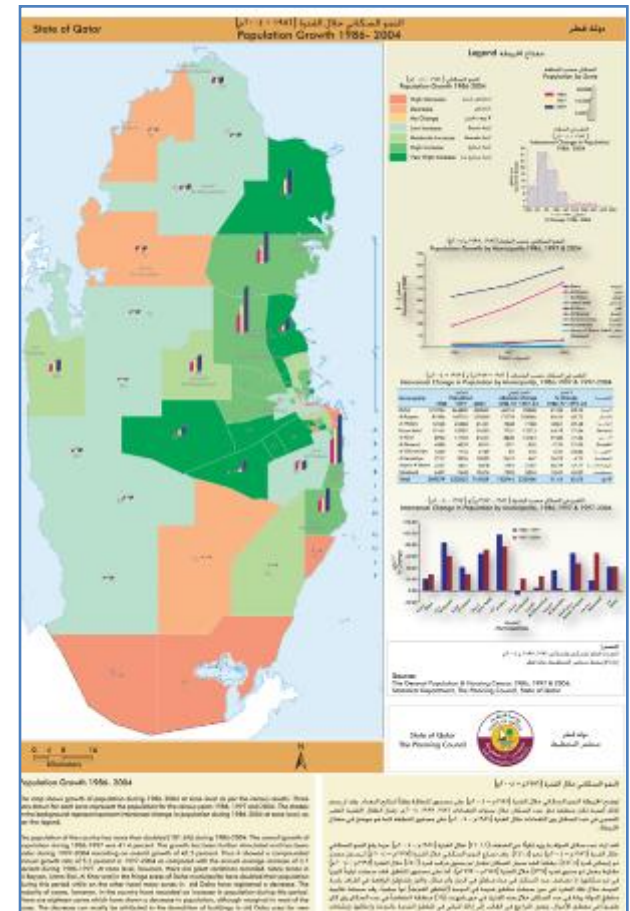
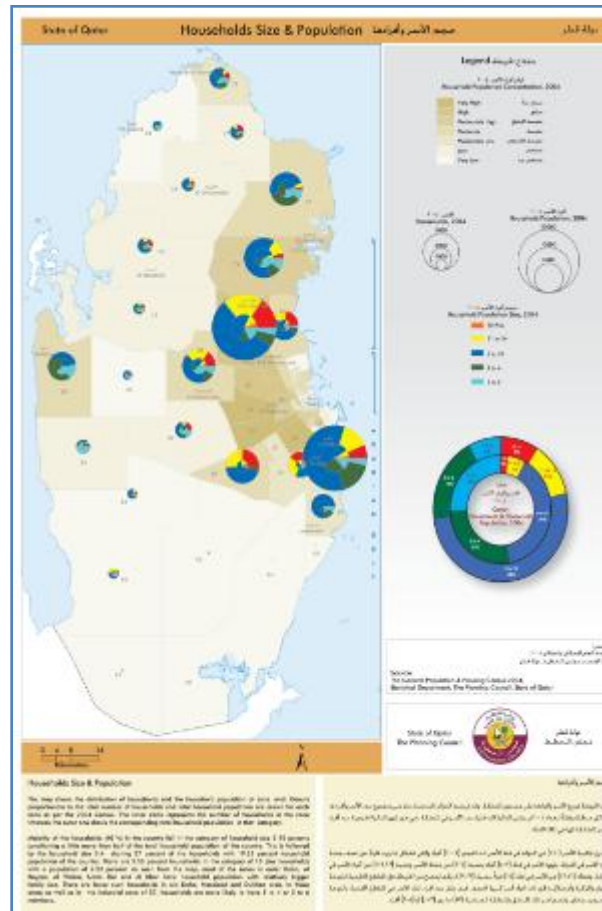
Disseminating Spatially Analyzed Statistics- Printed, Digital and through Web Applications

Disseminating Spatially Analyzed Statistics- Printed, Digital and Web Applications

- Thematic Maps in Printed form in Reports, Books and Atlases

- Theme Representation-

Atlases & Thematic Maps (Printed & Digital)



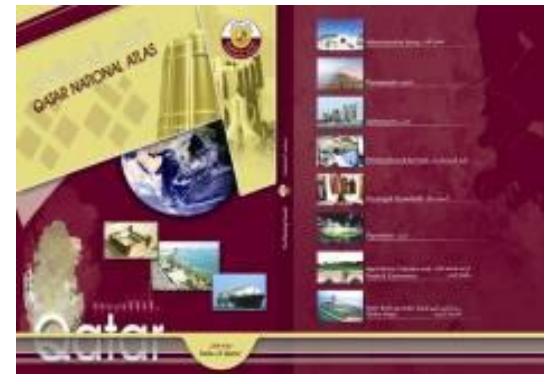
Disseminating Spatially Analyzed Statistics- Printed, Digital and Web Applications

- Atlases – Digital (Interactive) and Printed

Qatar Census 1997



Qatar Census 2004



Qatar Census 2010



Thank You!